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16. Abstract

Traffic congestion continues to be a growing problem for cities of all sizes in the United States. Transportation agencies in urban areas are facing the difficult challenges of providing an efficient and reliable transportation system for residents and businesses despite ever-diminishing resources. Agencies in these areas need the capability of determining the future benefits of transportation investments so they can communicate this information to the public. This capability is difficult for many agencies, especially some of the smaller ones, who may not have the resources to make these analyses without turning to expensive long-range models.

This research uses readily available socio-economic, land use, and traffic congestion data from many of the Texas urban areas to create prediction models to estimate future traffic congestion levels. Many of the transportation agencies that could utilize this tool do not have the resources to deal with large complex databases. Thus, basic information such as income, employment, single family residences, or commercial properties, to name a few, is used to create the predictions models.

Results from this research show that traffic congestion prediction models can be created from socio-economic and land use data. These models were created for eighteen individual Texas urban areas and several combinations of areas. Transportation agencies could use the results of this research to estimate future congestion in their respective areas.

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DEVELOPING A SKETCH-PLANNING TECHNIQUE RELATING ECONOMIC ACTIVITY AND URBAN MOBILITY IN SMALL AND MEDIUM-SIZED URBAN AREAS

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ABSTRACT

Traffic congestion continues to be a growing problem for cities of all sizes in the United States. Transportation agencies in urban areas are facing the difficult challenges of providing an efficient and reliable transportation system for residents and businesses despite ever-diminishing resources. Agencies in these areas need the capability of determining the future benefits of transportation investments so they can communicate this information to the public. This capability is difficult for many agencies, especially some of the smaller ones, who may not have the resources to make these analyses without turning to expensive long-range models.

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Results from this research show that traffic congestion prediction models can be created from socio-economic and land use data. These models were created for eighteen individual Texas urban areas and several combinations of areas. Transportation agencies could use the results of this research to estimate future congestion in their respective areas.

EXECUTIVE SUMMARY

INTRODUCTION

Many urban areas in Texas have experienced rapid population growth fueled by a strong state economy. With this rapid increase in population comes additional vehicle travel and traffic congestion. Small and medium-sized cities are particularly vulnerable to the increase in traffic congestion because of the inability of their relatively small transportation systems to handle fast-paced growth. Because of limited resources for large capital projects, especially in these smaller urban areas, the ability of transportation systems to expand is severely constrained and traffic congestion results.

Local economies are affected in both positive and negative ways by growth. The positive attributes of growth such as an increase in population and stronger local economy result in more traffic. The additional traffic and accompanying congestion result in the need for more transportation facilities. As those facilities are added, they invite more economic activity and more growth. This cycle of transportation and land use occurs continuously around the urban area (Lomax et al., 1997). The highway system in Atlanta, Georgia has allowed goods and people to move efficiently as the population of the area increased dramatically in the 1980s and 1990s (Neter et al., 1996). However, now the area is beleaguered with environmental quality issues, balanced growth problems and changing travel patterns that have resulted in traffic congestion.

Stephen Klineberg at Rice University conducts an annual survey of Houston residents to determine what they consider the biggest problem facing the city for that year (Klineberg, 2002). In the 20-year period between 1982 and 2001, Houston residents stated that traffic congestion was the largest problem facing the city in six of the twenty years surveyed. Only crime and the economy were rated higher than traffic congestion in the remaining 14 years. This is by no means a comprehensive look at the congestion, but it does point to the perspective of one city and the need to track the traffic congestion problem.

Metropolitan planning organizations (MPOs) are responsible for performing much of the transportation planning in urban areas. These MPOs could use a simple method of predicting future traffic congestion or mobility levels based on both current and future local indicators such as socio-economic information as well as data on land use types. The main reasons for using this data is that it is readily available, easy to understand, and easy to analyze.

Once the relationship between traffic congestion and basic economic and land use information is established, planners could use both economic and land use projections to more accurately predict future congestion levels across the urban area. The economic and land use indicators would provide support for the decisions made about future transportation improvements, so better investments could be made.

Many of the larger MPOs have full-scale transportation models that incorporate projected socio-economic and land use information to predict future travel demand on area roadways. These models may take hundreds and even thousands of person-hours to create and calibrate; funding and staffing resources that many of the smaller MPOs do not have. Without models such as these, MPOs have no means to estimate future congestion levels. Staffing and funding resources are so limited at many of the smaller MPOs, that they are often unable to even track simple demographic and land use changes (Stover & Koepke, 1988).

Many other limitations exist at the smaller MPOs that cause difficulties in attempting to predict future traffic levels with long-range modeling (Stover & Koepke, 1988). Some of these include:

- Lack of environmental planning capabilities
- Lack of adequate finances
- Lack of land-use forecasting capabilities
- Inadequate GIS training
- Outdated or no origin-destination surveys for the area
- Improper or no mode choice information for the area
- No in-house modeling capabilities.

Despite all of these limitations in performing long-range transportation modeling, many MPOs report that they have access to modeling software such as TRANPLAN or TRANSCAD that often generate the long-range models. However, just having the access does not mean they have the ability to use them. These models are very complex and require extensive training to operate.

STATEMENT OF THE PROBLEM

The hypothesis of this research is that there exists a relationship between economic and land use indicators that would allow for the prediction of traffic congestion levels at a macroscopic or areawide level in Texas urban areas.

This research will provide evidence to accept or reject this hypothesis through a statistical analysis. If evidence is found to accept the hypothesis, the research will provide a means for planners, especially in smaller cities, to project future traffic congestion levels. The hypothesis will be accepted if the results of the regression analysis show that models can be created with a certain amount of significance at a predetermined level.

MPOs in small and medium-sized cities often do not have the resources to create and maintain long-range planning transportation models. Without these models, MPOs currently have no basis to estimate future traffic congestion levels. Planners in these smaller cities could use a simple method of predicting future congestion levels based on readily available statistics. Basic socio-economic statistics such as per capita income or retail sales are typically maintained by state agencies. These agencies track information on land use for taxation purposes. If a quantitative link can be established between economic indicators, land use indicators, and traffic congestion levels, future congestion levels projections may be possible. This will enable local agencies to have a means of predicting how current or future funding levels or changes to local economic activities will affect roadway system performance.

RESEARCH OBJECTIVES

The proposed research presents will establish a quantitative link between economic indicators, land use indicators, and transportation congestion levels without the use of the 4-step modeling process. The link between land use, economic activity, and congestion levels will allow planners to estimate future congestion for an urban area. This estimation will allow planners to run “what if” scenarios of future transportation funding levels. The research will:

- Determine if relationships exist between the urban areas to be included in the research using a cluster analysis of the average performance of each area’s standardized economic and land use variables.

- Create a model showing the relationships between economic and land use indicators and urban area traffic congestion levels utilizing regression for each urban area or cluster of areas.

Literature Review

A comprehensive literature review was conducted on many aspects of urban data elements including economic and land use activity and urban mobility and congestion levels. Literature specific to the linkage between economic and land use activity and urban mobility and congestion levels was researched. The purpose of this task was to ensure that no research that may contribute to this was overlooked, unnecessarily duplicated, or to ensure that current literature was modified to meet the needs of the study.

Develop Study Design and Perform Data Collection

This task includes the development of the study design and the selection of the variables for inclusion in the research. Data was collected from two basic locations. The Texas State Comptroller's Office provided the information regarding economic and land use activity at the county level. A research report—the Urban Mobility Study—from the Texas Transportation Institute provided the information regarding mobility levels in the Texas urban areas (Schrank & Lomax, 2002). Data will be collected for the ten-year period 1988 to 1997.

Variables included in the analysis:

Economic indicators	Land use indicators
Total income	Single-family residences
Per capita income	Multi-family residences
Retail sales	Vacant land
Total employment	Farm acres
County population	Farm improved land (ranch)
Urban population	Commercial
Urban area size	Industrial

Mobility information

Travel Rate Index

Freeway lane-miles

Principal arterial lane-miles

Data Reduction

The data required some quality assurance after it was collected. The land use and economic data was obtained from the Texas Comptroller's Office for each county in Texas. The economic and land use data was at the county level and the congestion data were at the individual urban area level. The economic and land use data was aggregated from counties in each metropolitan area that correspond to each urban area. The urban boundaries were often much smaller than the metropolitan boundaries. Thus, this will ensure that the economic and land use changes occurring in and around each urban area were captured within those counties as the urban structure changes over time. Some of the influences on an urban area's congestion level occur outside of the urban boundary (Downs, 1992). Thus, including the land use and economic information from the semi-urban portions of the counties helped to better predict changes in the urban area as well.

Investigation of the Multicollinearity between the Predictor Variables—Economic and Land Use Indicators—for Each Area. A strong relationship often exists between demographic, economic, and land use variables depending on the indicators chosen. If there is a great deal of correlation between these predictors, called multicollinearity, it can affect the outcome of a regression analysis such as the Ordinary Least Squares (OLS). The multicollinearity of the predictors yields large estimated variances for the predicted values and makes it difficult to detect the significant regression coefficients.

This study used principal components analysis to remove the correlation in the predictors and provided the ability to solve a regression analysis when the sample size was less than the number of predictor variables. Principal components analysis produced composite variables that contained much of the original information from the predictor variables but removed the common information (correlation) between the original predictor variables. These new composite variables were used in the regression analysis instead of the original highly correlated predictor variables provided the true effect of each of the predictors (Neter et al., 1996; Hocking, 1996).

Investigation of the Relationships between Economic and Land Use Indicators and Urban Area Mobility Levels. Following the principal components analysis, a regression analysis was performed on the newly created principal component variables. Assuming the relationships were linear, the Ordinary Least Squares regression method was used to determine a regression equation, as it is one of the more powerful and popular methods of regression (Gujarati , 1995; Kleinbaum & Kupper, 1998). Two methods were evaluated for choosing the variables to be included in the regression equation (stepwise and Mallow's C_P) so that the most explanatory model could be selected. A regression model for each urban area was produced.

An analysis of the regression model results was performed to determine if autocorrelation existed as the data was from a time series. The Durbin-Watson test was performed to check for autocorrelation. In addition, the residual and studentized-residual plots were examined. If autocorrelation was found, a time series regression analysis was performed to remove this correlation. A new model was generated for the urban area.

Investigation of Relationships between Urban Areas. In order to detect if similar relationships existed among the urban areas, a clustering analysis was performed on the original predictor variables to discover any natural groupings. This was accomplished by developing a quantitative scale on which to measure the similarity between objects (Johnson & Wichern, 1982; Devore & Peck, 1997). Although a variety of distance measures were available to accomplish this, the research applied a cluster analysis over the average performance of each area's standardized predictors in SAS (SAS Institute, Inc., 1990). Several different clustering techniques were examined to determine which technique provided the best results. These techniques included k-means, single, average, and centroid (Johnson & Wichern, 1982; Devore & Peck, 1997). The process for the analysis of the clusters of areas followed the same one used to analyze the individual urban areas. The regression results of the cluster analysis and the individual urban area analysis were compared to determine if relationships exist.

CONCLUSIONS AND RECOMMENDATIONS

This research developed computer models that relate traffic congestion levels to socio-economic and land use data in Texas for urban areas and combinations of urban areas. Fourteen socio-economic and land use variables were utilized in these models. A summary of the key findings is presented in this chapter along with conclusions and a discussion of future research recommendations.

Findings

The findings in this report support the research hypothesis. There is evidence of a relationship between economic and land use data that allows for the prediction of traffic congestion at an areawide level. Fourteen of the eighteen individual urban area models have higher Adjusted R^2 values based on the predicted values of TRI from the models than a simple best-fit time trend line plotted through the original TRI information for each area. Since the best-fit time trend lines from the predicted values of the models outperform the best-fit time trend lines based on the original TRI data the majority of the time, there is sufficient evidence to accept the research hypothesis.

The models do not perform as well for the clusters of urban areas as they do for the individual urban areas. In all cases, the best-fit time trend lines for the original TRI information have a higher Adjusted R^2 values than the best-fit time trend lines for the predicted values generated by the models. Thus, at this time, one can predict the future TRI values for the clusters of urban areas better by using the historical TRI values rather than the models. The research hypothesis is not supported for the clusters of urban areas.

Conclusions

The findings in this report support the research hypothesis for individual urban areas. There is evidence of a relationship between economic and land use data that allows for the prediction of traffic congestion at an areawide level. At this time, the hypothesis is supported for individual urban areas but not groups of urban areas. A simple best-fit time trend model of the original TRI data is better at predicting future congestion levels in clusters of urban areas than the models that have been created in this research.

The models developed in this research provide a mechanism to predict future traffic congestion levels for a given urban area based on past economic and land use information. The models provide planning agencies with a means to perform "what-if" scenarios based on various economic forecasts, land use forecasts and projected transportation funding levels. Before this research, a long-range planning model had to be utilized to predict future congestion levels. And, for detailed transportation network information at the roadway section or corridor level, the long-range planning model remains a necessity. These new models will not replace the long-range model's capabilities. However, the new models will provide a means of quickly obtaining planning-level figures on future traffic congestion levels to convey to elected officials, policy makers, or others who may want to see the "big picture" effects of such things as transportation policy decisions or economic growth in their area.

A planner working in Denton County could enter a projected population estimate into the model and determine its effect on congestion in the Denton urban area. For example, the population of Denton County is expected to grow from about 371,500 in 1997 to 390,000 by 2005. After entering the new population into the model, the TRI rises from 1.104 to 1.106. If at the same time, the employment climbs from about 98,750 in 1997 to 110,000 in 2005, the TRI would climb to 1.110. Thus, the combination of the two socio-economic projections increased the TRI by 0.004. Not all variables, however, have a positive effect on the TRI.

Changes to some variables may show congestion to be improving despite adding more persons to the community or increasing total income; occurrences that would lead one to believe that congestion should worsen. In the Denton example above, if the number of commercial businesses in the urban area rises from 4,120 in 1997 to 4,250 in 2005 the TRI drops from 1.110 to 1.107. One would believe that congestion should increase if the number of businesses rises in an area. This decline in the TRI is due to the interaction of all of the variables and their relationship with TRI when the model was initially created. The value of one variable might have been relatively constant over the modeled period but would show growth over a longer period of time. With enough years of data in the model, some of these relationships between the individual variables and TRI will change and the expected outcomes will begin to occur.

This tool may be especially useful for smaller planning agencies that may not have the necessary staff to update or run a new long-range planning model. A small planning agency, as in the Denton example, could obtain the data utilized in this report, replicate the analysis that was performed without too much difficulty, and generate their own model internally. This model could be updated annually or every few years as more data becomes available.

The reason for performing the analysis on groups of urban areas is to determine if it might be possible to create one model that might fit all urban areas. This would be an extremely powerful tool that would be transportable from one area to the next. Functional models were created for several groups of urban areas in Texas. This is a promising finding, yet it appears that the individual urban area models tend to fit the data better at this point than do the group models. However, this does open the door for additional research to determine if more variables or different combinations of variables would make better predictors.

Recommendations for Future Research

Though this research provides contributions to the transportation literature in the area of projecting areawide traffic congestion levels using non-transportation related data, there are several areas in which future work is needed.

This research uses data obtained from two sources, the Texas State Comptrollers Office and the Texas Transportation Institute, to create a model capable of projecting traffic congestion levels in many Texas urban areas. There is a need for similar work that might look for additional sources of information to incorporate into the models. Other public agencies might have information on such things as unemployment rates or gross domestic products for individual urban areas. Also, the research needs to be replicated with data from states other than Texas to prove that the relationship holds elsewhere.

Future work should also include larger sample sizes in the model. This research used ten years of socio-economic, land use, and traffic congestion data. Additional data might create a model that is even more accurate at predicting traffic congestion levels if additional years of data are added.

More analysis needs to be performed on the clusters of urban areas to determine if it may be possible to generate one model that can be used in all areas. The results on this research effort are mixed in the analysis of multiple urban areas. The models of multiple urban areas are relatively good fits to the original data. However, at this time, they do not provide a better means of predicting future traffic congestion levels than a simple best-fit line projection of the original TRI values for the areas. Perhaps more variables or additional years of data may eventually make these models better predictors as well.

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CHAPTER I

INTRODUCTION

BACKGROUND

Many urban areas in Texas have experienced rapid population growth fueled by a strong state economy. With this rapid increase in population comes additional vehicle travel and traffic congestion. Small and medium-sized cities are particularly vulnerable to the increase in traffic congestion because of the inability of their relatively small transportation systems to handle fast-paced growth. Because of limited resources for large capital projects, especially in these smaller urban areas, the ability of transportation systems to expand is severely constrained and traffic congestion results.

Local economies are affected in both positive and negative ways by growth. The positive attributes of growth such as an increase in population and stronger local economy result in more traffic. The additional traffic and accompanying congestion result in the need for more transportation facilities. As those facilities are added, they invite more economic activity and more growth. This cycle of transportation and land use occurs continuously around the urban area (Lomax et al., 1997). The highway system in Atlanta, Georgia has allowed goods and people to move efficiently as the population of the area increased dramatically in the 1980s and 1990s (Neter et al., 1996). However, now the area is beleaguered with environmental quality issues, balanced growth problems and changing travel patterns that have resulted in traffic congestion.

Stephen Klineberg at Rice University conducts an annual survey of Houston residents to determine what they consider the biggest problem facing the city for that year (Klineberg, 2002). In the 20-year period between 1982 and 2001, Houston residents stated that traffic congestion was the largest problem facing the city in six of the twenty years surveyed. Only crime and the economy were rated higher than traffic congestion in the remaining 14 years. This is by no means a comprehensive look at the congestion, but it does point to the perspective of one city and the need to track the traffic congestion problem.

Metropolitan planning organizations (MPOs) are responsible for performing much of the transportation planning in urban areas. These MPOs could use a simple method of predicting future traffic congestion or mobility levels based on both current and future local indicators such as socio-economic information as well as data on land use types. The main reasons for using this data is that it is readily available, easy to understand, and easy to analyze.

Once the relationship between traffic congestion and basic economic and land use information is established, planners could use both economic and land use projections to more accurately predict future congestion levels across the urban area. The economic and land use indicators would provide support for the decisions made about future transportation improvements, so better investments could be made.

Many of the larger MPOs have full-scale transportation models that incorporate projected socio-economic and land use information to predict future travel demand on area roadways. These models may take hundreds and even thousands of person-hours to create and calibrate; funding and staffing resources that many of the smaller MPOs do not have. Without models such as these, MPOs have no means to estimate future congestion levels. Staffing and funding resources are so limited at many of the smaller MPOs, that they are often unable to even track simple demographic and land use changes (Stover & Koepke, 1988).

Many other limitations exist at the smaller MPOs that cause difficulties in attempting to predict future traffic levels with long-range modeling (Stover & Koepke, 1988). Some of these include:

- Lack of environmental planning capabilities
- Lack of adequate finances
- Lack of land-use forecasting capabilities
- Inadequate GIS training
- Outdated or no origin-destination surveys for the area
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Despite all of these limitations in performing long-range transportation modeling, many MPOs report that they have access to modeling software such as TRANPLAN or TRANSCAD that often generate the long-range models. However, just having the access does not mean they have the ability to use them. These models are very complex and require extensive training to operate.

STATEMENT OF THE PROBLEM

The hypothesis of this research is that there exists a relationship between economic and land use indicators that would allow for the prediction of traffic congestion levels at a macroscopic or areawide level in Texas urban areas.

This research will provide evidence to accept or reject this hypothesis through a statistical analysis. If evidence is found to accept the hypothesis, the research will provide a means for planners, especially in smaller cities, to project future traffic congestion levels. The hypothesis will be accepted if the results of the regression analysis show that models can be created with a certain amount of significance at a predetermined level.

MPOs in small and medium-sized cities often do not have the resources to create and maintain long-range planning transportation models. Without these models, MPOs currently have no basis to estimate future traffic congestion levels. Planners in these smaller cities could use a simple method of predicting future congestion levels based on readily available statistics. Basic socio-economic statistics such as per capita income or retail sales are typically maintained by state agencies. These agencies track information on land use for taxation purposes. If a quantitative link can be established between economic indicators, land use indicators, and traffic congestion levels, future congestion levels projections may be possible. This will enable local agencies to have a means of predicting how current or future funding levels or changes to local economic activities will affect roadway system performance.

RESEARCH OBJECTIVES

The proposed research presents will establish a quantitative link between economic indicators, land use indicators, and transportation congestion levels without the use of the 4-step modeling process. The link between land use, economic activity, and congestion levels will allow planners to estimate future congestion for an urban area. This estimation will allow planners to run "what if" scenarios of future transportation funding levels. The research will:

- Determine if relationships exist between the urban areas to be included in the research using a cluster analysis of the average performance of each area's standardized economic and land use variables.

- Create a model showing the relationships between economic and land use indicators and urban area traffic congestion levels utilizing regression for each urban area or cluster of areas.

ORGANIZATION OF THE REPORT

This report is organized into eight chapters. Chapter I includes an introduction to the research and discusses the background to the problem, statement of the problem, research objectives, research methodology, contribution of the research, and organization of the report. Chapter II provides a literature review of previous work specific to the relationship between socio-economic and land use data and traffic congestion levels. Chapter III presents aspects of the data collection including the experimental design and data sources. Chapter IV discusses the data preparation leading up to the regression analysis for the individual urban areas. This includes the standardization of the data, correlation matrix, and principal component analysis. Chapter V presents the results of the regression analysis for the individual urban areas and goes into detail on the analysis of one specific area. Chapter VI shows the data preparation for the analysis of the clusters of urban areas including the results of the cluster analysis. Chapter VII contains the results of the regression analysis of the clusters of urban areas. Chapter VIII provides research conclusions and recommendations based upon the research. Future research needs are also included. Appendices A through V contain supplemental materials for the analyses in Chapters V and VII, respectively.

CHAPTER II

LITERATURE REVIEW

INTRODUCTION

Cities have been experiencing tremendous growth in the past fifty years as the United States becomes increasingly urban. Local economies are affected in both positive and negative ways by this growth. The positive attributes of growth such as an increase in population and stronger local economy generally result in more traffic. The negative aspects include the additional traffic and accompanying congestion that often result in the need for more transportation facilities. Often, as those facilities are added, they invite more economic activity and more growth. This cycle of transportation and land use occurs continuously around the urban areas (Stover & Koepke, 1988). The highway system in Atlanta, Georgia has allowed goods and people to move efficiently as the population of the area increased dramatically in the 1980s and 1990s (Dunphy, 1997). However, now the area is plagued with environmental quality issues, balanced growth, problems with changing travel patterns and the resulting traffic congestion.

Stephen Klineberg at Rice University conducts an annual survey of Houston residents to determine what they consider the most prominent problem facing the city for that given year (Klineberg, 2002). In the 20-year period between 1982 and 2001, Houston residents stated that traffic congestion was the largest problem facing the city in six of the 20 years. Only crime and the economy were rated higher than traffic congestion in the remaining 14 years. This is by no means a comprehensive look at congestion, but it does point to the perspective of one city and the need to track the traffic congestion problem to communicate.

MPOs are responsible for performing much of the transportation planning in urban areas. They are also responsible for communicating this information to the residents of their area. Some of these MPOs need a simple method of predicting future traffic congestion or mobility levels to inform the public of future conditions. It would be beneficial if this method was based on both current and projected future local indicators such as socio-economic information and data on land use types. The main reasons for using this data is that it is readily available, easy to understand, and easy to analyze.

Once the relationship between congestion and basic economic and land use information is established, transportation agencies and planners alike could use both economic and land use projections to more accurately predict future congestion levels on an areawide basis. The economic and land use indicators would provide support for the decisions made about future transportation improvements, so better investments could be made.

Many of the larger MPOs have full-scale transportation models that incorporate projected socio-economic and land use information to predict future travel demand on area roadways. These models take hundreds and even thousands of person-hours to create and calibrate; funding and staffing resources that many of the smaller MPOs do not have. Without models such as these, MPOs have no way to estimate future congestion levels. Staffing and funding resources are so limited at many of the smaller MPOs that they are unable to even track simple demographic and land use changes in their respective areas (Wade, 1998).

Many other limitations exist at the smaller MPOs that cause difficulties in attempting to predict future traffic levels with long-range modeling (Wade, 1998). Some of these include:

- Lack of environmental planning capabilities
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Despite all of these limitations to perform long-range transportation modeling, many MPOs report that they have access to important modeling software such as TRANPLAN or TRANSCAD. However, they may not have the capabilities to use them despite having access to them.

BACKGROUND

The long range regional transportation model has been the basis for much of the transportation planning that has occurred in urban settings in the United States for the past three to four decades. Many areas began to look at regional transportation planning, and one, the Chicago Area Transportation Study (CATS), developed the first sophisticated land use and transportation network model in 1956. However, it took federal legislation, the 1973 Highway Act, to bring regional transportation modeling into the mainstream of the transportation profession (So & Getzels, 1988). Land use and economic information are used as the main input information into the long range model because cities have a certain amount of control over how the land is used in an area which has some effect on economic activity in an area (Branch, 1985). Since most cities have some idea of their future land use based on their current zoning and past growth, the availability of this information makes it a viable input to the long-range model.

Research has been performed for many years to determine the number of production and attraction trips associated with the various land use types (Edwards, 1999; Pline, 1999; Institute of Transportation Engineers [ITE], 1997). This information has been well documented and enables the regional models to estimate the trips that will occur in an area based on the combination of land uses. All of this information points to the fact that a relationship exists between land use type and trip generation. There is a large quantity of information published on the subject such as the ITE Trip Generation Handbook (ITE, 1997). Most of the research that has been performed on the relationship has been done at a localized level where the data collection is much easier to collect and analyze.

In addition to research at a localized level such as the individual shopping center or the housing subdivision, other research has looked into the effects of land use changes on transportation at a slightly higher level such as the corridor or sub-region. These efforts tie directly into this research but typically stop short, as they do not look at these changes as they affect the regional level. When reviewing the effect of a single land use change at the local level as compared to all of the changes at the regional level, the resulting traffic associated with a single new development may seem almost inconsequential in the massive amount of travel that occurs in an entire urban area. However, all of the traffic associated with the land use information could be aggregated to look at the effects of all of the land use changes from year to year represented as a single set of numbers. For example, the effect of a new shopping center may not have much of an impact at the regional land use information or in the areawide traffic congestion levels. But, all of the land use information such as the number of commercial shops or other uses could be aggregated by land use type on an annual basis. This information could be tracked with annual traffic congestion levels to form the relationship.

The following sections discuss in more detail some of the pertinent topics including the 4-step regional model, the land use and economic relationship to transportation, and performance measurement as it relates to traffic congestion.

THE 4-STEP REGIONAL PLANNING MODEL

The traditional long-range regional model involves the 4 steps that are shown below (Edwards, 1999; Mann & Dawoud, 2000). The premise behind the traditional 4-step model is that a given land use type will generate a certain number of trip ends, these trips will be distributed onto the transportation system as various modes, and the trips will choose a path from origin to destination that will minimize their travel time. The four steps are performed sequentially with the outputs from one step becoming the input for the following step. The initial inputs from the transportation network, land use, and socio-economic information are the inputs for the trip generation step. The output from the final step (network assignment) provides feedback information that can be used to make adjustments in the previous steps and additional models. The four steps are:

1. trip generation – traveling for a given purpose
2. trip distribution – choice of destination
3. modal choice – choice of travel mode
4. network assignment – choice of route

If one examines how long-range modeling is performed in Texas, MPOs from the majority of the Texas urban areas have other agencies, either the Texas Department of Transportation (TxDOT) or private consultants, perform their long-range travel forecast modeling efforts for them (Schrank and Farnsworth, 1998). Only the very large urban areas have the capabilities of performing their own modeling efforts in house. The smaller areas have the capability to perform a modeling analysis but do not have the resources necessary to construct and update the model prior to an analysis. TxDOT usually oversees the modeling process for the majority of the smaller areas. Based on conversations with several TxDOT employees, they may work on several of these the models for the small MPOs at once and do not always have the necessary resources to complete all of these models in a timely fashion. Even TxDOT with its large staff has to schedule when the various urban areas will have their models updated.

Attempts have been made to improve upon the analytical tools that are available for regional transportation planning. William Mann developed a software package called TP/4in1 that streamlines the four-step modeling process traditionally used for long-range modeling (Papacostas, 1987). TP/4in1 requires executing only one computer program and takes significantly less time than a traditional four-step travel forecasting process thus saving many person-hours of time to compile the model. The problem is that the model still requires all the data that is input into a traditional four-step model thus making the new software somewhat difficult for smaller MPOs to update.

MPOs also have used historic transportation and economic data to make forecasts. They form trendlines from the historic data and project these into the future. A problem with this method is that one of the key sources of economic data is the U.S. Census. This data is fine for analyses performed shortly after its release. However, since it is only collected every ten years, it is often too outdated to be used when the economy is booming like it has in Texas in recent years or when an economy is in a downturn. This information may represent a different economic growth rate than is currently in place. Another problem that exists when performing simple forecasting is that there can exist a disconnect between the transportation data and the economic activity in an area (Ortuzar & Willumson, 1994). The transportation projections are based on the traffic growth over the past 5 to 10 years while the economic activity could have already changed or may be changing dramatically in an area. The immediate impact of the changing economy will not be shown in the traffic data for several more years. This lag of information points to the need for an aggressive policy to maintain current economic information for input into the long-range model.

There are many different data required for 4-step models (Edwards, 1999). Some of these data include:

- Existing conditions of the regional transportation system
- Land use data in the region
- Demographic and economic data in the region
- Regional travel behavior
- Household travel data
- Transit on-board surveys
- Workplace surveys

- External trip surveys
- Commercial vehicle surveys

The process of collecting and incorporating this information is almost continuous. The information in this list that involves surveys is gathered by many different means. The surveys are conducted by telephone or mail and some are done with personal interviews. But, all of this information takes a great deal of time to gather and compile into the statistics that are needed by the model.

THE RELATIONSHIP BETWEEN TRANSPORTATION, LAND USE, AND ECONOMIC ACTIVITY

Many relationships have been shown between transportation and land use and transportation and economic activity (Hanson, 1995). The majority of these relationships are based on the change in trips or vehicle travel that occurs because of a land use change or a change in economic activity. Some research, discussed below, shows strong linkages between economic and land use activity and vehicle travel. Other research shows that the relationship is not as clear. These linkages have been shown at many different geographic levels including local neighborhood, roadway corridor and subarea. Thus, relationships have been shown to exist as is evident from the 4-step models which are based on land use and economic activity. Since the long-range modeling process typically uses economic and land use information to predict future transportation travel, the proposed model for this research should include it in some form as well.

Transportation and Economic Activity

Severe congestion can be detrimental to a region's economic growth. Traffic congestion reduces the efficiency of businesses and services that involve local travel (Litman & Laube, 1999). Many sectors of business such as manufacturing may change the way they conduct their business following a change in the transportation system such as reducing the amount of inventory they keep in stock because deliveries become more reliable (Lewis, 1991). Congestion and aging technologies used within companies may be viewed as bottlenecks to traffic, productivity and economic growth. A speaker at an Ohio forum offered the opinion that

Columbus area highway congestion was so bad that business growth had actually slowed (Bastarache et al., 1988).

Most studies on the relationship between economic and land use activity and transportation have focused on corridor-wide economics and traffic congestion, as opposed to more macroscopic levels. For example, a study in Garfield Township, Michigan was performed on the effects of widening a local street from two lanes to four (Schneider, 2000). The new roadway immediately had higher traffic levels and promoted rapid strip development along the newly widened roadway. This study, however, only focused on the area where the roadway was widened. It did not analyze whether the entire city benefited economically after the improvements were made or if the location of the economic activity had merely shifted within the city.

Congestion can serve as a sign that the economy of an area is doing well or is in distress (Schrank & Lomax, 2002). Traditionally in cities in the U.S., some amount of congestion is generated on the roadways during the peak periods. When the congestion does not form, it could be due to several factors including poorly located roadways relative to the current traffic needs, roadway capacity having been overbuilt in the past and traffic demand having not caught up with supply, or the area could be in economic distress (Kassoff, 1998). An increase in traffic demand in an area often stems from increased economic activity (i.e., more people need to get to jobs and more goods and services need to be shipped). Freight volumes are also a rough indicator of production, since each unit of economic output requires transportation inputs (Edwards, 1999). According to Hartgen and Curley (1999), the single most important factor affecting growth of traffic and traffic density in urban areas is employment growth. As the economy grows, the need for more transportation options grows as well.

Household income is an important factor in the changes in travel and the number of trips made. As income increases, passenger-miles of travel and vehicle trips usually increase as well (Ross & Dunning, 1999). The increase in real income, typically a sign of a healthy economy, results in more travel which can result in higher levels of traffic congestion. This is especially true when rapid economic expansion outpaces growth in transportation capacity (Schrank & Lomax, 2002).

Transportation and Land Use

The literature is divided on the link between land use and transportation, with some authors finding a strong link while others find very little in the way of a link if any at all. Most of the studies of the link between land use and transportation have been performed at the local level (i.e., a study of the effects of a new transit stop or effects of a new strip center on local traffic levels). Land use and transportation links are complex and often vary with modes, regions, densities, and land use policies. Some of the ways that changes to the transportation system impacts land use are with accessibility and complementary transportation investment policies (Polzin, 1999). This is especially true of new public transportation developments such as rail stations. Some research has shown that land use density and the mixes of land uses are tied to travel demand and ultimately affect traffic congestion levels.

Some authors postulate that the link between transportation and land use is weak. The proposition that travel is a derived demand underlies most policies intended to reduce vehicle travel and traffic congestion (Mokhtarian & Solomon, 1999). The jobs-to-housing balance (the relationship between the location of jobs and the location of housing) assumes that shortening the distance between residence and employment will shorten the commute. In theory this should somewhat reduce traffic congestion. The city of Portland has long been noted for its land use practices and increasing population density (Schrank & Lomax, 2002). Despite these efforts, the intensity of congestion in Portland has continued to increase. The trips that occur in Portland may be shorter, on average, than in many other U.S. cities, but the congestion experienced during the shorter trips is as severe or worse than that experienced in many other cities.

Additionally, travel to work is not always based on the shortest distance commute. High income groups may lengthen their commutes as they search for the low density development they prefer while low to medium income workers are drawn to higher density and accompanying affordability that potentially shorten their commutes. The link between land uses aimed at balancing jobs and housing and congestion is weak because different types of households have different preferences for where they want to live and work. If the land uses are changed to attract one certain household type, the other household types not attracted by that land use may negate the benefits derived by the changes. This negation happens as they seek another type of land use and counteract any benefits that were derived by the original land use changes. This process may result in the same congestion levels that existed before the changes (Levine, 1998).

In a study by Crane (1995), neo-traditional or new urbanism land use patterns do not appear to significantly affect travel behavior. Crane demonstrated that traffic calming and mixed-use land use policies, under general conditions, will not have much effect on automobile trips and total vehicle travel as many favoring new urbanism development would have one believe (Crane, 1995). Boarnet and Sarmiento (1996) suggest that evidence does not support the hypothesis that land use near a person's residence influences their non-work automobile trip frequencies. The same types and frequencies of trips will be made regardless of the nearby land uses. Other research states that land use is not the major cause of congestion on the transportation network but rather increases in population and vehicles. This is reflected by the increase of about 5 percent per year in average commute times despite relatively constant commute distances (Wachs et al., 1993). Thus, the increase must be due to more vehicles on the roadway.

Just as the case has been made that there is little relationship between land use and travel, other literature also suggests there is significant evidence demonstrating the link. The pattern of development following transportation access is well established although predicting how transportation will influence land use is difficult and inexact (Polzin, 1999). The jobs-to-housing balance of a region has a great deal of effect on the amount of travel in the region (Wachs et al., 1993). It has also been reported that increased land use density is highly correlated with reduced travel. This is influenced further when transit service becomes available with the land use changes. Areas with a high amount of retail employment may have longer than average peak periods but may have a lower amount of congestion during peak driving times (Federal Highway Administration, 1997). This is due to the fact that retail hours start after the morning peak commuting period and ends after the evening peak commute period. The work trips associated with these types of businesses would occur after the traditional peak periods of the day and may not contribute to congestion in those driving times but might create some additional congestion after the traditional rush to work.

Investments in transportation infrastructure often reduce congestion and allow the economy to grow. However, transportation investment will not directly generate an increase in the number of jobs; transportation investments improve the productivity of the workers but not necessarily the number of workers (Lewis, 1991). Macroeconomic studies have shown that transportation policies and investments make very little difference in total employment and related income in a region (Lewis, 1991). Only when the regional economy displays long-term unemployment can regional net gains in employment and income stem from transportation policies and projects. Long-term employment trends may be linked to under-investment in transportation and the associated increase in traffic congestion. One example is the Interstate highway system. This system of roadways contributed to overall economic growth where it was constructed, but as the system has become more and more congested it may have had adverse effects on the national economic performance with an increase in wasted productivity (Edwards, 1999).

Congestion Performance Measurement

There are many options regarding performance measures to use when analyzing urban mobility and congestion. Mobility measures are typically divided into the supplier's and user's perspectives (Lomax et al., 1997). The suppliers are concerned with system capacity and use measures such as Volume-to-Capacity (V/C) ratios or Level-of-Service (LOS) measures. User perspectives are typically shown with travel time, delay, and reliability measures. These types of measures reflect the concerns of motorists. This research will focus on these user perspective measures rather than the supplier perspective.

The Urban Mobility Study at the TTI has been reporting the results of research on traffic congestion for approximately 20 years (Schrank & Lomax, 2002). One important element of this research is the identification of performance measures for use in congestion research. This research has shown that there is no one measure that is preferred by either the users or the suppliers when it comes to reporting congestion levels. However, certain measures, when used in conjunction with information about the goals and desires of the public, can provide a framework to analyze how well the land use and transportation systems serve the needs of travelers and businesses. Performance measures based on travel time have been shown to satisfy the needs for providing mobility or congestion information to the public (Schrank & Lomax, 2000; Lomax et al., 1997). One such measure, the Travel Rate Index (TRI), shows the extra amount of time required to make a peak period trip versus the same trip at some other time of the day. As an area becomes more congested, this index will increase and show the added time for a trip due to congestion caused by increased demand. This research will use the TRI to reflect the urban area congestion levels.

Concluding Remarks

This chapter has described several studies that have been performed to review the link between traffic congestion and economic activity and land use. It was found that there is no definitive information on this linkage, especially at the areawide or macroscopic level as much of the research has been performed at a local level such as a specific shopping center or public transportation station. There also appears to be some uncertainty about the strength of the relationship. The research presented in this report will investigate this economic/land use activity and traffic congestion relationship at the areawide level as no previous research could be found.

The literature described in this chapter begins by discussing the need for a predictive model for future traffic congestion levels based on economic and land use variables. One of the more prevalent users of this model could be the smaller MPOs who do not have the staff to update and manipulate the long-range transportation models that could make such predictions.

The 4-step modeling process has been in existence in some form for nearly 50 years in the U.S. This model uses the linkage between land uses and trips both produced and attracted by each of the various land use types. These models have the capability of predicting future transportation scenarios but many smaller cities do not have the in-house capability to manipulate and update it.

This research will attempt to create models for Texas urban areas demonstrating the relationship between traffic congestion and economic activity and land use at the areawide level. This analysis is not concerned with the specific mix of land use or its ties to economic activity but only its aggregated effect on the transportation system. The following chapter will describe the data collection and data sources. Analyses of the data will be shown in detail in Chapters V and VII.

CHAPTER III

DATA COLLECTION AND DATA SOURCES

INTRODUCTION

Data were collected from two sources for this research. One of these sources was the Urban Mobility Study database at TTI (Schrank & Lomax, 2002). This database provided the necessary traffic congestion information. The second source was the Texas State Comptroller's Office. The Comptroller's office tracks economic and land use information at the county level. The land use data is tracked for taxation purposes and the economic data is tracked to monitor economic output and growth. The remainder of this chapter discusses the specifics details about how the data was prepared for analysis.

EXPERIMENTAL DESIGN

One requirement of the data utilized in this research is to be readily available to public agencies. The individuals who might perform this analysis should be able to quickly and easily obtain the necessary information to perform the work. One source of consistent economic and land use information is in the database at the Texas State Comptroller's office. This economic and land use data, in many instances, is reported by each individual county in Texas to the Comptroller's office. No consistent source of economic and land use data was discovered at an urban area level which is the level of reporting for the traffic congestion information. The county level economic and land use data was retained since transportation impacts inside the urban areas are not solely created by the urban dwellers. Many urban travelers begin their journey outside of the urban boundary and they obtain income due to working in the urban area. Additionally, the land use changes that occur at the county level will show suburban development before it actually gets incorporated into the urban area. Because of issues such as these, the decision was made that the economic and land use data at the county level would be sufficient for the analysis.

DATA SOURCES

TTI monitors traffic congestion levels in 75 urban areas in the United States including nine in Texas and produces an annual report detailing national traffic congestion trends (Schrank & Lomax, 2002). In this same effort, TTI monitors the congestion levels in the remaining urban areas in Texas and reports this information to the Texas Department of Transportation. The data obtained from the TTI analysis include:

- Travel Rate Index
- Freeway Lane-miles
- Principal Arterial Street Lane-miles
- Urban Area Population
- Urban Area Size (square miles)

The TTI data spanned the years 1982 to 1997 for each of these variables. A list of the Texas urban areas included in the TTI analysis is shown in Table 1.

TABLE 1. Texas urban areas in the TTI analysis.

Urban Area	
Abilene	Longview
Amarillo	Lubbock
Austin	McAllen-Edinburg-Mission
Beaumont	Midland
Brownsville	Odessa
Bryan-College Station	Port Arthur
Corpus Christi	San Angelo
Dallas-Fort Worth	San Antonio
Denton	Sherman-Denison
El Paso	Temple
Galveston	Texarkana
Harlingen	Texas City
Houston	Tyler
Killeen	Victoria
Laredo	Waco
Lewisville	Wichita Falls

Several of the urban areas listed in Table 1 are located in the same county as another urban area listed. These areas include Midland, Odessa, Beaumont, Port Arthur, Brownsville, Harlingen, McAllen-Edinburg-Mission, Dallas-Fort Worth, Lewisville, Killeen, Temple, Galveston, and Texas City. Due to the macroscopic level of detail in this analysis, the interaction between the two urban areas occupying the same county is unknown. Growth or changes in the land use or economic data at the county level could be attributable more to one of the urban areas than the other and this could mislead the analysis. Due to these factors these urban areas have been omitted from the research. Table 2 lists the urban areas that are included in the analysis. Many of the urban areas stretch across county lines and are contained in more than one county. A list of the urban areas and their corresponding counties is shown in Table 3.

TABLE 2. Texas urban areas included in the analysis.

Urban Area	
Abilene	Longview
Amarillo	Lubbock
Austin	San Angelo
Bryan-College Station	San Antonio
Corpus Christi	Sherman-Denison
Denton	Texarkana
El Paso	Tyler
Houston	Victoria
Laredo	Waco

TABLE 3. Counties linked with each urban area.

Urban Area	Counties
Abilene	Taylor
Amarillo	Potter, Randall
Austin	Hays, Travis, Williamson
Bryan-College Station	Brazos
Corpus Christi	Nueces, San Patricio
Denton	Denton
El Paso	El Paso
Houston	Brazoria, Fort Bend, Harris, Liberty, Montgomery, Waller
Laredo	Webb
Longview	Gregg, Harrison
Lubbock	Lubbock
San Angelo	Tom Green
San Antonio	Bexar, Comal, Guadalupe
Sherman-Denison	Grayson
Texarkana	Bowie
Tyler	Smith
Victoria	Victoria
Waco	McClennan

The socio-economic and land use data was obtained from the Texas State Comptroller's Office in Austin. This information is maintained in several different databases at the county level. Table 4 shows the socio-economic and land use information included in the analysis. These variables spanned different years from 1982 to 1997. Some of the variables span the entire sixteen year period while others are included for only 1988 to 1997.

TABLE 4. Socio-economic and land use variables.

Socio-Economic Variables	Land Use Variables
Total income (dollars)	Single-family residences (units)
Per capita income (dollars)	Multi-family residences (units)
Retail sales (dollars)	Vacant Land (acres)
Total employment	Farm acres (acres)
County population	Farm improved land (acres)
	Commercial units
	Industrial units

CHAPTER IV

SINGLE URBAN AREA ANALYSIS – DATA PREPARATION

This chapter discusses the step-by-step process that is used to prepare the data for the regression analysis of the individual urban areas. Lubbock is chosen as the urban area to demonstrate in this chapter since it has many of the pertinent statistical characteristics that need to be discussed. The results of the regression analysis for Lubbock are shown in the following chapter. The analysis for the remaining urban areas is performed and the results are shown in the following chapter as well. However, the data supporting the results for the additional areas are included in appendices.

The predicted variable to be used in this analysis is the Travel Rate Index (TRI). The 16 explanatory or predictor variables used in the analysis vary in their representations and magnitudes. Some of the variables such as total income are shown in millions of units while others, such as urban area size, are in hundreds of units. These variables need to be standardized before any further analysis can be performed. If they are not standardized, the variables with larger values will have more weight in each equation than variables with smaller values. The standardization procedure works by subtracting a location measure (mean) and dividing by a scale measure (standard deviation). This equation is shown below. This standardization places all variables on a similar scale.

$$\textit{standardized value} = \frac{(\textit{original value - mean value})}{(\textit{standard deviation})}$$

Table 5 displays an example of the original predictor variable values and the standardized values for Lubbock in 1997. In this example the standardized values for the variables are now all between -1.0 and 2.0 which will allow the weights to all be on a similar scale as the effort moves toward the regression analysis.

TABLE 5. Examples of standardized variables for Lubbock for 1997.

Variable	Original Value	Standardized Value
Single family homes	64,340	1.402
Multi-family homes	2,692	1.754
Vacant property	12,275	-0.169
Farm acreage	487,264	0.866
Farm improved acreage	2,381	-0.593
Commercial property	5,893	1.261
Industrial property	365	-0.933
Total income	5,082,000	1.583
Retail sales	2,908	1.425
Per capita income	22,032	1.637
Total employment	109,596	1.603
County population	232,458	0.866
Urban population	200	1.162
Urban area size	145	1.218
Freeway lane-miles	180	1.387
Principal arterial lane-miles	535	1.464
Travel Rate Index	1.024	-0.113

One of the desired aspects of the predictor variables in a regression analysis is that these variables should be uncorrelated of each other. Two variables are said to be independent when there is no association of any type between the values. However, in many statistical analyses, the predictor variables are not completely uncorrelated of each other. A simple test for this association, or correlation, between the variables was performed using the Pearson Correlation Coefficient which shows the amount of correlation between variables on a scale of zero to one. If the Pearson Correlation Coefficients for the predictor variables show values approaching one, the correlation needs to be removed before further analysis can occur with the data. The formula for Pearson's sample correlation coefficient is given by

$$r = \frac{\sum (x - \bar{x})(y - \bar{y})}{\sqrt{\sum (x - \bar{x})^2}\sqrt{\sum (y - \bar{y})}} = \frac{Sxy}{\sqrt{Sxx}\sqrt{Syy}}$$

The resulting values for the correlation test are shown in Table 6. It was found that the correlation between variables is very high, in some cases, greater between the predictor variables themselves than between the predictor variables and the TRI. The correlation between single family housing and industrial property, for example, is 0.78306, whereas, the correlation between industrial property and the TRI is 0.59244. The closer the absolute value of the Pearson

Coefficient is to one, the stronger the linear relationship between the variables. This strong linear relationship between values of the predictors is called multicollinearity and it causes many problems in a linear regression analysis such as variance inflation and difficulty in interpretation of the results. The Pearson Correlation Coefficients greater than 0.50 were arbitrarily chosen and highlighted in Table 6 to demonstrate how much correlation exists between the variables. Many of the unhighlighted coefficients still demonstrate strong correlation.

TABLE 6. Correlation matrix for Lubbock data.

Variable	Pearson's Coefficient					
	Single Family Homes	Multi-family Homes	Vacant Property	County Population	Farm Acreage	Farm Improvement Acreage
Single Family Homes	1.00000	0.57954	-0.55142	0.81170	-0.20105	-0.67297
Multi-family Homes	0.57954	1.00000	-0.03923	0.40265	0.47615	-0.15311
Vacant Property	-0.55142	-.03923	1.00000	-0.88407	0.64653	0.90980
County Population	0.81170	0.40265	-0.88407	1.00000	-0.32671	-0.93370
Farm Acreage	-0.20105	0.47615	0.64653	-0.32671	1.00000	0.46688
Farm Improved Acreage	-0.67297	-.15311	0.90980	-0.93370	0.46688	1.00000
Commercial Property	0.97235	0.56443	-0.65316	0.89635	-0.20177	-0.75556
Industrial Property	-0.78306	-0.37988	0.88154	-0.98883	0.34269	0.94765
Total Income	0.94068	0.57019	-0.73004	0.92335	-0.29039	-0.82705
Retail Sales	0.93647	0.61525	-0.73539	0.93916	-0.22751	-0.81207
Per Capita Income	0.94372	0.56455	-0.71897	0.91422	-0.29876	-0.81908
Total Employment	0.92430	0.59430	-0.69507	0.88739	-0.26126	-0.80364
Freeway Lane-miles	0.90933	0.62249	-0.55561	0.82788	-0.03623	-0.74429
Principal Arterial Lane-miles	0.73145	0.59201	-0.71494	0.90537	-0.06283	-0.79083
Travel Rate Index	-0.43301	0.18971	0.82088	-0.58297	0.93135	0.67442
Urban Population	0.87737	0.38511	-0.78267	0.93746	-0.34453	-0.91549
Urban Area Size	0.89157	0.51702	-0.81269	0.98105	-0.27236	-0.88757
	Commercial Property	Industrial Property	Total Income	Retail Sales	Per Capita Income	Total Employment
Single Family Homes	0.97235	-0.78306	0.94068	0.93647	0.94372	0.92430
Multi-family Homes	0.56443	-0.37988	0.57019	0.61525	0.56455	0.59430
Vacant Property	-0.65316	0.88154	-0.73004	-0.73539	-0.71897	-0.69507
County Population	0.89635	-0.98883	0.92335	0.93916	0.91422	0.88739
Farm Acreage	-0.20177	0.34629	-0.29039	-0.22751	-0.29876	-0.26126
Farm Improved Acreage	-0.75556	0.94765	-0.82705	-0.81207	-0.81908	-0.80364
Commercial Property	1.00000	-0.88169	0.95026	0.96454	0.94986	0.91113
Industrial Property	-0.88169	1.00000	-0.90761	-0.91925	-0.90024	-0.86345
Total Income	0.95026	-0.90761	1.00000	0.98993	0.99935	0.98879
Retail Sales	0.96454	-0.91925	0.98993	1.00000	0.98586	0.97307
Per Capita Income	0.94986	-0.90024	0.99935	0.98586	1.00000	0.98675
Total Environment	0.91113	-0.86345	0.98879	0.97307	0.98675	1.00000

TABLE 6. Continued

	Commercial Property	Industrial Property	Total Income	Retail Sales	Per Capita Income	Total Employment
Freeway Lane-miles	0.88651	-0.79092	0.92523	0.92021	0.92012	0.94996
Principal Arterial Lane-miles	0.83179	-0.90752	0.86916	0.89971	0.86165	0.83734
Travel Rate Index	-0.44707	0.59244	-0.54681	-0.50388	-0.54730	-0.53020
Urban Population	0.91107	-0.94080	0.95112	0.93521	0.95010	0.92780
Urban Area Size	0.94267	-0.96341	0.97646	0.98574	0.97030	0.95364

	Freeway Lane-miles	Principal Arterial Lane-miles	Travel Rate Index	Urban Population	Urban Area Size
Single Family Homes	0.90933	0.73145	-0.43301	0.87737	0.89157
Multi-family Homes	0.62249	0.59201	0.59201	0.38511	0.51702
Vacant Property	-0.69507	-0.71494	-0.71494	-0.78267	-0.81269
County Population	0.88739	0.90537	0.90537	0.93746	0.98105
Farm Acreage	-0.26126	-0.06283	-0.06283	-0.34453	-0.27238
Farm Improved Acreage	-0.74429	-0.79083	0.67442	-0.91549	-0.88757
Commercial Property	0.88651	0.83179	-0.44707	0.91107	0.94267
Industrial Property	-0.79092	-0.90752	0.59244	-0.94080	-0.96341
Total Income	0.92523	0.86916	-0.54681	0.95112	0.97646
Retail Sales	0.92021	0.89971	-0.50388	0.93521	0.98574
Per Capita Income	0.92012	0.86165	-0.54730	0.95010	0.97030
Total Employment	0.94996	0.83734	-0.53020	0.92780	0.95364
Freeway Lane-miles	1.00000	0.80222	-0.31669	0.87930	0.90291
Principal Arterial Lane-miles	0.80222	1.00000	-0.31758	0.84396	0.91971
Travel Rate Index	-0.31669	-0.31758	1.00000	-0.56651	-0.53962
Urban Population	0.87930	0.84396	-0.56651	1.00000	0.95717
Urban Area Size	0.90291	0.91971	-0.53962	0.95717	1.00000

Ordinary Least Squares (OLS) regression method was selected to determine a regression equation for this research. It is one of the most popular and familiar methods of regression. The equation for OLS is

$$\mathrm{Y} = \beta_o + \beta_1 X_1 + \ldots \beta_k X_k + \in$$

The assumptions of OLS regression are that the errors, the differences between the observed and modeled *y*-values are independent and identically distributed with a mean of zero and equal variances. "According to the principle of [ordinary] least squares, the fit of a particular estimated regression function $b_0+b_1x_1+\ldots+b_kx_k$ to the observed data is measured by the sum of squared deviations between the observed *y*-values and the *y*-values as predicted by the estimated function: $\sum[y_i-(b_0+b_1x_{i1}+\ldots+b_kx_{ik})]^2$" (Devore & Peck, 1997). Furthermore, "the least squares estimates of β are those values of $b_0, b_1, \ldots, b_k$ that make this sum of squared deviation as small as possible" (Devore & Peck, 1997).

The collinearity of the predictors "yields large estimated variances for the β_i's and it becomes difficult to detect the 'significant' regression coefficients β_i" (Johnson & Wichern, 1982). Additionally, in OLS if the sample size is less than the number of predictor variables there is no unique solution for β. This is true because there is not enough data to estimate the parameters uniquely.

Principal component analysis was chosen to deal with the problems of multicollinearity and sample size. Principal component analysis was used to remove the multicollinearity that exists between the predictor variables and to allow the Ordinary Least Squares (OLS) to calculate a regression equation since the number of prediction variables is greater than the sample size. The output from principal components analysis is a set of composite variables (scales) that contain much of the information from the original predictor variables minus much of the collinearity portion. These composite variables are then carried forward into the regression analysis instead of the original highly-correlated predictor variables.

Principal component analysis tries to explain the variance-covariance structure through a few linear combinations of the original variables. In other words, if a system has p components where much of the system's variability can be accounted for by a smaller number, k, of the principal components, then the original data set of n measurements on p variables can be reduced to n measurements on k variables. Algebraically, principal components are particular linear combinations of the random variables. The principal components are those uncorrelated linear combinations whose variances are as large as possible (Johnson & Wichern, 1982).

The principal component analysis on the Lubbock data produced the eigenvalues of the correlation matrix. Eigenvalues show how much of the variation from the original group of variables is accounted for by a particular factor. The eigenvalues show that eight principal component variables explain 99.94 percent of the data. Table 7 shows that all of the data is explained by the first nine principal components. Thus, the first nine principal component variables will be carried forward into the regression analysis for Lubbock.

The eigenvectors for each principal component are shown in Table 8. These eigenvectors show how much weight each of the original values have on each principal component composite variable. Weights of at least 0.25 whether positive or negative were arbitrarily chosen and have been shaded to show which of the original prediction variables contributed notably to each principal component variable. For example, principal component composite variable two is weighted heavily on multi-family dwelling units, vacant properties, farm acreage, and improved farm acreage.

Many of the remaining original predictor variables contributed very little to principal component composite variable two but may have been weighted heavily in other principal component composite variables. The first nine of the sixteen principal component composite variables are shown since the remaining principal component composite variables will not be carried forward into the regression analysis based on the eigenvalues information shown in Table 7.

TABLE 7. Eigenvalues of the correlation matrix for Lubbock.

Variable	Eigenvalue	Difference	Proportion	Cumulative
1	12.8057356	10.8088807	0.8004	0.8004
2	1.9968549	1.4065254	0.1248	0.9252
3	0.5903296	0.3180614	0.0369	0.9621
4	0.2722682	0.1055659	0.0170	0.9791
5	0.1667023	0.0886569	0.0104	0.9895
6	0.0780454	0.0177177	0.0049	0.9944
7	0.0603277	0.0403723	0.0038	0.9981
8	0.0199554	0.0101745	0.0012	0.9994
9	0.0097809	0.0097809	0.0006	1.0000
10	0.0000000	0.0000000	0.0000	1.0000
11	0.0000000	0.0000000	0.0000	1.0000
12	0.0000000	0.0000000	0.0000	1.0000
13	0.0000000	0.0000000	0.0000	1.0000
14	0.0000000	0.0000000	0.0000	1.0000
15	0.0000000	0.0000000	0.0000	1.0000
16	0.0000000		0.0000	1.0000

TABLE 8. Eigenvectors for Lubbock.

Variable	Principal Component Composite Variable								
	Principal Component 1	Principal Component 2	Principal Component 3	Principal Component 4	Principal Component 5	Principal Component 6	Principal Component 7	Principal Component 8	Principal Component 9
SINGLE	0.254802	0.131307	0.428644	0.138563	0.337241	-0.118767	0.079436	-0.012152	-0.062150
MULTI	0.145365	0.560188	-0.041809	-0.557260	-0.173165	-0.156656	-0.401163	-0.078022	-0.212355
CNTYPOP	0.270650	-0.092998	-0.230673	0.004462	0.156081	-0.292761	0.002306	0.117746	0.479121
VACANT	-0.222260	0.378734	0.261535	0.262934	0.064647	0.454244	-0.195518	-0.307291	0.283193
FARM	-0.081818	0.608938	-0.457927	0.409218	0.095185	-0.150682	0.016127	0.219289	0.139060
EMPLOY	0.270537	0.070189	0.192197	-0.041419	-0.426717	0.014097	0.053775	0.049451	0.063037
FARMIM	-0.247440	0.252821	0.259567	-0.316424	0.232803	0.036661	0.369028	0.441579	0.057688
COMM	0.265881	0.089103	0.177813	0.068321	0.583095	-0.085852	0.020117	-0.241322	-0.225274
INDUS	-0.267282	0.114922	0.269970	0.009527	-0.204148	-0.013526	0.348420	0.269624	-0.011035
INCOME	0.276091	0.042649	0.154480	-0.074538	-0.107180	0.144098	-0.017017	0.011526	0.331756
PERCAP	0.274903	0.041657	0.183016	-0.073365	-0.091718	0.235355	-0.028393	-0.014391	0.424809
RETAIL	0.276541	0.075108	0.059865	-0.137160	0.057905	-0.077875	0.092273	0.146666	-0.144085
URBAREA	0.278454	-0.002050	-0.076890	-0.018949	0.040551	-0.107938	0.130045	0.186246	0.246914
URBPOP	0.270495	-0.068757	0.029483	0.298358	-0.010491	0.384207	-0.379207	0.618113	-0.321152
FWYLANMI	0.255450	0.183774	0.123376	0.413349	-0.412810	-0.231892	0.348558	-0.211446	-0.246999
ARTLANMI	0.252623	0.091451	-0.437546	-0.192522	0.072813	0.585017	0.491506	-0.160318	-0.165469

When using principal component analysis, it is important to try to place some meaning with each of the principal component composite variables (i.e., review the predictor variables that weighted highly in each composite variable to determine if there is a pattern). The list below highlights some of the patterns:

- Composite Variable 1 is weighted fairly high on all of the original predictor variables except a few of the land use variables including land use associated with farming, vacant property, and multi-family housing.
- Composite Variable 2 is weighted highly on four land use variables including: multi-family dwelling units, vacant properties, farm acreage, and improved farm acreage.
- Composite Variable 3 is weighted high on single family residences, vacant properties, farm acreage, improved farm acreage, industrial properties, and principal arterial lane-miles.
- Composite Variable 4 is weighted highly on four land use predictor variables and also urban population and freeway miles of roadway. The lane use variables include multi-family dwelling units, vacant properties, farm acreage, and improved farm acreage. This variable appears to offset Composite Variable 1 as it is weighted highly on several of the predictor variables that were not weighted highly in that variable.
- Composite Variable 5 tends to be weighted highly on business-related predictor variables such as employment and commercial properties. It also is weighted high in single-family residences and freeway lane-miles.
- Composite Variable 6 tends to be the population variable. It is weighted highly on both urban and county population and also weights highly in vacant properties and principal arterial lane-miles.
- Composite Variables 7 and 8 are weighted highly on land use, socio-economic and roadway supply predictor variables. Composite variable 7 is weighted highly on multi-family dwelling units, improved farm acreage, industrial properties, urban population and freeway and principal arterial street lane-mileage. Composite Variable 8 is weighted highly on vacant properties, improved farm acreage, industrial properties, and urban population.

- Composite Variable 9 is the socio-economic variable. It is weighted highly on many of the socio-economic predictor variables including county population, vacant properties, total income, per capita income, and urban population.

The composite variables contain an assorted mix of the original predictor variables. There does not appear to be a set of "economic" composite variables or "land use" composite variables. Some of the composite variables are weighted heavier on economic or land use data than others; however, there does not appear to be a set pattern to the variable composition.

CHAPTER V

SINGLE URBAN AREA ANALYSIS – REGRESSION ANALYSIS

In this investigation, the principal component composite variables are used in a regression analysis rather than the original predictor variables as the composite variables have much of the multicollinearity removed. Two methods of variable selection for regression are applied to the principal component composite variables—Stepwise and Mallow's C_p. Stepwise regression begins with the first variable and adds or removes the remaining variables until it finds the best fit to the data. Mallow's C_p regression starts with all of the variables in the model and removes variables until it finds the best fit to the data. The two models do not necessarily produce the same end result.

The simplest model is generally selected if the simple model yielded approximately the same amount of explanation of the data as the more complicated model. The Stepwise and Mallow's C_p methods, shown in Tables 9 and 10, respectively, produce slightly different results for the Lubbock data. Both models select principal component composite variables one through four, but the Mallow's C_p method also included variables five and six as well.

TABLE 9. Stepwise selection method for Lubbock.

Analysis of Variance							
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F		
Model	4	0.00455		31.15	0.0010		
Error	5	0.00018275	0.00114				
Corrected Total	9	0.00474	0.0000366				
	Root MSE	0.00605	R-Square	0.9614			
	Depend. Mean	1.02660	Adj R-Sq	0.9305			
	Coeff Var	0.58890					
Parameter Estimates							
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > [t]	Type I SS	Type II SS
Intercept	1	1.02660	0.00191	536.98	0.0001	10.53908	10.53908
Prin1	1	-0.00357	0.0005632	-6.34	0.0014	0.00147	0.00147
Prin2	1	0.01163	0.00143	8.15	0.0005	0.00243	0.00243
Prin3	1	-0.00806	0.00262	-3.07	0.0277	0.000345	0.000345
Prin4	1	0.01127	0.00366	2.92	0.0331	0.000311	0.000311
Analysis of Autocorrelation							
	Durbin-Watson D-Value	2.300					
	Number of Obs.	10					
	1^{st} Order Autocorrelation	-0.208					

TABLE 10. Mallow's C_p selection method for Lubbock.

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	6	0.00467	0.0007791	37.68	0.0065
Error	3	0.0000620	0.0000207		
Corrected Total	9	0.00474			
	Root MSE	0.00455	R-Square	0.9869	
	Depend. Mean	1.02660	Adj R-Sq	0.9607	
	Coeff Var	0.44294			

Parameter Estimates							
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > [t]	Type I SS	Type II SS
Intercept	1	1.02660	0.00144	713.94	0.0001	10.53908	10.53908
Prin1	1	-0.00357	0.00042	-8.43	0.0035	0.00147	0.00147
Prin2	1	0.01163	0.00107	10.84	0.0017	0.00243	0.00243
Prin3	1	-0.00806	0.00197	-4.09	0.0265	0.00035	0.00035
Prin4	1	0.01127	0.00290	3.88	0.0303	0.00031	0.00031
Prin5	1	0.00616	0.00371	1.66	0.1956	0.00006	0.00006
Prin6	1	0.00953	0.00543	1.76	0.1773	0.00006	0.00006
	Durbin-Watson D-Value	3.616					
	Number of Obs.	10					
	1st Order Autocorrelation	-0.813					

Often, in regression analysis, the coefficient of determination (R^2) is used to determine how well the data has fit a model. However, since this analysis has a limited number of variables, the Adjusted R^2 (R^2-Adj) value is used to determine how well the composite variables predict the independent variable. The R^2-Adj value of the Stepwise selection method (0.9305) was slightly lower than the R^2-Adj value for the Mallow's C_p model (0.9607). This is due to the fact that the Stepwise model contains four composite variables as opposed to six in the Mallow's C_p model.

To ensure that a good model is created, the residuals and the studentized residuals from the model are plotted and analyzed. Figure 1 shows that the residuals generally lie in the range of -0.4 to 0.3. They appear to be randomly distributed on either side of 0. The studentized residuals are the residuals divided by their standard errors and they should generally lie in the range of -3.0 to 3.0 to reflect a good fit to the data (Ott, 1993). Therefore, when a studentized residual is greater than |-3.0| or |3.0|, it is an indication that the model does not fit the data well. The studentized residuals for the chosen model from the Stepwise selection method, shown in Figure 2, are well within the range -3.0 to 3.0. Figure 3 shows the studentized residuals plotted against the predicted value of Travel Rate Index. The data points appear scattered on both sides of 0 and well within the range -3.0 to 3.0.

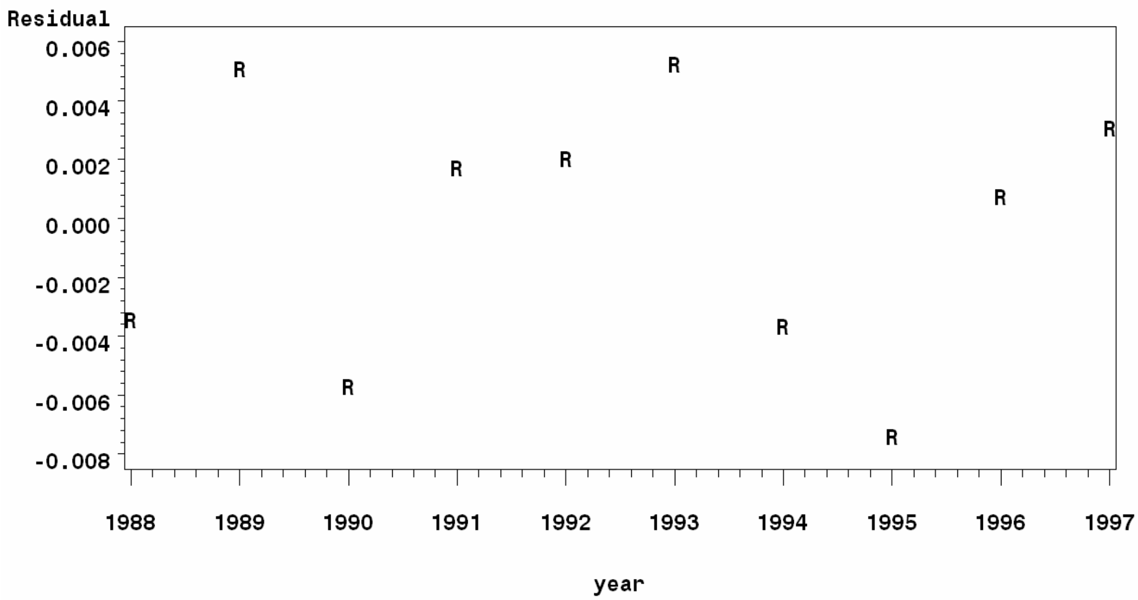

FIGURE 1. Residual plot of Stepwise model selection for Lubbock.

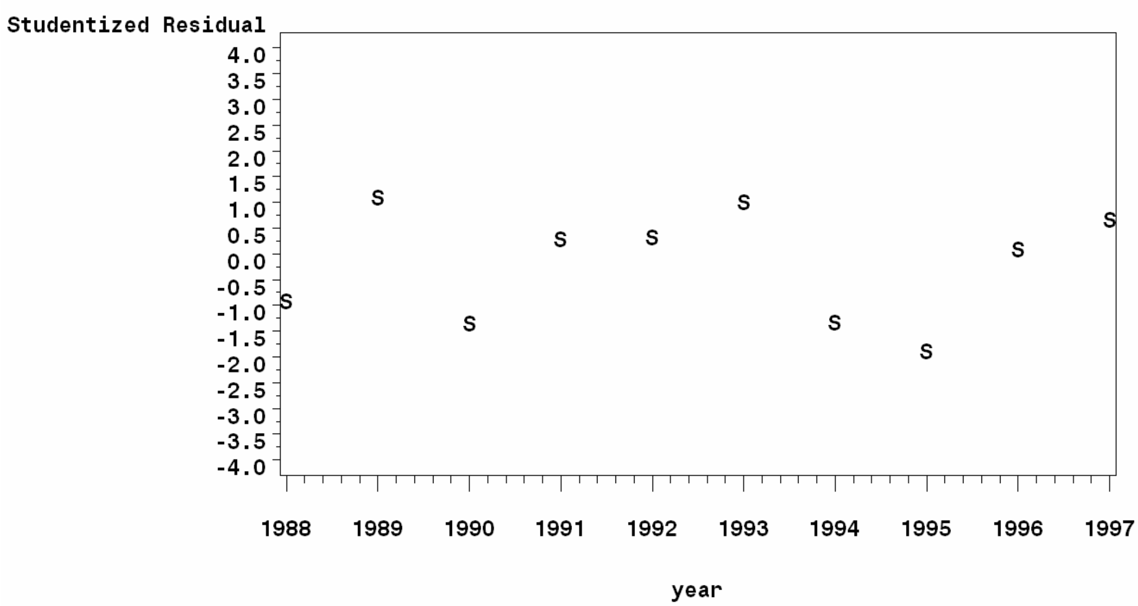

FIGURE 2. Studentized residual plot of Stepwise selection model for Lubbock.

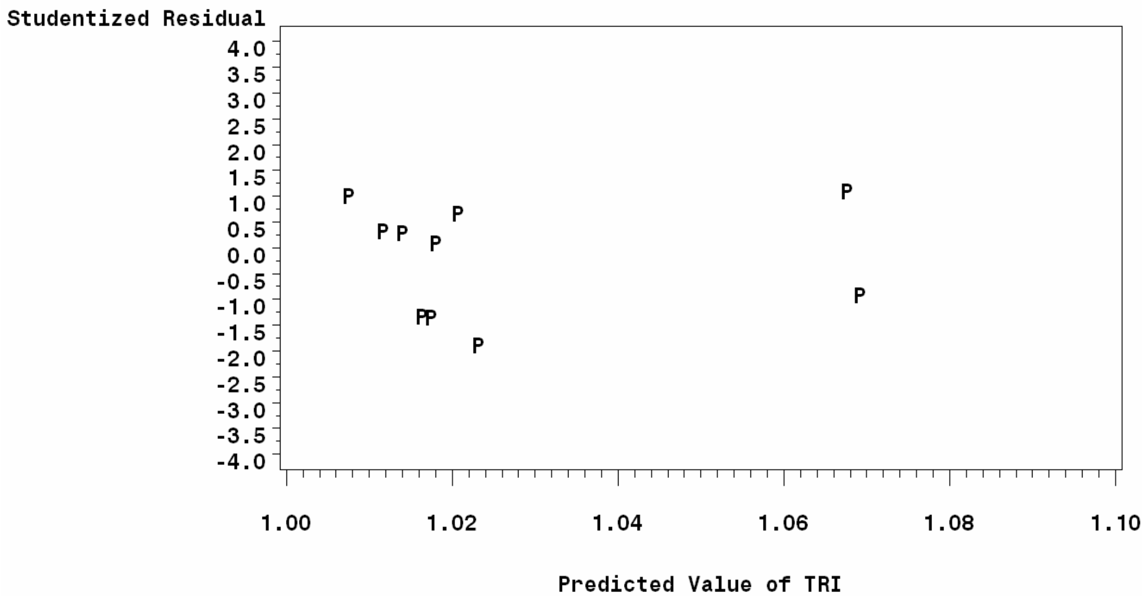

FIGURE 3. Predicted value plot of Stepwise model selection for Lubbock.

The same basically holds true when analyzing the residual plots from the Mallow's C_p selection method. The basic residual plot shown in Figure 4 appears to have random points distributed on either side of 0. There appears to be the hint of a pattern in the plot but not enough to halt the analysis. The plot of the studentized residuals in Figure 5 appears to generally be random as well. Figure 6 shows the studentized residuals plotted against the predicted values of the Travel Time Index. The data points appear to be distributed on both sides of zero and well within the range -3.0 to 3.0.

Further investigation to look at serial correlation in the model may be needed in order to make a decision regarding the best model although the results from the Stepwise and Mallow's C_p selection models appear to be about the same at this point.

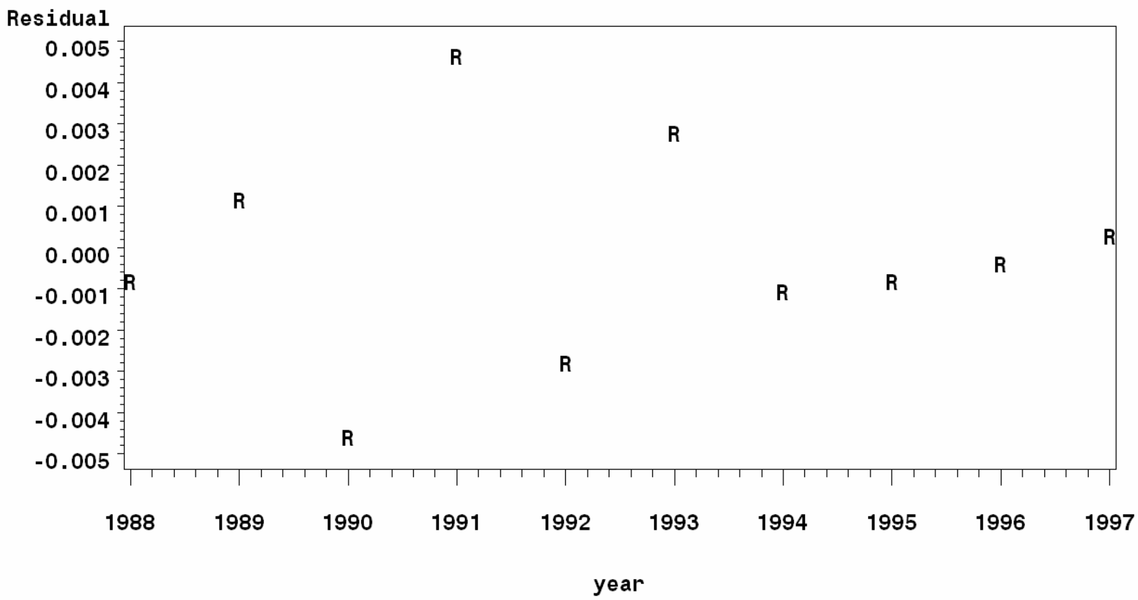

FIGURE 4. Residual plot of Mallow's C_p selection model for Lubbock.

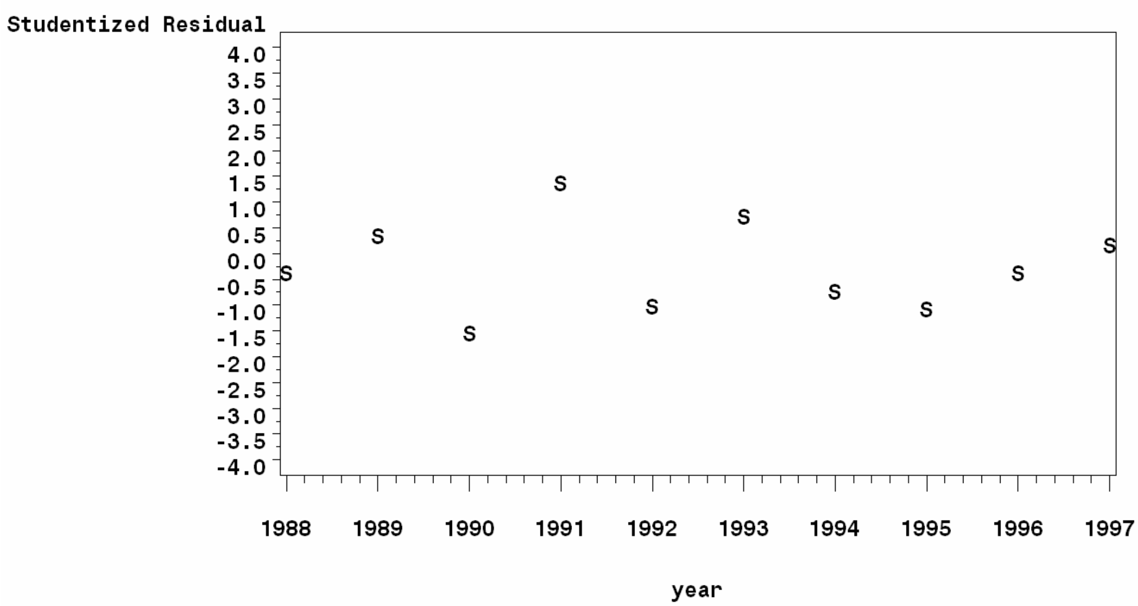

FIGURE 5. Studentized residual plot of Mallow's C_p model selection for Lubbock.

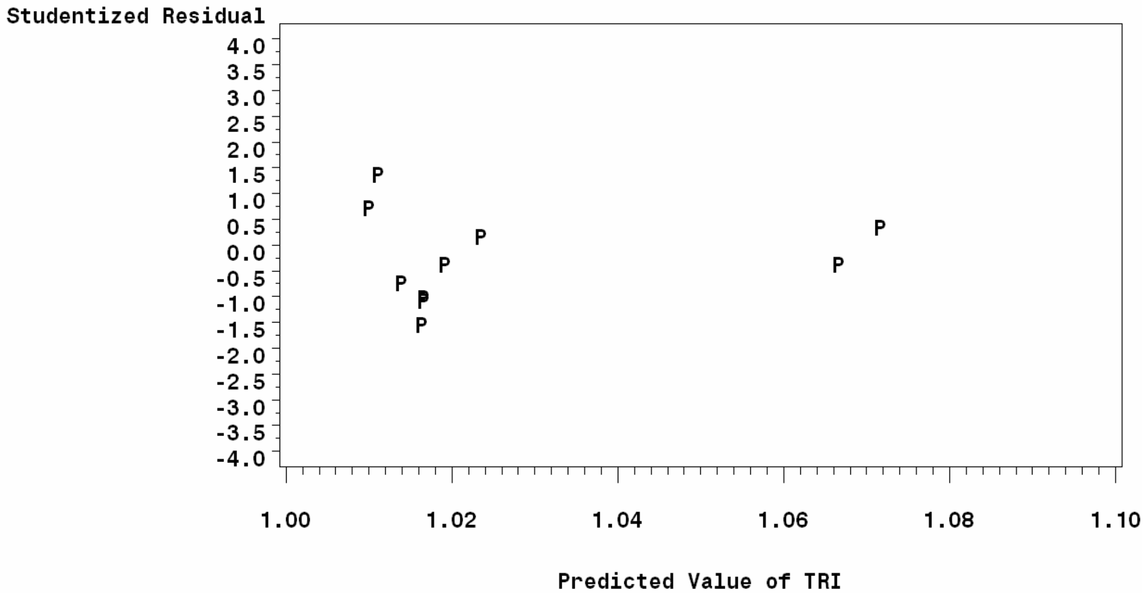

FIGURE 6. Predicted value plot of Mallow's C_p selection model for Lubbock.

Another concern when dealing with time series data is the existence of correlation over time or autocorrelation. The principal component analysis eliminates correlation between the prediction variables but it did not address autocorrelation. A test for autocorrelation is the Durbin-Watson test which produces a d-statistic. If positive autocorrelation exists then successive residuals will be similar and their squared difference will tend to be smaller than if there was no correlation between the residuals. Generally, if the d-statistic is less than about 1.5 then positive serial correlation exists and if the d-statistic is greater than about 2.5 then negative serial correlation exists. However, these thresholds are not rigid but serve as a general guideline. The result of the Durbin-Watson test for the Stepwise model is shown in Table 9. The d-statistic of 2.30 indicates no obvious presence of serial correlation. The first order autocorrelation for the residuals is -0.208 which indicates very little autocorrelation over time. The absolute value of the correlations among the residuals should be less than the absolute value of two standard errors for each lag of the model. Table 10 shows the correlation of each residual and the standard errors. For each lag, the correlation is less than twice the standard error so there does not appear to be a problem with autocorrelation with the Stepwise model.

The analysis of the autocorrelation test of the Mallow's C_p model does not appear as clear. The Mallow's C_p model shown in Table 11 shows a first order autocorrelation for the residuals of -0.813. Additionally, the correlation value in lag 1 of the model shown in Table 12 exceeds twice the standard error. This indicates possible autocorrelation of one year in the model. This may or may not reflect a problem with the Mallow's C_p model. Since the correlation values in each lag move closer to zero fairly rapidly after one year, the model does not appear to have much of a problem with autocorrelation. Since this did not appear to be of any concern with the Stepwise model, it will be chosen as the prediction model for Lubbock.

TABLE 11. Autocorrelation analysis of Stepwise selection for Lubbock.

	Name of Variable	**Residual**	
	Mean of Working Series	2.447E-16	
	Standard Deviation	0.004275	
	Number of Obs.	10	
Lag	Covariance	Correlation	Standard Error
0	0.00001828	1.00000	0
1	-3.8077E-6	-0.20835	0.316228
2	-4.7769E-6	-0.26138	0.329670
3	-5.312E-6	-0.29067	0.349781
4	4.68678E-6	0.25646	0.373154
5	1.26404E-6	0.06917	0.390382
6	-2.6041E-6	-0.14249	0.391606
7	1.30668E-6	0.05674	0.396756
8	1.44007E-6	0.07880	0.397567
9	-1.0647E-6	-0.05826	0.399126
Check for White Noise			
To Lag	6		
Chi-Square	5.09		
DF	6		
Pr>Chi-Square	0.5322		
Autocorrelations	-0.208		
	-0.261		
	-0.291		
	0.256		
	0.069		
	-0.142		

TABLE 12. Autocorrelation analysis of Mallow's C_p results for Lubbock.

	Name of Variable	Residual	
	Mean of Working Series	2.45E-16	
	Standard Deviation	0.002491	
	Number of Obs.	10	
Lag	Covariance	Correlation	Standard Error
0	6.20304E-6	1.00000	0
1	-5.0443E-6	-0.81320	0.316228
2	3.54185E-6	0.57099	0.481932
3	-2.3349E-6	-0.37642	0.545402
4	8.34063E-7	0.13446	0.570791
5	-2.4512E-7	-0.03952	0.573949
6	2.85431E-7	0.04601	0.574221
7	-1.826E-7	-0.02944	0.574590
8	7.34011E-8	0.01183	0.574741
9	-2.93E-8	-0.00472	0.574765
Check for White Noise			
To Lag	6		
Chi-Square	16.60		
DF	6		
Pr>Chi-Square	0.0109		
Autocorrelations	-0.813		
	0.571		
	-0.376		
	0.134		
	-0.040		
	0.046		

Based on this analysis, the selected model for Lubbock shows to be:

TRI=1.02660-0.00357(PC1)+0.01163(PC2)-0.00806(PC3)+0.01127(PC4)

The selected models for the other urban areas are listed in Table 13. Also displayed in Table 13 are the R^2-Adj values that show how well the data fits the model for each urban area. Generally, the models all have R^2-Adj values of at least 0.90 or higher indicating that the models are good choices for prediction as they explain at least 90 percent of the variability in the data. The few exceptions are Houston with an R^2-Adj value of 0.8998. The smallest model includes three predictor variables while the largest includes seven predictor variables. The models for Amarillo, Denton, Sherman-Denison, and Waco all had R^2-Adj values of at least 0.99.

TABLE 13. Travel rate index prediction equations for individual urban areas.

Urban Area	Equation	AdjustedR^2
Abilene	TRI=1.0250-0.00005613(PC1)+0.00014688(PC2) -0.00019129(PC3)+0.00042507(PC4)-0.00149(PC8)-0.00149(PC9)	0.8629
Amarillo	TRI=1.00980+0.00114(PC1)-0.00054977(PC2)-0.00065346(PC3) -0.00158(PC4)-0.00299(PC5)-0.00421(PC6)-0.00269(PC7)	0.9974
Austin	TRI=1.14380+0.01088(PC1)-0.00283(PC2)-0.01491(PC4)-0.13443(PC9)	0.9727
Bryan-College Station	TRI=1.02680-0.00328(PC1)-0.01161(PC2)-0.00459(PC3)	0.9453
Corpus Christi	TRI=1.02900+0.00060833(PC1)+0.00089888(PC3)+0.00136(PC4)+0.00 300(PC5)-0.00291(PC7)-0.00203(PC8)	0.9591
Denton	TRI=1.04933+0.00642(PC1)-0.00390(PC5)-0.01816(PC7)	0.9844
El Paso	TRI=1.06950+0.00363(PC1)- 0.00505(PC2)+0.00524(PC4)+0.01240(PC5)-0.01413(PC6)	0.9114
Houston	TRI=1.24540+0.01236(PC2)+0.02142(PC4)+0.01042(PC5)	0.8497
Laredo	TRI=1.03210+0.00190(PC1)- 0.00252(PC2)+0.00287(PC4)+0.00331(PC5)-0.00686(PC8)	0.9680
Lubbock	TRI=1.02660-0.00357(PC1)+0.01163(PC2)-0.00806(PC3)+0.01127(PC4)	0.9305
Longview	TRI=1.00810-0.00032213(PC1)	0.6072
San Angelo	TRI=1.00040+0.00013604(PC1)+0.00068955(PC7)+0.00082885 (PC9)	0.9285
San Antonio	TRI=1.09700+0.00634(PC1)+0.00858(PC2)-0.00623(PC3)	0.8678
Sherman-Denison	TRI=1.00130-0.00009317(PC1)-0.00010241(PC2)-0.00035818(PC3)- 0.00038911(PC5)+0.00024151(PC6)	0.9894
Texarkana	TRI=1.00620-0.00031341(PC2)-0.00039325(PC5)+0.00026329(PC6)- 0.00042738(PC7)-0.00231 (PC9)	0.9534
Tyler	TRI=1.02822+0.00584(PC5)-0.00808(PC6)+0.01006(PC7)	0.6980
Victoria	TRI=1.00310+0.00018964(PC1)+0.00113(PC4)- 0.00056502(PC5)+0.00065757(PC6)+0.00160(PC7)-0.00242(PC8)	0.9463
Waco	TRI=1.00320+0.00073124(PC1)+0.00065108(PC2)+0.00133(PC4)- 0.00122(PC7)+0.00309(PC9)	0.9953

CHAPTER VI

CLUSTER ANALYSIS – DATA PREPARATION

This chapter discusses the step-by-step process used leading up to the regression analysis of the clusters of urban areas. One cluster, that contains the Corpus Christi and Lubbock urban areas, is chosen for illustration purposes in this chapter. All of the clusters are shown in Figure 7. The results of the regression analysis for the Corpus Christi and Lubbock cluster are shown in the following chapter. The analysis for the remaining clusters of urban areas is performed and the results are shown in the following chapter as well. However, the data supporting the results for the additional clusters is included in an appendix.

A cluster analysis is a technique designed to discover natural groupings of variables. This grouping is accomplished by developing a quantitative scale on which to measure the similarity between objects (Johnson & Wichern, 1982). A variety of distance measures are available. In this study, the cluster analysis is applied over the average performance of each area's standardized predictors in SAS, generally using Euclidean distance. Euclidean distance is the distance between points x and y in a Euclidean space R^n. Euclidean n-space is the space of all n-tuples of real numbers (x1,…,xn) and is denoted R^n. The formula for Euclidean distance is

$$\sqrt{(x-y)'(x-y)}$$

There are many different clustering methods. In this analysis, the k-means method and average linkage is used (Johnson & Wichern, 1982). The k-means method is a nonhierarchical clustering method where the sum of squared distance from each item to its group mean is minimized. There are up to *k* clusters created using this method. The average linkage is an agglomerative hierarchical method. That is, it begins with as many clusters as urban areas. Average linkage treats the distance between two clusters as the average distance between pairs of observations, one member in each cluster. "Average linkage tends to join clusters with small variances, and it is slightly biased toward producing clusters with the same variance" (SAS Institute, Inc., 1990).

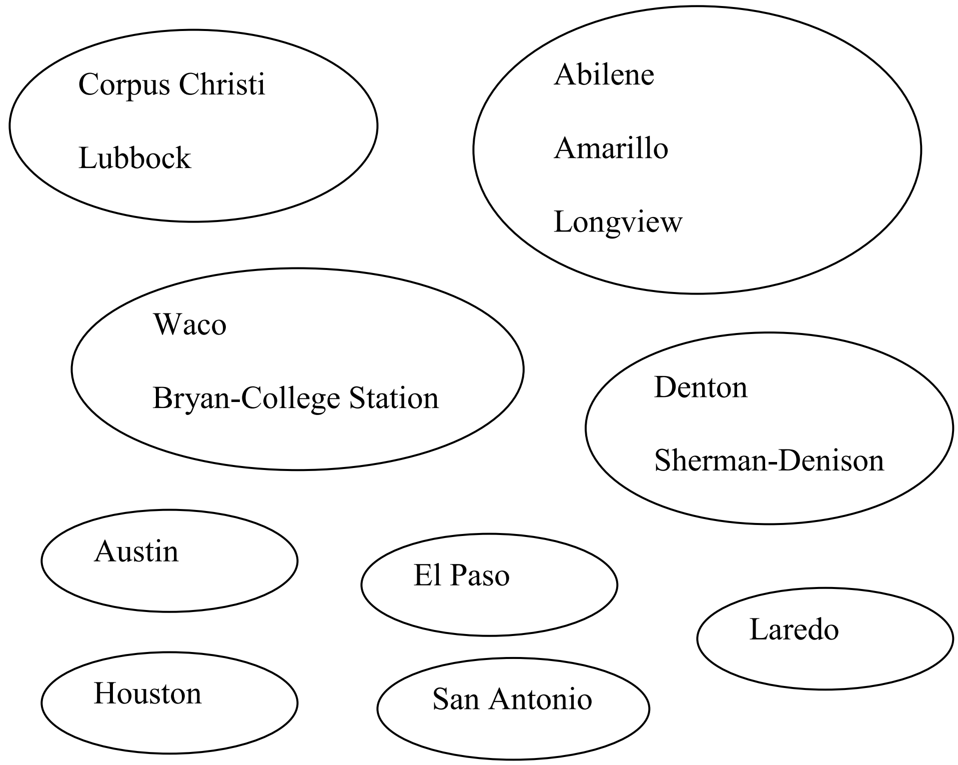

FIGURE 7. Results of the clustering analysis.

After examining the results of the three types of linkage clustering and several different k-means methods, the 9 clusters are chosen. This technique is selected because it clusters the urban areas into somewhat balanced groups. Five urban areas (Austin, El Paso, Houston, Laredo, and San Antonio) do not cluster with other urban areas and remain as individual urban areas. There is no additional analysis of these five areas. The individual urban area analysis is used for these areas. Figure 7 shows the results of the clustering analysis.

The process used to prepare the clustered urban area data for the regression analysis is virtually the same as with the individual urban area analysis with the exception that the clustering analysis is performed on the data at the beginning of the process. Chapter V contains more details regarding the preparation of the data. The background information from that chapter is not reproduced in this chapter.

The first step following the cluster analysis is to standardize the data for further analysis. The standardized data is shown for the Lubbock urban area in Table 5. Since that information is shown only for demonstration purposes, no table will be shown in this chapter for the clustered data.

The second step is to determine if correlation exists between the predictor variables. The resulting values for the Pearson Correlation Coefficient are shown in Table 14. It was found that the correlation between many of the variables is very high. There is still a great deal of correlation between the values of the variables despite the clustering of the urban areas. The closer the Pearson Coefficient is to one, the stronger the linear relationship between the variables.

TABLE 14. Correlation matrix for the Lubbock and Corpus Christi cluster.

Variable	**Pearson's Coefficient**					
	Single Family Homes	Multi-family Homes	Vacant Property	County Population	Farm Acreage	Farm Improvement Acreage
Single Family Homes	1.0000	-0.6546	0.9351	0.5073	0.6655	-0.0614
Multi-family Homes	-0.6546	1.0000	-0.8544	-0.9411	-0.9933	0.3936
Vacant Property	0.9351	-0.8544	1.0000	0.7357	0.8670	-0.1442
County Population	0.5073	-0.9411	0.7357	1.0000	0.9465	-0.4866
Farm Acreage	0.6655	-0.9933	0.8670	0.9465	1.0000	-0.3779
Farm Improved Acreage	-0.0614	0.3936	-0.1442	-0.4866	-0.3779	1.0000
Commercial Property	0.9672	-0.6095	0.8767	0.4817	0.6241	-0.2224
Industrial Property	-0.0445	0.1612	-0.0529	-0.0325	-0.1313	0.4257
Total Income	0.6235	-0.6320	0.5956	0.4766	0.6076	-0.5244
Retail Sales	0.5565	-0.5403	0.5022	0.4068	0.5183	-0.5612
Per Capita Income	0.1602	0.2114	-0.0787	-0.3788	-0.2362	-0.2304
Total Employment	0.6836	-0.9263	0.8036	0.8161	0.9141	-0.4974
Freeway Lane-miles	0.7103	-0.8579	0.7999	0.6754	0.8478	-0.3510
Principal Arterial Lane-miles	-0.6552	0.9138	-0.8375	-0.7830	-0.9072	0.0942
Urban Population	0.7044	-0.9864	0.8667	0.9032	0.9802	-0.4333
Urban Area Size	0.6979	-0.9140	0.8115	0.8629	0.9145	-0.6154
	Commercial Property	Industrial Property	Total Income	Retail Sales	Per Capita Income	Total Employment
Single Family Homes	0.9672	-0.0445	0.6235	0.5565	0.1602	0.6836
Multi-family Homes	-0.6095	0.1612	-0.6320	-0.5403	0.2114	-0.9263
Vacant Property	0.8767	-0.0529	0.5956	0.5022	-0.0787	0.8036
County Population	0.4817	-0.0325	0.4766	0.4068	-0.3788	0.8161
Farm Acreage	0.6241	-0.1313	0.6076	0.5183	-0.2362	0.9141
Farm Improved Acreage	-0.2224	0.4257	-0.5244	-0.5612	-0.2304	-0.4974
Commercial Property	1.0000	-0.1509	0.7174	0.6801	0.3166	0.7009
Industrial Property	-0.1509	1.0000	-0.5325	-0.5572	-0.5347	-0.3399
Total Income	0.7174	-0.5325	1.0000	0.9863	0.6162	0.8712
Retail Sales	0.6801	-0.5572	0.9863	1.0000	0.6817	0.8079
Per Capita Income	0.3166	-0.5347	0.6162	0.6817	1.0000	0.1593
Total Employment	0.7009	-0.3399	0.8712	0.8079	0.1593	1.0000

TABLE 14. Continued

	Commercial Property	Industrial Property	Total Income	Retail Sales	Per Capita Income	Total Employment
Freeway Lane-miles	0.7082	-0.4264	0.8653	0.7918	0.2424	0.9542
Principal Arterial Lane-miles	-0.5484	0.0760	-0.5128	-0.3920	0.2520	-0.8200
Urban Population	0.6839	-0.2253	0.7423	0.6611	-0.0596	0.9721
Urban Area Size	0.7459	-0.3206	0.8295	0.7846	0.1132	0.9669

	Freeway Lane-miles	Principal Arterial Lane-miles	Urban Population	Urban Area Size
Single Family Homes	0.7103	-0.6552	0.7044	0.6979
Multi-family Homes	-0.8579	0.9138	-0.9864	-0.9140
Vacant Property	0.7999	-0.8375	0.8667	0.8115
County Population	0.6754	-0.7830	0.9032	0.8629
Farm Acreage	0.8478	-0.9072	0.9802	0.9145
Farm Improved Acreage	-0.3510	0.0942	-0.4333	-0.6154
Commercial Property	0.7082	-0.5484	0.6839	0.7459
Industrial Property	-0.4264	0.0760	-0.2253	-0.3206
Total Income	0.8653	-0.5128	0.7423	0.8295
Retail Sales	0.7918	-0.3920	0.6611	0.7846
Per Capita Income	0.2424	0.2520	-0.0596	0.1132
Total Employment	0.9542	-0.8200	0.9721	0.9669
Freeway Lane-miles	1.0000	-0.8472	0.9161	0.8862
Principal Arterial Lane-miles	-0.8472	1.0000	-0.8952	-0.7448
Urban Population	0.9161	-0.8952	1.0000	0.9554
Urban Area Size	0.8862	-0.7448	0.9554	1.0000

Just as in the single area analysis, there is a great deal of correlation, or multicollinearity, between the predictor variables. The Pearson Correlation Coefficients greater than 0.50 are arbitrarily chosen and highlighted in Table 14 to demonstrate how much correlation exists between the variables. Many of the unhighlighted coefficients still demonstrate strong correlation.

Principal component analysis (PCA) was chosen to deal with the problem of multicollinearity. PCA is also used in the single urban area analysis to help solve the regression analysis as there are more predictor variables than years of data. However, this is not a problem in the urban area group analysis because the combination of urban areas now has data points outnumbering the predictor variables. Principal component analysis is used to remove much of the multicollinearity that exists between the predictor variables.

The principal component analysis on the Corpus Christi/Lubbock cluster data produces the eigenvalues of the correlation matrix. The eigenvalues show that nine principal component variables explain 99.93 percent of the data. Nine variables explained 100 percent of the data in the single urban area analysis. Table 15 shows that all of the data is explained by the first fourteen principal components yet all sixteen principal component variables have eigenvalues. For the urban area group analysis, all sixteen variables are carried into the regression analysis. In the single urban area analysis, only the first nine variables have eigenvalues and are carried forward into the regression analysis. Thus, both regression analyses, single urban area and urban area clusters, will have access to the variables explaining 100 percent of the data.

TABLE 15. Eigenvalues of the Correlation Matrix for Corpus Christi/Lubbock cluster.

Variable	Eigenvalue	Difference	Proportion	Cumulative
1	10.5679290	7.8061227	0.6605	0.6605
2	2.7618063	1.3110149	0.1726	0.8331
3	1.4507914	0.7701144	0.0907	0.9238
4	0.6806770	0.2999706	0.0425	0.9663
5	0.3807064	0.2822992	0.0238	0.9901
6	0.0984072	0.0773323	0.0062	0.9963
7	0.0210750	0.0026310	0.0013	0.9976
8	0.0184440	0.0102166	0.0012	0.9987
9	0.0082273	0.0030502	0.0005	0.9993
10	0.0051771	0.0025048	0.0003	0.9996
11	0.0026724	0.0003538	0.0002	0.9997
12	0.0023185	0.0014424	0.0001	0.9999
13	0.0008762	0.0001731	0.0001	0.9999
14	0.0007031	0.0005595	0.0000	1.0000
15	0.0001436	0.0000980	0.0000	1.0000
16	0.0000455		0.0000	1.0000

The eigenvectors for each principal component are shown in Table 16. These eigenvectors show how much weight each of the original values have on each principal component composite variable. Weights of at least 0.25 whether positive or negative are arbitrarily chosen and are shaded to show which of the original prediction variables contributed notably to each principal component variable. All sixteen principal component composite variables are shown since each of these variables had eigenvalues greater than zero. Additionally, unlike the individual urban area analysis, there are more data points in each cluster than variables so there is sufficient data in each cluster to support all sixteen principal component variables.

TABLE 16. Eigenvectors for Lubbock/Corpus Christi cluster.

Variable	Principal Component Composite Variable				
	Prin. Comp. 1	Prin. Comp. 2	Prin. Comp. 3	Prin. Comp. 4	Prin. Comp. 5
SINGLE	0.242089	-0.036448	0.474742	0.166653	-0.263917
MULTI	-0.288164	0.178712	0.131590	0.077563	-0.019814
CNTYPOP	0.254841	-0.244583	-0.274004	0.164728	-0.023469
VACANT	0.273280	-0.157583	0.274457	0.045478	-0.261870
FARM	0.286596	-0.195690	-0.115346	-0.047372	-0.008960
EMPLOY	0.302143	0.033112	-0.083047	-0.062065	0.213101
FARMIM	-0.142514	-0.221209	0.531711	-0.537119	0.199094
COMM	0.244956	0.074431	0.417423	0.300347	-0.290716
INDUS	-0.095563	-0.405037	0.240711	0.531308	0.671599
INCOME	0.257984	0.309220	0.031036	-0.008743	0.267514
PERCAP	0.035953	0.569643	0.214047	0.011671	0.226976
RETAIL	0.237105	0.363495	0.009094	0.065639	0.260748
URBAREA	0.300049	0.024958	-0.122693	0.164705	-0.018751
URBPOP	0.300760	-0.097237	-0.087955	-0.055237	0.081613
FWYLANMI	0.291090	0.069562	0.030941	-0.303546	0.151118
ARTLANMI	-0.258009	0.238757	-0.034475	0.378256	-0.138621
Variable	**Prin. Comp. 6**	**Prin. Comp. 7**	**Prin. Comp. 8**	**Prin. Comp. 9**	**Prin. Comp. 10**
SINGLE	-0.068897	-0.252235	-0.114236	0.474664	0.049906
MULTI	-0.065796	0.143907	0.390417	0.033207	0.271245
CNTYPOP	0.402846	-0.303473	0.260773	-0.020676	0.567127
VACANT	-0.072143	0.141971	-0.392746	-0.108281	0.198209
FARM	0.110604	0.408762	-0.022715	-0.194282	0.055155
EMPLOY	0.062142	0.081970	-0.258381	-0.092530	-0.025341
FARMIM	0.536490	0.066837	0.071418	-0.083390	0.001392
COMM	0.019928	0.047264	0.375988	-0.315790	-0.165861
INDUS	-0.153863	0.080403	-0.012519	0.020845	0.008545
INCOME	0.118120	-0.254789	-0.166053	0.053621	0.303525
PERCAP	-0.123255	0.027818	-0.154463	-0.438286	0.247537
RETAIL	0.292042	-0.150233	0.230283	0.291195	-0.410218
URBAREA	0.132258	0.299437	0.289497	-0.173023	-0.153579
URBPOP	0.037365	0.001909	-0.217041	0.010734	-0.332690
FWYLANMI	-0.323119	0.466846	0.251560	0.465986	0.264331
ARTLANMI	0.507661	0.469652	-0.315770	0.284712	0.076980

TABLE 16. Continued

Variable	Principal Component Composite Variable				
	Prin. Comp. 11	Prin. Comp. 12	Prin. Comp. 13	Prin. Comp. 14	Prin. Comp. 15
SINGLE	-0.333596	0.389164	0.085728	-0.049528	-0.090570
MULTI	0.275028	0.380191	0.522969	0.225402	0.159743
CNTYPOP	-0.000795	-0.064951	-0.044999	0.075129	0.229157
VACANT	0.687825	0.012432	-0.175062	0.138948	0.010393
FARM	-0.071974	0.037950	0.500462	-0.144383	-0.545104
EMPLOY	-0.014633	0.274888	0.200170	-0.563684	0.538871
FARMIM	-0.057767	0.038473	-0.084970	0.043818	0.024839
COMM	-0.113754	-0.464202	0.113449	-0.145195	0.159289
INDUS	0.018955	-0.037329	-0.040019	0.016237	-0.026092
INCOME	-0.059997	-0.168094	0.085716	0.092835	-0.376883
PERCAP	-0.170919	0.085211	-0.105149	0.133642	0.066072
RETAIL	0.475743	-0.010872	0.036558	-0.085671	-0.097170
URBAREA	-0.124113	0.518040	-0.480105	0.185058	-0.110176
URBPOP	-0.159252	-0.080927	0.315594	0.700904	0.317085
FWYLANMI	-0.061964	-0.265590	-0.152940	0.016561	0.147183
ARTLANMI	-0.119123	-0.152264	-0.032079	0.018262	0.095307

Variable	Prin. Comp. 16
SINGLE	0.165238
MULTI	-0.197868
CNTYPOP	0.252241
VACANT	-0.023978
FARM	0.261245
EMPLOY	-0.202336
FARMIM	-0.028148
COMM	-0.162821
INDUS	0.020879
INCOME	-0.611487
PERCAP	0.462379
RETAIL	0.284152
URBAREA	-0.248341
URBPOP	0.004001
FWYLANMI	0.046275
ARTLANMI	-0.011540

When using principal component analysis, it is important to try to place some meaning with each of the principal component composite variables (i.e., review the predictor variables that weighted highly in each composite variable to determine if there is a pattern). The list below highlights some of the patterns. It is apparent that the majority of these variables are a mixed blend of the original predictor variables with most having some combination of socio-economic and land use variables:

- Composite Variable 1 is weighted fairly high on over half of the original predictor variables. The land use variables weighted high are multi-family dwelling units, farm acreage, and vacant properties. The socio-economic variables weighted highly are county population, total employment, total income, urban area size, and urban area population. It also weights highly on both freeway and principal arterial lane-miles.

- Composite Variable 4 weights highly on three land use variables including improved farm acreage, commercial properties, and industrial properties. It also weights highly on freeway and principal arterial lane-miles.
- Composite Variable 5 weights highly on six original predictor variables including single family residences, vacant properties, commercial properties, industrial properties, total income, and total retail sales.
- Composite Variable 6 weights highly on county population, improved farm acreage, total retail sales, and freeway and principal arterial street lane-mileage.
- Composite Variable 7 is weighted high on single-family residences, county population, farm acreage, total income, urban area size, and freeway and principal arterial lane-mileage.
- Composite Variable 8 weights highly on eight of the original predictor variables. These include multi-family dwelling units, county population, vacant properties, total employment, commercial properties, urban area size, and freeway and principal arterial lane-mileage.
- Composite Variable 2 weights highly on three socio-economic variables including total income, per capita income, and total retail sales. It also weights highly on industrial properties. This variable might be considered a socio-economic variable due to it weighting heavily on socio-economic information. Composite Variable 3 weights highly on four land use variables including single family residences, vacant properties, improved farm acreage, and commercial properties. It also weights high on county population. This variable appears to be based more on land use activities.
- Composite Variable 9 weights highly on single family residences, commercial properties, per capita income, total retail sales, and freeway and principal arterial lane-mileage.
- Composite Variable 10 weights high on a mix of the original predictor variables including multi-family dwelling units, county population, total income, total retail sales, urban population, and freeway lane-miles.

- Composite Variable 11 weights high on three land use variables: single family residences, multi-family dwelling units, and vacant properties. It also weights heavily on total retail sales. This variable appears to be more of a land use variable.
- Composite Variable 12 weights high on single family residences, multi-family dwelling units, total employment, commercial properties, urban area size, and freeway lane-miles.
- Composite Variable 13 weights highly on only four variables: multi-family dwelling units, farm acreage, urban area size, and urban area population.
- Composite Variable 14 weights highly on only two original predictor variables: total employment and urban population.
- Composite Variable 15 weights highly on farm acreage, total employment, total income, and urban population.
- Composite Variable 16 weights highly on county population, farm acreage, total income, per capita income, and total retail sales.

As with the composite variable in the single urban area analysis, there does not appear to be any true “economic” or “land use” composite variables. There still appears to be a mixed assortment of predictor variables in the new composite variables.

CHAPTER VII

URBAN AREA CLUSTER ANALYSIS – REGRESSION ANALYSIS

In this investigation, the principal component composite variables are used in a regression analysis rather than the original predictor variables as the composite variables have had much of the multicollinearity removed. Two methods of regression are applied to the principal component composite variables—Stepwise and Mallow's C_p. The simplest model is generally selected if the simple model yielded approximately the same amount of explanation of the data as the more complicated model. The Stepwise and Mallow's C_p methods, shown in Tables 17 and 18, respectively, produce slightly different results for the Corpus Christi/Lubbock Cluster data. Both models select principal component composite variables two through seven, ten and fifteen. However, the Stepwise model also included principal component composite variables eleven and sixteen.

Often, in regression analysis, the coefficient of determination (R^2) is used to determine how well the data has fit a model. However, since this analysis has a limited number of variables, the adjusted R^2 (R^2-Adj) value are used to determine how well the composite variables predict the independent variable. Since the R^2-Adj value of the Stepwise selection method (0.6281) is quite a bit higher than the R^2-Adj value for the Mallow's C_p model (0.4500), the Stepwise selection model is chosen pending analysis of the residual plots.

To ensure that a good model is created, the residuals and the studentized residuals from the model are plotted and analyzed. Figure 8 shows that the residuals generally lie in the range of -0.2 to 0.15. They appear to be randomly distributed on either side of zero. The studentized residuals are the residuals divided by their standard errors and they should generally lie in the range of -3.0 to 3.0 to reflect a good fit to the data (Ott, 1993). Therefore, when a studentized residual is greater than |-3.0| or |3.0|, it is an indication that the model does not fit the data well. The studentized residuals for the chosen model from the Stepwise selection method, shown in Figure 9, are well within the range -3.0 to 3.0 and actually fall between -2.0 and 2.0. Figure 10 shows a plot of the studentized residuals and the predicted value of Travel Rate Index. The points appear to be randomly distributed about zero on the y-axis and Travel Rate Index values fall between 1.00 and 1.10.

TABLE 17. Stepwise selection method for Lubbock and Corpus Christi cluster.

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	7	0.00371		5.58	0.0048
Error	12	0.00114	0.0005294		
Corrected Total	19	0.00484	0.0000948		
	Root MSE	0.00974	R-Square	0.7651	
	Depend. Mean	1.02780	Adj R-Sq	0.6281	
	Coeff Var	0.94736			

Parameter Estimates							
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > [t]	Type I SS	Type II SS
Intercept	1	1.20780	0.00218	472.06	0.0001	21.12746	21.12746
Prin2	1	-0.00348	0.00134	-2.59	0.0236	0.000636	0.000636
Prin3	1	0.00315	0.00185	1.70	0.1152	0.000273	0.000273
Prin4	1	-0.00716	0.00271	-2.64	0.0214	0.000663	0.000663
Prin5	1	0.00602	0.00362	1.66	0.1223	0.000262	0.000262
Prin6	1	0.01516	0.00712	2.13	0.0547	0.000430	0.000430
Prin7	1	0.04533	0.01539	2.95	0.0122	0.000823	0.000823
Prin13	1	0.19270	0.07547	2.55	0.0253	0.000618	0.000618

Analysis of Autocorrelation	
Durbin-Watson D-Value	2.504
Number of Obs.	20
1st Order Autocorrelation	-0.265

TABLE 18. Mallow's C_p selection method for Lubbock and Corpus Christi cluster.

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	4	0.00274	0.000685	4.89	0.0101
Error	15	0.00210	0.000140		
Corrected Total	19	0.00484			
	Root MSE	0.01184	R-Square	0.5658	
	Depend. Mean	1.02780	Adj R-Sq	0.4500	
	Coeff Var	1.15199			

Parameter Estimates							
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > [t]	Type I SS	Type II SS
Intercept	1	1.02780	0.00265	388.21	0.0001	21.12746	21.12746
Prin2	1	-0.00348	0.00163	-2.13	0.0501	0.000636	0.000636
Prin4	1	-0.00716	0.00329	-2.17	0.0461	0.000663	0.000663
Prin7	1	0.04533	0.01871	2.42	0.0285	0.000823	0.000823
Prin13	1	0.19270	0.09177	2.10	0.0531	0.000618	0.000618

Analysis of Autocorrelation	
Durbin-Watson D-Value	1.491
Number of Obs.	20
1st Order Autocorrelation	0.247

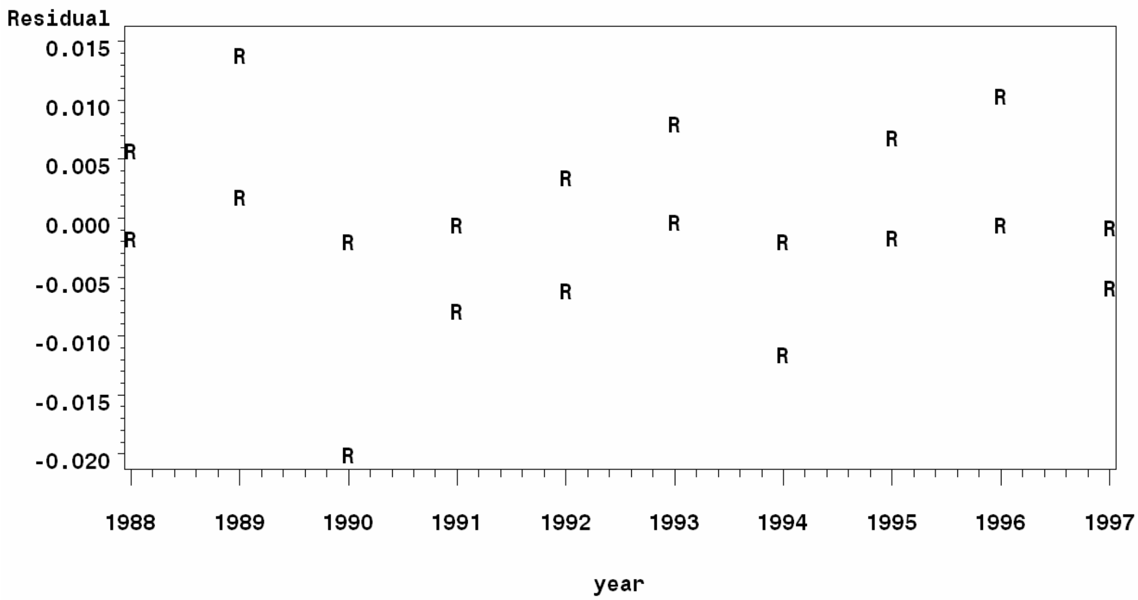

FIGURE 8. Residual plot of Stepwise model selection for Lubbock and Corpus Christi cluster.

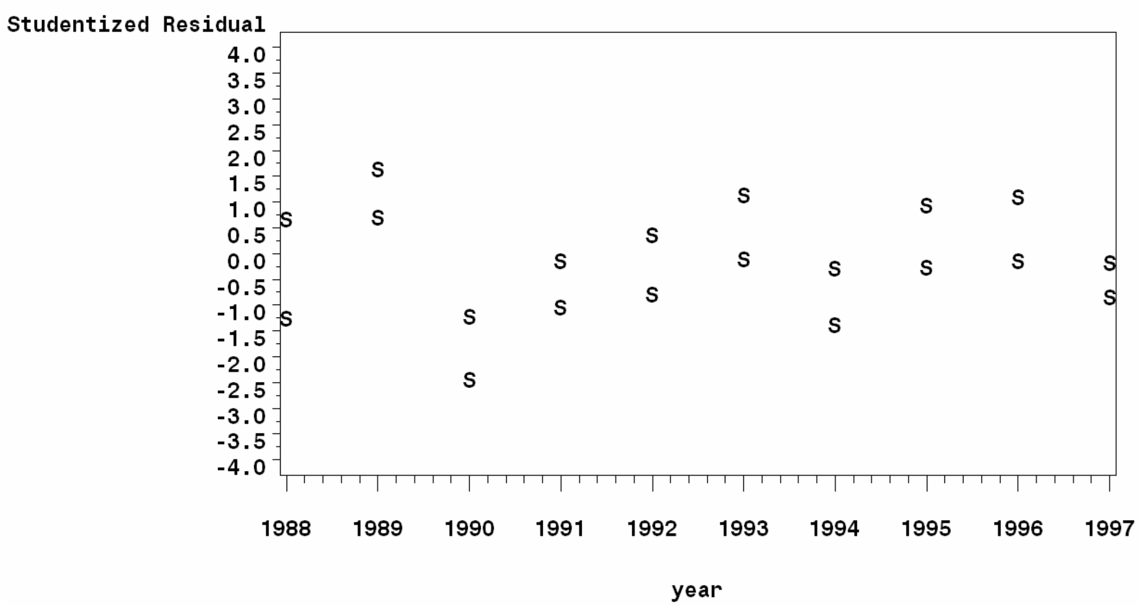

FIGURE 9. Studentized residual plot of Stepwise selection model for Lubbock and Corpus Christi cluster.

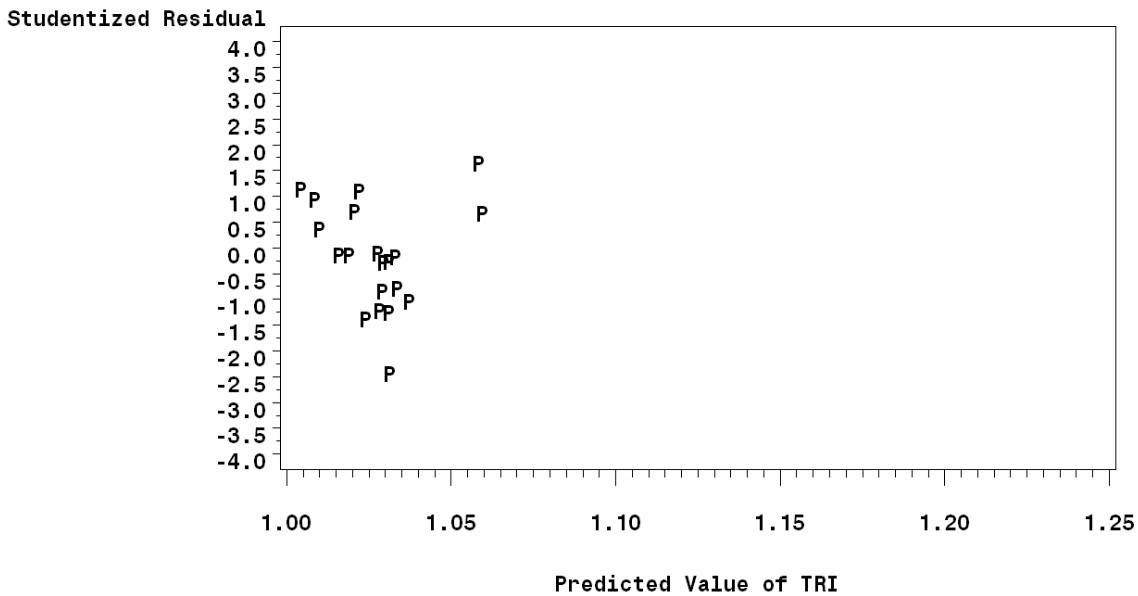

FIGURE 10. Predicted value plot of Stepwise model selection for Lubbock and Corpus Christi cluster.

The same basically holds true when analyzing the residual plots from the Mallow's C_p selection method. The basic residual plot shown in Figure 11 appears to have random points distributed on either side of zero. There appears to be the hint of a pattern in the plot but not enough to halt the analysis. The plot of the studentized residuals in Figure 12 appears to generally be random as well. The comparison of the studentized residuals and the predicted values of the Travel Rate Index are shown in Figure 13. The predicted values appear to be randomly distributed around zero on the y-axis and the Travel Rate Index values generally fall between 1.00 and 1.05.

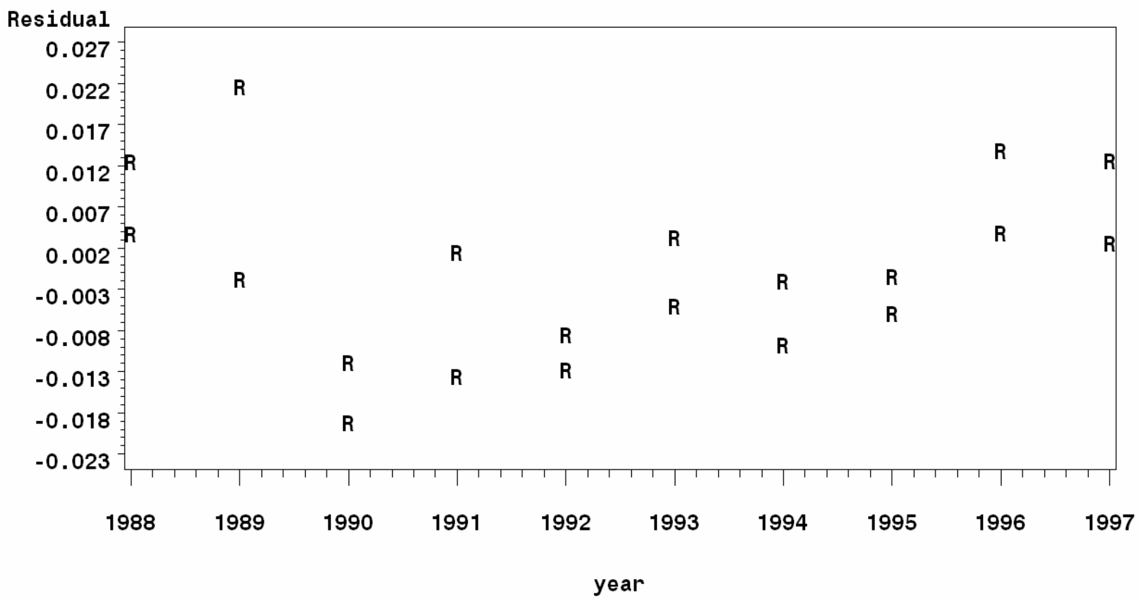

FIGURE 11. Residual plot of Mallow's C_p selection model for Lubbock and Corpus Christi cluster.

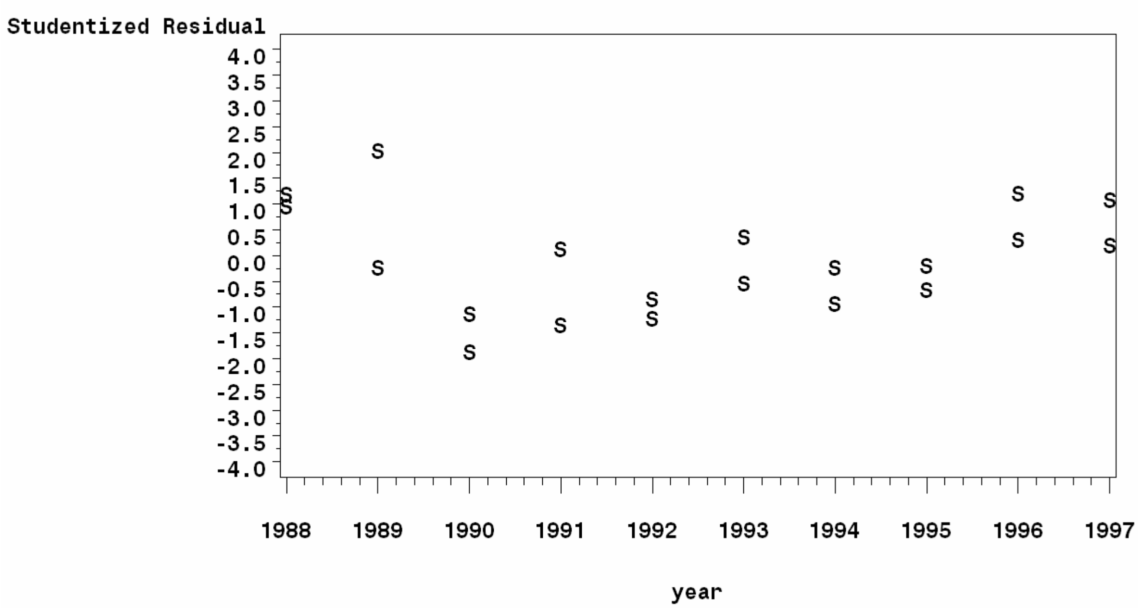

FIGURE 12. Studentized residual plot of Mallow's C_p model selection for Lubbock and Corpus Christi cluster.

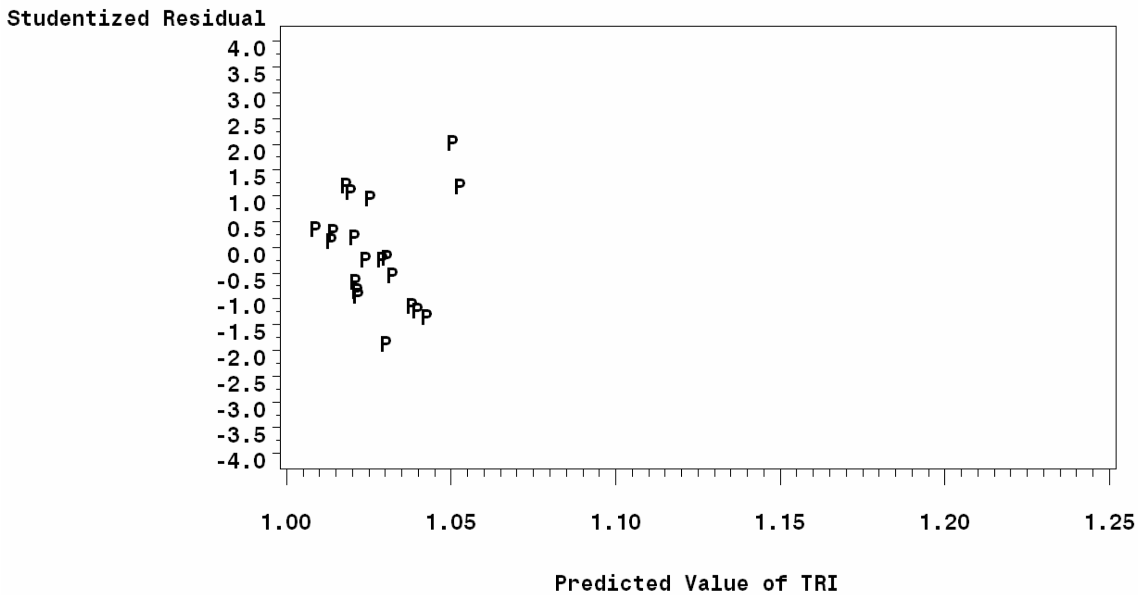

FIGURE 13. Predicted value plot of Mallow's C_p selection model for Lubbock and Corpus Christi cluster.

More investigation may be needed in order to make a decision regarding the model that best fits the data although the results from the Stepwise and Mallow's C_p selection models appear to be about the same at this point.

Another concern when dealing with time series data is the existence of correlation over time or autocorrelation. The principal component analysis eliminates correlation between the prediction variables but it does not address autocorrelation. A test for autocorrelation is the Durbin-Watson test which produces a d-statistic. If positive autocorrelation exists then successive residuals will be similar and their squared difference will tend to be smaller than if there was no correlation between the residuals. Generally, if the d-statistic is less than about 1.5 then positive serial correlation exists and if the d-statistic is greater than about 2.5 then negative serial correlation exists. However, these thresholds are not rigid but serve as a general guideline. The result of the Durbin-Watson test for the Stepwise model is shown in Table 17. The d-statistic of 2.504 indicates a possible presence of serial correlation. The first order autocorrelation for the residuals is -0.265 which indicates very little autocorrelation over time. The absolute value of the correlations among the residuals should be less than the absolute value of two standard errors for each lag of the model. Table 19 also shows the correlation of each residual and the standard errors. For each lag, the correlation is generally less than twice the standard error so there does not appear to be a problem with autocorrelation with the Stepwise model.

TABLE 19. Autocorrelation analysis of Stepwise selection for Lubbock and Corpus Christi cluster.

	Name of variable	**Residual**	
	Mean of Working Series	1.55E-16	
	Standard Deviation	0.007542	
	Number of Obs.	26	
Lag	Covariance	Correlation	Standard Error
0	0.00005689	1.00000	0
1	-0.0000167	-0.29318	0.196116
2	-0.0000150	-0.26334	0.212305
3	-3.46E-7	-0.00608	0.224517
4	0.00002277	0.40029	0.224523
5	-0.0000351	-0.61648	0.250472
6	2.83315E-6	0.04980	0.303266
7	0.00002519	0.44286	0.303581
8	-4.161E-6	-0.07315	0.327487
9	-0.00002441	0.42916	0.328115
Check for White Noise			
To Lag	6		
Chi-Square	23.18		
DF	6		
Pr>Chi-Square	0.0007		
Autocorrelations	-0.293		
	-0.263		
	-0.006		
	0.400		
	-0.616		
	0.050		

The analysis of the Mallow's Cp model in Table 18 shows a d-statistic of 1.491 indicating no real presence of serial correlation. The Mallow's C_p model displayed in Table 20 shows a first order autocorrelation for the residuals of 0.247. This indicates very little autocorrelation over time. Additionally, Table 20 shows the correlation values in lags 1 through 4 of the model do not exceed twice the standard error. This indicates no problem with autocorrelation of one year in the model. It is not until lag 5 that correlation values exceed twice the standard error. Since the early correlation values in each lag move closer to zero fairly rapidly after one year, the model may not be too bad. Since this does not appear to be of any concern with the Stepwise model, it is chosen as the prediction model for the Corpus Christi/Lubbock Cluster.

TABLE 20. Autocorrelation analysis of Mallow's C_p results for Lubbock and Corpus Christi cluster.

	Name of Variable	Residual	
	Mean of Working Series	1.56E-16	
	Standard Deviation	0.010254	
	Number of Obs.	26	
Lag	Covariance	Correlation	Standard Error
0	0.00010514	1.00000	0
1	0.00001895	0.18023	0.196116
2	5.45258E-6	0.05186	0.202386
3	-0.0000188	-0.17889	0.202897
4	-0.0000118	-0.11185	0.208875
5	-0.0000424	-0.40330	0.211166
6	-0.0000814	-0.77426	0.238961
7	-1.8887E-6	-0.01796	0.321272
8	0.0001145	1.00000	0.321310
9	0.00003595	0.34194	0.424457
Check for White Noise			
To Lag	6		
Chi-Square	29.91		
DF	6		
Pr>Chi-Square	0.0001		
Autocorrelations	0.180		
	0.052		
	-0.179		
	-0.112		
	-0.403		
	-0.774		

Based on this analysis, the selected model for the Corpus Christi/Lubbock Cluster shows to be:

$$TRI=1.02780-0.00348(PC2)+0.00315(PC3)-0.00716(PC4)+0.00602(PC5)+0.01516(PC6)+0.04533(PC7)+0.19270(PC13)$$

The selected models for the other urban areas are listed in Table 21. Also shown in Table 21 are the R^2-Adj values that show how well the data fits the model for each urban area. Generally, the models all have R^2-Adj values of at least 0.90 or higher indicating that the models are good choices for prediction as they explain at least 90 percent of the variability in the data. The lone exception is Houston with an R^2-Adj value of 0.8998. The smallest model includes three predictor variables while the largest includes seven predictor variables. The models for Amarillo, Denton, Sherman-Denison, and Waco all have R^2-Adj values of at least 0.99.

TABLE 21. Travel rate index prediction equations for clusters of areas.

Urban Area	Equation	AdjustedR^2
Cluster 1 - Corpus Christi Lubbock	TRI=1.20780-0.00348(PC2)+0.00315(PC3)-0.00716(PC4)+0.00602(PC5)+0.01516(PC6)+0.04533(PC7)+0.19270(PC13)	0.6281
Cluster 2 - Abilene Amarillo Longview San Angelo Victoria	TRI=1.00478+0.00104(PC1)+0.000777115(PC2)-0.00077115(PC4)-0.00087968(PC5)-0.00199(PC6)-0.00111(PC7)+0.00788(PC13)-0.01886(PC15)	0.8702
Cluster 3 – Bryan-College Station Texarkana Waco	TRI=1.01207-0.00160(PC1)-0.00691(PC2)-0.00476(PC6)+0.01071(PC7)+0.05003(PC8)-0.01800(PC9)+0.14792(PC14)-0.20185(PC16)	0.8754
Cluster 4 – Denton Sherman-Denison Tyler	TRI=1.02405+0.00807(PC1)+0.00442(PC2)+0.00420(PC3)-0.00611(PC4)+0.00535(PC7)+0.01308(PC8)-0.02171(PC9)+0.09098(PC13)	0.9923

CHAPTER VIII

CONCLUSIONS AND RECOMMENDATIONS

This research developed computer models that relate traffic congestion levels to socio-economic and land use data in Texas for urban areas and combinations of urban areas. Fourteen socio-economic and land use variables were utilized in these models. A summary of the key findings is presented in this chapter along with conclusions and a discussion of future research recommendations.

FINDINGS

The findings in this report support the research hypothesis. There is evidence of a relationship between economic and land use data that allows for the prediction of traffic congestion at an areawide level. Fourteen of the eighteen individual urban area models have higher Adjusted R^2 values based on the predicted values of TRI from the models than a simple best-fit time trend line plotted through the original TRI information for each area. Figure 14 shows the best-fit time trend lines for both the predicted values generated by the model and the original TRI information for Denton. The Adjusted R^2 value for the line based on the original TRI values is 0.939. The Adjusted R^2 value for the line using the predicted values from the model is 0.957. Since the best-fit time trend lines from the predicted values of the models outperform the best-fit time trend lines based on the original TRI data the majority of the time, there is sufficient evidence to accept the research hypothesis.

The models do not perform as well for the clusters of urban areas as they do for the individual urban areas. In all cases, the best-fit time trend lines for the original TRI information have a higher Adjusted R^2 value than the best-fit time trend lines for the predicted values generated by the models. Thus, at this time, one can predict the future TRI values for the clusters of urban areas better by using the historical TRI values rather than the models. The research hypothesis is not supported for the clusters of urban areas.

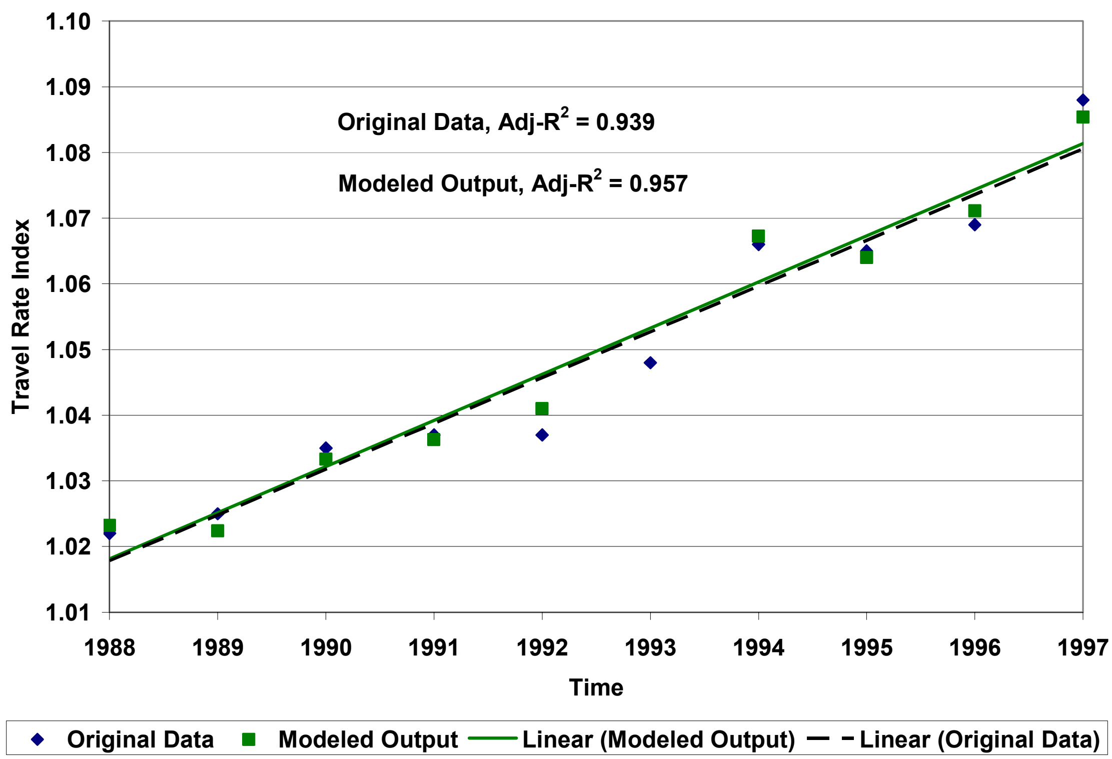

FIGURE 14. Best-fit time trend lines for modeled and original TRI values in Denton.

It is important to note that just because the individual area models perform well and support the hypothesis, a given model may not be a realistic predictor. Figure 15 shows the original TRI information and predicted TRI values for Lubbock. The best-fit time trend lines have been plotted as well. These lines suggest that traffic congestion has been improving each year since 1988. However, if you remove the TRI values from 1988 and 1989, the trend of the remaining data points appears to be slightly upward, or more congested, between 1990 and 1997. A more accurate model for predicting future TRI values in Lubbock would be based upon the data points from 1990 to 1997 rather than the points the entire span of data. There were some significant changes made to the Lubbock transportation system during the late 1980s that significantly changed the congestion level for the city making the model that was developed in this research somewhat obsolete for predicting future congestion. This is the reason that the Denton model is used in this chapter rather than the Lubbock model that was shown throughout this report.

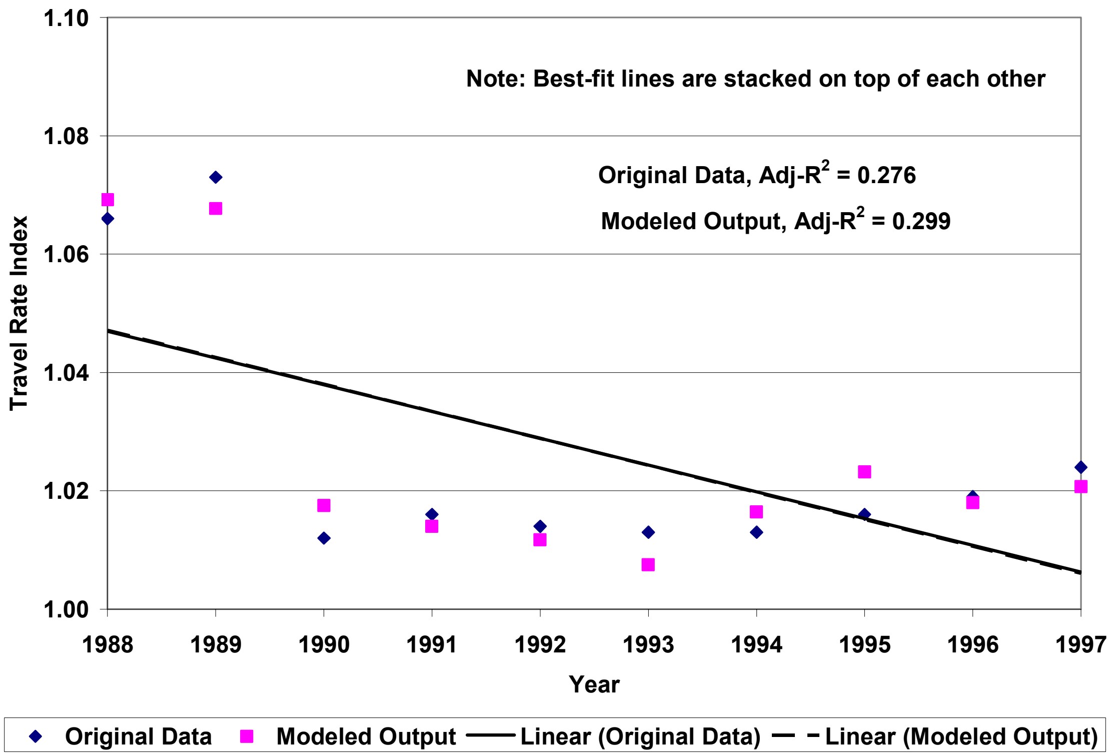

FIGURE 15. Best-fit time trend lines for modeled and original TRI values in Lubbock.

CONCLUSIONS

The findings in this report support the research hypothesis for individual urban areas. There is evidence of a relationship between economic and land use data that allows for the prediction of traffic congestion at an areawide level. At this time, the hypothesis is supported for individual urban areas but not groups of urban areas. A simple best-fit time trend model of the original TRI data is better at predicting future congestion levels in clusters of urban areas than the models that have been created in this research.

The models developed in this research provide a mechanism to predict future traffic congestion levels for a given urban area based on past economic and land use information. The models provide planning agencies with a means to perform "what-if" scenarios based on various economic forecasts, land use forecasts and projected transportation funding levels. Before this research, a long-range planning model had to be utilized to predict future congestion levels. And, for detailed transportation network information at the roadway section or corridor level, the long-range planning model remains a necessity. These new models will not replace the long-range model's capabilities. However, the new models will provide a means of quickly obtaining planning-level figures on future traffic congestion levels to convey to elected officials, policy makers, or others who may want to see the "big picture" effects of such things as transportation policy decisions or economic growth in their area.

A planner working in Denton County could enter a projected population estimate into the model and determine its effect on congestion in the Denton urban area. For example, the population of Denton County is expected to grow from about 371,500 in 1997 to 390,000 by 2005. After entering the new population into the model, the TRI rises from 1.104 to 1.106. If at the same time, the employment climbs from about 98,750 in 1997 to 110,000 in 2005, the TRI would climb to 1.110. Thus, the combination of the two socio-economic projections increased the TRI by 0.004. Not all variables, however, have a positive effect on the TRI.

Changes to some variables may show congestion to be improving despite adding more persons to the community or increasing total income; occurrences that would lead one to believe that congestion should worsen. In the Denton example above, if the number of commercial businesses in the urban area rises from 4,120 in 1997 to 4,250 in 2005 the TRI drops from 1.110 to 1.107. One would believe that congestion should increase if the number of businesses rises in an area. This decline in the TRI is due to the interaction of all of the variables and their relationship with TRI when the model was initially created. The value of one variable might have been relatively constant over the modeled period but would show growth over a longer period of time. With enough years of data in the model, some of these relationships between the individual variables and TRI will change and the expected outcomes will begin to occur.

This tool may be especially useful for smaller planning agencies that may not have the necessary staff to update or run a new long-range planning model. A small planning agency, as in the Denton example, could obtain the data utilized in this report, replicate the analysis that was performed without too much difficulty, and generate their own model internally. This model could be updated annually or every few years as more data becomes available.

The reason for performing the analysis on groups of urban areas is to determine if it might be possible to create one model that might fit all urban areas. This would be an extremely powerful tool that would be transportable from one area to the next. Functional models were created for several groups of urban areas in Texas. This is a promising finding, yet it appears that the individual urban area models tend to fit the data better at this point than do the group models. However, this does open the door for additional research to determine if more variables or different combinations of variables would make better predictors.

RECOMMENDATIONS FOR FUTURE RESEARCH

Though this research provides contributions to the transportation literature in the area of projecting areawide traffic congestion levels using non-transportation related data, there are several areas in which future work is needed.

This research uses data obtained from two sources, the Texas State Comptrollers Office and the Texas Transportation Institute, to create a model capable of projecting traffic congestion levels in many Texas urban areas. There is a need for similar work that might look for additional sources of information to incorporate into the models. Other public agencies might have information on such things as unemployment rates or gross domestic products for individual urban areas. Also, the research needs to be replicated with data from states other than Texas to prove that the relationship holds elsewhere.

Future work should also include larger sample sizes in the model. This research used ten years of socio-economic, land use, and traffic congestion data. Additional data might create a model that is even more accurate at predicting traffic congestion levels if additional years of data are added.

More analysis needs to be performed on the clusters of urban areas to determine if it may be possible to generate one model that can be used in all areas. The results on this research effort are mixed in the analysis of multiple urban areas. The models of multiple urban areas are relatively good fits to the original data. However, at this time, they do not provide a better means of predicting future traffic congestion levels than a simple best-fit line projection of the original TRI values for the areas. Perhaps more variables or additional years of data may eventually make these models better predictors as well.

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APPENDIX A

ABILENE URBAN AREA REGRESSION ANALYSIS

The PRINCOMP Procedure

Observations	10
Variables	16

Simple Statistics

	A_SING	B_MULTI	CNTYPOP	C_VACANT
Mean	0.2974050447	0.3743168675	0.142589286	-.4787965719
StD	0.9630854812	0.8297686230	1.177213899	0.7221336625

Simple Statistics

	D_FARM	EMPLOY	E_FARMIM	F_COMM
Mean	-.4024698145	-.2783733462	0.3554274694	0.000000000
StD	0.6667684059	0.9435159584	0.9742452752	1.000000000

Simple Statistics

	F_INDUS	INCOME	PERCAP	RETAIL
Mean	0.000000000	0.5895209456	0.6054903199	0.1962271612
StD	1.000000000	0.7654626653	0.7351935680	0.9823278885

Simple Statistics

	URBAREA	URBPOP	FWYLANMI	ARTLANMI
Mean	0.6143859210	0.6168863595	0.5217062577	-0.391137357
StD	0.6596436466	0.6451822708	0.8829325526	1.091108150

Correlation Matrix

	A_SING	B_MULTI	CNTYPOP	C_VACANT	D_FARM	EMPLOY	E_FARMIM	F_COMM
A_SING	1.0000	0.8813	0.8843	0.2354	-.6270	0.9684	0.7550	0.9163
B_MULTI	0.8813	1.0000	0.8428	0.2035	-.4996	0.8685	0.9143	0.9089
CNTYPOP	0.8843	0.8428	1.0000	-.1842	-.5733	0.9517	0.7739	0.7438
C_VACANT	0.2354	0.2035	-.1842	1.0000	0.1727	0.0501	0.0647	0.4201
D_FARM	-.6270	-.4996	-.5733	0.1727	1.0000	-.6053	-.4831	-.6070
EMPLOY	0.9684	0.8685	0.9517	0.0501	-.6053	1.0000	0.8008	0.8586
E_FARMIM	0.7550	0.9143	0.7739	0.0647	-.4831	0.8008	1.0000	0.8249
F_COMM	0.9163	0.9089	0.7438	0.4201	-.6070	0.8586	0.8249	1.0000
F_INDUS	0.2353	0.2497	-.0651	0.8515	0.3603	0.0824	0.0810	0.2988
INCOME	0.8491	0.8028	0.9660	-.2602	-.7319	0.9177	0.7538	0.7429
PERCAP	0.8544	0.8087	0.9553	-.2381	-.7568	0.9163	0.7625	0.7636
RETAIL	0.8222	0.8247	0.9831	-.2916	-.5853	0.9104	0.7881	0.6932
URBAREA	0.6914	0.7064	0.9068	-.4816	-.6790	0.7948	0.6793	0.5428
URBPOP	0.5125	0.6274	0.8105	-.6071	-.5220	0.6435	0.6488	0.3723
FWYLANMI	0.7816	0.7562	0.9639	-.3641	-.5865	0.8882	0.7690	0.6442
ARTLANMI	-.6157	-.6436	-.8888	0.5354	0.5583	-.7547	-.6553	-.4950

The SAS System

The PRINCOMP Procedure

Correlation Matrix

	F_INDUS	INCOME	PERCAP	RETAIL	URBAREA	URBPOP	FWYLANMI	ARTLANMI
A_SING	0.2353	0.8491	0.8544	0.8222	0.6914	0.5125	0.7816	-.6157
B_MULTI	0.2497	0.8028	0.8087	0.8247	0.7064	0.6274	0.7562	-.6436
CNTYPOP	-.0651	0.9660	0.9553	0.9831	0.9068	0.8105	0.9639	-.8888
C_VACANT	0.8515	-.2602	-.2381	-.2916	-.4816	-.6071	-.3641	0.5354
D_FARM	0.3603	-.7319	-.7568	-.5853	-.6790	-.5220	-.5865	0.5583
EMPLOY	0.0824	0.9177	0.9163	0.9104	0.7948	0.6435	0.8882	-.7547
E_FARMIM	0.0810	0.7538	0.7625	0.7881	0.6793	0.6488	0.7690	-.6553
F_COMM	0.2988	0.7429	0.7636	0.6932	0.5428	0.3723	0.6442	-.4950
F_INDUS	1.0000	-.2379	-.2441	-.1922	-.3450	-.3851	-.2848	0.4658
INCOME	-.2379	1.0000	0.9983	0.9746	0.9414	0.8269	0.9571	-.9272
PERCAP	-.2441	0.9983	1.0000	0.9653	0.9289	0.8075	0.9494	-.9164
RETAIL	-.1922	0.9746	0.9653	1.0000	0.9366	0.8648	0.9807	-.9443
URBAREA	-.3450	0.9414	0.9289	0.9366	1.0000	0.9580	0.9147	-.9358
URBPOP	-.3851	0.8269	0.8075	0.8648	0.9580	1.0000	0.8476	-.8988
FWYLANMI	-.2848	0.9571	0.9494	0.9807	0.9147	0.8476	1.0000	-.9460
ARTLANMI	0.4658	-.9272	-.9164	-.9443	-.9358	-.8988	-.9460	1.0000

Eigenvalues of the Correlation Matrix

	Eigenvalue	Difference	Proportion	Cumulative
1	11.4426235	8.4591210	0.7152	0.7152
2	2.9835025	2.2060123	0.1865	0.9016
3	0.7774902	0.3941053	0.0486	0.9502
4	0.3833849	0.1208842	0.0240	0.9742
5	0.2625007	0.1686983	0.0164	0.9906
6	0.0938023	0.0673302	0.0059	0.9965
7	0.0264721	0.0048064	0.0017	0.9981
8	0.0216657	0.0131076	0.0014	0.9995
9	0.0085581	0.0085581	0.0005	1.0000
10	0.0000000	0.0000000	0.0000	1.0000
11	0.0000000	0.0000000	0.0000	1.0000
12	0.0000000	0.0000000	0.0000	1.0000
13	0.0000000	0.0000000	0.0000	1.0000
14	0.0000000	0.0000000	0.0000	1.0000
15	0.0000000	0.0000000	0.0000	1.0000
16	0.0000000		0.0000	1.0000

Eigenvectors

	Prin1	Prin2	Prin3	Prin4	Prin5	Prin6
A_SING	0.257716	0.248398	-.114479	0.302766	0.037781	0.255179
B_MULTI	0.255920	0.239133	0.139681	-.328065	0.089893	-.316667
CNTYPOP	0.288516	0.022859	0.151259	0.259201	0.003510	0.051984
C_VACANT	-.062366	0.558522	-.130891	0.017103	-.103496	-.277891
D_FARM	-.205714	0.053829	0.773664	0.130750	-.348140	-.145375
EMPLOY	0.277080	0.150192	0.001554	0.277205	-.112447	0.382802
E_FARMIM	0.246149	0.158219	0.150433	-.689911	-.228426	0.412076
F_COMM	0.230626	0.332000	-.214369	-.159272	-.176538	-.243535
F_INDUS	-.048189	0.519721	0.337543	0.164044	0.491199	0.068658
INCOME	0.292357	-.040063	-.080606	0.139185	-.021928	-.190683
PERCAP	0.291864	-.030582	-.129791	0.100214	-.061362	-.208676
RETAIL	0.290425	-.044095	0.153804	0.109041	-.082588	-.080647
URBAREA	0.276431	-.163709	0.049678	0.009037	0.387662	-.081959
URBPOP	0.247991	-.234101	0.256412	-.228638	0.483364	-.017943
FWYLANMI	0.284644	-.087853	0.121147	0.117899	-.270295	0.294167
ARTLANMI	-.268003	0.209799	-.128077	-.058937	0.230766	0.416169

Eigenvectors

	Prin7	Prin8	Prin9	Prin10	Prin11	Prin12
A_SING	0.363545	0.131607	-.165961	-.015500	-.007945	0.084334
B_MULTI	0.664520	0.106189	0.083752	0.012981	0.092386	-.037540
CNTYPOP	-.020912	-.256947	0.285627	-.090489	-.120626	-.807884
C_VACANT	-.125049	0.194455	-.095123	-.063059	-.075074	-.117787
D_FARM	0.001740	0.225514	0.186815	0.128755	0.141537	0.062717
EMPLOY	-.154759	0.565582	0.117043	-.018034	-.049540	0.091495
E_FARMIM	-.268643	0.013061	-.215247	0.058354	0.063753	-.164635
F_COMM	-.179064	-.154869	0.479521	-.154045	-.149368	0.247064
F_INDUS	-.262265	-.360512	-.167369	0.049915	-.010663	0.178156
INCOME	-.199790	-.042216	-.088744	-.200842	0.871952	0.000000
PERCAP	-.120180	-.049807	-.042398	0.906068	0.000000	0.000000
RETAIL	0.157828	-.062466	-.587714	-.119237	-.176445	0.008400
URBAREA	-.172526	0.342857	0.187284	-.076349	-.126687	0.091801
URBPOP	-.032293	0.063902	0.129433	0.008122	-.014735	0.085100
FWYLANMI	0.171059	-.461128	0.229605	-.032812	-.016883	0.407037
ARTLANMI	0.271784	0.016303	0.249601	0.241684	0.338015	-.106396

Eigenvectors

	Prin13	Prin14	Prin15	Prin16
A_SING	0.024014	-.718014	0.000000	0.000000
B_MULTI	-.024407	0.236205	-.166872	-.295971
CNTYPOP	0.000000	0.000000	0.000000	0.000000
C_VACANT	0.080672	0.080080	0.692747	0.000000
D_FARM	0.081609	-.188630	-.016607	0.167262
EMPLOY	-.328904	0.397122	-.135620	-.108086
E_FARMIM	0.132659	-.138123	-.025740	-.056578
F_COMM	-.096377	-.130300	-.292471	0.412208
F_INDUS	-.012193	0.087478	-.206846	-.170401
INCOME	0.000000	0.000000	0.000000	0.000000

The PRINCOMP Procedure

Eigenvectors

	Prin13	Prin14	Prin15	Prin16
PERCAP	0.000000	0.000000	0.000000	0.000000
RETAIL	0.076999	0.289830	-.062318	0.592777
URBAREA	0.724251	0.000000	0.000000	0.000000
URBPOP	-.506981	-.151739	0.414375	0.224826
FWYLANMI	0.181351	0.196282	0.406486	-.157431
ARTLANMI	0.173380	0.199252	0.061473	0.493835

The REG Procedure
Model: MODEL1
Dependent Variable: TRI

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	0.00000221	4.42725E-7	6.18	0.0510
Error	4	2.86375E-7	7.159375E-8		
Corrected Total	9	0.00000250			

Root MSE	0.00026757	R-Square	0.8855
Dependent Mean	1.00250	Adj R-Sq	0.7423
Coeff Var	0.02669		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Type I SS	Type II SS
Intercept	1	1.00250	0.00008461	11848.0	<.0001	10.05006	10.05006
Prin1	1	-0.00005613	0.00002637	-2.13	0.1003	3.245085E-7	3.245085E-7
Prin2	1	0.00014688	0.00005164	2.84	0.0467	5.792542E-7	5.792542E-7
Prin3	1	-0.00019129	0.00010115	-1.89	0.1316	2.56046E-7	2.56046E-7
Prin4	1	0.00042507	0.00014405	2.95	0.0419	6.234327E-7	6.234327E-7
Prin8	1	-0.00149	0.00060594	-2.45	0.0703	4.303835E-7	4.303835E-7

Durbin-Watson D	3.042
Number of Observations	10
1st Order Autocorrelation	-0.531

```
                         Mean of Working Series    -152E-20
                         Standard Deviation        0.000169
                         Number of Observations          10


                                    Autocorrelations

Lag  Covariance  Correlation  -1 9 8 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 1    Std Error

  0  2.86375E-8      1.00000  |                    |********************|            0
  1  -1.5211E-8      -.53117  |        . ***********|            .       |     0.316228
  2  -2.3719E-9      -.08282  |    .             **|               .    |     0.395509
  3  4.67718E-9      0.16332  |    .               |***            .    |     0.397240
  4  -4.3162E-9      -.15072  |    .            ***|               .    |     0.403899
  5  4.85803E-9      0.16964  |    .               |***            .    |     0.409484
  6  -1.2475E-9      -.04356  |   .               *|                .   |     0.416453
  7  -1.1882E-9      -.04149  |   .               *|                .   |     0.416908
  8  3.5477E-10      0.01239  |   .                |                .   |     0.417321
  9  1.2623E-10      0.00441  |   .                |                .   |     0.417358

                            "." marks two standard errors
```

```
                    Plot of sres*year.  Symbol used is 'S'.

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        1988    1989    1990    1991    1992    1993    1994    1995    1996    1997

                                              year
NOTE: 6 obs out of range.
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                         Plot of sres*preds.  Symbol used is 'P'.

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 n         ‚
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 e         ‚
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 e    -0.5 ˆ P
 s         ‚
 i         ‚ P
 d    -1.0 ˆ
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           1.00          1.05          1.10          1.15          1.20          1.25

                                    Predicted Value of TRI
 NOTE: 6 obs had missing values.  1 obs hidden.
```

The REG Procedure
Model: MODEL1
Dependent Variable: TRI

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	0.00000163	5.443568E-7	3.77	0.0784
Error	6	8.669295E-7	1.444883E-7		
Corrected Total	9	0.00000250			

Root MSE	0.00038012	R-Square	0.6532
Dependent Mean	1.00250	Adj R-Sq	0.4798
Coeff Var	0.03792		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Type I SS	Type II SS
Intercept	1	1.00250	0.00012020	8340.04	<.0001	10.05006	10.05006
Prin2	1	0.00014688	0.00007336	2.00	0.0921	5.792542E-7	5.792542E-7
Prin4	1	0.00042507	0.00020463	2.08	0.0831	6.234327E-7	6.234327E-7
Prin8	1	-0.00149	0.00086081	-1.73	0.1351	4.303835E-7	4.303835E-7

Name of Variable = res

Mean of Working Series	-169E-20
Standard Deviation	0.000294
Number of Observations	10

Autocorrelations

```
Lag  Covariance  Correlation  -1 9 8 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 1    Std Error

  0   8.6693E-8      1.00000  |                    |********************|           0
  1  2.80075E-8      0.32306  |       .            |******      .       |    0.316228
  2  7.30149E-9      0.08422  |      .             |**           .      |    0.347670
  3   1.0889E-9      0.01256  |      .             |             .      |    0.349704
  4  -1.7452E-8      -.20131  |      .         ****|             .      |    0.349749
  5  -1.9492E-8      -.22483  |      .         ****|             .      |    0.361150
  6  -3.5793E-8      -.41287  |     .      ********|              .     |    0.374886
  7    -9.71E-9      -.11200  |   .              **|                .   |    0.417889
  8  2.61398E-9      0.03015  |   .                |*               .   |    0.420881
  9  8.7943E-11      0.00101  |   .                |                .   |    0.421097
```

"." marks two standard errors

The ARIMA Procedure

Autocorrelation Check for White Noise

To Lag	Chi-Square	DF	Pr > ChiSq	Autocorrelations					
6	8.64	6	0.1950	0.323	0.084	0.013	-0.201	-0.225	-0.413

Conditional Least Squares Estimation

Parameter	Estimate	Standard Error	t Value	Approx Pr > |t|	Lag
MU	-1.691E-18	0.00009815	-0.00	1.0000	0

Constant Estimate	-169E-20
Variance Estimate	9.633E-8
Std Error Estimate	0.00031
AIC	-132.23
SBC	-131.928
Number of Residuals	10

* AIC and SBC do not include log determinant.

Autocorrelation Check of Residuals

To Lag	Chi-Square	DF	Pr > ChiSq	Autocorrelations					
6	8.64	6	0.1950	0.323	0.084	0.013	-0.201	-0.225	-0.413

Autocorrelation Plot of Residuals

```
Lag  Covariance  Correlation  -1 9 8 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 1    Std Error

  0  9.63255E-8      1.00000  |                    |********************|           0
  1  3.11194E-8      0.32306  |       .            |******      .       |    0.316228
  2  8.11277E-9      0.08422  |      .             |**           .      |    0.347670
  3  1.20989E-9      0.01256  |      .             |             .      |    0.349704
  4  -1.9391E-8      -.20131  |      .         ****|             .      |    0.349749
  5  -2.1657E-8      -.22483  |      .         ****|             .      |    0.361150
  6   -3.977E-8      -.41287  |     .      ********|              .     |    0.374886
  7  -1.0789E-8      -.11200  |   .              **|                .   |    0.417889
  8  2.90442E-9      0.03015  |   .                |*               .   |    0.420881
  9  9.7715E-11      0.00101  |   .                |                .   |    0.421097
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"." marks two standard errors

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                       Plot of sres*year.  Symbol used is 'S'.

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        1988    1989    1990    1991    1992    1993    1994    1995    1996    1997

                                            year
NOTE: 6 obs out of range.
```

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                    Plot of sres*preds.  Symbol used is 'P'.

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         1.00           1.05           1.10           1.15           1.20           1.25

                                   Predicted Value of TRI
NOTE: 6 obs had missing values.  3 obs hidden.
```

APPENDIX B

AMARILLO URBAN AREA REGRESSION ANALYSIS

Observations	10
Variables	16

Simple Statistics

	A_SING	B_MULTI	CNTYPOP	C_VACANT
Mean	0.194558756	-.3546908863	0.4633342532	0.055722814
StD	1.135531194	0.9747729157	0.9759065962	1.185583668

Simple Statistics

	D_FARM	EMPLOY	E_FARMIM	F_COMM
Mean	0.013007682	0.207033183	-.3050343837	0.000000000
StD	1.201513168	1.191283590	0.7110005495	1.000000000

Simple Statistics

	F_INDUS	INCOME	PERCAP	RETAIL
Mean	0.000000000	0.5542787749	0.5892218573	0.2432722379
StD	1.000000000	0.8478130334	0.7752780107	0.9097670059

Simple Statistics

	URBAREA	URBPOP	FWYLANMI	ARTLANMI
Mean	0.4236995121	0.4805424566	0.6397491285	0.5151556709
StD	0.9602009246	0.9058216273	0.5764988094	0.9368779165

Correlation Matrix

	A_SING	B_MULTI	CNTYPOP	C_VACANT	D_FARM	EMPLOY	E_FARMIM	F_COMM
A_SING	1.0000	0.8409	0.1529	0.9685	0.7327	0.2456	0.4837	0.6066
B_MULTI	0.8409	1.0000	-.0021	0.8240	0.7089	0.0608	0.4341	0.4378
CNTYPOP	0.1529	-.0021	1.0000	0.3546	-.1269	0.9784	0.7818	-.3677
C_VACANT	0.9685	0.8240	0.3546	1.0000	0.6408	0.4357	0.6510	0.4240
D_FARM	0.7327	0.7089	-.1269	0.6408	1.0000	-.1444	0.4066	0.6343
EMPLOY	0.2456	0.0608	0.9784	0.4357	-.1444	1.0000	0.7381	-.2939
E_FARMIM	0.4837	0.4341	0.7818	0.6510	0.4066	0.7381	1.0000	-.2097
F_COMM	0.6066	0.4378	-.3677	0.4240	0.6343	-.2939	-.2097	1.0000
F_INDUS	-.2480	0.0699	-.7329	-.3165	0.0189	-.7431	-.3934	-.1692
INCOME	0.2267	-.0324	0.9696	0.3944	-.0999	0.9780	0.7128	-.2250
PERCAP	0.2585	-.0283	0.9504	0.4113	-.0620	0.9629	0.6936	-.1569
RETAIL	0.2924	0.0011	0.9466	0.4490	-.0746	0.9675	0.7040	-.1944
URBAREA	-.1385	-.2019	0.9134	0.0899	-.2799	0.8490	0.7345	-.6820
URBPOP	0.1371	-.0346	0.9544	0.3286	-.2558	0.9748	0.6625	-.3826
FWYLANMI	0.3911	0.1070	0.8958	0.5212	0.0025	0.9333	0.6340	0.0342
ARTLANMI	0.3503	0.0490	0.8986	0.4743	0.0025	0.9317	0.6324	0.0140

Correlation Matrix

	F_INDUS	INCOME	PERCAP	RETAIL	URBAREA	URBPOP	FWYLANMI	ARTLANMI
A_SING	-.2480	0.2267	0.2585	0.2924	-.1385	0.1371	0.3911	0.3503
B_MULTI	0.0699	-.0324	-.0283	0.0011	-.2019	-.0346	0.1070	0.0490
CNTYPOP	-.7329	0.9696	0.9504	0.9466	0.9134	0.9544	0.8958	0.8986
C_VACANT	-.3165	0.3944	0.4113	0.4490	0.0899	0.3286	0.5212	0.4743
D_FARM	0.0189	-.0999	-.0620	-.0746	-.2799	-.2558	0.0025	0.0025
EMPLOY	-.7431	0.9780	0.9629	0.9675	0.8490	0.9748	0.9333	0.9317
E_FARMIM	-.3934	0.7128	0.6936	0.7040	0.7345	0.6625	0.6340	0.6324
F_COMM	-.1692	-.2250	-.1569	-.1944	-.6820	-.3826	0.0342	0.0140
F_INDUS	1.0000	-.8135	-.8450	-.8276	-.4717	-.6744	-.8868	-.8908
INCOME	-.8135	1.0000	0.9967	0.9886	0.8314	0.9457	0.9489	0.9677
PERCAP	-.8450	0.9967	1.0000	0.9894	0.7909	0.9246	0.9597	0.9813
RETAIL	-.8276	0.9886	0.9894	1.0000	0.7928	0.9347	0.9505	0.9637
URBAREA	-.4717	0.8314	0.7909	0.7928	1.0000	0.8537	0.6488	0.6710
URBPOP	-.6744	0.9457	0.9246	0.9347	0.8537	1.0000	0.8934	0.8865
FWYLANMI	-.8868	0.9489	0.9597	0.9505	0.6488	0.8934	1.0000	0.9882
ARTLANMI	-.8908	0.9677	0.9813	0.9637	0.6710	0.8865	0.9882	1.0000

Eigenvalues of the Correlation Matrix

	Eigenvalue	Difference	Proportion	Cumulative
1	9.88764132	5.88192116	0.6180	0.6180
2	4.00572016	2.66512876	0.2504	0.8683
3	1.34059140	0.87749270	0.0838	0.9521
4	0.46309870	0.32058321	0.0289	0.9811
5	0.14251549	0.04525021	0.0089	0.9900
6	0.09726528	0.06293589	0.0061	0.9961
7	0.03432940	0.00850329	0.0021	0.9982
8	0.02582611	0.02281397	0.0016	0.9998
9	0.00301214	0.00301214	0.0002	1.0000
10	0.00000000	0.00000000	0.0000	1.0000
11	0.00000000	0.00000000	0.0000	1.0000
12	0.00000000	0.00000000	0.0000	1.0000
13	0.00000000	0.00000000	0.0000	1.0000
14	0.00000000	0.00000000	0.0000	1.0000
15	0.00000000	0.00000000	0.0000	1.0000
16	0.00000000		0.0000	1.0000

Eigenvectors

	Prin1	Prin2	Prin3	Prin4	Prin5	Prin6
A_SING	0.103447	0.459309	0.011251	0.231908	0.358663	-.235768
B_MULTI	0.029280	0.437736	0.282476	0.336429	-.649268	0.081697
CNTYPOP	0.309716	-.079574	0.102574	-.061151	-.225142	0.034702
C_VACANT	0.157821	0.410521	0.123478	0.278892	0.283201	-.264684
D_FARM	-.005831	0.439400	0.113601	-.658317	0.039788	0.171516
EMPLOY	0.313357	-.046882	0.047536	0.166179	-.076053	0.112142
E_FARMIM	0.246254	0.143169	0.439942	-.346832	-.025601	-.039817
F_COMM	-.060046	0.380697	-.516145	-.126099	-.027476	0.374428
F_INDUS	-.255285	-.011722	0.453529	0.180400	0.443554	0.599592
INCOME	0.314680	-.050912	-.050581	-.047624	0.120201	0.066484
PERCAP	0.313192	-.031610	-.104482	-.084486	0.160696	0.050198
RETAIL	0.313576	-.025698	-.066194	0.012369	0.248987	-.220585
URBAREA	0.259321	-.209865	0.319804	-.198978	-.034248	-.063141
URBPOP	0.300606	-.104204	0.058612	0.253299	0.027928	0.421583
FWYLANMI	0.305234	0.044226	-.207523	0.090271	-.089518	0.192505
ARTLANMI	0.306178	0.024876	-.216498	-.017857	0.034210	0.220945

	Prin7	Prin8	Prin9	Prin10	Prin11	Prin12
A_SING	-.067547	-.058317	-.147839	0.006609	0.184409	0.013133
B_MULTI	-.256417	0.249428	-.019136	0.064142	0.117615	0.083838
CNTYPOP	0.241618	-.094046	-.502670	0.092141	-.181255	-.213517
C_VACANT	0.330532	-.085764	-.045030	-.096167	-.030452	-.110523
D_FARM	-.354698	-.182581	0.035312	0.023573	0.056381	0.070696
EMPLOY	0.081771	0.186838	0.658763	0.082548	-.217635	-.141834
E_FARMIM	0.282757	-.054666	0.127738	-.101020	-.414766	-.052250
F_COMM	0.389963	0.099684	0.157100	0.181366	0.166638	-.300261
F_INDUS	0.064920	0.206411	-.022323	0.027563	-.029682	0.165488
INCOME	-.074620	0.349027	-.260327	0.320828	-.060484	0.023960
PERCAP	-.149045	0.361492	-.200743	0.339145	-.026349	0.045863
RETAIL	-.391515	-.012839	0.329288	0.085777	0.004569	0.033673
URBAREA	0.266190	0.085274	0.108823	-.031332	0.806678	0.000000
URBPOP	-.270572	-.583184	-.048759	0.040909	0.108782	-.382210
FWYLANMI	0.233418	-.331062	0.031806	0.059696	-.014811	0.799819
ARTLANMI	-.117071	0.291156	-.120961	-.833876	0.000000	0.000000

	Prin13	Prin14	Prin15	Prin16
A_SING	0.052138	-.211959	0.654609	0.000000
B_MULTI	0.014081	0.133908	-.052431	-.110201
CNTYPOP	0.251000	0.286145	0.192749	0.492671
C_VACANT	-.064578	-.000858	-.631478	0.138982
D_FARM	-.030425	-.137321	-.140613	0.347744
EMPLOY	0.016990	-.339079	0.131782	0.410957
E_FARMIM	-.030752	0.058075	0.168948	-.534504
F_COMM	0.027938	0.251478	0.066878	-.149013
F_INDUS	0.091897	0.206811	0.034243	0.107121
INCOME	-.756551	0.000000	0.000000	0.000000
PERCAP	0.572568	-.305097	-.235379	-.259204
RETAIL	0.112442	0.709075	0.000000	0.000000
URBAREA	0.000000	0.000000	0.000000	0.000000
URBPOP	-.075367	-.127178	-.078047	-.222355
FWYLANMI	0.000000	0.000000	0.000000	0.000000
ARTLANMI	0.000000	0.000000	0.000000	0.000000

Dependent Variable: TRI

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	0.00013129	0.00006564	11.40	0.0063
Error	7	0.00004031	0.00000576		
Corrected Total	9	0.00017160			

Root MSE	0.00240	R-Square	0.7651
Dependent Mean	1.00980	Adj R-Sq	0.6980
Coeff Var	0.23764		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Type I SS	Type II SS
Intercept	1	1.00980	0.00075886	1330.69	<.0001	10.19696	10.19696
Prin1	1	0.00114	0.00025439	4.48	0.0029	0.00011575	0.00011575
Prin6	1	-0.00421	0.00256	-1.64	0.1445	0.00001554	0.00001554

Durbin-Watson D	1.885
Number of Observations	10
1st Order Autocorrelation	0.027

Mean of Working Series	-664E-19
Standard Deviation	0.002008
Number of Observations	10

Autocorrelations

```
Lag  Covariance  Correlation  -1 9 8 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 1    Std Error

  0  4.03104E-6      1.00000  |                    |********************|            0
  1   1.0686E-7      0.02651  |        .           |*          .        |     0.316228
  2  -1.2429E-6      -.30833  |        .     ******|           .        |     0.316450
  3  -2.3521E-6      -.58351  |       . ************|           .        |     0.345187
  4  2.84953E-7      0.07069  |    .               |*              .    |     0.432724
  5  1.21461E-6      0.30131  |    .               |******         .    |     0.433877
  6   5.7456E-7      0.14253  |   .                |***             .   |     0.454321
  7  -3.2935E-7      -.08170  |   .              **|                .   |     0.458771
  8  -2.7971E-7      -.06939  |   .               *|                .   |     0.460224
  9  7.58601E-9      0.00188  |   .                |                .   |     0.461268
```

"." marks two standard errors

Autocorrelation Check for White Noise

To Lag	Chi-Square	DF	Pr > ChiSq	Autocorrelations					
6	10.16	6	0.1181	0.027	-0.308	-0.584	0.071	0.301	0.143

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t  1.5 ^                                          S
u      ,
d      ,
e  1.0 ^
n      ,                                                                          S
t      ,                                  S
i  0.5 ^
z      ,
e      ,                                                                  S
d  0.0 ^  S
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R      ,
e -0.5 ^
s      ,                                                          S
i      ,          S       S
d -1.0 ^
u      ,
a      ,
l -1.5 ^
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        1988    1989    1990    1991    1992    1993    1994    1995    1996    1997

                                            year
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NOTE: 6 obs out of range.

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t  1.5 ˆ  P
u      ,
d      ,
e  1.0 ˆ
n      ,    P
t      ,   P
i  0.5 ˆ
z      ,
e      ,    P
d  0.0 ˆ P
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R      ,
e -0.5 ˆ
s      ,    P
i      ,  P
d -1.0 ˆ
u      ,
a      ,
l -1.5 ˆ
       ,    P
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  -2.0 ˆ
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      1.00           1.05           1.10           1.15           1.20           1.25

                                 Predicted Value of TRI

NOTE: 6 obs had missing values.  1 obs hidden.
```

Dependent Variable: TRI

C(p) Selection Method

Number in Model	C(p)	R-Square	Variables in Model
7	7.8837	0.9994	Prin1 Prin2 Prin3 Prin4 Prin5 Prin6 Prin7
8	9.0000	0.9997	Prin1 Prin2 Prin3 Prin4 Prin5 Prin6 Prin7 Prin8
6	48.5365	0.9864	Prin1 Prin2 Prin3 Prin4 Prin5 Prin6
7	49.6528	0.9867	Prin1 Prin2 Prin3 Prin4 Prin5 Prin6 Prin8
6	104.4301	0.9694	Prin1 Prin2 Prin4 Prin5 Prin6 Prin7
7	105.5464	0.9697	Prin1 Prin2 Prin4 Prin5 Prin6 Prin7 Prin8
5	145.0829	0.9564	Prin1 Prin2 Prin4 Prin5 Prin6
6	146.1992	0.9567	Prin1 Prin2 Prin4 Prin5 Prin6 Prin8
6	205.3683	0.9387	Prin1 Prin2 Prin3 Prin5 Prin6 Prin7
7	206.4846	0.9389	Prin1 Prin2 Prin3 Prin5 Prin6 Prin7 Prin8
6	214.3059	0.9359	Prin1 Prin3 Prin4 Prin5 Prin6 Prin7
7	215.4222	0.9362	Prin1 Prin3 Prin4 Prin5 Prin6 Prin7 Prin8
6	225.9431	0.9324	Prin1 Prin2 Prin3 Prin4 Prin6 Prin7
7	227.0594	0.9327	Prin1 Prin2 Prin3 Prin4 Prin6 Prin7 Prin8
5	246.0211	0.9257	Prin1 Prin2 Prin3 Prin5 Prin6

Dependent Variable: TRI

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	7	0.00017150	0.00002450	497.57	0.0020
Error	2	9.84794E-8	4.92397E-8		
Corrected Total	9	0.00017160			

Root MSE	0.00022190	R-Square	0.9994
Dependent Mean	1.00980	Adj R-Sq	0.9974
Coeff Var	0.02197		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Type I SS	Type II SS
Intercept	1	1.00980	0.00007017	14390.6	<.0001	10.19696	10.19696
Prin1	1	0.00114	0.00002352	48.49	0.0004	0.00011575	0.00011575
Prin2	1	-0.00054977	0.00003696	-14.88	0.0045	0.00001090	0.00001090
Prin3	1	-0.00065346	0.00006388	-10.23	0.0094	0.00000515	0.00000515
Prin4	1	-0.00158	0.00010869	-14.55	0.0047	0.00001043	0.00001043
Prin5	1	-0.00299	0.00019593	-15.29	0.0043	0.00001150	0.00001150
Prin6	1	-0.00421	0.00023717	-17.76	0.0032	0.00001554	0.00001554
Prin7	1	-0.00269	0.00039921	-6.73	0.0214	0.00000223	0.00000223

Durbin-Watson D	2.624
Number of Observations	10
1st Order Autocorrelation	-0.520

Mean of Working Series	-662E-19
Standard Deviation	0.000099
Number of Observations	10

Autocorrelations

```
Lag  Covariance  Correlation  -1 9 8 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 1    Std Error

  0  9.84794E-9      1.00000  |                    |********************|           0
  1  -5.1233E-9      -.52024  |       .  **********|         .          |    0.316228
  2  -7.983E-11      -.00811  |    .               |            .       |    0.392595
  3  1.95594E-9      0.19861  |    .               |****        .       |    0.392612
  4   -3.032E-9      -.30788  |    .         ******|            .       |    0.402534
  5  1.55765E-9      0.15817  |   .                |***          .      |    0.425431
  6  8.2114E-10      0.08338  |   .                |**           .      |    0.431271
  7  -2.7016E-9      -.27434  |   .           *****|             .      |    0.432881
  8  2.16557E-9      0.21990  |  .                 |****          .     |    0.449931
  9  -4.875E-10      -.04950  |  .                *|              .     |    0.460553

                     "." marks two standard errors
```

Autocorrelation Check for White Noise

To Lag	Chi-Square	DF	Pr > ChiSq	Autocorrelations					
6	6.99	6	0.3217	-0.520	-0.008	0.199	-0.308	0.158	0.083

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u      ,                                                                          S
d      ,
e  1.0 ^                                                          S
n      ,                                  S
t      ,
i  0.5 ^          S
z      ,
e      ,
d  0.0 ^
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R      ,                  S
e -0.5 ^
s      ,
i      ,  S                       S               S
d -1.0 ^
u      ,                                                  S
a      ,                                                                  S
l -1.5 ^
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        1988    1989    1990    1991    1992    1993    1994    1995    1996    1997

                                          year

NOTE: 6 obs out of range.
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 S          ‚
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 e   1.0 ˆ    P
 n          ‚   P
 t          ‚
 i   0.5 ˆ P
 z          ‚
 e          ‚
 d   0.0 ˆ
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 R          ‚ P
 e  -0.5 ˆ
 s          ‚
 i          ‚  PPP
 d  -1.0 ˆ
 u          ‚   P
 a          ‚     P
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           1.00          1.05          1.10          1.15          1.20          1.25

                                  Predicted Value of TRI

NOTE: 6 obs had missing values.
```

APPENDIX C

AUSTIN URBAN AREA REGRESSION ANALYSIS

Observations	10
Variables	16

Simple Statistics

	A_SING	B_MULTI	CNTYPOP	C_VACANT
Mean	0.3002134137	0.2951590537	0.5822365695	-.0404515138
StD	0.9728154753	0.8546280345	0.7035416565	0.6784846239

Simple Statistics

	D_FARM	EMPLOY	E_FARMIM	F_COMM
Mean	-.0792271948	0.5172663899	0.1978022936	0.000000000
StD	0.9614974502	0.8752806359	0.9655469172	1.000000000

Simple Statistics

	F_INDUS	INCOME	PERCAP	RETAIL
Mean	0.000000000	0.5534192024	0.5689387958	0.1905431107
StD	1.000000000	0.8442505815	0.8152391913	0.9900066818

Simple Statistics

	URBAREA	URBPOP	FWYLANMI	ARTLANMI
Mean	0.6066444260	0.6504169191	0.5803143528	0.5594514372
StD	0.6539204187	0.5088326273	0.7175626369	0.8487510272

Correlation Matrix

	A_SING	B_MULTI	CNTYPOP	C_VACANT	D_FARM	EMPLOY	E_FARMIM	F_COMM
A_SING	1.0000	0.9536	0.7798	0.5716	-.6296	0.7401	0.7676	0.9543
B_MULTI	0.9536	1.0000	0.7120	0.4468	-.6222	0.6834	0.8268	0.9378
CNTYPOP	0.7798	0.7120	1.0000	0.1416	-.9399	0.9968	0.3401	0.5919
C_VACANT	0.5716	0.4468	0.1416	1.0000	0.0970	0.0912	0.6074	0.6025
D_FARM	-.6296	-.6222	-.9399	0.0970	1.0000	-.9584	-.2235	-.4343
EMPLOY	0.7401	0.6834	0.9968	0.0912	-.9584	1.0000	0.3076	0.5427
E_FARMIM	0.7676	0.8268	0.3401	0.6074	-.2235	0.3076	1.0000	0.8074
F_COMM	0.9543	0.9378	0.5919	0.6025	-.4343	0.5427	0.8074	1.0000
F_INDUS	0.8759	0.7943	0.9042	0.3393	-.8481	0.8871	0.5118	0.7191
INCOME	0.7569	0.7015	0.9954	0.0823	-.9578	0.9954	0.2951	0.5743
PERCAP	0.7388	0.6924	0.9923	0.0422	-.9654	0.9946	0.2809	0.5550
RETAIL	0.7613	0.7025	0.9960	0.1072	-.9600	0.9973	0.3166	0.5734
URBAREA	0.7626	0.7252	0.9919	0.0927	-.9553	0.9950	0.3776	0.5698
URBPOP	0.7118	0.6856	0.9756	-.0311	-.9543	0.9804	0.3136	0.5329
FWYLANMI	0.5623	0.5696	0.8950	-.0123	-.9336	0.9230	0.2845	0.3469
ARTLANMI	0.5408	0.5695	0.8953	-.1658	-.9542	0.9236	0.2450	0.3444

Correlation Matrix

	F_INDUS	INCOME	PERCAP	RETAIL	URBAREA	URBPOP	FWYLANMI	ARTLANMI
A_SING	0.8759	0.7569	0.7388	0.7613	0.7626	0.7118	0.5623	0.5408
B_MULTI	0.7943	0.7015	0.6924	0.7025	0.7252	0.6856	0.5696	0.5695
CNTYPOP	0.9042	0.9954	0.9923	0.9960	0.9919	0.9756	0.8950	0.8953
C_VACANT	0.3393	0.0823	0.0422	0.1072	0.0927	-.0311	-.0123	-.1658
D_FARM	-.8481	-.9578	-.9654	-.9600	-.9553	-.9543	-.9336	-.9542
EMPLOY	0.8871	0.9954	0.9946	0.9973	0.9950	0.9804	0.9230	0.9236
E_FARMIM	0.5118	0.2951	0.2809	0.3166	0.3776	0.3136	0.2845	0.2450
F_COMM	0.7191	0.5743	0.5550	0.5734	0.5698	0.5329	0.3469	0.3444
F_INDUS	1.0000	0.8958	0.8821	0.9057	0.8911	0.8350	0.7416	0.7173
INCOME	0.8958	1.0000	0.9987	0.9979	0.9878	0.9775	0.8925	0.9035
PERCAP	0.8821	0.9987	1.0000	0.9956	0.9883	0.9844	0.9001	0.9173
RETAIL	0.9057	0.9979	0.9956	1.0000	0.9905	0.9742	0.9057	0.9085
URBAREA	0.8911	0.9878	0.9883	0.9905	1.0000	0.9846	0.9290	0.9330
URBPOP	0.8350	0.9775	0.9844	0.9742	0.9846	1.0000	0.9100	0.9456
FWYLANMI	0.7416	0.8925	0.9001	0.9057	0.9290	0.9100	1.0000	0.9771
ARTLANMI	0.7173	0.9035	0.9173	0.9085	0.9330	0.9456	0.9771	1.0000

Eigenvalues of the Correlation Matrix

	Eigenvalue	Difference	Proportion	Cumulative
1	12.1541629	9.3785246	0.7596	0.7596
2	2.7756383	2.2650889	0.1735	0.9331
3	0.5105494	0.1628905	0.0319	0.9650
4	0.3476589	0.2191692	0.0217	0.9868
5	0.1284898	0.0675002	0.0080	0.9948
6	0.0609896	0.0437030	0.0038	0.9986
7	0.0172865	0.0129811	0.0011	0.9997
8	0.0043055	0.0033864	0.0003	0.9999
9	0.0009191	0.0009191	0.0001	1.0000
10	0.0000000	0.0000000	0.0000	1.0000
11	0.0000000	0.0000000	0.0000	1.0000
12	0.0000000	0.0000000	0.0000	1.0000
13	0.0000000	0.0000000	0.0000	1.0000
14	0.0000000	0.0000000	0.0000	1.0000
15	0.0000000	0.0000000	0.0000	1.0000
16	0.0000000		0.0000	1.0000

Eigenvectors

	Prin1	Prin2	Prin3	Prin4	Prin5	Prin6
A_SING	0.242603	0.312288	0.029441	-.191333	0.040119	0.077591
B_MULTI	0.233153	0.303811	-.335588	-.142884	0.068872	-.417920
CNTYPOP	0.282130	-.067923	0.162660	-.038998	0.123169	0.239308
C_VACANT	0.054801	0.495862	0.637645	0.446342	0.150675	-.138062
D_FARM	-.268686	0.184134	0.053120	0.018414	0.325690	0.445785
EMPLOY	0.280888	-.103394	0.131074	0.021218	0.090912	0.138979
E_FARMIM	0.137119	0.456058	-.500476	0.379621	-.208566	0.412385
F_COMM	0.195976	0.406708	-.110022	-.380372	0.268435	-.219941
F_INDUS	0.266341	0.093987	0.217518	-.143017	-.796689	0.080192
INCOME	0.280850	-.094466	0.133446	-.127955	0.095877	0.002322
PERCAP	0.280008	-.112534	0.088756	-.131951	0.110066	-.004568
RETAIL	0.281923	-.086918	0.143674	-.050382	0.024931	0.013035
URBAREA	0.283218	-.080656	0.020356	0.062851	0.046983	0.245990
URBPOP	0.276755	-.128677	-.087619	-.074967	0.228347	0.364648
FWYLANMI	0.256321	-.178585	-.078148	0.546826	0.041744	-.301949
ARTLANMI	0.256279	-.220802	-.251081	0.295441	0.114640	-.123446

	Prin7	Prin8	Prin9	Prin10	Prin11	Prin12
A_SING	-.014447	-.218024	-.112448	-.087804	0.028782	-.854160
B_MULTI	0.644462	-.119175	-.046750	-.127978	-.012993	0.201399
CNTYPOP	0.063351	0.003582	0.471149	-.095313	0.194148	0.049493
C_VACANT	-.015120	-.143012	-.099402	0.014714	0.028978	0.162698
D_FARM	0.229597	0.218018	0.188766	0.060470	0.056720	-.044182
EMPLOY	0.086064	0.145503	0.015253	-.121689	-.906412	0.000000
E_FARMIM	-.069668	0.180075	-.106145	0.151368	-.030521	0.083662
F_COMM	-.547797	0.175450	0.267324	0.017912	-.039031	0.204531
F_INDUS	-.045818	-.057219	0.180400	0.004376	0.021224	0.111304
INCOME	0.105135	0.298231	0.107997	-.131137	0.201362	0.011353
PERCAP	0.123513	-.039975	-.081933	0.920837	0.000000	0.000000
RETAIL	-.057347	0.492482	-.660715	-.150049	0.204013	0.051432
URBAREA	0.285782	0.086600	0.167668	-.112983	0.202838	0.031565
URBPOP	-.173205	-.655268	-.264081	-.156375	0.059747	0.312223
FWYLANMI	-.039853	-.065176	0.201327	0.000065	0.048324	-.150714
ARTLANMI	-.264961	0.091696	0.094155	-.004795	0.059573	-.117419

	Prin13	Prin14	Prin15	Prin16
A_SING	0.000000	0.000000	0.000000	0.000000
B_MULTI	0.071190	0.165372	0.129891	0.052797
CNTYPOP	0.281595	0.478944	-.134601	-.461883
C_VACANT	-.046122	-.059451	0.171604	-.101700
D_FARM	0.067772	0.222426	0.169603	0.598670
EMPLOY	0.000000	0.000000	0.000000	0.000000
E_FARMIM	-.154384	0.031525	-.132856	-.207820
F_COMM	0.109479	-.149641	-.117458	0.157429
F_INDUS	0.047376	0.099364	0.167267	0.347052
INCOME	-.836236	0.000000	0.000000	0.000000
PERCAP	0.000000	0.000000	0.000000	0.000000
RETAIL	0.294486	0.183349	-.100920	0.096525
URBAREA	0.259389	-.778928	0.000000	0.000000
URBPOP	-.114258	0.054145	-.006896	0.194385
FWYLANMI	0.021391	0.095991	-.493627	0.423801
ARTLANMI	0.063594	0.067131	0.770371	0.000000

Dependent Variable: TRI

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	4	0.01398	0.00350	81.11	<.0001
Error	5	0.00021549	0.00004310		
Corrected Total	9	0.01420			

Root MSE	0.00656	R-Square	0.9848
Dependent Mean	1.14380	Adj R-Sq	0.9727
Coeff Var	0.57395		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Type I SS	Type II SS
Intercept	1	1.14380	0.00208	550.96	<.0001	13.08278	13.08278
Prin1	1	0.01088	0.00062769	17.33	<.0001	0.01294	0.01294
Prin2	1	-0.00283	0.00131	-2.16	0.0837	0.00020017	0.00020017
Prin4	1	-0.01491	0.00371	-4.02	0.0101	0.00069550	0.00069550
Prin9	1	-0.13443	0.07218	-1.86	0.1216	0.00014947	0.00014947

Durbin-Watson D	1.696
Number of Observations	10
1st Order Autocorrelation	-0.139

Mean of Working Series	7.07E-17
Standard Deviation	0.004642
Number of Observations	10

Autocorrelations

```
Lag  Covariance  Correlation  -1 9 8 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 1    Std Error

  0  0.00002155      1.00000  |                    |********************|            0
  1  -3.0007E-6      -.13925  |       .         ***|          .         |     0.316228
  2  -1.2535E-6      -.05817  |       .           *|          .         |     0.322301
  3  -5.3785E-6      -.24959  |       .       *****|          .         |     0.323350
  4  1.99247E-7      0.00925  |      .             |           .        |     0.342074
  5  3.72161E-6      0.17271  |      .             |***        .        |     0.342099
  6  -5.6859E-6      -.26386  |      .        *****|           .        |     0.350709
  7  -2.3949E-6      -.11114  |     .            **|            .       |     0.370029
  8  -1.9102E-6      -.08864  |     .            **|            .       |     0.373352
  9  4.92845E-6      0.22871  |     .              |*****       .       |     0.375451
```

"." marks two standard errors

Autocorrelation Check for White Noise

To Lag	Chi-Square	DF	Pr > ChiSq	Autocorrelations					
6	4.18	6	0.6519	-0.139	-0.058	-0.250	0.009	0.173	-0.264

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i  0.5 ˆ
z      ,
e      ,
d  0.0 ˆ                                                                  S
       ,                  S
R      ,                                  S                       S
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s      ,          S                                       S
i      ,
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u      ,                          S
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        1988    1989    1990    1991    1992    1993    1994    1995    1996    1997

                                              year

NOTE: 6 obs out of range.
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t  1.5 ˆ
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d      ,
e  1.0 ˆ
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z      ,
e      ,
d  0.0 ˆ                                                    P
       ,                                 P
R      ,                                         P        P
e -0.5 ˆ
s      ,                             P             P
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d -1.0 ˆ
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a      ,
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      1.00           1.05           1.10           1.15           1.20           1.25

                               Predicted Value of TRI

NOTE: 6 obs had missing values.
```

Dependent Variable: TRI

C(p) Selection Method

Number in Model	C(p)	R-Square	Variables in Model
3	2.6522	0.9743	Prin1 Prin2 Prin4
4	2.7469	0.9848	Prin1 Prin2 Prin4 Prin9
2	3.2039	0.9602	Prin1 Prin4
3	3.2985	0.9707	Prin1 Prin4 Prin9
4	3.7956	0.9790	Prin1 Prin2 Prin4 Prin5
5	3.8903	0.9896	Prin1 Prin2 Prin4 Prin5 Prin9
4	4.0511	0.9776	Prin1 Prin2 Prin3 Prin4
5	4.1458	0.9881	Prin1 Prin2 Prin3 Prin4 Prin9
3	4.3472	0.9649	Prin1 Prin4 Prin5
4	4.4419	0.9755	Prin1 Prin4 Prin5 Prin9
4	4.4790	0.9753	Prin1 Prin2 Prin4 Prin6
4	4.5363	0.9749	Prin1 Prin2 Prin4 Prin7
5	4.5737	0.9858	Prin1 Prin2 Prin4 Prin6 Prin9
3	4.6028	0.9635	Prin1 Prin3 Prin4
5	4.6310	0.9855	Prin1 Prin2 Prin4 Prin7 Prin9
4	4.6974	0.9740	Prin1 Prin3 Prin4 Prin9
3	5.0307	0.9612	Prin1 Prin4 Prin6
3	5.0880	0.9608	Prin1 Prin4 Prin7

Dependent Variable: TRI

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	0.01383	0.00461	75.80	<.0001
Error	6	0.00036496	0.00006083		
Corrected Total	9	0.01420			

Root MSE	0.00780	R-Square	0.9743
Dependent Mean	1.14380	Adj R-Sq	0.9614
Coeff Var	0.68186		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Type I SS	Type II SS
Intercept	1	1.14380	0.00247	463.77	<.0001	13.08278	13.08278
Prin1	1	0.01088	0.00074570	14.58	<.0001	0.01294	0.01294
Prin2	1	-0.00283	0.00156	-1.81	0.1196	0.00020017	0.00020017
Prin4	1	-0.01491	0.00441	-3.38	0.0148	0.00069550	0.00069550

Durbin-Watson D	2.181
Number of Observations	10
1st Order Autocorrelation	-0.365

```
                    Mean of Working Series        7E-17
                    Standard Deviation         0.006041
                    Number of Observations           10


                                  Autocorrelations

Lag  Covariance  Correlation  -1 9 8 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 1    Std Error

  0  0.00003650      1.00000  |                    |********************|           0
  1  -0.0000133      -.36533  |        .     *******|         .          |    0.316228
  2  -1.5847E-6      -.04342  |       .            *|          .         |    0.355939
  3  -4.5916E-6      -.12581  |       .          ***|          .         |    0.356468
  4  1.76573E-6      0.04838  |       .             |*         .         |    0.360881
  5  3.58862E-6      0.09833  |       .             |**        .         |    0.361529
  6  -3.3465E-6      -.09169  |      .            **|           .        |    0.364194
  7  4.23239E-6      0.11597  |      .              |**         .        |    0.366495
  8  -0.0000150      -.41129  |      .      ********|           .        |    0.370147
  9  0.00001003      0.27486  |    .                |*****        .      |    0.413329

                              "." marks two standard errors

                   Autocorrelation Check for White Noise

 To       Chi-         Pr >
Lag     Square   DF    ChiSq  ------------------Autocorrelations-----------------

  6       2.61    6   0.8559  -0.365   -0.043   -0.126    0.048    0.098   -0.092
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d  0.0 ^                  S
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e -0.5 ^
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i      ,          S
d -1.0 ^
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a      ,
l -1.5 ^                                                                  S
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        1988    1989    1990    1991    1992    1993    1994    1995    1996    1997

                                              year
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NOTE: 6 obs out of range.

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i  0.5 ˆ                                        P
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d  0.0 ˆ                                   P
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       Šˆffffffffffffffˆffffffffffffffˆffffffffffffffˆffffffffffffffˆffffffffffffffˆf
      1.00           1.05           1.10           1.15           1.20           1.25

                                   Predicted Value of TRI

NOTE: 6 obs had missing values.
```

APPENDIX D

BRYAN-COLLEGE STATION URBAN AREA REGRESSION ANALYSIS

Observations	10
Variables	16

Simple Statistics

	A_SING	B_MULTI	CNTYPOP	C_VACANT
Mean	0.146491682	0.2578743546	0.5034192853	-.2560426427
StD	1.027026836	0.9998150107	0.8803480841	0.7479389062

Simple Statistics

	D_FARM	EMPLOY	E_FARMIM	F_COMM
Mean	-.3726500490	0.5823843534	0.4554787364	0.000000000
StD	0.3482241085	0.8032929190	0.2959024199	1.000000000

Simple Statistics

	F_INDUS	INCOME	PERCAP	RETAIL
Mean	0.000000000	0.5844293803	0.6038274720	0.2439196818
StD	1.000000000	0.7903489544	0.7505778636	0.9086081530

Simple Statistics

	URBAREA	URBPOP	FWYLANMI	ARTLANMI
Mean	0.6314199438	0.5963958508	0.457273198	0.019353308
StD	0.6182968014	0.6925056193	1.023286241	1.283493867

Correlation Matrix

	A_SING	B_MULTI	CNTYPOP	C_VACANT	D_FARM	EMPLOY	E_FARMIM	F_COMM
A_SING	1.0000	0.8828	0.9197	-.9853	-.9393	0.9343	0.9208	0.4187
B_MULTI	0.8828	1.0000	0.6946	-.8888	-.7597	0.7296	0.7996	0.6614
CNTYPOP	0.9197	0.6946	1.0000	-.9185	-.9471	0.9554	0.9115	0.1150
C_VACANT	-.9853	-.8888	-.9185	1.0000	0.9259	-.9400	-.9482	-.3936
D_FARM	-.9393	-.7597	-.9471	0.9259	1.0000	-.9677	-.9203	-.1319
EMPLOY	0.9343	0.7296	0.9554	-.9400	-.9677	1.0000	0.9604	0.0901
E_FARMIM	0.9208	0.7996	0.9115	-.9482	-.9203	0.9604	1.0000	0.2193
F_COMM	0.4187	0.6614	0.1150	-.3936	-.1319	0.0901	0.2193	1.0000
F_INDUS	0.0922	-.1836	0.3792	-.1316	-.3890	0.4247	0.3244	-.8390
INCOME	0.9503	0.7722	0.9688	-.9533	-.9780	0.9909	0.9725	0.1588
PERCAP	0.9401	0.7681	0.9593	-.9448	-.9800	0.9889	0.9736	0.1397
RETAIL	0.9618	0.7826	0.9705	-.9552	-.9858	0.9871	0.9568	0.1784
URBAREA	0.7390	0.6091	0.8434	-.7797	-.8485	0.8267	0.7761	-.0549
URBPOP	0.9520	0.7800	0.9606	-.9457	-.9866	0.9654	0.9301	0.1873
FWYLANMI	0.8694	0.5971	0.9444	-.8591	-.8487	0.8975	0.8137	0.0931
ARTLANMI	-.8188	-.6153	-.8208	0.7934	0.6901	-.7406	-.6797	-.3408

Correlation Matrix

	F_INDUS	INCOME	PERCAP	RETAIL	URBAREA	URBPOP	FWYLANMI	ARTLANMI
A_SING	0.0922	0.9503	0.9401	0.9618	0.7390	0.9520	0.8694	-.8188
B_MULTI	-.1836	0.7722	0.7681	0.7826	0.6091	0.7800	0.5971	-.6153
CNTYPOP	0.3792	0.9688	0.9593	0.9705	0.8434	0.9606	0.9444	-.8208
C_VACANT	-.1316	-.9533	-.9448	-.9552	-.7797	-.9457	-.8591	0.7934
D_FARM	-.3890	-.9780	-.9800	-.9858	-.8485	-.9866	-.8487	0.6901
EMPLOY	0.4247	0.9909	0.9889	0.9871	0.8267	0.9654	0.8975	-.7406
E_FARMIM	0.3244	0.9725	0.9736	0.9568	0.7761	0.9301	0.8137	-.6797
F_COMM	-.8390	0.1588	0.1397	0.1784	-.0549	0.1873	0.0931	-.3408
F_INDUS	1.0000	0.3752	0.3975	0.3511	0.5024	0.3291	0.3050	0.0243
INCOME	0.3752	1.0000	0.9986	0.9962	0.8384	0.9810	0.8827	-.7365
PERCAP	0.3975	0.9986	1.0000	0.9929	0.8481	0.9810	0.8617	-.7027
RETAIL	0.3511	0.9962	0.9929	1.0000	0.8217	0.9814	0.8906	-.7557
URBAREA	0.5024	0.8384	0.8481	0.8217	1.0000	0.8790	0.7239	-.5163
URBPOP	0.3291	0.9810	0.9810	0.9814	0.8790	1.0000	0.8742	-.7356
FWYLANMI	0.3050	0.8827	0.8617	0.8906	0.7239	0.8742	1.0000	-.9358
ARTLANMI	0.0243	-.7365	-.7027	-.7557	-.5163	-.7356	-.9358	1.0000

Eigenvalues of the Correlation Matrix

	Eigenvalue	Difference	Proportion	Cumulative
1	12.5536176	10.2263240	0.7846	0.7846
2	2.3272936	1.6617360	0.1455	0.9301
3	0.6655576	0.4212768	0.0416	0.9717
4	0.2442808	0.1503332	0.0153	0.9869
5	0.0939477	0.0335860	0.0059	0.9928
6	0.0603617	0.0289514	0.0038	0.9966
7	0.0314103	0.0165094	0.0020	0.9985
8	0.0149009	0.0062709	0.0009	0.9995
9	0.0086300	0.0086300	0.0005	1.0000
10	0.0000000	0.0000000	0.0000	1.0000
11	0.0000000	0.0000000	0.0000	1.0000
12	0.0000000	0.0000000	0.0000	1.0000
13	0.0000000	0.0000000	0.0000	1.0000
14	0.0000000	0.0000000	0.0000	1.0000
15	0.0000000	0.0000000	0.0000	1.0000
16	0.0000000		0.0000	1.0000

Eigenvectors

	Prin1	Prin2	Prin3	Prin4	Prin5	Prin6
A_SING	0.274419	-.139073	-.003956	0.078559	-.222045	-.144348
B_MULTI	0.227960	-.316543	0.336438	-.057217	0.268815	-.663229
CNTYPOP	0.275169	0.067478	-.158930	-.096061	-.066363	0.337284
C_VACANT	-.275057	0.117837	-.053714	-.022796	-.239281	0.072014
D_FARM	-.274945	-.064042	-.118817	-.029045	0.550715	0.187874
EMPLOY	0.277211	0.085355	0.008347	0.202244	0.057111	-.090701
E_FARMIM	0.270345	0.007390	0.164340	0.355021	0.508523	0.344515
F_COMM	0.062972	-.632195	0.131526	-.020095	-.044373	0.343931
F_INDUS	0.084968	0.619339	0.090461	0.147717	0.140624	-.147564
INCOME	0.280027	0.048165	0.063592	0.143004	-.019166	0.161203
PERCAP	0.278493	0.063162	0.116709	0.144623	-.034081	0.163749
RETAIL	0.280303	0.031700	0.033919	0.145604	-.194576	-.034833
URBAREA	0.237773	0.183071	0.238827	-.831295	0.201682	0.128943
URBPOP	0.278262	0.028551	0.077368	-.144256	-.343357	0.129764
FWYLANMI	0.256765	0.043629	-.497708	-.081153	0.092782	-.080128
ARTLANMI	-.224066	0.154206	0.680015	0.098911	-.152707	0.155462

	Prin7	Prin8	Prin9	Prin10	Prin11	Prin12
A_SING	-.224510	-.188023	0.114270	0.070294	0.851627	0.000000
B_MULTI	0.372294	0.203365	0.019124	-.004054	-.019820	0.019813
CNTYPOP	0.602926	-.271430	0.022119	0.138350	0.054973	0.110477
C_VACANT	0.335013	0.608021	0.364586	0.137622	0.221824	0.221016
D_FARM	-.040931	0.061696	0.362065	0.037106	0.206883	-.004070
EMPLOY	-.420668	-.018690	0.474920	0.229925	-.292214	0.305809
E_FARMIM	-.025044	0.270396	-.347996	0.128884	0.162241	0.237486
F_COMM	0.107642	-.220422	0.069546	0.057640	-.108717	0.041648
F_INDUS	0.229536	-.256512	-.096187	0.014311	0.087812	-.012247
INCOME	0.053627	0.105324	0.277489	-.881730	0.000000	0.000000
PERCAP	0.022793	0.231771	0.204338	0.247826	-.064048	-.833324
RETAIL	0.173662	-.102326	0.274541	0.199414	-.185162	0.244357
URBAREA	-.127150	-.006225	0.138008	0.022061	0.050279	0.030933
URBPOP	-.171469	0.434496	-.370674	0.028121	-.040724	0.157255
FWYLANMI	-.080690	0.057386	0.022249	0.027154	-.073658	0.018734
ARTLANMI	-.077894	-.144471	0.101324	0.043983	0.008295	0.080980

	Prin13	Prin14	Prin15	Prin16
A_SING	0.000000	0.000000	0.000000	0.000000
B_MULTI	0.069949	0.104135	-.034430	0.145555
CNTYPOP	-.081311	0.318334	-.341115	0.265930
C_VACANT	0.071367	0.126435	0.135682	-.270710
D_FARM	-.030777	-.186746	0.138402	0.575340
EMPLOY	-.178953	0.442682	0.003591	0.027727
E_FARMIM	0.019280	-.067360	-.130476	-.283579
F_COMM	0.144762	0.116652	0.564922	-.151053
F_INDUS	0.031094	0.086764	0.627175	0.000000
INCOME	0.000000	0.000000	0.000000	0.000000
PERCAP	0.000000	0.000000	0.000000	0.000000
RETAIL	-.048833	-.779008	0.000000	0.000000
URBAREA	-.045367	-.080761	0.005104	-.238174
URBPOP	-.050849	0.001111	0.258555	0.554998
FWYLANMI	0.803758	0.000000	0.000000	0.000000
ARTLANMI	0.524481	0.044071	-.220208	0.187195

Dependent Variable: TRI

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	0.00416	0.00139	52.88	0.0001
Error	6	0.00015750	0.00002625		
Corrected Total	9	0.00432			

Root MSE	0.00512	R-Square	0.9636
Dependent Mean	1.02680	Adj R-Sq	0.9453
Coeff Var	0.49897		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Type I SS	Type II SS
Intercept	1	1.02680	0.00162	633.76	<.0001	10.54318	10.54318
Prin1	1	-0.00328	0.00048201	-6.81	0.0005	0.00122	0.00122
Prin2	1	-0.01161	0.00112	-10.37	<.0001	0.00282	0.00282
Prin3	1	-0.00459	0.00209	-2.19	0.0708	0.00012620	0.00012620

Durbin-Watson D	3.256
Number of Observations	10
1st Order Autocorrelation	-0.710

Mean of Working Series	-186E-18
Standard Deviation	0.003969
Number of Observations	10

Autocorrelations

```
Lag  Covariance  Correlation  -1 9 8 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 1    Std Error

  0  0.00001575      1.00000  |                    |********************|           0
  1  -0.0000112      -.70961  |      **************|           .        |    0.316228
  2  5.94269E-6      0.37732  |  .                 |********        .   |    0.448007
  3   -7.069E-7      -.04488  | .                 *|                 .  |    0.478732
  4  -4.7366E-6      -.30074  | .            ******|                 .  |    0.479153
  5  6.09898E-6      0.38725  |.                   |********          . |    0.497671
  6  -5.8535E-6      -.37166  |             *******|                    |    0.526943
  7  3.75314E-6      0.23830  |                    |*****               |    0.552535
  8  -2.3994E-6      -.15235  |                 ***|                    |    0.562719
  9  1.20283E-6      0.07637  |                    |**                  |    0.566829
```

"." marks two standard errors

Autocorrelation Check for White Noise

To Lag	Chi-Square	DF	Pr > ChiSq	Autocorrelations					
6	18.44	6	0.0052	-0.710	0.377	-0.045	-0.301	0.387	-0.372

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        1988    1989    1990    1991    1992    1993    1994    1995    1996    1997

                                           year

NOTE: 6 obs out of range.
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e  1.0 ˆ
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i  0.5 ˆ
z      ,      P
e      ,
d  0.0 ˆ    P
       ,    P
R      ,
e -0.5 ˆ
s      ,       P
i      ,      P
d -1.0 ˆ
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a      ,                     P
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      1.00           1.05           1.10           1.15           1.20           1.25

                                Predicted Value of TRI

NOTE: 6 obs had missing values.
```

Dependent Variable: TRI

C(p) Selection Method

Number in Model	C(p)	R-Square	Variables in Model
3	1.4394	0.9636	Prin1 Prin2 Prin3
2	2.1954	0.9344	Prin1 Prin2
4	2.2331	0.9763	Prin1 Prin2 Prin3 Prin9
4	2.7351	0.9710	Prin1 Prin2 Prin3 Prin4
3	2.9891	0.9471	Prin1 Prin2 Prin9
4	3.0575	0.9676	Prin1 Prin2 Prin3 Prin7
4	3.3407	0.9646	Prin1 Prin2 Prin3 Prin6
4	3.3913	0.9641	Prin1 Prin2 Prin3 Prin5
3	3.4911	0.9418	Prin1 Prin2 Prin4
5	3.5288	0.9838	Prin1 Prin2 Prin3 Prin4 Prin9
3	3.8136	0.9384	Prin1 Prin2 Prin7
5	3.8512	0.9804	Prin1 Prin2 Prin3 Prin7 Prin9
3	4.0967	0.9354	Prin1 Prin2 Prin6
5	4.1344	0.9774	Prin1 Prin2 Prin3 Prin6 Prin9
3	4.1473	0.9349	Prin1 Prin2 Prin5
5	4.1850	0.9768	Prin1 Prin2 Prin3 Prin5 Prin9
4	4.2848	0.9546	Prin1 Prin2 Prin4 Prin9
5	4.3532	0.9751	Prin1 Prin2 Prin3 Prin4 Prin7
4	4.6073	0.9512	Prin1 Prin2 Prin7 Prin9
5	4.6363	0.9721	Prin1 Prin2 Prin3 Prin4 Prin6
5	4.6869	0.9715	Prin1 Prin2 Prin3 Prin4 Prin5
4	4.8904	0.9482	Prin1 Prin2 Prin6 Prin9
4	4.9410	0.9476	Prin1 Prin2 Prin5 Prin9

Dependent Variable: TRI

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	0.00416	0.00139	52.88	0.0001
Error	6	0.00015750	0.00002625		
Corrected Total	9	0.00432			

Root MSE	0.00512	R-Square	0.9636
Dependent Mean	1.02680	Adj R-Sq	0.9453
Coeff Var	0.49897		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Type I SS	Type II SS
Intercept	1	1.02680	0.00162	633.76	<.0001	10.54318	10.54318
Prin1	1	-0.00328	0.00048201	-6.81	0.0005	0.00122	0.00122
Prin2	1	-0.01161	0.00112	-10.37	<.0001	0.00282	0.00282
Prin3	1	-0.00459	0.00209	-2.19	0.0708	0.00012620	0.00012620

```
                     Durbin-Watson D                 3.256
                     Number of Observations             10
                     1st Order Autocorrelation      -0.710

                      Mean of Working Series    -186E-18
                      Standard Deviation        0.003969
                      Number of Observations          10


                               Autocorrelations

Lag  Covariance  Correlation  -1 9 8 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 1    Std Error

  0  0.00001575      1.00000  |                    |********************|           0
  1  -0.0000112      -.70961  |      **************|            .       |    0.316228
  2  5.94269E-6      0.37732  |  .                 |********        .   |    0.448007
  3   -7.069E-7      -.04488  | .                 *|                 .  |    0.478732
  4  -4.7366E-6      -.30074  | .            ******|                 .  |    0.479153
  5  6.09898E-6      0.38725  |.                   |********           .|    0.497671
  6  -5.8535E-6      -.37166  |             *******|                    |    0.526943
  7  3.75314E-6      0.23830  |                    |*****               |    0.552535
  8  -2.3994E-6      -.15235  |                 ***|                    |    0.562719
  9  1.20283E-6      0.07637  |                    |**                  |    0.566829

                           "." marks two standard errors

                     Autocorrelation Check for White Noise

 To       Chi-          Pr >
Lag     Square    DF    ChiSq   ------------------Autocorrelations-----------------

  6      18.44     6   0.0052   -0.710     0.377   -0.045   -0.301     0.387   -0.372
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        1988    1989    1990    1991    1992    1993    1994    1995    1996    1997

                                          year

NOTE: 6 obs out of range.
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      1.00           1.05           1.10           1.15           1.20           1.25

                                   Predicted Value of TRI

NOTE: 6 obs had missing values.
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APPENDIX E

CORPUS CHRISTI URBAN AREA REGRESSION ANALYSIS

Observations	10
Variables	16

Simple Statistics

	A_SING	B_MULTI	CNTYPOP	C_VACANT
Mean	-0.021831970	0.2795616594	-.5233289166	-0.149224975
StD	1.199288798	0.9646573998	0.9156502860	1.164023147

Simple Statistics

	D_FARM	EMPLOY	E_FARMIM	F_COMM
Mean	-.3232646149	0.110088677	0.163848800	0.000000000
StD	0.3654348000	1.100473217	1.001662625	1.000000000

Simple Statistics

	F_INDUS	INCOME	PERCAP	RETAIL
Mean	0.000000000	0.5759264569	0.5777900516	0.2505711395
StD	1.000000000	0.8163176310	0.8189809741	0.8964639603

Simple Statistics

	URBAREA	URBPOP	FWYLANMI	ARTLANMI
Mean	0.5123475383	0.5938668882	0.6368971630	-0.024078750
StD	0.9202774935	0.6715469733	0.6753289558	1.192967879

Correlation Matrix

	A_SING	B_MULTI	CNTYPOP	C_VACANT	D_FARM	EMPLOY	E_FARMIM	F_COMM
A_SING	1.0000	-.0089	-.5495	0.9771	0.7325	0.2352	0.9566	0.9977
B_MULTI	-.0089	1.0000	0.0713	0.0918	-.5326	-.7338	0.1634	-.0231
CNTYPOP	-.5495	0.0713	1.0000	-.5317	-.3599	-.6151	-.5107	-.5954
C_VACANT	0.9771	0.0918	-.5317	1.0000	0.6362	0.1049	0.9644	0.9752
D_FARM	0.7325	-.5326	-.3599	0.6362	1.0000	0.5622	0.5815	0.7375
EMPLOY	0.2352	-.7338	-.6151	0.1049	0.5622	1.0000	0.0561	0.2790
E_FARMIM	0.9566	0.1634	-.5107	0.9644	0.5815	0.0561	1.0000	0.9465
F_COMM	0.9977	-.0231	-.5954	0.9752	0.7375	0.2790	0.9465	1.0000
F_INDUS	0.1159	0.3904	0.4551	0.1219	0.1066	-.4496	0.1421	0.0883
INCOME	0.3746	-.7020	-.6713	0.2502	0.6225	0.9834	0.2022	0.4153
PERCAP	0.4537	-.5688	-.8147	0.3518	0.5913	0.9466	0.3071	0.4988
RETAIL	0.3404	-.7350	-.6283	0.2082	0.6301	0.9871	0.1570	0.3800
URBAREA	0.4667	-.6718	-.6049	0.3200	0.7246	0.9351	0.2570	0.5000
URBPOP	0.3723	-.7615	-.5774	0.2388	0.6851	0.9685	0.1564	0.4099
FWYLANMI	0.3661	-.4160	-.8307	0.2697	0.4240	0.8879	0.2427	0.4145
ARTLANMI	-.4765	0.0828	0.7882	-.4090	-.3741	-.6574	-.3503	-.5224

Correlation Matrix

	F_INDUS	INCOME	PERCAP	RETAIL	URBAREA	URBPOP	FWYLANMI	ARTLANMI
A_SING	0.1159	0.3746	0.4537	0.3404	0.4667	0.3723	0.3661	-.4765
B_MULTI	0.3904	-.7020	-.5688	-.7350	-.6718	-.7615	-.4160	0.0828
CNTYPOP	0.4551	-.6713	-.8147	-.6283	-.6049	-.5774	-.8307	0.7882
C_VACANT	0.1219	0.2502	0.3518	0.2082	0.3200	0.2388	0.2697	-.4090
D_FARM	0.1066	0.6225	0.5913	0.6301	0.7246	0.6851	0.4240	-.3741
EMPLOY	-.4496	0.9834	0.9466	0.9871	0.9351	0.9685	0.8879	-.6574
E_FARMIM	0.1421	0.2022	0.3071	0.1570	0.2570	0.1564	0.2427	-.3503
F_COMM	0.0883	0.4153	0.4988	0.3800	0.5000	0.4099	0.4145	-.5224
F_INDUS	1.0000	-.4767	-.5038	-.4742	-.3449	-.3802	-.5875	0.3881
INCOME	-.4767	1.0000	0.9766	0.9950	0.9557	0.9722	0.9202	-.7178
PERCAP	-.5038	0.9766	1.0000	0.9594	0.9216	0.9274	0.9599	-.7902
RETAIL	-.4742	0.9950	0.9594	1.0000	0.9682	0.9819	0.9041	-.7005
URBAREA	-.3449	0.9557	0.9216	0.9682	1.0000	0.9808	0.8574	-.7241
URBPOP	-.3802	0.9722	0.9274	0.9819	0.9808	1.0000	0.8391	-.6527
FWYLANMI	-.5875	0.9202	0.9599	0.9041	0.8574	0.8391	1.0000	-.8912
ARTLANMI	0.3881	-.7178	-.7902	-.7005	-.7241	-.6527	-.8912	1.0000

Eigenvalues of the Correlation Matrix

	Eigenvalue	Difference	Proportion	Cumulative
1	9.68319265	5.91008688	0.6052	0.6052
2	3.77310577	2.25718579	0.2358	0.8410
3	1.51591998	0.90822008	0.0947	0.9358
4	0.60769990	0.39327216	0.0380	0.9737
5	0.21442773	0.11493860	0.0134	0.9871
6	0.09948914	0.03867093	0.0062	0.9934
7	0.06081821	0.02211854	0.0038	0.9972
8	0.03869967	0.03205270	0.0024	0.9996
9	0.00664697	0.00664697	0.0004	1.0000
10	0.00000000	0.00000000	0.0000	1.0000
11	0.00000000	0.00000000	0.0000	1.0000
12	0.00000000	0.00000000	0.0000	1.0000
13	0.00000000	0.00000000	0.0000	1.0000
14	0.00000000	0.00000000	0.0000	1.0000
15	0.00000000	0.00000000	0.0000	1.0000
16	0.00000000		0.0000	1.0000

Eigenvectors

	Prin1	Prin2	Prin3	Prin4	Prin5	Prin6
A_SING	0.197593	0.400086	0.060323	-.093644	-.113314	0.156113
B_MULTI	-.180253	0.264317	-.458867	0.395065	-.015483	-.077880
CNTYPOP	-.251439	-.082773	0.414559	0.010647	-.615891	0.385197
C_VACANT	0.163700	0.432324	0.000514	-.183970	-.035239	0.065780
D_FARM	0.234434	0.169523	0.439192	0.016789	-.093720	-.774799
EMPLOY	0.288848	-.206836	0.073611	0.125121	0.224334	0.112752
E_FARMIM	0.146207	0.443474	-.028195	-.192431	0.111871	0.258683
F_COMM	0.209545	0.387044	0.037273	-.068882	-.083375	0.113256
F_INDUS	-.131910	0.252915	0.384257	0.751449	0.299594	0.163822
INCOME	0.306588	-.141865	0.045864	0.032529	0.079646	0.204724
PERCAP	0.312628	-.086031	-.084295	0.022367	0.239892	0.052301
RETAIL	0.302674	-.162090	0.079546	0.042736	-.008151	0.120712
URBAREA	0.305160	-.087651	0.134799	0.145802	-.216509	0.053921
URBPOP	0.298547	-.142372	0.168415	0.085035	-.017356	0.097416
FWYLANMI	0.293896	-.110176	-.261235	0.101436	-.039178	0.082461
ARTLANMI	-.255729	-.021550	0.368078	-.369656	0.570399	0.137246

	Prin7	Prin8	Prin9	Prin10	Prin11	Prin12
A_SING	-.090985	0.171659	0.218293	0.042172	0.099299	0.345201
B_MULTI	0.125135	0.357980	0.420251	0.205811	0.215089	0.106183
CNTYPOP	0.275404	-.079744	0.248498	-.012557	0.112937	0.021999
C_VACANT	-.335495	-.430313	-.066228	0.074340	0.086643	0.307610
D_FARM	0.289267	0.004872	0.130197	-.003412	0.023112	0.026118
EMPLOY	0.100513	-.081829	-.060013	-.189186	0.856435	0.000000
E_FARMIM	0.517074	0.158727	-.317910	-.152235	-.076456	0.118183
F_COMM	-.164341	0.043275	0.137276	0.039971	0.078461	-.851408
F_INDUS	-.025462	-.165564	-.153581	-.024934	-.166383	-.013777
INCOME	0.192612	-.155018	0.448140	-.089462	-.219949	0.032503
PERCAP	0.062481	-.126732	0.412281	-.034504	-.190135	0.044630
RETAIL	0.147474	0.023327	-.200434	0.892669	0.000000	0.000000
URBAREA	-.195040	0.638811	-.238286	-.185620	-.081138	0.073244
URBPOP	-.428692	0.136955	0.152036	-.058109	-.109036	0.125353
FWYLANMI	0.335347	-.062678	-.131426	-.196015	-.216544	-.100854
ARTLANMI	0.042793	0.343885	0.193396	0.081711	-.004629	-.020504

	Prin13	Prin14	Prin15	Prin16
A_SING	-.076037	-.216022	0.170630	-.673430
B_MULTI	-.068673	0.124457	0.056914	0.284507
CNTYPOP	0.160504	0.098859	0.133518	0.139784
C_VACANT	-.007463	-.107036	0.211867	0.529825
D_FARM	-.035025	0.065493	0.054686	0.060411
EMPLOY	0.000000	0.000000	0.000000	0.000000
E_FARMIM	0.061851	0.328639	-.330739	0.082861
F_COMM	0.000000	0.000000	0.000000	0.000000
F_INDUS	0.013179	-.059493	0.040823	-.064718
INCOME	-.514189	-.311610	-.355126	0.165706
PERCAP	0.773110	0.000000	0.000000	0.000000
RETAIL	0.000000	0.000000	0.000000	0.000000
URBAREA	0.155944	-.379674	-.021156	0.302920
URBPOP	-.182496	0.745173	0.000000	0.000000
FWYLANMI	-.179417	0.054289	0.741847	0.000000
ARTLANMI	-.080965	-.036051	0.337619	0.177115

Dependent Variable: TRI

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	6	0.00007694	0.00001282	36.16	0.0069
Error	3	0.00000106	3.545792E-7		
Corrected Total	9	0.00007800			

Root MSE	0.00059547	R-Square	0.9864
Dependent Mean	1.02900	Adj R-Sq	0.9591
Coeff Var	0.05787		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Type I SS	Type II SS
Intercept	1	1.02900	0.00018830	5464.60	<.0001	10.58841	10.58841
Prin1	1	0.00060833	0.00006379	9.54	0.0024	0.00003225	0.00003225
Prin3	1	0.00089888	0.00016121	5.58	0.0114	0.00001102	0.00001102
Prin4	1	0.00136	0.00025462	5.36	0.0127	0.00001018	0.00001018
Prin5	1	0.00300	0.00042864	7.01	0.0060	0.00001740	0.00001740
Prin7	1	-0.00291	0.00080486	-3.62	0.0364	0.00000464	0.00000464
Prin8	1	-0.00203	0.00101	-2.02	0.1371	0.00000144	0.00000144

Durbin-Watson D	2.101
Number of Observations	10
1st Order Autocorrelation	-0.121

Mean of Working Series	6.67E-17
Standard Deviation	0.000326
Number of Observations	10

Autocorrelations

```
Lag  Covariance  Correlation  -1 9 8 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 1    Std Error

  0  1.06374E-7      1.00000  |                    |********************|            0
  1  -1.2839E-8      -.12070  |       .          **|            .       |     0.316228
  2  -5.5515E-8      -.52188  |       .  **********|            .       |     0.320801
  3  -6.1017E-9      -.05736  |    .              *|               .    |     0.396719
  4  2.91708E-8      0.27423  |    .               |*****          .    |     0.397547
  5  -3.2167E-9      -.03024  |   .               *|                .   |     0.416034
  6  1.01111E-8      0.09505  |   .                |**              .   |     0.416254
  7  -9.0325E-9      -.08491  |   .              **|                .   |     0.418419
  8   -8.784E-9      -.08258  |   .              **|                .   |     0.420138
  9  3.01972E-9      0.02839  |   .                |*               .   |     0.421758
```

"." marks two standard errors

Autocorrelation Check for White Noise

To Lag	Chi-Square	DF	Pr > ChiSq	Autocorrelations					
6	6.13	6	0.4084	-0.121	-0.522	-0.057	0.274	-0.030	0.095

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e  1.0 ^                                                     S
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d  0.0 ^
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R      ,                                             S                               S
e -0.5 ^                                                             S
s      ,
i      ,                                  S
d -1.0 ^
u      ,
a      ,
l -1.5 ^  S
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        1988    1989    1990    1991    1992    1993    1994    1995    1996    1997

                                          year

NOTE: 6 obs out of range.
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z      ,
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R      ,        P P
e -0.5 ˆ         P
s      ,
i      ,         P
d -1.0 ˆ
u      ,
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l -1.5 ˆ         P
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      1.00          1.05          1.10          1.15          1.20          1.25

                             Predicted Value of TRI

NOTE: 6 obs had missing values.
```

Dependent Variable: TRI

C(p) Selection Method

Number in Model	C(p)	R-Square	Variables in Model
8	9.0000	0.9988	Prin1 Prin2 Prin3 Prin4 Prin5 Prin6 Prin7 Prin8
7	10.2829	0.9950	Prin1 Prin2 Prin3 Prin4 Prin5 Prin7 Prin8
7	14.3445	0.9902	Prin1 Prin3 Prin4 Prin5 Prin6 Prin7 Prin8
6	15.6274	0.9864	Prin1 Prin3 Prin4 Prin5 Prin7 Prin8
7	22.7602	0.9803	Prin1 Prin2 Prin3 Prin4 Prin5 Prin6 Prin7
6	24.0431	0.9765	Prin1 Prin2 Prin3 Prin4 Prin5 Prin7
6	28.1047	0.9717	Prin1 Prin3 Prin4 Prin5 Prin6 Prin7
5	29.3876	0.9679	Prin1 Prin3 Prin4 Prin5 Prin7
7	57.6720	0.9394	Prin1 Prin2 Prin3 Prin4 Prin5 Prin6 Prin8
6	58.9549	0.9355	Prin1 Prin2 Prin3 Prin4 Prin5 Prin8
6	63.0165	0.9308	Prin1 Prin3 Prin4 Prin5 Prin6 Prin8
5	64.2994	0.9269	Prin1 Prin3 Prin4 Prin5 Prin8
6	71.4322	0.9209	Prin1 Prin2 Prin3 Prin4 Prin5 Prin6
5	72.7151	0.9171	Prin1 Prin2 Prin3 Prin4 Prin5
5	76.7767	0.9123	Prin1 Prin3 Prin4 Prin5 Prin6
4	78.0596	0.9084	Prin1 Prin3 Prin4 Prin5
7	118.3033	0.8683	Prin1 Prin2 Prin3 Prin5 Prin6 Prin7 Prin8
6	119.5862	0.8644	Prin1 Prin2 Prin3 Prin5 Prin7 Prin8
6	123.6478	0.8597	Prin1 Prin3 Prin5 Prin6 Prin7 Prin8
5	124.9307	0.8558	Prin1 Prin3 Prin5 Prin7 Prin8
7	127.4942	0.8575	Prin1 Prin2 Prin4 Prin5 Prin6 Prin7 Prin8
6	128.7771	0.8537	Prin1 Prin2 Prin4 Prin5 Prin7 Prin8
6	132.0635	0.8498	Prin1 Prin2 Prin3 Prin5 Prin6 Prin7
6	132.8387	0.8489	Prin1 Prin4 Prin5 Prin6 Prin7 Prin8
5	133.3464	0.8459	Prin1 Prin2 Prin3 Prin5 Prin7
5	134.1217	0.8450	Prin1 Prin4 Prin5 Prin7 Prin8
5	137.4080	0.8412	Prin1 Prin3 Prin5 Prin6 Prin7
4	138.6909	0.8373	Prin1 Prin3 Prin5 Prin7
6	141.2544	0.8390	Prin1 Prin2 Prin4 Prin5 Prin6 Prin7
5	142.5373	0.8352	Prin1 Prin2 Prin4 Prin5 Prin7
5	146.5990	0.8304	Prin1 Prin4 Prin5 Prin6 Prin7
4	147.8819	0.8266	Prin1 Prin4 Prin5 Prin7
6	166.9752	0.8088	Prin1 Prin2 Prin3 Prin5 Prin6 Prin8
5	168.2581	0.8050	Prin1 Prin2 Prin3 Prin5 Prin8
5	172.3198	0.8002	Prin1 Prin3 Prin5 Prin6 Prin8
4	173.6027	0.7964	Prin1 Prin3 Prin5 Prin8
6	176.1662	0.7981	Prin1 Prin2 Prin4 Prin5 Prin6 Prin8
5	177.4491	0.7942	Prin1 Prin2 Prin4 Prin5 Prin8
5	180.7354	0.7904	Prin1 Prin2 Prin3 Prin5 Prin6
5	181.5107	0.7895	Prin1 Prin4 Prin5 Prin6 Prin8
4	182.0183	0.7865	Prin1 Prin2 Prin3 Prin5
4	182.7936	0.7856	Prin1 Prin4 Prin5 Prin8
4	186.0800	0.7817	Prin1 Prin3 Prin5 Prin6
3	187.3629	0.7779	Prin1 Prin3 Prin5

Dependent Variable: TRI

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	8	0.00007791	0.00000974	106.45	0.0748
Error	1	9.148527E-8	9.148527E-8		
Corrected Total	9	0.00007800			

Root MSE	0.00030247	R-Square	0.9988
Dependent Mean	1.02900	Adj R-Sq	0.9894
Coeff Var	0.02939		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Type I SS	Type II SS
Intercept	1	1.02900	0.00009565	10758.2	<.0001	10.58841	10.58841
Prin1	1	0.00060833	0.00003240	18.78	0.0339	0.00003225	0.00003225
Prin2	1	-0.00014067	0.00005190	-2.71	0.2250	6.719153E-7	6.719153E-7
Prin3	1	0.00089888	0.00008189	10.98	0.0578	0.00001102	0.00001102
Prin4	1	0.00136	0.00012933	10.55	0.0602	0.00001018	0.00001018
Prin5	1	0.00300	0.00021773	13.79	0.0461	0.00001740	0.00001740
Prin6	1	-0.00057916	0.00031964	-1.81	0.3211	3.003371E-7	3.003371E-7
Prin7	1	-0.00291	0.00040883	-7.12	0.0889	0.00000464	0.00000464
Prin8	1	-0.00203	0.00051251	-3.97	0.1571	0.00000144	0.00000144

Durbin-Watson D	3.125
Number of Observations	10
1st Order Autocorrelation	-0.563

Mean of Working Series	6.67E-17
Standard Deviation	0.000096
Number of Observations	10

Autocorrelations

```
Lag  Covariance  Correlation  -1 9 8 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 1    Std Error

  0  9.14853E-9      1.00000  |                    |********************|          0
  1   -5.153E-9      -.56326  |        . ***********|            .       |   0.316228
  2  -1.0371E-9      -.11337  |     .             **|               .    |   0.404291
  3  2.76009E-9      0.30170  |     .               |******         .    |   0.407458
  4  -1.4711E-9      -.16080  |    .             ***|                .   |   0.429216
  5  3.1776E-10      0.03473  |    .                |*               .   |   0.435199
  6   5.645E-11      0.00617  |    .                |                .   |   0.435476
  7   -6.25E-11      -.00683  |    .                |                .   |   0.435484
  8  1.9321E-11      0.00211  |    .                |                .   |   0.435495
  9  -4.166E-12      -.00046  |    .                |                .   |   0.435496
```

"." marks two standard errors

Autocorrelation Check for White Noise

To Lag	Chi-Square	DF	Pr > ChiSq	Autocorrelations					
6	6.53	6	0.3665	-0.563	-0.113	0.302	-0.161	0.035	0.006

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        1988    1989    1990    1991    1992    1993    1994    1995    1996    1997

                                         year

NOTE: 6 obs out of range.
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       1.00           1.05           1.10           1.15           1.20           1.25

                                    Predicted Value of TRI

NOTE: 6 obs had missing values.  3 obs hidden.
```

APPENDIX F

DENTON URBAN AREA REGRESSION ANALYSIS

Observations	9
Variables	16

Simple Statistics

	A_SING	B_MULTI	CNTYPOP	C_VACANT
Mean	0.1075005293	-.3070500871	0.6094920294	-.1351773659
StD	0.6200536100	0.3899145484	0.6758987311	0.9356970340

Simple Statistics

	D_FARM	EMPLOY	E_FARMIM	F_COMM
Mean	-0.284757595	0.5693360888	0.1299793228	-0.034539931
StD	1.150349945	0.8151739816	0.7827002698	1.054314314

Simple Statistics

	F_INDUS	INCOME	PERCAP	RETAIL
Mean	0.000000000	0.5820806565	0.5719410008	0.182893681
StD	1.000000000	0.8334095434	0.8354447780	1.066221069

Simple Statistics

	URBAREA	URBPOP	FWYLANMI	ARTLANMI
Mean	0.5974246761	0.6009029028	0.5642660954	0.5716580719
StD	0.7804723287	0.6457464030	0.7755095708	0.7907410355

Correlation Matrix

	A_SING	B_MULTI	CNTYPOP	C_VACANT	D_FARM	EMPLOY	E_FARMIM	F_COMM
A_SING	1.0000	0.4809	0.9981	0.6148	-.6775	0.9944	0.5589	0.9725
B_MULTI	0.4809	1.0000	0.4864	0.2407	-.8369	0.5538	-.0536	0.4244
CNTYPOP	0.9981	0.4864	1.0000	0.5963	-.7062	0.9939	0.5321	0.9689
C_VACANT	0.6148	0.2407	0.5963	1.0000	-.3195	0.6117	0.4053	0.5651
D_FARM	-.6775	-.8369	-.7062	-.3195	1.0000	-.7236	0.0125	-.6177
EMPLOY	0.9944	0.5538	0.9939	0.6117	-.7236	1.0000	0.5308	0.9598
E_FARMIM	0.5589	-.0536	0.5321	0.4053	0.0125	0.5308	1.0000	0.6778
F_COMM	0.9725	0.4244	0.9689	0.5651	-.6177	0.9598	0.6778	1.0000
F_INDUS	0.4312	0.0798	0.4369	0.2799	-.3934	0.3834	0.2011	0.4299
INCOME	0.9940	0.5315	0.9968	0.5884	-.7388	0.9946	0.5348	0.9740
PERCAP	0.9923	0.5456	0.9943	0.5946	-.7402	0.9945	0.5402	0.9754
RETAIL	0.9920	0.5780	0.9928	0.6085	-.7524	0.9986	0.5130	0.9574
URBAREA	0.9382	0.4350	0.9471	0.4255	-.7098	0.9185	0.4310	0.9403
URBPOP	0.9639	0.3044	0.9600	0.4992	-.5342	0.9368	0.5677	0.9548
FWYLANMI	0.9431	0.2436	0.9368	0.5703	-.4754	0.9121	0.5296	0.8999
ARTLANMI	0.9722	0.3189	0.9646	0.5976	-.5224	0.9485	0.5613	0.9409

Correlation Matrix

	F_INDUS	INCOME	PERCAP	RETAIL	URBAREA	URBPOP	FWYLANMI	ARTLANMI
A_SING	0.4312	0.9940	0.9923	0.9920	0.9382	0.9639	0.9431	0.9722
B_MULTI	0.0798	0.5315	0.5456	0.5780	0.4350	0.3044	0.2436	0.3189
CNTYPOP	0.4369	0.9968	0.9943	0.9928	0.9471	0.9600	0.9368	0.9646
C_VACANT	0.2799	0.5884	0.5946	0.6085	0.4255	0.4992	0.5703	0.5976
D_FARM	-.3934	-.7388	-.7402	-.7524	-.7098	-.5342	-.4754	-.5224
EMPLOY	0.3834	0.9946	0.9945	0.9986	0.9185	0.9368	0.9121	0.9485
E_FARMIM	0.2011	0.5348	0.5402	0.5130	0.4310	0.5677	0.5296	0.5613
F_COMM	0.4299	0.9740	0.9754	0.9574	0.9403	0.9548	0.8999	0.9409
F_INDUS	1.0000	0.4350	0.4266	0.4153	0.5327	0.4350	0.3998	0.3925
INCOME	0.4350	1.0000	0.9994	0.9957	0.9482	0.9456	0.9083	0.9451
PERCAP	0.4266	0.9994	1.0000	0.9958	0.9443	0.9410	0.8990	0.9401
RETAIL	0.4153	0.9957	0.9958	1.0000	0.9241	0.9283	0.9004	0.9379
URBAREA	0.5327	0.9482	0.9443	0.9241	1.0000	0.9526	0.8911	0.9167
URBPOP	0.4350	0.9456	0.9410	0.9283	0.9526	1.0000	0.9701	0.9866
FWYLANMI	0.3998	0.9083	0.8990	0.9004	0.8911	0.9701	1.0000	0.9901
ARTLANMI	0.3925	0.9451	0.9401	0.9379	0.9167	0.9866	0.9901	1.0000

Eigenvalues of the Correlation Matrix

	Eigenvalue	Difference	Proportion	Cumulative
1	12.1498796	10.5262230	0.7594	0.7594
2	1.6236566	0.7399117	0.1015	0.8608
3	0.8837450	0.2039311	0.0552	0.9161
4	0.6798139	0.1921065	0.0425	0.9586
5	0.4877073	0.3849852	0.0305	0.9891
6	0.1027221	0.0466776	0.0064	0.9955
7	0.0560445	0.0396135	0.0035	0.9990
8	0.0164310	0.0164310	0.0010	1.0000
9	0.0000000	0.0000000	0.0000	1.0000
10	0.0000000	0.0000000	0.0000	1.0000
11	0.0000000	0.0000000	0.0000	1.0000
12	0.0000000	0.0000000	0.0000	1.0000
13	0.0000000	0.0000000	0.0000	1.0000
14	0.0000000	0.0000000	0.0000	1.0000
15	0.0000000	0.0000000	0.0000	1.0000
16	0.0000000		0.0000	1.0000

Eigenvectors

	Prin1	Prin2	Prin3	Prin4	Prin5	Prin6
A_SING	0.286240	0.019860	-.038864	-.015066	-.038594	0.056333
B_MULTI	0.142992	-.610598	-.247335	0.099598	0.302464	0.604917
CNTYPOP	0.286068	-.003253	-.019748	-.036382	-.051568	-.084428
C_VACANT	0.175885	0.124240	-.172933	0.891191	-.244537	-.105934
D_FARM	-.201776	0.531409	-.100280	-.031981	-.095110	0.511473
EMPLOY	0.284481	-.040609	-.100518	-.001033	-.006276	0.033224
E_FARMIM	0.158232	0.488196	-.202926	0.044956	0.743590	-.009704
F_COMM	0.280394	0.088721	-.039262	-.070819	0.179854	-.166671
F_INDUS	0.134004	0.021153	0.894410	0.256509	0.218939	0.236706
INCOME	0.285897	-.036906	-.030392	-.028218	0.027070	-.148249
PERCAP	0.285581	-.042400	-.045956	-.015851	0.049159	-.135665
RETAIL	0.284672	-.067614	-.065849	0.014895	0.017895	0.027204
URBAREA	0.272706	-.033280	0.183739	-.231204	-.067569	-.228820
URBPOP	0.274987	0.139246	0.041957	-.213202	-.150954	0.127889
FWYLANMI	0.266724	0.177678	0.009709	-.113140	-.337496	0.297684
ARTLANMI	0.275919	0.144333	-.034404	-.086430	-.239895	0.259783

	Prin7	Prin8	Prin9	Prin10	Prin11	Prin12
A_SING	-.142019	0.112067	-.937306	0.000000	0.000000	0.000000
B_MULTI	0.235315	-.082381	0.017782	0.046087	0.089788	0.036947
CNTYPOP	-.203906	0.076878	0.125832	-.147355	0.906432	0.000000
C_VACANT	0.205323	-.050157	0.015786	-.013761	-.000826	-.037537
D_FARM	0.264060	0.352966	-.008840	0.131325	0.156389	0.123596
EMPLOY	-.254805	0.285132	0.165155	-.175004	-.222301	-.274950
E_FARMIM	-.100374	-.222886	0.023716	-.033655	-.021842	-.029619
F_COMM	0.388354	-.088577	0.003419	-.071241	-.014345	-.118476
F_INDUS	-.061336	0.058148	0.021620	0.010991	0.002125	0.016316
INCOME	-.079989	0.149014	0.108152	0.923131	0.000000	0.000000
PERCAP	0.001106	0.255414	0.108667	-.169232	-.165768	0.871950
RETAIL	-.233444	0.207199	0.149035	-.159871	-.204135	-.245308
URBAREA	0.599367	-.209650	-.048178	-.030151	0.037779	-.049260
URBPOP	0.230478	0.306441	0.104234	-.101476	-.095715	-.197486
FWYLANMI	-.260970	-.658309	0.079255	0.053430	-.084532	0.162668
ARTLANMI	0.007191	-.061925	0.107133	-.036635	-.094189	-.053029

	Prin13	Prin14	Prin15	Prin16
A_SING	0.000000	0.000000	0.000000	0.000000
B_MULTI	0.037649	0.040715	-.028763	-.017047
CNTYPOP	0.000000	0.000000	0.000000	0.000000
C_VACANT	0.041096	0.084205	-.026678	-.049673
D_FARM	0.157910	-.067375	0.160243	0.297721
EMPLOY	0.146902	0.003962	-.491151	0.560539
E_FARMIM	-.050191	0.260844	-.043302	-.071911
F_COMM	0.034952	-.817073	0.000000	0.000000
F_INDUS	-.008293	-.056102	-.016679	0.019211
INCOME	0.000000	0.000000	0.000000	0.000000
PERCAP	0.000000	0.000000	0.000000	0.000000
RETAIL	0.130217	0.016481	0.802807	0.000000
URBAREA	0.061755	0.452138	0.135708	0.378745
URBPOP	0.231701	0.192471	-.257199	-.667385
FWYLANMI	0.362156	-.078459	-.018259	0.003092
ARTLANMI	-.860788	0.000000	0.000000	0.000000

Dependent Variable: TRI

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	0.00421	0.00140	168.86	<.0001
Error	5	0.00004158	0.00000832		
Corrected Total	8	0.00425			

Root MSE	0.00288	R-Square	0.9902
Dependent Mean	1.04933	Adj R-Sq	0.9844
Coeff Var	0.27481		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Type I SS	Type II SS
Intercept	1	1.04933	0.00096121	1091.68	<.0001	9.90990	9.90990
Prin1	1	0.00642	0.00029249	21.95	<.0001	0.00401	0.00401
Prin5	1	-0.00390	0.00146	-2.67	0.0444	0.00005926	0.00005926
Prin7	1	-0.01816	0.00431	-4.22	0.0083	0.00014790	0.00014790

Durbin-Watson D	2.005
Number of Observations	9
1st Order Autocorrelation	-0.101

Mean of Working Series	7.43E-17
Standard Deviation	0.002149
Number of Observations	10
Embedded missing values in working series	1

Autocorrelations

```
Lag  Covariance  Correlation  -1 9 8 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 1    Std Error

  0  4.61962E-6      1.00000  |                    |********************|            0
  1  -1.3405E-6      -.29018  |       .      ******|           .        |     0.316228
  2  6.09487E-7      0.13193  |      .             |***         .       |     0.341820
  3  -3.9635E-6      -.85797  |   *****************|            .       |     0.346875
  4  2.97671E-6      0.64436  |                    |*************       |     0.517247
  5  -3.4096E-6      -.73807  |     ***************|                    |     0.592102
  6  6.75288E-7      0.14618  |                    |***                 |     0.677891
  7  -7.6744E-7      -.16613  |                 ***|                    |     0.681036
  8  4.62086E-6      1.00000  |                    |********************|     0.685076
  9   -3.153E-6      -.68252  |      **************|                    |     0.818125
```

"." marks two standard errors

Autocorrelation Check for White Noise

To Lag	Chi-Square	DF	Pr > ChiSq	Autocorrelations					
6	36.02	6	<.0001	-0.290	0.132	-0.858	0.644	-0.738	0.146

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i  0.5 ˆ                                                          S
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d  0.0 ˆ
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R      ,
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s      ,
i      ,
d -1.0 ˆ                                                  S
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a      ,                                                                  S
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        1988    1989    1990    1991    1992    1993    1994    1995    1996    1997

                                             year

NOTE: 1 obs had missing values.  6 obs out of range.
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e  1.0 ^
n      ,
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i  0.5 ^                   P
z      ,           P
e      ,
d  0.0 ^
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R      ,
e -0.5 ^       P
s      ,
i      ,
d -1.0 ^                    P
u      ,
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      1.00           1.05           1.10           1.15           1.20           1.25

                                   Predicted Value of TRI

NOTE: 7 obs had missing values.
```

Dependent Variable: TRI

C(p) Selection Method

Number in Model	C(p)	R-Square	Variables in Model
5	4.3529	0.9976	Prin1 Prin2 Prin4 Prin5 Prin7
4	4.3769	0.9940	Prin1 Prin2 Prin5 Prin7
4	4.4324	0.9939	Prin1 Prin4 Prin5 Prin7
3	4.4563	0.9902	Prin1 Prin5 Prin7
6	6.1047	0.9980	Prin1 Prin2 Prin3 Prin4 Prin5 Prin7
5	6.1286	0.9944	Prin1 Prin2 Prin3 Prin5 Prin7
5	6.1841	0.9943	Prin1 Prin3 Prin4 Prin5 Prin7
4	6.2080	0.9907	Prin1 Prin3 Prin5 Prin7
6	6.2483	0.9978	Prin1 Prin2 Prin4 Prin5 Prin6 Prin7
5	6.2722	0.9941	Prin1 Prin2 Prin5 Prin6 Prin7
5	6.3277	0.9940	Prin1 Prin4 Prin5 Prin6 Prin7
4	6.3516	0.9904	Prin1 Prin5 Prin6 Prin7
7	8.0000	0.9982	Prin1 Prin2 Prin3 Prin4 Prin5 Prin6 Prin7
6	8.0239	0.9946	Prin1 Prin2 Prin3 Prin5 Prin6 Prin7
6	8.0794	0.9945	Prin1 Prin3 Prin4 Prin5 Prin6 Prin7
5	8.1034	0.9909	Prin1 Prin3 Prin5 Prin6 Prin7
4	10.1299	0.9836	Prin1 Prin2 Prin4 Prin7
3	10.1538	0.9800	Prin1 Prin2 Prin7
3	10.2093	0.9799	Prin1 Prin4 Prin7
2	10.2332	0.9763	Prin1 Prin7
5	11.8816	0.9841	Prin1 Prin2 Prin3 Prin4 Prin7
4	11.9055	0.9805	Prin1 Prin2 Prin3 Prin7
4	11.9610	0.9804	Prin1 Prin3 Prin4 Prin7
3	11.9849	0.9767	Prin1 Prin3 Prin7
5	12.0252	0.9838	Prin1 Prin2 Prin4 Prin6 Prin7
4	12.0492	0.9802	Prin1 Prin2 Prin6 Prin7
4	12.1046	0.9801	Prin1 Prin4 Prin6 Prin7
3	12.1286	0.9765	Prin1 Prin6 Prin7
6	13.7769	0.9843	Prin1 Prin2 Prin3 Prin4 Prin6 Prin7
5	13.8009	0.9807	Prin1 Prin2 Prin3 Prin6 Prin7
5	13.8563	0.9806	Prin1 Prin3 Prin4 Prin6 Prin7
4	13.8803	0.9769	Prin1 Prin3 Prin6 Prin7
4	21.7627	0.9628	Prin1 Prin2 Prin4 Prin5
3	21.7866	0.9592	Prin1 Prin2 Prin5
3	21.8421	0.9591	Prin1 Prin4 Prin5
2	21.8660	0.9555	Prin1 Prin5
5	23.5144	0.9633	Prin1 Prin2 Prin3 Prin4 Prin5
4	23.5383	0.9596	Prin1 Prin2 Prin3 Prin5
4	23.5938	0.9595	Prin1 Prin3 Prin4 Prin5
3	23.6177	0.9559	Prin1 Prin3 Prin5
5	23.6580	0.9630	Prin1 Prin2 Prin4 Prin5 Prin6
4	23.6820	0.9594	Prin1 Prin2 Prin5 Prin6
4	23.7374	0.9593	Prin1 Prin4 Prin5 Prin6
3	23.7614	0.9556	Prin1 Prin5 Prin6

Dependent Variable: TRI

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	0.00424	0.00084874	246.98	0.0004
Error	3	0.00001031	0.00000344		
Corrected Total	8	0.00425			

Root MSE	0.00185	R-Square	0.9976
Dependent Mean	1.04933	Adj R-Sq	0.9935
Coeff Var	0.17666		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Type I SS	Type II SS
Intercept	1	1.04933	0.00061792	1698.16	<.0001	9.90990	9.90990
Prin1	1	0.00642	0.00018803	34.14	<.0001	0.00401	0.00401
Prin2	1	-0.00110	0.00051435	-2.15	0.1210	0.00001584	0.00001584
Prin4	1	-0.00168	0.00079490	-2.12	0.1244	0.00001542	0.00001542
Prin5	1	-0.00390	0.00093849	-4.15	0.0254	0.00005926	0.00005926
Prin7	1	-0.01816	0.00277	-6.56	0.0072	0.00014790	0.00014790

Durbin-Watson D	1.990
Number of Observations	9
1st Order Autocorrelation	-0.007

Mean of Working Series	7.4E-17
Standard Deviation	0.00107
Number of Observations	10
Embedded missing values in working series	1

Autocorrelations

```
Lag  Covariance  Correlation  -1 9 8 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 1    Std Error

  0  1.14548E-6      1.00000  |                    |********************|           0
  1  -2.3761E-7      -.20743  |       .        ****|            .       |    0.316228
  2  -1.7174E-7      -.14993  |       .         ***|            .       |    0.329553
  3  -3.8533E-7      -.33639  |       .     *******|            .       |    0.336305
  4  -8.9163E-7      -.77839  |    ****************|              .     |    0.368419
  5    7.851E-7      0.68539  |.                   |**************     .|    0.506864
  6   -1.348E-7      -.11768  |                  **|                    |    0.592336
  7  1.20023E-7      0.10478  |                    |**                  |    0.594670
  8  8.00345E-8      0.06987  |                    |*                   |    0.596513
  9  -8.9122E-8      -.07780  |                  **|                    |    0.597331
```

"." marks two standard errors

Autocorrelation Check for White Noise

To Lag	Chi-Square	DF	Pr > ChiSq	Autocorrelations					
6	26.66	6	0.0002	-0.207	-0.150	-0.336	-0.778	0.685	-0.118

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        1988    1989    1990    1991    1992    1993    1994    1995    1996    1997

                                            year

NOTE: 1 obs had missing values.  6 obs out of range.
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i  0.5 ˆ      P              P
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e      ,
d  0.0 ˆ
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      1.00           1.05           1.10           1.15           1.20           1.25

                                   Predicted Value of TRI

NOTE: 7 obs had missing values.
```

APPENDIX G

EL PASO URBAN AREA REGRESSION ANALYSIS

Observations	10
Variables	16

Simple Statistics

	A_SING	B_MULTI	CNTYPOP	C_VACANT
Mean	0.4530419609	0.0921390009	0.6127866684	-.4232199462
StD	0.7908355137	0.9973311363	0.7064127105	0.1514671169

Simple Statistics

	D_FARM	EMPLOY	E_FARMIM	F_COMM
Mean	-.3465766471	0.6303159436	0.5186451031	0.000000000
StD	0.9874442905	0.6803095100	0.4205860767	1.000000000

Simple Statistics

	F_INDUS	INCOME	PERCAP	RETAIL
Mean	0.000000000	0.6024723288	0.6178181689	0.2752679535
StD	1.000000000	0.7452521015	0.6982709152	0.8463684470

Simple Statistics

	URBAREA	URBPOP	FWYLANMI	ARTLANMI
Mean	0.5977900477	0.6513691019	0.5674874313	0.6774417970
StD	0.5326997871	0.5799233464	0.7943823116	0.4914941579

Correlation Matrix

	A_SING	B_MULTI	CNTYPOP	C_VACANT	D_FARM	EMPLOY	E_FARMIM	F_COMM
A_SING	1.0000	-.4152	0.9879	-.9080	0.4091	0.9716	0.8992	0.9592
B_MULTI	-.4152	1.0000	-.5116	0.6499	-.0882	-.5329	-.4592	-.3212
CNTYPOP	0.9879	-.5116	1.0000	-.9491	0.3810	0.9899	0.8888	0.9505
C_VACANT	-.9080	0.6499	-.9491	1.0000	-.3461	-.9601	-.8698	-.8826
D_FARM	0.4091	-.0882	0.3810	-.3461	1.0000	0.3155	0.3915	0.4393
EMPLOY	0.9716	-.5329	0.9899	-.9601	0.3155	1.0000	0.9145	0.9521
E_FARMIM	0.8992	-.4592	0.8888	-.8698	0.3915	0.9145	1.0000	0.9286
F_COMM	0.9592	-.3212	0.9505	-.8826	0.4393	0.9521	0.9286	1.0000
F_INDUS	0.8122	-.0482	0.7574	-.5984	0.3485	0.7008	0.5398	0.7019
INCOME	0.9928	-.4689	0.9931	-.9377	0.3552	0.9820	0.8780	0.9424
PERCAP	0.9879	-.4624	0.9838	-.9376	0.3542	0.9725	0.8733	0.9294
RETAIL	0.9835	-.4679	0.9915	-.9309	0.4273	0.9861	0.9075	0.9726
URBAREA	0.9770	-.3962	0.9687	-.8678	0.4232	0.9537	0.8543	0.9386
URBPOP	0.9670	-.6156	0.9859	-.9620	0.3886	0.9724	0.8873	0.9066
FWYLANMI	0.9449	-.4280	0.9560	-.8706	0.3797	0.9549	0.8422	0.9347
ARTLANMI	0.9535	-.5715	0.9670	-.9611	0.4002	0.9671	0.9290	0.9094

Correlation Matrix

	F_INDUS	INCOME	PERCAP	RETAIL	URBAREA	URBPOP	FWYLANMI	ARTLANMI
A_SING	0.8122	0.9928	0.9879	0.9835	0.9770	0.9670	0.9449	0.9535
B_MULTI	-.0482	-.4689	-.4624	-.4679	-.3962	-.6156	-.4280	-.5715
CNTYPOP	0.7574	0.9931	0.9838	0.9915	0.9687	0.9859	0.9560	0.9670
C_VACANT	-.5984	-.9377	-.9376	-.9309	-.8678	-.9620	-.8706	-.9611
D_FARM	0.3485	0.3552	0.3542	0.4273	0.4232	0.3886	0.3797	0.4002
EMPLOY	0.7008	0.9820	0.9725	0.9861	0.9537	0.9724	0.9549	0.9671
E_FARMIM	0.5398	0.8780	0.8733	0.9075	0.8543	0.8873	0.8422	0.9290
F_COMM	0.7019	0.9424	0.9294	0.9726	0.9386	0.9066	0.9347	0.9094
F_INDUS	1.0000	0.8061	0.8161	0.7276	0.8451	0.7061	0.7755	0.6757
INCOME	0.8061	1.0000	0.9973	0.9795	0.9707	0.9760	0.9454	0.9581
PERCAP	0.8161	0.9973	1.0000	0.9660	0.9599	0.9708	0.9267	0.9579
RETAIL	0.7276	0.9795	0.9660	1.0000	0.9672	0.9662	0.9603	0.9519
URBAREA	0.8451	0.9707	0.9599	0.9672	1.0000	0.9328	0.9853	0.9146
URBPOP	0.7061	0.9760	0.9708	0.9662	0.9328	1.0000	0.9117	0.9808
FWYLANMI	0.7755	0.9454	0.9267	0.9603	0.9853	0.9117	1.0000	0.8938
ARTLANMI	0.6757	0.9581	0.9579	0.9519	0.9146	0.9808	0.8938	1.0000

Eigenvalues of the Correlation Matrix

	Eigenvalue	Difference	Proportion	Cumulative
1	13.3316712	12.1693671	0.8332	0.8332
2	1.1623041	0.3567906	0.0726	0.9059
3	0.8055135	0.4141310	0.0503	0.9562
4	0.3913825	0.2421156	0.0245	0.9807
5	0.1492669	0.0602334	0.0093	0.9900
6	0.0890335	0.0493961	0.0056	0.9956
7	0.0396374	0.0158656	0.0025	0.9981
8	0.0237717	0.0163526	0.0015	0.9995
9	0.0074191	0.0074191	0.0005	1.0000
10	0.0000000	0.0000000	0.0000	1.0000
11	0.0000000	0.0000000	0.0000	1.0000
12	0.0000000	0.0000000	0.0000	1.0000
13	0.0000000	0.0000000	0.0000	1.0000
14	0.0000000	0.0000000	0.0000	1.0000
15	0.0000000	0.0000000	0.0000	1.0000
16	0.0000000		0.0000	1.0000

Eigenvectors

	Prin1	Prin2	Prin3	Prin4	Prin5	Prin6
A_SING	0.271289	0.084295	0.059747	0.008156	-.099242	0.092237
B_MULTI	-.137862	0.729483	0.239135	0.427637	-.167127	-.230225
CNTYPOP	0.272779	-.019862	0.042648	-.026802	0.032543	-.164958
C_VACANT	-.259848	0.213530	0.052568	-.008531	0.230045	0.530078
D_FARM	0.115172	0.375509	-.899635	-.134608	-.004011	-.044678
EMPLOY	0.270788	-.082224	0.082343	0.103710	0.098424	-.141028
E_FARMIM	0.249845	-.073054	-.096854	0.538024	-.165367	0.622524
F_COMM	0.262212	0.119745	-.004990	0.373699	0.158025	-.190602
F_INDUS	0.208741	0.444581	0.268310	-.552728	-.183324	0.242418
INCOME	0.271719	0.021883	0.104661	-.070445	-.117694	-.095629
PERCAP	0.270003	0.026900	0.107559	-.095829	-.269567	-.068234
RETAIL	0.271240	0.018666	-.010603	0.105356	0.173596	-.190914
URBAREA	0.266907	0.132161	0.067552	-.108240	0.336506	0.225487
URBPOP	0.269254	-.119665	-.030679	-.107239	-.171044	-.005157
FWYLANMI	0.262461	0.071129	0.076699	-.033092	0.658757	0.037574
ARTLANMI	0.266833	-.106146	-.055856	0.056630	-.345693	0.152471

	Prin7	Prin8	Prin9	Prin10	Prin11	Prin12
A_SING	0.369295	-.021689	0.043796	-.159362	-.159934	0.069944
B_MULTI	-.096691	0.224330	0.039857	0.032188	0.000980	-.078184
CNTYPOP	0.222743	0.218962	-.127484	-.079050	0.879960	0.000000
C_VACANT	0.514050	0.218543	0.085415	0.098864	0.010178	0.151318
D_FARM	-.014470	-.030110	0.063559	0.032488	0.027330	0.031233
EMPLOY	-.101318	0.055644	0.404311	-.113917	-.056565	0.119795
E_FARMIM	-.134974	-.245169	0.046103	-.004877	0.166210	0.096767
F_COMM	0.144057	-.298992	-.535630	-.050986	-.152776	0.006750
F_INDUS	-.149845	-.155039	-.116058	-.133103	0.015450	0.223025
INCOME	0.139792	-.160040	0.127546	0.908490	0.000000	0.000000
PERCAP	0.011099	-.332998	0.245319	-.238139	0.000154	0.008620
RETAIL	0.336527	0.154552	0.454512	-.158157	-.194149	0.118833
URBAREA	-.074926	0.013861	0.076524	-.028631	-.032470	-.846994
URBPOP	0.310882	0.283271	-.445867	-.040469	-.299998	-.042174
FWYLANMI	-.362319	0.125745	-.121691	0.092669	-.050680	0.397800
ARTLANMI	-.319467	0.647552	-.021261	0.071057	-.116275	-.001928

	Prin13	Prin14	Prin15	Prin16
A_SING	-.838253	0.000000	0.000000	0.000000
B_MULTI	-.014750	-.008525	0.066037	-.234077
CNTYPOP	0.000000	0.000000	0.000000	0.000000
C_VACANT	0.189295	0.149229	0.306308	0.214800
D_FARM	-.005897	0.071774	0.051755	-.021321
EMPLOY	0.076569	0.812146	0.000000	0.000000
E_FARMIM	0.086500	-.055973	-.178040	-.242342
F_COMM	0.143123	0.098060	0.004824	0.512613
F_INDUS	0.147287	0.068431	-.350542	0.109504
INCOME	0.000000	0.000000	0.000000	0.000000
PERCAP	0.193514	-.215985	0.718489	0.000000
RETAIL	0.293402	-.430889	-.391102	0.055008
URBAREA	0.000000	0.000000	0.000000	0.000000
URBPOP	0.259307	0.131291	0.064428	-.560114
FWYLANMI	-.120605	-.188242	0.240810	-.210805
ARTLANMI	-.020137	-.102498	0.114922	0.451585

Dependent Variable: TRI

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	0.00232	0.00046312	19.52	0.0065
Error	4	0.00009490	0.00002373		
Corrected Total	9	0.00241			

Root MSE	0.00487	R-Square	0.9606
Dependent Mean	1.06950	Adj R-Sq	0.9114
Coeff Var	0.45543		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Type I SS	Type II SS
Intercept	1	1.06950	0.00154	694.35	<.0001	11.43830	11.43830
Prin1	1	0.00363	0.00044467	8.17	0.0012	0.00158	0.00158
Prin2	1	-0.00505	0.00151	-3.36	0.0284	0.00026717	0.00026717
Prin4	1	0.00524	0.00260	2.02	0.1135	0.00009679	0.00009679
Prin5	1	0.01240	0.00420	2.95	0.0419	0.00020669	0.00020669
Prin6	1	-0.01413	0.00544	-2.60	0.0602	0.00016010	0.00016010

Durbin-Watson D	2.819
Number of Observations	10
1st Order Autocorrelation	-0.500

Mean of Working Series	-1E-16
Standard Deviation	0.003081
Number of Observations	10

Autocorrelations

```
Lag  Covariance  Correlation  -1 9 8 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 1    Std Error

  0  9.49004E-6      1.00000  |                    |********************|           0
  1  -4.7463E-6      -.50014  |       .  **********|            .       |    0.316228
  2  -2.7524E-6      -.29003  |     .        ******|              .     |    0.387334
  3  5.70344E-6      0.60099  |    .               |************   .    |    0.408473
  4   -2.745E-6      -.28925  |.             ******|                   .|    0.488967
  5  -1.7359E-6      -.18292  |.               ****|                   .|    0.505789
  6  2.75341E-6      0.29014  |.                   |******             .|    0.512362
  7  -9.8389E-7      -.10368  |                  **|                    |    0.528536
  8  -1.0604E-6      -.11174  |                  **|                    |    0.530566
  9  8.22057E-7      0.08662  |                    |**                  |    0.532914
```

"." marks two standard errors

Autocorrelation Check for White Noise

To Lag	Chi-Square	DF	Pr > ChiSq	Autocorrelations					
6	15.79	6	0.0149	-0.500	-0.290	0.601	-0.289	-0.183	0.290

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d  0.0 ˆ
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R      ,
e -0.5 ˆ                                                          S
s      ,          S
i      ,                                                                  S
d -1.0 ˆ                  S
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        1988    1989    1990    1991    1992    1993    1994    1995    1996    1997

                                           year

NOTE: 6 obs out of range.
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d      ,              P
e  1.0 ˆ                        P
n      ,
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i  0.5 ˆ                  P   P
z      ,
e      ,
d  0.0 ˆ
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R      ,
e -0.5 ˆ                         P
s      ,               P
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      1.00           1.05           1.10           1.15           1.20           1.25

                                   Predicted Value of TRI

NOTE: 6 obs had missing values.
```

Dependent Variable: TRI

C(p) Selection Method

Number in Model	C(p)	R-Square	Variables in Model
7	8.1798	0.9938	Prin1 Prin2 Prin4 Prin5 Prin6 Prin7 Prin8
8	9.0000	0.9971	Prin1 Prin2 Prin3 Prin4 Prin5 Prin6 Prin7 Prin8
6	11.1312	0.9796	Prin1 Prin2 Prin4 Prin5 Prin6 Prin7
7	11.9514	0.9830	Prin1 Prin2 Prin3 Prin4 Prin5 Prin6 Prin7
6	12.8108	0.9748	Prin1 Prin2 Prin4 Prin5 Prin6 Prin8
7	13.6310	0.9782	Prin1 Prin2 Prin3 Prin4 Prin5 Prin6 Prin8
5	15.7622	0.9606	Prin1 Prin2 Prin4 Prin5 Prin6
6	16.5823	0.9640	Prin1 Prin2 Prin3 Prin4 Prin5 Prin6
6	20.2159	0.9536	Prin1 Prin2 Prin5 Prin6 Prin7 Prin8
7	21.0361	0.9570	Prin1 Prin2 Prin3 Prin5 Prin6 Prin7 Prin8
5	23.1673	0.9394	Prin1 Prin2 Prin5 Prin6 Prin7
6	23.9874	0.9428	Prin1 Prin2 Prin3 Prin5 Prin6 Prin7
5	24.8469	0.9346	Prin1 Prin2 Prin5 Prin6 Prin8
6	25.6670	0.9380	Prin1 Prin2 Prin3 Prin5 Prin6 Prin8
4	27.7982	0.9205	Prin1 Prin2 Prin5 Prin6
5	28.6184	0.9239	Prin1 Prin2 Prin3 Prin5 Prin6
6	29.3968	0.9273	Prin1 Prin2 Prin4 Prin5 Prin7 Prin8
7	30.2169	0.9307	Prin1 Prin2 Prin3 Prin4 Prin5 Prin7 Prin8
5	32.3481	0.9132	Prin1 Prin2 Prin4 Prin5 Prin7
6	33.1683	0.9166	Prin1 Prin2 Prin3 Prin4 Prin5 Prin7
5	34.0277	0.9084	Prin1 Prin2 Prin4 Prin5 Prin8
6	34.8479	0.9118	Prin1 Prin2 Prin3 Prin4 Prin5 Prin8
6	36.1534	0.9080	Prin1 Prin2 Prin4 Prin6 Prin7 Prin8
7	36.9736	0.9114	Prin1 Prin2 Prin3 Prin4 Prin6 Prin7 Prin8
4	36.9791	0.8942	Prin1 Prin2 Prin4 Prin5
5	37.7992	0.8976	Prin1 Prin2 Prin3 Prin4 Prin5
5	39.1048	0.8939	Prin1 Prin2 Prin4 Prin6 Prin7
6	39.9249	0.8972	Prin1 Prin2 Prin3 Prin4 Prin6 Prin7
5	40.7844	0.8890	Prin1 Prin2 Prin4 Prin6 Prin8
5	41.4328	0.8872	Prin1 Prin2 Prin5 Prin7 Prin8
6	41.6045	0.8924	Prin1 Prin2 Prin3 Prin4 Prin6 Prin8
6	42.2530	0.8906	Prin1 Prin2 Prin3 Prin5 Prin7 Prin8
4	43.7357	0.8749	Prin1 Prin2 Prin4 Prin6
4	44.3842	0.8730	Prin1 Prin2 Prin5 Prin7
5	44.5559	0.8783	Prin1 Prin2 Prin3 Prin4 Prin6
6	44.9236	0.8829	Prin1 Prin4 Prin5 Prin6 Prin7 Prin8
5	45.2044	0.8764	Prin1 Prin2 Prin3 Prin5 Prin7
7	45.7438	0.8863	Prin1 Prin3 Prin4 Prin5 Prin6 Prin7 Prin8
4	46.0638	0.8682	Prin1 Prin2 Prin5 Prin8
5	46.8839	0.8716	Prin1 Prin2 Prin3 Prin5 Prin8
5	47.8750	0.8688	Prin1 Prin4 Prin5 Prin6 Prin7
5	48.1895	0.8679	Prin1 Prin2 Prin6 Prin7 Prin8
6	48.6951	0.8721	Prin1 Prin3 Prin4 Prin5 Prin6 Prin7
6	49.0096	0.8712	Prin1 Prin2 Prin3 Prin6 Prin7 Prin8
3	49.0152	0.8541	Prin1 Prin2 Prin5

Dependent Variable: TRI

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	7	0.00240	0.00034221	45.53	0.0217
Error	2	0.00001503	0.00000752		
Corrected Total	9	0.00241			

Root MSE	0.00274	R-Square	0.9938
Dependent Mean	1.06950	Adj R-Sq	0.9719
Coeff Var	0.25633		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Type I SS	Type II SS
Intercept	1	1.06950	0.00086694	1233.65	<.0001	11.43830	11.43830
Prin1	1	0.00363	0.00025028	14.52	0.0047	0.00158	0.00158
Prin2	1	-0.00505	0.00084763	-5.96	0.0270	0.00026717	0.00026717
Prin4	1	0.00524	0.00146	3.59	0.0696	0.00009679	0.00009679
Prin5	1	0.01240	0.00237	5.24	0.0345	0.00020669	0.00020669
Prin6	1	-0.01413	0.00306	-4.62	0.0439	0.00016010	0.00016010
Prin7	1	0.01132	0.00459	2.47	0.1325	0.00004573	0.00004573
Prin8	1	0.01263	0.00593	2.13	0.1667	0.00003414	0.00003414

Durbin-Watson D	2.813
Number of Observations	10
1st Order Autocorrelation	-0.484

Mean of Working Series	-104E-18
Standard Deviation	0.001226
Number of Observations	10

Autocorrelations

```
Lag  Covariance  Correlation  -1 9 8 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 1    Std Error

  0  1.50317E-6      1.00000  |                    |********************|           0
  1  -7.2702E-7      -.48366  |        .  **********|          .         |    0.316228
  2   1.4746E-7      0.09810  |      .              |**          .       |    0.383126
  3  9.76068E-8      0.06493  |      .              |*           .       |    0.385629
  4  -5.0584E-7      -.33651  |      .       *******|            .       |    0.386721
  5  4.51894E-7      0.30063  |    .                |******        .     |    0.414972
  6  -3.9351E-7      -.26179  |    .          *****|               .     |    0.436208
  7  1.16204E-7      0.07731  |   .                 |**              .   |    0.451645
  8  3.63597E-8      0.02419  |   .                 |                .   |    0.452967
  9  2.52579E-8      0.01680  |   .                 |                .   |    0.453096
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"." marks two standard errors

Autocorrelation Check for White Noise

To Lag	Chi-Square	DF	Pr > ChiSq	Autocorrelations					
6	9.83	6	0.1322	-0.484	0.098	0.065	-0.337	0.301	-0.262

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        1988    1989    1990    1991    1992    1993    1994    1995    1996    1997

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NOTE: 6 obs out of range.
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t      ,              P             P
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z      ,
e      ,                      P
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      1.00           1.05           1.10           1.15           1.20           1.25

                                   Predicted Value of TRI

NOTE: 6 obs had missing values.
```

APPENDIX H

HOUSTON URBAN AREA REGRESSION ANALYSIS

Observations	10
Variables	16

Simple Statistics

	A_SING	B_MULTI	CNTYPOP	C_VACANT
Mean	0.3512544947	-.3344774640	0.5129156309	-.2250681729
StD	0.3065236479	0.9177417204	0.9290278960	0.2844738325

Simple Statistics

	D_FARM	EMPLOY	E_FARMIM	F_COMM
Mean	0.111171343	0.4871637642	0.159336978	0.000000000
StD	1.172605764	0.9118894715	1.139767566	1.000000000

Simple Statistics

	F_INDUS	INCOME	PERCAP	RETAIL
Mean	0.000000000	0.5547954173	0.5778545014	0.2333967913
StD	1.000000000	0.8643265490	0.8178104518	0.9267261737

Simple Statistics

	URBAREA	URBPOP	FWYLANMI	ARTLANMI
Mean	0.6451397210	0.6227608815	0.6479399701	0.5042790897
StD	0.4333076959	0.3434509137	0.6274642587	0.9420417981

Correlation Matrix

	A_SING	B_MULTI	CNTYPOP	C_VACANT	D_FARM	EMPLOY	E_FARMIM	F_COMM
A_SING	1.0000	-.5926	0.9599	-.6143	0.5352	0.9360	0.7522	0.0456
B_MULTI	-.5926	1.0000	-.6533	0.0948	0.0170	-.6209	-.5583	0.5448
CNTYPOP	0.9599	-.6533	1.0000	-.6766	0.5525	0.9704	0.8452	0.0755
C_VACANT	-.6143	0.0948	-.6766	1.0000	-.6522	-.6372	-.6189	-.4503
D_FARM	0.5352	0.0170	0.5525	-.6522	1.0000	0.4636	0.6088	0.4348
EMPLOY	0.9360	-.6209	0.9704	-.6372	0.4636	1.0000	0.7383	0.1379
E_FARMIM	0.7522	-.5583	0.8452	-.6189	0.6088	0.7383	1.0000	0.0636
F_COMM	0.0456	0.5448	0.0755	-.4503	0.4348	0.1379	0.0636	1.0000
F_INDUS	0.5320	-.5707	0.6048	-.3317	0.2945	0.5127	0.7067	0.1620
INCOME	0.9601	-.5748	0.9865	-.6892	0.5447	0.9833	0.8143	0.1850
PERCAP	0.9552	-.5815	0.9820	-.6808	0.5251	0.9868	0.8076	0.1750
RETAIL	0.9201	-.4686	0.9544	-.7211	0.5703	0.9704	0.7521	0.3415
URBAREA	0.9155	-.4483	0.9453	-.7225	0.6165	0.9575	0.7619	0.3765
URBPOP	0.9110	-.4596	0.9426	-.6695	0.5490	0.9561	0.7673	0.3465
FWYLANMI	0.9278	-.7036	0.9723	-.6575	0.5817	0.9168	0.8800	-.0741
ARTLANMI	0.9438	-.6428	0.9774	-.6382	0.5095	0.9832	0.7420	0.1467

Correlation Matrix

	F_INDUS	INCOME	PERCAP	RETAIL	URBAREA	URBPOP	FWYLANMI	ARTLANMI
A_SING	0.5320	0.9601	0.9552	0.9201	0.9155	0.9110	0.9278	0.9438
B_MULTI	-.5707	-.5748	-.5815	-.4686	-.4483	-.4596	-.7036	-.6428
CNTYPOP	0.6048	0.9865	0.9820	0.9544	0.9453	0.9426	0.9723	0.9774
C_VACANT	-.3317	-.6892	-.6808	-.7211	-.7225	-.6695	-.6575	-.6382
D_FARM	0.2945	0.5447	0.5251	0.5703	0.6165	0.5490	0.5817	0.5095
EMPLOY	0.5127	0.9833	0.9868	0.9704	0.9575	0.9561	0.9168	0.9832
E_FARMIM	0.7067	0.8143	0.8076	0.7521	0.7619	0.7673	0.8800	0.7420
F_COMM	0.1620	0.1850	0.1750	0.3415	0.3765	0.3465	-.0741	0.1467
F_INDUS	1.0000	0.5733	0.5543	0.5695	0.5935	0.5776	0.5597	0.5874
INCOME	0.5733	1.0000	0.9988	0.9818	0.9744	0.9786	0.9348	0.9785
PERCAP	0.5543	0.9988	1.0000	0.9780	0.9695	0.9757	0.9322	0.9753
RETAIL	0.5695	0.9818	0.9780	1.0000	0.9962	0.9899	0.8721	0.9697
URBAREA	0.5935	0.9744	0.9695	0.9962	1.0000	0.9852	0.8666	0.9605
URBPOP	0.5776	0.9786	0.9757	0.9899	0.9852	1.0000	0.8520	0.9564
FWYLANMI	0.5597	0.9348	0.9322	0.8721	0.8666	0.8520	1.0000	0.9177
ARTLANMI	0.5874	0.9785	0.9753	0.9697	0.9605	0.9564	0.9177	1.0000

Eigenvalues of the Correlation Matrix

	Eigenvalue	Difference	Proportion	Cumulative
1	11.8657973	9.8383807	0.7416	0.7416
2	2.0274166	1.2433404	0.1267	0.8683
3	0.7840762	0.0797672	0.0490	0.9173
4	0.7043089	0.3838437	0.0440	0.9613
5	0.3204652	0.1542477	0.0200	0.9814
6	0.1662175	0.0636789	0.0104	0.9918
7	0.1025385	0.0867343	0.0064	0.9982
8	0.0158042	0.0024288	0.0010	0.9992
9	0.0133755	0.0133755	0.0008	1.0000
10	0.0000000	0.0000000	0.0000	1.0000
11	0.0000000	0.0000000	0.0000	1.0000
12	0.0000000	0.0000000	0.0000	1.0000
13	0.0000000	0.0000000	0.0000	1.0000
14	0.0000000	0.0000000	0.0000	1.0000
15	0.0000000	0.0000000	0.0000	1.0000
16	0.0000000		0.0000	1.0000

Eigenvectors

	Prin1	Prin2	Prin3	Prin4	Prin5	Prin6
A_SING	0.275886	-.073848	-.160910	-.040910	0.158570	-.072843
B_MULTI	-.170427	0.542607	-.121241	-.035687	0.063418	0.352841
CNTYPOP	0.287578	-.075115	-.052033	-.045832	-.010143	0.008246
C_VACANT	-.208535	-.313852	0.029565	0.286327	0.819142	0.247151
D_FARM	0.175037	0.353252	0.184433	-.598412	0.514155	-.330527
EMPLOY	0.281059	-.054087	-.217091	0.127609	0.004771	-.009984
E_FARMIM	0.247189	-.053812	0.396479	-.296858	-.076811	0.690342
F_COMM	0.057152	0.635392	0.153029	0.405137	0.033988	-.010830
F_INDUS	0.184347	-.105682	0.792090	0.303120	-.044452	-.213823
INCOME	0.288020	-.009971	-.108863	0.058419	0.011445	0.134929
PERCAP	0.286647	-.018457	-.134781	0.066619	-.002055	0.174080
RETAIL	0.283431	0.089047	-.107438	0.167109	0.020251	-.006794
URBAREA	0.283111	0.113655	-.053839	0.148745	0.088248	-.055611
URBPOP	0.280526	0.082751	-.084085	0.207839	0.110083	0.220482
FWYLANMI	0.275785	-.139636	-.019968	-.279793	-.033296	0.018100
ARTLANMI	0.283389	-.053343	-.121389	0.122731	0.069056	-.276949

	Prin7	Prin8	Prin9	Prin10	Prin11	Prin12
A_SING	0.718801	-.329473	-.226172	-.192360	-.063285	-.308936
B_MULTI	0.456611	0.253642	0.349589	0.042369	0.162439	0.182869
CNTYPOP	0.037873	0.414662	0.234052	-.036510	0.248646	0.088118
C_VACANT	-.068536	-.021091	0.118700	0.025402	0.008442	0.031067
D_FARM	-.125197	0.009690	-.084503	0.043245	-.056423	0.080533
EMPLOY	-.225226	-.284210	0.368383	-.053028	0.229150	-.131730
E_FARMIM	-.158708	-.035047	-.073365	-.117735	-.059642	-.205519
F_COMM	-.259327	-.277462	-.139764	-.039704	0.052930	-.151771
F_INDUS	0.294890	0.055005	0.141503	0.058182	0.057874	0.160522
INCOME	0.054175	-.040421	-.167382	0.922366	0.000000	0.000000
PERCAP	-.012029	-.260885	-.250700	-.191496	-.009930	0.834719
RETAIL	-.033088	0.165112	0.312475	-.044180	-.862475	0.000000
URBAREA	-.027449	-.196233	0.298983	-.048642	0.217108	-.083965
URBPOP	-.022267	0.388932	-.383627	-.194675	0.098619	-.207849
FWYLANMI	-.057033	-.125050	0.339929	-.014941	0.125735	-.022287
ARTLANMI	-.119260	0.436172	-.171340	-.076486	0.160243	-.002463

	Prin13	Prin14	Prin15	Prin16
A_SING	0.107704	-.053468	0.076908	0.164964
B_MULTI	0.073273	0.017384	0.189108	-.184238
CNTYPOP	0.124903	-.234599	-.349614	0.643994
C_VACANT	0.053529	0.074382	0.054664	0.103809
D_FARM	0.011679	-.138415	-.106221	-.117618
EMPLOY	0.411225	-.437163	-.005125	-.392961
E_FARMIM	-.057324	-.177950	0.273930	0.082242
F_COMM	0.229387	0.163374	0.029765	0.364427
F_INDUS	0.084847	-.009812	-.035892	-.191752
INCOME	0.000000	0.000000	0.000000	0.000000
PERCAP	0.000000	0.000000	0.000000	0.000000
RETAIL	0.000000	0.000000	0.000000	0.000000
URBAREA	-.828144	0.000000	0.000000	0.000000
URBPOP	-.024579	0.193459	-.454889	-.410788
FWYLANMI	0.211742	0.792792	0.000000	0.000000
ARTLANMI	0.030944	0.039999	0.733253	0.000000

Dependent Variable: TRI

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	0.00601	0.00200	17.96	0.0021
Error	6	0.00066912	0.00011152		
Corrected Total	9	0.00668			

Root MSE	0.01056	R-Square	0.8998
Dependent Mean	1.24540	Adj R-Sq	0.8497
Coeff Var	0.84794		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Type I SS	Type II SS
Intercept	1	1.24540	0.00334	372.94	<.0001	15.51021	15.51021
Prin2	1	0.01236	0.00247	5.00	0.0025	0.00279	0.00279
Prin4	1	0.02142	0.00419	5.11	0.0022	0.00291	0.00291
Prin5	1	0.01042	0.00622	1.68	0.1449	0.00031307	0.00031307

Durbin-Watson D	1.219
Number of Observations	10
1st Order Autocorrelation	0.289

Mean of Working Series	-406E-19
Standard Deviation	0.00818
Number of Observations	10

Autocorrelations

```
Lag  Covariance  Correlation  -1 9 8 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 1    Std Error

  0  0.00006691      1.00000  |                    |********************|           0
  1  0.00001932      0.28877  |       .            |******      .       |    0.316228
  2  -0.0000175      -.26200  |      .        *****|             .      |    0.341581
  3  -0.0000130      -.19393  |      .         ****|             .      |    0.361119
  4  1.19292E-6      0.01783  |     .              |              .     |    0.371387
  5   8.4895E-6      0.12688  |     .              |***           .     |    0.371473
  6  -0.0000126      -.18843  |     .          ****|              .     |    0.375781
  7  -0.0000192      -.28769  |     .        ******|              .     |    0.385114
  8  6.03001E-7      0.00901  |    .               |               .    |    0.406037
  9  -6.9797E-7      -.01043  |    .               |               .    |    0.406057
```

"." marks two standard errors

Autocorrelation Check for White Noise

To Lag	Chi-Square	DF	Pr > ChiSq	Autocorrelations					
6	4.24	6	0.6437	0.289	-0.262	-0.194	0.018	0.127	-0.188

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   4.0 ^
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   3.5 ^
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   3.0 ^
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   2.5 ^
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   2.0 ^
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S      ,
t  1.5 ^                                                                          S
u      ,
d      ,                                          S
e  1.0 ^                                                  S
n      ,
t      ,
i  0.5 ^
z      ,                                  S
e      ,
d  0.0 ^  S       S                                                       S
       ,
R      ,
e -0.5 ^                                                          S
s      ,
i      ,
d -1.0 ^
u      ,
a      ,
l -1.5 ^
       ,
       ,
  -2.0 ^                          S
       ,                  S
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  -2.5 ^
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  -3.0 ^
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  -3.5 ^
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  -4.0 ^
       Šff^fffffff^fffffff^fffffff^fffffff^fffffff^fffffff^fffffff^fffffff^fffffff^fffffff^ff
        1988    1989    1990    1991    1992    1993    1994    1995    1996    1997

                                            year

NOTE: 6 obs out of range.
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       ,
   4.0 ˆ
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       ,
   3.5 ˆ
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       ,
   3.0 ˆ
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   2.5 ˆ
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       ,
   2.0 ˆ
       ,
S      ,
t  1.5 ˆ                                                            P
u      ,
d      ,                                               P
e  1.0 ˆ                                              P
n      ,
t      ,
i  0.5 ˆ
z      ,                                             P
e      ,
d  0.0 ˆ                                                     P PP
       ,
R      ,
e -0.5 ˆ                                               P
s      ,
i      ,
d -1.0 ˆ
u      ,
a      ,
l -1.5 ˆ
       ,
       ,
  -2.0 ˆ                                                  P
       ,                                                      P
       ,
  -2.5 ˆ
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       ,
  -3.0 ˆ
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       ,
  -3.5 ˆ
       ,
       ,
  -4.0 ˆ
       Šffˆfffffffffˆfffffffffˆfffffffffˆfffffffffˆfffffffffˆfffffffffˆfffffffffˆfffffffffˆff
        1.00      1.05      1.10      1.15      1.20      1.25      1.30      1.35

                                  Predicted Value of TRI
```

NOTE: 6 obs had missing values.

Dependent Variable: TRI

C(p) Selection Method

Number in Model	C(p)	R-Square	Variables in Model
8	9.0000	0.9964	Prin1 Prin2 Prin3 Prin4 Prin5 Prin6 Prin7 Prin8
7	9.7990	0.9862	Prin1 Prin2 Prin4 Prin5 Prin6 Prin7 Prin8
7	11.4068	0.9804	Prin1 Prin2 Prin3 Prin4 Prin5 Prin6 Prin8
7	12.1140	0.9779	Prin1 Prin2 Prin3 Prin4 Prin5 Prin7 Prin8
6	12.2058	0.9703	Prin1 Prin2 Prin4 Prin5 Prin6 Prin8
6	12.9130	0.9677	Prin1 Prin2 Prin4 Prin5 Prin7 Prin8
7	14.1466	0.9705	Prin2 Prin3 Prin4 Prin5 Prin6 Prin7 Prin8
7	14.2007	0.9703	Prin1 Prin2 Prin3 Prin4 Prin5 Prin6 Prin7
6	14.5208	0.9619	Prin1 Prin2 Prin3 Prin4 Prin5 Prin8
6	14.9456	0.9604	Prin2 Prin4 Prin5 Prin6 Prin7 Prin8
6	14.9996	0.9602	Prin1 Prin2 Prin4 Prin5 Prin6 Prin7
5	15.3198	0.9518	Prin1 Prin2 Prin4 Prin5 Prin8
6	16.5533	0.9545	Prin2 Prin3 Prin4 Prin5 Prin6 Prin8
6	16.6074	0.9543	Prin1 Prin2 Prin3 Prin4 Prin5 Prin6
6	17.2606	0.9520	Prin2 Prin3 Prin4 Prin5 Prin7 Prin8
6	17.3147	0.9518	Prin1 Prin2 Prin3 Prin4 Prin5 Prin7
5	17.3523	0.9444	Prin2 Prin4 Prin5 Prin6 Prin8
5	17.4064	0.9442	Prin1 Prin2 Prin4 Prin5 Prin6
5	18.0596	0.9418	Prin2 Prin4 Prin5 Prin7 Prin8
5	18.1137	0.9416	Prin1 Prin2 Prin4 Prin5 Prin7
6	19.3472	0.9444	Prin2 Prin3 Prin4 Prin5 Prin6 Prin7
5	19.6674	0.9360	Prin2 Prin3 Prin4 Prin5 Prin8
5	19.7215	0.9358	Prin1 Prin2 Prin3 Prin4 Prin5
7	19.9450	0.9495	Prin1 Prin2 Prin3 Prin4 Prin6 Prin7 Prin8
5	20.1462	0.9343	Prin2 Prin4 Prin5 Prin6 Prin7
4	20.4663	0.9259	Prin2 Prin4 Prin5 Prin8
4	20.5204	0.9257	Prin1 Prin2 Prin4 Prin5
6	20.7440	0.9394	Prin1 Prin2 Prin4 Prin6 Prin7 Prin8
5	21.7540	0.9285	Prin2 Prin3 Prin4 Prin5 Prin6
6	22.3518	0.9335	Prin1 Prin2 Prin3 Prin4 Prin6 Prin8
5	22.4613	0.9259	Prin2 Prin3 Prin4 Prin5 Prin7
4	22.5530	0.9183	Prin2 Prin4 Prin5 Prin6
6	23.0591	0.9310	Prin1 Prin2 Prin3 Prin4 Prin7 Prin8
5	23.1508	0.9234	Prin1 Prin2 Prin4 Prin6 Prin8
4	23.2602	0.9158	Prin2 Prin4 Prin5 Prin7
5	23.8580	0.9208	Prin1 Prin2 Prin4 Prin7 Prin8
4	24.8680	0.9099	Prin2 Prin3 Prin4 Prin5
6	25.0916	0.9236	Prin2 Prin3 Prin4 Prin6 Prin7 Prin8
6	25.1457	0.9234	Prin1 Prin2 Prin3 Prin4 Prin6 Prin7
5	25.4658	0.9150	Prin1 Prin2 Prin3 Prin4 Prin8
3	25.6670	0.8998	Prin2 Prin4 Prin5

Dependent Variable: TRI

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	8	0.00665	0.00083178	34.39	0.1312
Error	1	0.00002418	0.00002418		
Corrected Total	9	0.00668			

Root MSE	0.00492	R-Square	0.9964
Dependent Mean	1.24540	Adj R-Sq	0.9674
Coeff Var	0.39488		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Type I SS	Type II SS
Intercept	1	1.24540	0.00156	800.83	0.0008	15.51021	15.51021
Prin1	1	0.00127	0.00047588	2.67	0.2279	0.00017284	0.00017284
Prin2	1	0.01236	0.00115	10.74	0.0591	0.00279	0.00279
Prin3	1	0.00310	0.00185	1.67	0.3430	0.00006769	0.00006769
Prin4	1	0.02142	0.00195	10.96	0.0579	0.00291	0.00291
Prin5	1	0.01042	0.00290	3.60	0.1726	0.00031307	0.00031307
Prin6	1	-0.00909	0.00402	-2.26	0.2651	0.00012368	0.00012368
Prin7	1	0.01075	0.00512	2.10	0.2830	0.00010658	0.00010658
Prin8	1	0.03499	0.01304	2.68	0.2271	0.00017415	0.00017415

Durbin-Watson D	2.920
Number of Observations	10
1st Order Autocorrelation	-0.488

Mean of Working Series	-43E-18
Standard Deviation	0.001555
Number of Observations	10

```
                                  Autocorrelations
Lag  Covariance  Correlation  -1 9 8 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 1    Std Error

  0  2.41847E-6      1.00000  |                    |********************|            0
  1  -1.1807E-6      -.48821  |       .  **********|            .       |     0.316228
  2  -5.2064E-7      -.21528  |     .          ****|              .     |     0.384278
  3   5.3367E-7      0.22066  |    .               |****           .    |     0.396154
  4  4.45697E-7      0.18429  |    .               |****           .    |     0.408261
  5  -8.6415E-7      -.35732  |   .         *******|                .   |     0.416497
  6  3.77433E-7      0.15606  |  .                 |***              .  |     0.446099
  7  3.91232E-8      0.01618  |  .                 |                 .  |     0.451526
  8  -3.4713E-8      -.01435  |  .                 |                 .  |     0.451584
  9  -4.9336E-9      -.00204  |  .                 |                 .  |     0.451629
```

"." marks two standard errors

Autocorrelation Check for White Noise

To Lag	Chi-Square	DF	Pr > ChiSq	Autocorrelations					
6	9.18	6	0.1636	-0.488	-0.215	0.221	0.184	-0.357	0.156

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   4.0 ˆ
       ,
       ,
   3.5 ˆ
       ,
       ,
   3.0 ˆ
       ,
       ,
   2.5 ˆ
       ,
       ,
   2.0 ˆ
       ,
S      ,
t  1.5 ˆ
u      ,
d      ,
e  1.0 ˆ          S               S       S       S               S       S       S
n      ,
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        1988    1989    1990    1991    1992    1993    1994    1995    1996    1997

                                         year

NOTE: 6 obs out of range.
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 R     ‚
 e -0.5 ˆ
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        1.00      1.05      1.10      1.15      1.20      1.25      1.30      1.35

                              Predicted Value of TRI

NOTE: 6 obs had missing values.
```

APPENDIX I

LAREDO URBAN AREA REGRESSION ANALYSIS

Observations	10
Variables	16

Simple Statistics

	A_SING	B_MULTI	CNTYPOP	C_VACANT
Mean	0.4253187057	0.4183672402	0.5432773801	0.1000901387
StD	0.8507511902	0.7422122181	0.8772398524	0.8321635100

Simple Statistics

	D_FARM	EMPLOY	E_FARMIM	F_COMM
Mean	0.2488617728	0.6070746686	0.3524477969	0.000000000
StD	0.7813928179	0.7460753094	0.9678848344	1.000000000

Simple Statistics

	F_INDUS	INCOME	PERCAP	RETAIL
Mean	0.000000000	0.5703795825	0.6127832767	0.3393282935
StD	1.000000000	0.8332254087	0.7355113355	0.6740657294

Simple Statistics

	URBAREA	URBPOP	FWYLANMI	ARTLANMI
Mean	0.5067934714	0.6044079655	0.4803335705	0.429855891
StD	0.9180235812	0.7309802220	0.9914892069	1.057913969

Correlation Matrix

	A_SING	B_MULTI	CNTYPOP	C_VACANT	D_FARM	EMPLOY	E_FARMIM	F_COMM
A_SING	1.0000	0.6320	0.6318	0.4498	-.2508	0.6439	0.6472	0.6073
B_MULTI	0.6320	1.0000	0.9558	0.8629	-.3284	0.9252	0.8223	0.9550
CNTYPOP	0.6318	0.9558	1.0000	0.9559	-.3460	0.9590	0.8982	0.9955
C_VACANT	0.4498	0.8629	0.9559	1.0000	-.3231	0.8755	0.8233	0.9514
D_FARM	-.2508	-.3284	-.3460	-.3231	1.0000	-.2665	-.3331	-.3432
EMPLOY	0.6439	0.9252	0.9590	0.8755	-.2665	1.0000	0.8672	0.9680
E_FARMIM	0.6472	0.8223	0.8982	0.8233	-.3331	0.8672	1.0000	0.8794
F_COMM	0.6073	0.9550	0.9955	0.9514	-.3432	0.9680	0.8794	1.0000
F_INDUS	0.5912	0.8448	0.9224	0.8949	-.1943	0.9121	0.8409	0.9067
INCOME	0.6463	0.9572	0.9933	0.9323	-.2659	0.9775	0.8902	0.9925
PERCAP	0.6680	0.9398	0.9741	0.8951	-.2071	0.9879	0.8836	0.9762
RETAIL	0.1819	0.1899	0.1260	0.0028	0.3082	0.3780	-.0155	0.1816
URBAREA	0.6434	0.9360	0.9802	0.9293	-.3934	0.9660	0.8691	0.9812
URBPOP	0.6265	0.9706	0.9691	0.9175	-.3711	0.8889	0.8565	0.9568
FWYLANMI	0.5579	0.8717	0.9629	0.9381	-.3051	0.9720	0.8671	0.9718
ARTLANMI	0.5854	0.9545	0.9760	0.9255	-.3272	0.9579	0.8457	0.9772

Correlation Matrix

	F_INDUS	INCOME	PERCAP	RETAIL	URBAREA	URBPOP	FWYLANMI	ARTLANMI
A_SING	0.5912	0.6463	0.6680	0.1819	0.6434	0.6265	0.5579	0.5854
B_MULTI	0.8448	0.9572	0.9398	0.1899	0.9360	0.9706	0.8717	0.9545
CNTYPOP	0.9224	0.9933	0.9741	0.1260	0.9802	0.9691	0.9629	0.9760
C_VACANT	0.8949	0.9323	0.8951	0.0028	0.9293	0.9175	0.9381	0.9255
D_FARM	-.1943	-.2659	-.2071	0.3082	-.3934	-.3711	-.3051	-.3272
EMPLOY	0.9121	0.9775	0.9879	0.3780	0.9660	0.8889	0.9720	0.9579
E_FARMIM	0.8409	0.8902	0.8836	-.0155	0.8691	0.8565	0.8671	0.8457
F_COMM	0.9067	0.9925	0.9762	0.1816	0.9812	0.9568	0.9718	0.9772
F_INDUS	1.0000	0.9316	0.9370	0.1565	0.8761	0.8349	0.9163	0.8607
INCOME	0.9316	1.0000	0.9930	0.2157	0.9723	0.9506	0.9668	0.9727
PERCAP	0.9370	0.9930	1.0000	0.3000	0.9548	0.9134	0.9633	0.9525
RETAIL	0.1565	0.2157	0.3000	1.0000	0.2234	0.0237	0.2662	0.2364
URBAREA	0.8761	0.9723	0.9548	0.2234	1.0000	0.9499	0.9649	0.9890
URBPOP	0.8349	0.9506	0.9134	0.0237	0.9499	1.0000	0.8759	0.9623
FWYLANMI	0.9163	0.9668	0.9633	0.2662	0.9649	0.8759	1.0000	0.9489
ARTLANMI	0.8607	0.9727	0.9525	0.2364	0.9890	0.9623	0.9489	1.0000

Eigenvalues of the Correlation Matrix

	Eigenvalue	Difference	Proportion	Cumulative
1	12.7328352	11.3115303	0.7958	0.7958
2	1.4213049	0.7052266	0.0888	0.8846
3	0.7160783	0.1257068	0.0448	0.9294
4	0.5903715	0.3334733	0.0369	0.9663
5	0.2568981	0.1091248	0.0161	0.9823
6	0.1477734	0.0495113	0.0092	0.9916
7	0.0982620	0.0688075	0.0061	0.9977
8	0.0294546	0.0224324	0.0018	0.9996
9	0.0070221	0.0070221	0.0004	1.0000
10	0.0000000	0.0000000	0.0000	1.0000
11	0.0000000	0.0000000	0.0000	1.0000
12	0.0000000	0.0000000	0.0000	1.0000
13	0.0000000	0.0000000	0.0000	1.0000
14	0.0000000	0.0000000	0.0000	1.0000
15	0.0000000	0.0000000	0.0000	1.0000
16	0.0000000		0.0000	1.0000

Eigenvectors

	Prin1	Prin2	Prin3	Prin4	Prin5	Prin6
A_SING	0.185997	0.039900	-.655315	0.632119	0.026921	-.233573
B_MULTI	0.267829	-.001387	-.030959	-.017797	0.477395	0.044455
CNTYPOP	0.279213	-.043531	0.066483	0.004485	0.048180	-.048324
C_VACANT	0.262180	-.113743	0.312158	-.100587	-.039190	-.299244
D_FARM	-.095016	0.599844	0.539615	0.512275	0.171753	0.064379
EMPLOY	0.273874	0.143860	-.060375	-.091012	-.141932	0.101515
E_FARMIM	0.252968	-.124767	0.026406	0.262813	-.374528	0.754815
F_COMM	0.278465	-.010016	0.056575	-.073895	0.053327	-.017437
F_INDUS	0.259091	0.049285	0.169509	0.137680	-.427325	-.499256
INCOME	0.278967	0.046035	0.059356	0.030744	0.030644	-.019290
PERCAP	0.275820	0.124086	0.021254	0.059528	-.070172	0.011052
RETAIL	0.053715	0.740455	-.350854	-.399647	-.043679	0.057004
URBAREA	0.276537	-.008477	-.058483	-.120674	0.059859	0.027028
URBPOP	0.268360	-.122789	0.052122	0.055755	0.468661	0.044742
FWYLANMI	0.271586	0.058745	0.077905	-.154329	-.318407	-.015024
ARTLANMI	0.274305	0.024072	0.031646	-.141704	0.244472	0.105485

	Prin7	Prin8	Prin9	Prin10	Prin11	Prin12
A_SING	0.237400	-.039539	0.033370	-.030197	-.015167	0.029613
B_MULTI	-.517160	-.101851	0.220871	-.086888	0.088990	0.125442
CNTYPOP	0.016192	-.127291	-.073410	0.942971	0.000000	0.000000
C_VACANT	0.389289	-.039266	0.542179	-.087522	-.015422	-.076636
D_FARM	0.143117	0.008311	-.003609	0.008251	-.058795	0.040189
EMPLOY	-.116436	-.013221	0.008781	-.056411	-.919200	0.000000
E_FARMIM	-.074121	0.141521	0.247376	0.013677	0.178157	-.036644
F_COMM	0.044268	-.444205	0.179131	-.136949	0.085738	0.187105
F_INDUS	-.462643	0.423226	0.003921	-.025418	0.125102	0.036986
INCOME	-.072212	-.238923	-.269862	-.139383	0.095077	-.866422
PERCAP	-.169354	-.291853	-.244029	-.129058	0.137605	0.302706
RETAIL	-.020327	0.078558	0.228009	0.078772	0.206333	-.065410
URBAREA	0.321390	0.358201	0.160280	-.023937	0.047736	-.084581
URBPOP	0.005886	0.191422	0.023048	-.083189	-.013801	0.052423
FWYLANMI	0.300903	-.246349	-.329904	-.131069	0.118101	0.259153
ARTLANMI	0.201666	0.446694	-.487797	-.069891	0.039008	0.120506

	Prin13	Prin14	Prin15	Prin16
A_SING	-.059000	-.023419	0.110437	0.047330
B_MULTI	-.363326	-.281897	0.001464	0.357517
CNTYPOP	0.000000	0.000000	0.000000	0.000000
C_VACANT	-.092592	-.299396	0.352674	-.190457
D_FARM	-.056937	0.032719	-.075143	0.090791
EMPLOY	0.000000	0.000000	0.000000	0.000000
E_FARMIM	0.019626	-.005609	0.142303	-.001321
F_COMM	-.048031	0.784705	0.000000	0.000000
F_INDUS	0.077486	0.169979	0.003748	0.071700
INCOME	0.000000	0.000000	0.000000	0.000000
PERCAP	0.008718	-.296361	-.213600	-.682145
RETAIL	0.159768	-.007568	0.149092	-.037772
URBAREA	-.207503	0.037268	-.767736	0.000000
URBPOP	0.798980	0.000000	0.000000	0.000000
FWYLANMI	0.148817	-.264052	-.037865	0.582783
ARTLANMI	-.338863	0.159977	0.422855	-.117882

Dependent Variable: TRI

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	0.00057460	0.00011492	55.41	0.0009
Error	4	0.00000830	0.00000207		
Corrected Total	9	0.00058290			

Root MSE	0.00144	R-Square	0.9858
Dependent Mean	1.03210	Adj R-Sq	0.9680
Coeff Var	0.13953		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Type I SS	Type II SS
Intercept	1	1.03210	0.00045540	2266.34	<.0001	10.65230	10.65230
Prin1	1	0.00190	0.00013453	14.10	0.0001	0.00041204	0.00041204
Prin2	1	-0.00252	0.00040265	-6.25	0.0033	0.00008096	0.00008096
Prin4	1	0.00287	0.00062476	4.59	0.0101	0.00004377	0.00004377
Prin5	1	0.00331	0.00094710	3.50	0.0249	0.00002537	0.00002537
Prin8	1	-0.00686	0.00280	-2.45	0.0704	0.00001246	0.00001246

Durbin-Watson D	2.655
Number of Observations	10
1st Order Autocorrelation	-0.466

Mean of Working Series	-235E-19
Standard Deviation	0.000911
Number of Observations	10

Autocorrelations

```
Lag  Covariance  Correlation  -1 9 8 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 1    Std Error

  0  8.29571E-7      1.00000  |                    |********************|           0
  1  -3.8628E-7      -.46564  |       .   *********|          .         |    0.316228
  2  -2.8284E-9      -.00341  |     .              |            .       |    0.378633
  3  -4.7731E-8      -.05754  |     .             *|            .       |    0.378637
  4  3.21753E-8      0.03879  |     .              |*           .       |    0.379510
  5  -5.8088E-8      -.07002  |     .             *|            .       |    0.379906
  6  -1.2256E-7      -.14774  |     .           ***|            .       |    0.381194
  7  3.50978E-7      0.42308  |     .              |********    .       |    0.386878
  8  -2.0823E-7      -.25101  |   .           *****|              .     |    0.430667
  9  2.77738E-8      0.03348  |  .                 |*              .    |    0.445057

                         "." marks two standard errors
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Autocorrelation Check for White Noise

To Lag	Chi-Square	DF	Pr > ChiSq	Autocorrelations					
6	3.75	6	0.7104	-0.466	-0.003	-0.058	0.039	-0.070	-0.148

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e      ,                          S               S
d  0.0 ^                  S
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R      ,                                                  S                       S
e -0.5 ^
s      ,                                  S
i      ,
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        1988    1989    1990    1991    1992    1993    1994    1995    1996    1997

                                           year

NOTE: 6 obs out of range.
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u      ,             P
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e  1.0 ˆ
n      ,
t      ,
i  0.5 ˆ
z      ,
e      ,        PP
d  0.0 ˆ        P
       ,
R      ,         P    P
e -0.5 ˆ
s      ,       P
i      ,
d -1.0 ˆ
u      ,
a      ,
l -1.5 ˆ            P
       ,        P
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  -2.0 ˆ
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  -2.5 ˆ
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  -3.5 ˆ
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  -4.0 ˆ
       Šˆffffffffffffffˆffffffffffffffˆffffffffffffffˆffffffffffffffˆffffffffffffffˆf
      1.00           1.05           1.10           1.15           1.20           1.25

                            Predicted Value of TRI

NOTE: 6 obs had missing values.
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Dependent Variable: TRI

C(p) Selection Method

Number in Model	C(p)	R-Square	Variables in Model
7	7.1467	0.9990	Prin1 Prin2 Prin4 Prin5 Prin6 Prin7 Prin8
8	9.0000	0.9991	Prin1 Prin2 Prin3 Prin4 Prin5 Prin6 Prin7 Prin8
6	12.5045	0.9924	Prin1 Prin2 Prin4 Prin5 Prin6 Prin8
6	12.5688	0.9923	Prin1 Prin2 Prin4 Prin5 Prin7 Prin8
7	14.3578	0.9925	Prin1 Prin2 Prin3 Prin4 Prin5 Prin6 Prin8
7	14.4221	0.9925	Prin1 Prin2 Prin3 Prin4 Prin5 Prin7 Prin8
5	17.9266	0.9858	Prin1 Prin2 Prin4 Prin5 Prin8
6	19.7798	0.9859	Prin1 Prin2 Prin3 Prin4 Prin5 Prin8
6	29.0693	0.9776	Prin1 Prin2 Prin4 Prin5 Prin6 Prin7
7	30.9226	0.9777	Prin1 Prin2 Prin3 Prin4 Prin5 Prin6 Prin7
5	34.4271	0.9710	Prin1 Prin2 Prin4 Prin5 Prin6
5	34.4914	0.9710	Prin1 Prin2 Prin4 Prin5 Prin7
6	36.2803	0.9712	Prin1 Prin2 Prin3 Prin4 Prin5 Prin6
6	36.3446	0.9711	Prin1 Prin2 Prin3 Prin4 Prin5 Prin7
4	39.8491	0.9644	Prin1 Prin2 Prin4 Prin5
5	41.7024	0.9645	Prin1 Prin2 Prin3 Prin4 Prin5
6	53.8599	0.9554	Prin1 Prin2 Prin4 Prin6 Prin7 Prin8
7	55.7131	0.9556	Prin1 Prin2 Prin3 Prin4 Prin6 Prin7 Prin8
5	59.2176	0.9489	Prin1 Prin2 Prin4 Prin6 Prin8
5	59.2819	0.9488	Prin1 Prin2 Prin4 Prin7 Prin8
6	61.0709	0.9490	Prin1 Prin2 Prin3 Prin4 Prin6 Prin8
6	61.1352	0.9489	Prin1 Prin2 Prin3 Prin4 Prin7 Prin8
4	64.6397	0.9422	Prin1 Prin2 Prin4 Prin8
5	66.4929	0.9424	Prin1 Prin2 Prin3 Prin4 Prin8
5	75.7824	0.9341	Prin1 Prin2 Prin4 Prin6 Prin7
6	77.6357	0.9342	Prin1 Prin2 Prin3 Prin4 Prin6 Prin7
4	81.1402	0.9275	Prin1 Prin2 Prin4 Prin6
4	81.2045	0.9274	Prin1 Prin2 Prin4 Prin7
5	82.9934	0.9276	Prin1 Prin2 Prin3 Prin4 Prin6
5	83.0577	0.9276	Prin1 Prin2 Prin3 Prin4 Prin7
3	86.5622	0.9209	Prin1 Prin2 Prin4
4	88.4155	0.9210	Prin1 Prin2 Prin3 Prin4
6	89.1813	0.9239	Prin1 Prin2 Prin5 Prin6 Prin7 Prin8
7	91.0345	0.9240	Prin1 Prin2 Prin3 Prin5 Prin6 Prin7 Prin8
5	94.5390	0.9173	Prin1 Prin2 Prin5 Prin6 Prin8
5	94.6033	0.9173	Prin1 Prin2 Prin5 Prin7 Prin8
6	96.3923	0.9174	Prin1 Prin2 Prin3 Prin5 Prin6 Prin8
6	96.4566	0.9174	Prin1 Prin2 Prin3 Prin5 Prin7 Prin8
4	99.9611	0.9107	Prin1 Prin2 Prin5 Prin8
5	101.8143	0.9108	Prin1 Prin2 Prin3 Prin5 Prin8
5	111.1038	0.9025	Prin1 Prin2 Prin5 Prin6 Prin7
6	112.9571	0.9026	Prin1 Prin2 Prin3 Prin5 Prin6 Prin7
4	116.4616	0.8959	Prin1 Prin2 Prin5 Prin6
4	116.5259	0.8959	Prin1 Prin2 Prin5 Prin7
5	118.3148	0.8961	Prin1 Prin2 Prin3 Prin5 Prin6
5	118.3791	0.8960	Prin1 Prin2 Prin3 Prin5 Prin7
3	121.8836	0.8893	Prin1 Prin2 Prin5

Dependent Variable: TRI

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	7	0.00058230	0.00008319	278.54	0.0036
Error	2	5.973044E-7	2.986522E-7		
Corrected Total	9	0.00058290			

Root MSE	0.00054649	R-Square	0.9990
Dependent Mean	1.03210	Adj R-Sq	0.9954
Coeff Var	0.05295		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Type I SS	Type II SS
Intercept	1	1.03210	0.00017282	5972.26	<.0001	10.65230	10.65230
Prin1	1	0.00190	0.00005105	37.14	0.0007	0.00041204	0.00041204
Prin2	1	-0.00252	0.00015280	-16.46	0.0037	0.00008096	0.00008096
Prin4	1	0.00287	0.00023708	12.11	0.0068	0.00004377	0.00004377
Prin5	1	0.00331	0.00035940	9.22	0.0116	0.00002537	0.00002537
Prin6	1	-0.00170	0.00047387	-3.60	0.0693	0.00000387	0.00000387
Prin7	1	-0.00208	0.00058112	-3.58	0.0699	0.00000383	0.00000383
Prin8	1	-0.00686	0.00106	-6.46	0.0231	0.00001246	0.00001246

Durbin-Watson D	3.141
Number of Observations	10
1st Order Autocorrelation	-0.598

Mean of Working Series	-241E-19
Standard Deviation	0.000244
Number of Observations	10

Autocorrelations

```
Lag  Covariance  Correlation  -1 9 8 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 1    Std Error

  0  5.97304E-8      1.00000  |                    |********************|           0
  1  -3.5695E-8      -.59761  |       .************|            .       |    0.316228
  2  5.92282E-9      0.09916  |   .                |**              .   |    0.414037
  3  -2.9797E-9      -.04989  |   .               *|                .   |    0.416405
  4  -1.4014E-9      -.02346  |   .                |                .   |    0.417002
  5  1.14999E-8      0.19253  |   .                |****            .   |    0.417134
  6  -8.8359E-9      -.14793  |   .             ***|                .   |    0.425928
  7  2.59814E-9      0.04350  |   .                |*               .   |    0.431035
  8  -2.3849E-9      -.03993  |   .               *|                .   |    0.431474
  9   1.4111E-9      0.02362  |   .                |                .   |    0.431843
```

"." marks two standard errors

Autocorrelation Check for White Noise

To Lag	Chi-Square	DF	Pr > ChiSq	Autocorrelations					
6	6.51	6	0.3686	-0.598	0.099	-0.050	-0.023	0.193	-0.148

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       ,
   4.0 ˆ
       ,
       ,
   3.5 ˆ
       ,
       ,
   3.0 ˆ
       ,
       ,
   2.5 ˆ
       ,
       ,
   2.0 ˆ
       ,
S      ,
t  1.5 ˆ
u      ,                  S                               S
d      ,
e  1.0 ˆ
n      ,                                                                  S
t      ,
i  0.5 ˆ          S               S
z      ,
e      ,
d  0.0 ˆ
       ,
R      ,
e -0.5 ˆ                                  S
s      ,
i      ,
d -1.0 ˆ  S                                       S
u      ,                                                                          S
a      ,                                                          S
l -1.5 ˆ
       ,
       ,
  -2.0 ˆ
       ,
       ,
  -2.5 ˆ
       ,
       ,
  -3.0 ˆ
       ,
       ,
  -3.5 ˆ
       ,
       ,
  -4.0 ˆ
       Šffˆfffffffˆfffffffˆfffffffˆfffffffˆfffffffˆfffffffˆfffffffˆfffffffˆfffffffˆfffffffˆff
        1988    1989    1990    1991    1992    1993    1994    1995    1996    1997

                                             year

NOTE: 6 obs out of range.
```

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       ,
   4.0 ˆ
       ,
       ,
   3.5 ˆ
       ,
       ,
   3.0 ˆ
       ,
       ,
   2.5 ˆ
       ,
       ,
   2.0 ˆ
       ,
S      ,
t  1.5 ˆ
u      ,        PP
d      ,
e  1.0 ˆ
n      ,             P
t      ,
i  0.5 ˆ        PP
z      ,
e      ,
d  0.0 ˆ
       ,
R      ,
e -0.5 ˆ       P
s      ,
i      ,
d -1.0 ˆ        P
u      ,              P
a      ,           P
l -1.5 ˆ
       ,
       ,
  -2.0 ˆ
       ,
       ,
  -2.5 ˆ
       ,
       ,
  -3.0 ˆ
       ,
       ,
  -3.5 ˆ
       ,
       ,
  -4.0 ˆ
       Šˆƒƒƒƒƒƒƒƒƒƒƒƒƒƒˆƒƒƒƒƒƒƒƒƒƒƒƒƒƒˆƒƒƒƒƒƒƒƒƒƒƒƒƒƒˆƒƒƒƒƒƒƒƒƒƒƒƒƒƒˆƒƒƒƒƒƒƒƒƒƒƒƒƒƒˆƒ
      1.00           1.05           1.10           1.15           1.20           1.25

                                   Predicted Value of TRI

NOTE: 6 obs had missing values.  1 obs hidden.
```

APPENDIX J

LONGVIEW URBAN AREA REGRESSION ANALYSIS

Observations 10
Variables 16

Simple Statistics

	A_SING	B_MULTI	CNTYPOP	C_VACANT
Mean	-.2123819557	-.1679645559	0.138206033	-0.029447046
StD	0.1539128234	0.1395278095	1.229839512	1.190721517

Simple Statistics

	D_FARM	EMPLOY	E_FARMIM	F_COMM
Mean	-.4361998087	0.414421870	0.3975753144	0.000000000
StD	0.7724219746	1.024610118	0.8007866530	1.000000000

Simple Statistics

	F_INDUS	INCOME	PERCAP	RETAIL
Mean	0.000000000	0.5909274738	0.6166577467	0.2172479498
StD	1.000000000	0.7801991712	0.7144444131	0.9526133584

Simple Statistics

	URBAREA	URBPOP	FWYLANMI	ARTLANMI
Mean	0.5809475019	0.6007665213	5.000000000	0.6086116687
StD	0.7144345083	0.7109625874	0.000000000	0.7354021529

Correlation Matrix

	A_SING	B_MULTI	CNTYPOP	C_VACANT	D_FARM	EMPLOY	E_FARMIM	F_COMM
A_SING	1.0000	0.1165	0.6137	0.0716	0.1941	0.7042	0.3261	0.6203
B_MULTI	0.1165	1.0000	-.5008	-.9232	0.4397	-.2550	-.6177	0.0912
CNTYPOP	0.6137	-.5008	1.0000	0.5656	-.1569	0.9437	0.8068	0.5649
C_VACANT	0.0716	-.9232	0.5656	1.0000	-.3529	0.4017	0.6370	0.2000
D_FARM	0.1941	0.4397	-.1569	-.3529	1.0000	0.0424	-.4931	0.3409
EMPLOY	0.7042	-.2550	0.9437	0.4017	0.0424	1.0000	0.6373	0.7103
E_FARMIM	0.3261	-.6177	0.8068	0.6370	-.4931	0.6373	1.0000	0.4001
F_COMM	0.6203	0.0912	0.5649	0.2000	0.3409	0.7103	0.4001	1.0000
F_INDUS	0.1243	0.0558	0.2124	0.1916	0.1997	0.3015	0.3517	0.8142
INCOME	0.6332	-.3568	0.9784	0.4476	-.1238	0.9727	0.7411	0.6312
PERCAP	0.6191	-.3505	0.9734	0.4322	-.1333	0.9641	0.7421	0.6247
RETAIL	0.7290	-.2943	0.9641	0.4361	-.0414	0.9855	0.7262	0.7232
URBAREA	0.6746	-.1562	0.8744	0.2636	0.1493	0.9096	0.5985	0.7854
URBPOP	0.5728	-.3174	0.9566	0.3988	-.0913	0.9515	0.7441	0.6685
FWYLANMI	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
ARTLANMI	0.6271	-.2529	0.9294	0.3643	-.0518	0.9443	0.6955	0.7175

Correlation Matrix

	F_INDUS	INCOME	PERCAP	RETAIL	URBAREA	URBPOP	FWYLANMI	ARTLANMI
A_SING	0.1243	0.6332	0.6191	0.7290	0.6746	0.5728	0.0000	0.6271
B_MULTI	0.0558	-.3568	-.3505	-.2943	-.1562	-.3174	0.0000	-.2529
CNTYPOP	0.2124	0.9784	0.9734	0.9641	0.8744	0.9566	0.0000	0.9294
C_VACANT	0.1916	0.4476	0.4322	0.4361	0.2636	0.3988	0.0000	0.3643
D_FARM	0.1997	-.1238	-.1333	-.0414	0.1493	-.0913	0.0000	-.0518
EMPLOY	0.3015	0.9727	0.9641	0.9855	0.9096	0.9515	0.0000	0.9443
E_FARMIM	0.3517	0.7411	0.7421	0.7262	0.5985	0.7441	0.0000	0.6955
F_COMM	0.8142	0.6312	0.6247	0.7232	0.7854	0.6685	0.0000	0.7175
F_INDUS	1.0000	0.2675	0.2704	0.3427	0.4342	0.3412	0.0000	0.3875
INCOME	0.2675	1.0000	0.9989	0.9841	0.9186	0.9797	0.0000	0.9744
PERCAP	0.2704	0.9989	1.0000	0.9780	0.9239	0.9805	0.0000	0.9769
RETAIL	0.3427	0.9841	0.9780	1.0000	0.9253	0.9605	0.0000	0.9669
URBAREA	0.4342	0.9186	0.9239	0.9253	1.0000	0.9379	0.0000	0.9517
URBPOP	0.3412	0.9797	0.9805	0.9605	0.9379	1.0000	0.0000	0.9651
FWYLANMI	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
ARTLANMI	0.3875	0.9744	0.9769	0.9669	0.9517	0.9651	0.0000	1.0000

Eigenvalues of the Correlation Matrix

	Eigenvalue	Difference	Proportion	Cumulative
1	9.68663264	7.09560749	0.6458	0.6458
2	2.59102515	1.34211487	0.1727	0.8185
3	1.24891028	0.52089528	0.0833	0.9018
4	0.72801499	0.27642484	0.0485	0.9503
5	0.45159016	0.28234869	0.0301	0.9804
6	0.16924147	0.08652165	0.0113	0.9917
7	0.08271982	0.05055174	0.0055	0.9972
8	0.03216808	0.02247067	0.0021	0.9994
9	0.00969741	0.00969741	0.0006	1.0000
10	0.00000000	0.00000000	0.0000	1.0000
11	0.00000000	0.00000000	0.0000	1.0000
12	0.00000000	0.00000000	0.0000	1.0000
13	0.00000000	0.00000000	0.0000	1.0000
14	0.00000000	0.00000000	0.0000	1.0000
15	0.00000000	0.00000000	0.0000	1.0000
16	0.00000000		0.0000	1.0000

Eigenvectors

	Prin1	Prin2	Prin3	Prin4	Prin5	Prin6
A_SING	0.213037	0.246416	-.278933	0.132289	0.799106	0.112563
B_MULTI	-.119502	0.522056	-.159749	-.394942	0.051733	-.138255
CNTYPOP	0.312461	-.100631	-.117072	0.085514	-.046336	0.136368
C_VACANT	0.161224	-.420602	0.313084	0.413771	0.231234	-.330700
D_FARM	-.024814	0.473882	0.111711	0.683437	-.246961	0.391383
EMPLOY	0.310126	0.070156	-.115440	0.100063	-.051811	-.232557
E_FARMIM	0.250429	-.277742	0.143365	-.294671	0.151542	0.723084
F_COMM	0.235074	0.315548	0.378620	-.011432	0.194918	-.207763
F_INDUS	0.129133	0.206810	0.738166	-.250308	0.019989	-.003967
INCOME	0.315697	-.019738	-.132337	-.027097	-.127599	-.113670
PERCAP	0.314624	-.019439	-.133440	-.054261	-.159872	-.095261
RETAIL	0.318103	0.039339	-.082290	0.011909	0.061028	-.070886
URBAREA	0.300706	0.158805	-.022082	0.018284	-.191485	0.146093
URBPOP	0.312490	0.007695	-.069385	-.088283	-.254737	0.021731
FWYLANMI	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
ARTLANMI	0.312006	0.056068	-.054352	-.096633	-.176019	-.134633

	Prin7	Prin8	Prin9	Prin10	Prin11	Prin12
A_SING	-.176721	0.020475	-.044651	0.00000	0.120700	-.054982
B_MULTI	0.259873	-.002104	0.068733	0.00000	0.064841	0.087245
CNTYPOP	0.112223	-.067009	0.173659	0.00000	0.114122	0.888940
C_VACANT	0.030306	-.017873	0.067566	0.00000	0.059262	-.066051
D_FARM	0.173329	0.135007	0.039620	0.00000	0.026842	-.084470
EMPLOY	0.500452	-.085400	-.190891	0.00000	0.252901	-.157714
E_FARMIM	0.239264	0.061179	0.059806	0.00000	0.079183	-.222708
F_COMM	-.041271	-.267577	0.266571	0.00000	0.027450	-.024472
F_INDUS	0.021671	0.146405	-.250892	0.00000	0.023993	0.155199
INCOME	0.077650	0.124016	-.255629	0.00000	0.171205	-.089732
PERCAP	-.017226	0.153704	-.443892	0.00000	0.155216	-.038313
RETAIL	0.218616	0.152383	-.030102	0.00000	-.899822	0.000000
URBAREA	-.652394	-.229832	-.291034	0.00000	-.096675	0.009522
URBPOP	0.040882	-.597297	0.360473	0.00000	-.006282	-.246026
FWYLANMI	0.000000	0.000000	0.000000	1.00000	0.000000	0.000000
ARTLANMI	-.257682	0.632977	0.552297	0.00000	0.141223	-.135485

	Prin13	Prin14	Prin15	Prin16
A_SING	-.007955	0.215232	0.085398	-.205993
B_MULTI	0.001703	0.186722	0.125628	0.612501
CNTYPOP	0.000000	0.000000	0.000000	0.000000
C_VACANT	-.015910	0.228627	0.138923	0.528716
D_FARM	0.036578	0.032638	0.129275	0.065375
EMPLOY	-.324154	0.029107	-.565468	-.100497
E_FARMIM	-.019266	-.141109	-.050984	0.252244
F_COMM	0.094561	-.682548	0.000000	0.000000
F_INDUS	-.020900	0.396479	0.028081	-.254287
INCOME	0.853450	0.000000	0.000000	0.000000
PERCAP	-.364725	-.265890	0.628495	0.000000
RETAIL	0.000000	0.000000	0.000000	0.000000
URBAREA	-.093599	0.063961	-.345324	0.347631
URBPOP	0.002271	0.376161	0.308746	-.196336
FWYLANMI	0.000000	0.000000	0.000000	0.000000
ARTLANMI	-.115543	0.073230	-.090513	-.028484

Dependent Variable: TRI

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	0.00000905	0.00000905	12.36	0.0079
Error	8	0.00000585	7.316826E-7		
Corrected Total	9	0.00001490			

Root MSE	0.00085538	R-Square	0.6072
Dependent Mean	1.00810	Adj R-Sq	0.5580
Coeff Var	0.08485		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Type I SS	Type II SS
Intercept	1	1.00810	0.00027050	3726.85	<.0001	10.16266	10.16266
Prin1	1	-0.00032213	0.00009161	-3.52	0.0079	0.00000905	0.00000905

Durbin-Watson D	1.404
Number of Observations	10
1st Order Autocorrelation	0.142

Mean of Working Series	-666E-19
Standard Deviation	0.000765
Number of Observations	10

Autocorrelations

```
Lag  Covariance  Correlation  -1 9 8 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 1    Std Error

  0  5.85346E-7      1.00000  |                    |********************|            0
  1  8.31233E-8      0.14201  |       .            |***         .       |     0.316228
  2  -1.9215E-7      -.32827  |       .     *******|            .       |     0.322542
  3  -3.2343E-7      -.55254  |      .  ***********|             .      |     0.354381
  4   -2.484E-8      -.04244  |   .               *|                .   |     0.432026
  5  5.63918E-8      0.09634  |   .                |**              .   |     0.432443
  6  1.00146E-7      0.17109  |   .                |***             .   |     0.434584
  7  5.92213E-8      0.10117  |  .                 |**               .  |     0.441268
  8  -3.496E-10      -.00060  |  .                 |                 .  |     0.443582
  9  -5.0783E-8      -.08676  |  .               **|                 .  |     0.443582
```

"." marks two standard errors

Autocorrelation Check for White Noise

To Lag	Chi-Square	DF	Pr > ChiSq	Autocorrelations					
6	8.26	6	0.2199	0.142	-0.328	-0.553	-0.042	0.096	0.171

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   4.0 ˆ
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   3.5 ˆ
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   3.0 ˆ
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   2.5 ˆ
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       ,
   2.0 ˆ
       ,                                                                          S
S      ,
t  1.5 ˆ
u      ,
d      ,                                          S
e  1.0 ˆ                                  S
n      ,
t      ,
i  0.5 ˆ
z      ,                          S
e      ,
d  0.0 ˆ                  S
       ,
R      ,          S
e -0.5 ˆ  S
s      ,
i      ,
d -1.0 ˆ                                                  S
u      ,                                                                  S
a      ,                                                          S
l -1.5 ˆ
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       ,
  -2.0 ˆ
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       ,
  -2.5 ˆ
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  -3.5 ˆ
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       ,
  -4.0 ˆ
       Šffˆfffffffˆfffffffˆfffffffˆfffffffˆfffffffˆfffffffˆfffffffˆfffffffˆfffffffˆfffffffˆff
        1988    1989    1990    1991    1992    1993    1994    1995    1996    1997

                                            year

NOTE: 6 obs out of range.
```

```
       ‚
   4.0 ˆ
       ‚
       ‚
   3.5 ˆ
       ‚
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   3.0 ˆ
       ‚
       ‚
   2.5 ˆ
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   2.0 ˆ
       ‚  P
S      ‚
t  1.5 ˆ
u      ‚
d      ‚  P
e  1.0 ˆ  P
n      ‚
t      ‚
i  0.5 ˆ
z      ‚   P
e      ‚
d  0.0 ˆ   P
       ‚
R      ‚   P
e -0.5 ˆ   P
s      ‚
i      ‚
d -1.0 ˆ  P
u      ‚  P
a      ‚  P
l -1.5 ˆ
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       ‚
  -2.0 ˆ
       ‚
       ‚
  -2.5 ˆ
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       ‚
  -3.0 ˆ
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       ‚
  -3.5 ˆ
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       ‚
  -4.0 ˆ
       Šˆƒƒƒƒƒƒƒƒƒƒƒƒƒƒˆƒƒƒƒƒƒƒƒƒƒƒƒƒƒˆƒƒƒƒƒƒƒƒƒƒƒƒƒƒˆƒƒƒƒƒƒƒƒƒƒƒƒƒƒˆƒƒƒƒƒƒƒƒƒƒƒƒƒƒˆƒ
      1.00           1.05           1.10           1.15           1.20           1.25

                                   Predicted Value of TRI

NOTE: 6 obs had missing values.
```

Dependent Variable: TRI

C(p) Selection Method

Number in Model	C(p)	R-Square	Variables in Model
1	0.6117	0.6072	Prin1
2	0.8740	0.7104	Prin1 Prin5
2	1.0000	0.7029	Prin1 Prin8
3	1.2623	0.8062	Prin1 Prin5 Prin8
2	1.6192	0.6661	Prin1 Prin3
3	1.8815	0.7694	Prin1 Prin3 Prin5
3	2.0076	0.7619	Prin1 Prin3 Prin8
2	2.0121	0.6428	Prin1 Prin2
2	2.2052	0.6313	Prin1 Prin6
4	2.2699	0.8651	Prin1 Prin3 Prin5 Prin8
3	2.2744	0.7460	Prin1 Prin2 Prin5
3	2.4004	0.7385	Prin1 Prin2 Prin8
2	2.4059	0.6194	Prin1 Prin7
3	2.4675	0.7346	Prin1 Prin5 Prin6
2	2.5536	0.6106	Prin1 Prin4
3	2.5935	0.7271	Prin1 Prin6 Prin8
4	2.6627	0.8418	Prin1 Prin2 Prin5 Prin8
3	2.6683	0.7226	Prin1 Prin5 Prin7
3	2.7943	0.7151	Prin1 Prin7 Prin8
3	2.8159	0.7138	Prin1 Prin4 Prin5
4	2.8558	0.8303	Prin1 Prin5 Prin6 Prin8
3	2.9420	0.7064	Prin1 Prin4 Prin8
3	3.0196	0.7017	Prin1 Prin2 Prin3
4	3.0566	0.8184	Prin1 Prin5 Prin7 Prin8
4	3.2043	0.8096	Prin1 Prin4 Prin5 Prin8
3	3.2127	0.6903	Prin1 Prin3 Prin6
4	3.2819	0.8050	Prin1 Prin2 Prin3 Prin5
4	3.4080	0.7975	Prin1 Prin2 Prin3 Prin8
3	3.4135	0.6783	Prin1 Prin3 Prin7
4	3.4750	0.7935	Prin1 Prin3 Prin5 Prin6
3	3.5611	0.6696	Prin1 Prin3 Prin4
4	3.6011	0.7860	Prin1 Prin3 Prin6 Prin8
3	3.6056	0.6669	Prin1 Prin2 Prin6
5	3.6703	0.9008	Prin1 Prin2 Prin3 Prin5 Prin8
4	3.6758	0.7816	Prin1 Prin3 Prin5 Prin7
4	3.8018	0.7741	Prin1 Prin3 Prin7 Prin8
3	3.8063	0.6550	Prin1 Prin2 Prin7
4	3.8234	0.7728	Prin1 Prin3 Prin4 Prin5
5	3.8634	0.8893	Prin1 Prin3 Prin5 Prin6 Prin8
4	3.8679	0.7702	Prin1 Prin2 Prin5 Prin6
4	3.9495	0.7653	Prin1 Prin3 Prin4 Prin8
3	3.9540	0.6462	Prin1 Prin2 Prin4
4	3.9939	0.7627	Prin1 Prin2 Prin6 Prin8
3	3.9995	0.6435	Prin1 Prin6 Prin7

Dependent Variable: TRI

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	0.00000905	0.00000905	12.36	0.0079
Error	8	0.00000585	7.316826E-7		
Corrected Total	9	0.00001490			

Root MSE	0.00085538	R-Square	0.6072
Dependent Mean	1.00810	Adj R-Sq	0.5580
Coeff Var	0.08485		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Type I SS	Type II SS
Intercept	1	1.00810	0.00027050	3726.85	<.0001	10.16266	10.16266
Prin1	1	-0.00032213	0.00009161	-3.52	0.0079	0.00000905	0.00000905

Durbin-Watson D	1.404
Number of Observations	10
1st Order Autocorrelation	0.142

Mean of Working Series	-666E-19
Standard Deviation	0.000765
Number of Observations	10

Autocorrelations

```
Lag  Covariance  Correlation  -1 9 8 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 1    Std Error

  0  5.85346E-7      1.00000  |                    |********************|           0
  1  8.31233E-8      0.14201  |       .            |***        .        |    0.316228
  2  -1.9215E-7      -.32827  |       .     *******|           .        |    0.322542
  3  -3.2343E-7      -.55254  |      .  ***********|            .       |    0.354381
  4   -2.484E-8      -.04244  |   .               *|               .    |    0.432026
  5  5.63918E-8      0.09634  |   .                |**             .    |    0.432443
  6  1.00146E-7      0.17109  |   .                |***            .    |    0.434584
  7  5.92213E-8      0.10117  |  .                 |**              .   |    0.441268
  8  -3.496E-10      -.00060  |  .                 |                .   |    0.443582
  9  -5.0783E-8      -.08676  |  .               **|                .   |    0.443582
```

"." marks two standard errors

Autocorrelation Check for White Noise

To Lag	Chi-Square	DF	Pr > ChiSq	Autocorrelations					
6	8.26	6	0.2199	0.142	-0.328	-0.553	-0.042	0.096	0.171

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   4.0 ^
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   3.5 ^
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   3.0 ^
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   2.5 ^
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t  1.5 ^
u      ,
d      ,                                          S
e  1.0 ^                                  S
n      ,
t      ,
i  0.5 ^
z      ,                          S
e      ,
d  0.0 ^                  S
       ,
R      ,          S
e -0.5 ^  S
s      ,
i      ,
d -1.0 ^                                                  S
u      ,                                                                  S
a      ,                                                          S
l -1.5 ^
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       ,
  -2.0 ^
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  -3.0 ^
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  -3.5 ^
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  -4.0 ^
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        1988    1989    1990    1991    1992    1993    1994    1995    1996    1997

                                            year

NOTE: 6 obs out of range.
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S      ‚
t  1.5 ˆ
u      ‚
d      ‚  P
e  1.0 ˆ  P
n      ‚
t      ‚
i  0.5 ˆ
z      ‚   P
e      ‚
d  0.0 ˆ   P
       ‚
R      ‚   P
e -0.5 ˆ   P
s      ‚
i      ‚
d -1.0 ˆ  P
u      ‚  P
a      ‚  P
l -1.5 ˆ
       ‚
       ‚
  -2.0 ˆ
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  -2.5 ˆ
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  -3.0 ˆ
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  -3.5 ˆ
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  -4.0 ˆ
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      1.00         1.05         1.10         1.15         1.20         1.25

                                Predicted Value of TRI

NOTE: 6 obs had missing values.
```

APPENDIX K

LUBBOCK URBAN AREA REGRESSION ANALYSIS

Observations	10
Variables	16

Simple Statistics

	A_SING	B_MULTI	CNTYPOP	C_VACANT
Mean	0.3422984670	0.3266186224	0.5606871683	-.5848987584
StD	0.9802178292	0.0521679793	0.8159432122	0.2653968663

Simple Statistics

	D_FARM	EMPLOY	E_FARMIM	F_COMM
Mean	-0.202657738	0.5214077781	-.3025331411	0.000000000
StD	1.056443817	0.9203639660	0.7620410138	1.000000000

Simple Statistics

	F_INDUS	INCOME	PERCAP	RETAIL
Mean	0.000000000	0.5916928213	0.6028364334	0.2305912932
StD	1.000000000	0.7661337552	0.7392558019	0.9314354024

Simple Statistics

	URBAREA	URBPOP	FWYLANMI	ARTLANMI
Mean	0.5366860487	0.6351012979	0.5234050154	0.315777525
StD	0.8861265194	0.6246950476	0.6913084607	1.166260552

Correlation Matrix

	A_SING	B_MULTI	CNTYPOP	C_VACANT	D_FARM	EMPLOY	E_FARMIM	F_COMM
A_SING	1.0000	0.5795	0.8117	-.5514	-.2011	0.9243	-.6730	0.9724
B_MULTI	0.5795	1.0000	0.4026	-.0392	0.4761	0.5943	-.1531	0.5644
CNTYPOP	0.8117	0.4026	1.0000	-.8841	-.3267	0.8874	-.9337	0.8963
C_VACANT	-.5514	-.0392	-.8841	1.0000	0.6465	-.6951	0.9098	-.6532
D_FARM	-.2011	0.4761	-.3267	0.6465	1.0000	-.2613	0.4669	-.2018
EMPLOY	0.9243	0.5943	0.8874	-.6951	-.2613	1.0000	-.8036	0.9111
E_FARMIM	-.6730	-.1531	-.9337	0.9098	0.4669	-.8036	1.0000	-.7556
F_COMM	0.9724	0.5644	0.8963	-.6532	-.2018	0.9111	-.7556	1.0000
F_INDUS	-.7831	-.3799	-.9888	0.8815	0.3463	-.8635	0.9477	-.8817
INCOME	0.9407	0.5702	0.9233	-.7300	-.2904	0.9888	-.8271	0.9503
PERCAP	0.9437	0.5645	0.9142	-.7190	-.2988	0.9868	-.8191	0.9499
RETAIL	0.9365	0.6153	0.9392	-.7354	-.2275	0.9731	-.8121	0.9645
URBAREA	0.8916	0.5170	0.9810	-.8127	-.2724	0.9536	-.8876	0.9427
URBPOP	0.8774	0.3851	0.9375	-.7827	-.3445	0.9278	-.9155	0.9111
FWYLANMI	0.9093	0.6225	0.8279	-.5556	-.0362	0.9500	-.7443	0.8865
ARTLANMI	0.7315	0.5920	0.9054	-.7149	-.0628	0.8373	-.7908	0.8318

Correlation Matrix

	F_INDUS	INCOME	PERCAP	RETAIL	URBAREA	URBPOP	FWYLANMI	ARTLANMI
A_SING	-.7831	0.9407	0.9437	0.9365	0.8916	0.8774	0.9093	0.7315
B_MULTI	-.3799	0.5702	0.5645	0.6153	0.5170	0.3851	0.6225	0.5920
CNTYPOP	-.9888	0.9233	0.9142	0.9392	0.9810	0.9375	0.8279	0.9054
C_VACANT	0.8815	-.7300	-.7190	-.7354	-.8127	-.7827	-.5556	-.7149
D_FARM	0.3463	-.2904	-.2988	-.2275	-.2724	-.3445	-.0362	-.0628
EMPLOY	-.8635	0.9888	0.9868	0.9731	0.9536	0.9278	0.9500	0.8373
E_FARMIM	0.9477	-.8271	-.8191	-.8121	-.8876	-.9155	-.7443	-.7908
F_COMM	-.8817	0.9503	0.9499	0.9645	0.9427	0.9111	0.8865	0.8318
F_INDUS	1.0000	-.9076	-.9002	-.9193	-.9634	-.9408	-.7909	-.9075
INCOME	-.9076	1.0000	0.9994	0.9899	0.9765	0.9511	0.9252	0.8692
PERCAP	-.9002	0.9994	1.0000	0.9859	0.9703	0.9501	0.9201	0.8616
RETAIL	-.9193	0.9899	0.9859	1.0000	0.9857	0.9352	0.9202	0.8997
URBAREA	-.9634	0.9765	0.9703	0.9857	1.0000	0.9572	0.9029	0.9197
URBPOP	-.9408	0.9511	0.9501	0.9352	0.9572	1.0000	0.8793	0.8440
FWYLANMI	-.7909	0.9252	0.9201	0.9202	0.9029	0.8793	1.0000	0.8022
ARTLANMI	-.9075	0.8692	0.8616	0.8997	0.9197	0.8440	0.8022	1.0000

Eigenvalues of the Correlation Matrix

	Eigenvalue	Difference	Proportion	Cumulative
1	12.8057356	10.8088807	0.8004	0.8004
2	1.9968549	1.4065254	0.1248	0.9252
3	0.5903296	0.3180614	0.0369	0.9621
4	0.2722682	0.1055659	0.0170	0.9791
5	0.1667023	0.0886569	0.0104	0.9895
6	0.0780454	0.0177177	0.0049	0.9944
7	0.0603277	0.0403723	0.0038	0.9981
8	0.0199554	0.0101745	0.0012	0.9994
9	0.0097809	0.0097809	0.0006	1.0000
10	0.0000000	0.0000000	0.0000	1.0000
11	0.0000000	0.0000000	0.0000	1.0000
12	0.0000000	0.0000000	0.0000	1.0000
13	0.0000000	0.0000000	0.0000	1.0000
14	0.0000000	0.0000000	0.0000	1.0000
15	0.0000000	0.0000000	0.0000	1.0000
16	0.0000000		0.0000	1.0000

Eigenvectors

	Prin1	Prin2	Prin3	Prin4	Prin5	Prin6
A_SING	0.254802	0.131307	0.428644	0.138563	0.337241	-.118767
B_MULTI	0.145365	0.560188	-.041809	-.557260	-.173165	-.156656
CNTYPOP	0.270650	-.092998	-.230673	0.004462	0.156081	-.292761
C_VACANT	-.222260	0.378734	0.261535	0.262934	0.064647	0.454244
D_FARM	-.081818	0.608938	-.457927	0.409218	0.095185	-.150682
EMPLOY	0.270537	0.070189	0.192197	-.041419	-.426717	0.014097
E_FARMIM	-.247440	0.252821	0.259567	-.316424	0.232803	0.036661
F_COMM	0.265881	0.089103	0.177813	0.068321	0.583095	-.085852
F_INDUS	-.267282	0.114922	0.269970	0.009527	-.204148	-.013526
INCOME	0.276091	0.042649	0.154480	-.074538	-.107180	0.144098
PERCAP	0.274903	0.041657	0.183016	-.073365	-.091718	0.235355
RETAIL	0.276541	0.075108	0.059865	-.137160	0.057905	-.077875
URBAREA	0.278454	-.002050	-.076890	-.018949	0.040551	-.107938
URBPOP	0.270495	-.068757	0.029483	0.298358	-.010491	0.384207
FWYLANMI	0.255450	0.183774	0.123376	0.413349	-.412810	-.231892
ARTLANMI	0.252623	0.091451	-.437546	-.192522	0.072813	0.585017

	Prin7	Prin8	Prin9	Prin10	Prin11	Prin12
A_SING	0.079436	-.012152	-.062150	-.142526	-.077234	0.086002
B_MULTI	-.401163	-.078022	-.212355	-.153746	0.046530	0.034416
CNTYPOP	0.002306	0.117746	0.479121	-.036900	-.311532	0.215949
C_VACANT	-.195518	-.307291	0.283193	0.206764	0.189123	0.107906
D_FARM	0.016127	0.219289	0.139060	0.032357	-.110525	-.077560
EMPLOY	0.053775	0.049451	0.063037	-.081623	-.092933	0.229659
E_FARMIM	0.369028	0.441579	0.057688	-.121048	-.088740	0.026015
F_COMM	0.020117	-.241322	-.225274	-.132245	-.007665	-.055262
F_INDUS	0.348420	0.269624	-.011035	-.013227	0.009420	-.018031
INCOME	-.017017	0.011526	0.331756	-.037111	-.149276	-.852137
PERCAP	-.028393	-.014391	0.424809	-.011589	-.152000	0.374975
RETAIL	0.092273	0.146666	-.144085	0.913939	0.000000	0.000000
URBAREA	0.130045	0.186246	0.246914	-.097752	0.883613	0.000000
URBPOP	-.379207	0.618113	-.321152	-.111487	-.026090	0.030062
FWYLANMI	0.348558	-.211446	-.246999	-.072248	-.015558	-.009229
ARTLANMI	0.491506	-.160318	-.165469	-.088935	-.055625	0.050928

	Prin13	Prin14	Prin15	Prin16
A_SING	0.060188	-.038074	-.733481	0.000000
B_MULTI	0.180690	0.113303	-.019379	0.115242
CNTYPOP	0.087569	0.183662	0.083226	0.563914
C_VACANT	-.041640	0.007369	0.057955	0.388519
D_FARM	-.147911	0.001518	-.071182	-.315703
EMPLOY	-.789677	0.000000	0.000000	0.000000
E_FARMIM	-.019765	-.467690	0.238652	0.134270
F_COMM	-.211142	0.273739	0.520887	-.129943
F_INDUS	0.128672	0.767567	0.000000	0.000000
INCOME	0.000000	0.000000	0.000000	0.000000
PERCAP	0.359252	-.019915	0.169675	-.562532
RETAIL	0.000000	0.000000	0.000000	0.000000
URBAREA	0.000000	0.000000	0.000000	0.000000
URBPOP	0.101197	0.026925	0.098961	0.143945
FWYLANMI	0.328520	-.244807	0.236014	0.185450
ARTLANMI	0.010150	0.089709	-.153997	0.107876

Dependent Variable: TRI

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	4	0.00455	0.00114	31.15	0.0010
Error	5	0.00018275	0.00003655		
Corrected Total	9	0.00474			

Root MSE	0.00605	R-Square	0.9614
Dependent Mean	1.02660	Adj R-Sq	0.9305
Coeff Var	0.58890		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Type I SS	Type II SS
Intercept	1	1.02660	0.00191	536.98	<.0001	10.53908	10.53908
Prin1	1	-0.00357	0.00056315	-6.34	0.0014	0.00147	0.00147
Prin2	1	0.01163	0.00143	8.15	0.0005	0.00243	0.00243
Prin3	1	-0.00806	0.00262	-3.07	0.0277	0.00034509	0.00034509
Prin4	1	0.01127	0.00386	2.92	0.0331	0.00031126	0.00031126

Durbin-Watson D	2.300
Number of Observations	10
1st Order Autocorrelation	-0.208

Mean of Working Series	2.44E-16
Standard Deviation	0.004275
Number of Observations	10

Autocorrelations

```
Lag  Covariance  Correlation  -1 9 8 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 1    Std Error

  0  0.00001828      1.00000  |                    |********************|           0
  1  -3.8077E-6      -.20835  |       .        ****|            .       |    0.316228
  2  -4.7769E-6      -.26138  |       .       *****|            .       |    0.329670
  3   -5.312E-6      -.29067  |      .       ******|             .      |    0.349781
  4  4.68678E-6      0.25646  |     .              |*****         .     |    0.373154
  5  1.26404E-6      0.06917  |    .               |*              .    |    0.390382
  6  -2.6041E-6      -.14249  |    .            ***|               .    |    0.391606
  7  1.03688E-6      0.05674  |    .               |*              .    |    0.396756
  8  1.44007E-6      0.07880  |    .               |**             .    |    0.397567
  9  -1.0647E-6      -.05826  |    .              *|               .    |    0.399126
```

"." marks two standard errors

Autocorrelation Check for White Noise

To Lag	Chi-Square	DF	Pr > ChiSq	Autocorrelations					
6	5.09	6	0.5322	-0.208	-0.261	-0.291	0.256	0.069	-0.142

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u      ,
d      ,          S                               S
e  1.0 ˆ
n      ,                                                                          S
t      ,
i  0.5 ˆ                          S       S
z      ,
e      ,                                                                  S
d  0.0 ˆ
       ,
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e -0.5 ˆ
s      ,
i      ,  S
d -1.0 ˆ
u      ,                  S                               S
a      ,
l -1.5 ˆ
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  -2.0 ˆ
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        1988    1989    1990    1991    1992    1993    1994    1995    1996    1997

                                            year

NOTE: 6 obs out of range.
```

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       ,
   4.0 ˆ
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   2.5 ˆ
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S      ,
t  1.5 ˆ
u      ,
d      ,  P                 P
e  1.0 ˆ
n      ,      P
t      ,
i  0.5 ˆ    P
z      ,
e      ,     P
d  0.0 ˆ
       ,
R      ,
e -0.5 ˆ
s      ,
i      ,                     P
d -1.0 ˆ
u      ,     P
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l -1.5 ˆ
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  -4.0 ˆ
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      1.00           1.05           1.10           1.15           1.20           1.25

                           Predicted Value of TRI

NOTE: 6 obs had missing values.  2 obs hidden.
```

Dependent Variable: TRI

C(p) Selection Method

Number in Model	C(p)	R-Square	Variables in Model
6	6.5271	0.9869	Prin1 Prin2 Prin3 Prin4 Prin5 Prin6
5	6.8468	0.9749	Prin1 Prin2 Prin3 Prin4 Prin6
5	7.1254	0.9734	Prin1 Prin2 Prin3 Prin4 Prin5
4	7.4452	0.9614	Prin1 Prin2 Prin3 Prin4
7	7.6034	0.9917	Prin1 Prin2 Prin3 Prin4 Prin5 Prin6 Prin7
6	7.9232	0.9797	Prin1 Prin2 Prin3 Prin4 Prin6 Prin7
7	7.9237	0.9900	Prin1 Prin2 Prin3 Prin4 Prin5 Prin6 Prin8
6	8.2018	0.9782	Prin1 Prin2 Prin3 Prin4 Prin5 Prin7
6	8.2434	0.9780	Prin1 Prin2 Prin3 Prin4 Prin6 Prin8
5	8.5215	0.9662	Prin1 Prin2 Prin3 Prin4 Prin7
6	8.5220	0.9766	Prin1 Prin2 Prin3 Prin4 Prin5 Prin8
5	8.8418	0.9645	Prin1 Prin2 Prin3 Prin4 Prin8
8	9.0000	0.9948	Prin1 Prin2 Prin3 Prin4 Prin5 Prin6 Prin7 Prin8
7	9.3198	0.9828	Prin1 Prin2 Prin3 Prin4 Prin6 Prin7 Prin8
7	9.5984	0.9814	Prin1 Prin2 Prin3 Prin4 Prin5 Prin7 Prin8
6	9.9181	0.9693	Prin1 Prin2 Prin3 Prin4 Prin7 Prin8
5	17.2076	0.9212	Prin1 Prin2 Prin3 Prin5 Prin6
4	17.5274	0.9092	Prin1 Prin2 Prin3 Prin6
4	17.8060	0.9077	Prin1 Prin2 Prin3 Prin5
3	18.1257	0.8957	Prin1 Prin2 Prin3
6	18.2839	0.9260	Prin1 Prin2 Prin3 Prin5 Prin6 Prin7
5	18.5859	0.9140	Prin1 Prin2 Prin4 Prin5 Prin6
5	18.6037	0.9140	Prin1 Prin2 Prin3 Prin6 Prin7
6	18.6042	0.9243	Prin1 Prin2 Prin3 Prin5 Prin6 Prin8
5	18.8823	0.9125	Prin1 Prin2 Prin3 Prin5 Prin7
4	18.9057	0.9020	Prin1 Prin2 Prin4 Prin6
5	18.9240	0.9123	Prin1 Prin2 Prin3 Prin6 Prin8
4	19.1843	0.9006	Prin1 Prin2 Prin4 Prin5
4	19.2021	0.9005	Prin1 Prin2 Prin3 Prin7
5	19.2025	0.9108	Prin1 Prin2 Prin3 Prin5 Prin8
3	19.5041	0.8886	Prin1 Prin2 Prin4
4	19.5223	0.8988	Prin1 Prin2 Prin3 Prin8
6	19.6623	0.9188	Prin1 Prin2 Prin4 Prin5 Prin6 Prin7
7	19.6805	0.9291	Prin1 Prin2 Prin3 Prin5 Prin6 Prin7 Prin8
5	19.9820	0.9068	Prin1 Prin2 Prin4 Prin6 Prin7
6	19.9825	0.9172	Prin1 Prin2 Prin4 Prin5 Prin6 Prin8
6	20.0003	0.9171	Prin1 Prin2 Prin3 Prin6 Prin7 Prin8
5	20.2606	0.9054	Prin1 Prin2 Prin4 Prin5 Prin7
6	20.2789	0.9156	Prin1 Prin2 Prin3 Prin5 Prin7 Prin8
5	20.3023	0.9051	Prin1 Prin2 Prin4 Prin6 Prin8
4	20.5804	0.8933	Prin1 Prin2 Prin4 Prin7
5	20.5809	0.9037	Prin1 Prin2 Prin4 Prin5 Prin8
5	20.5986	0.9036	Prin1 Prin2 Prin3 Prin7 Prin8
4	20.9007	0.8917	Prin1 Prin2 Prin4 Prin8

Dependent Variable: TRI

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	6	0.00467	0.00077906	37.68	0.0065
Error	3	0.00006203	0.00002068		
Corrected Total	9	0.00474			

Root MSE	0.00455	R-Square	0.9869
Dependent Mean	1.02660	Adj R-Sq	0.9607
Coeff Var	0.44294		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Type I SS	Type II SS
Intercept	1	1.02660	0.00144	713.94	<.0001	10.53908	10.53908
Prin1	1	-0.00357	0.00042356	-8.43	0.0035	0.00147	0.00147
Prin2	1	0.01163	0.00107	10.84	0.0017	0.00243	0.00243
Prin3	1	-0.00806	0.00197	-4.09	0.0265	0.00034509	0.00034509
Prin4	1	0.01127	0.00290	3.88	0.0303	0.00031126	0.00031126
Prin5	1	0.00616	0.00371	1.66	0.1956	0.00005694	0.00005694
Prin6	1	0.00953	0.00543	1.76	0.1773	0.00006378	0.00006378

Durbin-Watson D	3.616
Number of Observations	10
1st Order Autocorrelation	-0.813

Mean of Working Series	2.45E-16
Standard Deviation	0.002491
Number of Observations	10

Autocorrelations

```
Lag  Covariance  Correlation  -1 9 8 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 1    Std Error

  0  6.20304E-6      1.00000  |                    |********************|          0
  1  -5.0443E-6      -.81320  |    ****************|          .         |   0.316228
  2  3.54185E-6      0.57099  | .                  |***********       . |   0.481932
  3  -2.3349E-6      -.37642  |            ********|                    |   0.545402
  4  8.34063E-7      0.13446  |                    |***                 |   0.570791
  5  -2.4512E-7      -.03952  |                   *|                    |   0.573949
  6  2.85431E-7      0.04601  |                    |*                   |   0.574221
  7   -1.826E-7      -.02944  |                   *|                    |   0.574590
  8  7.34011E-8      0.01183  |                    |                    |   0.574741
  9    -2.93E-8      -.00472  |                    |                    |   0.574765
```

"." marks two standard errors

Autocorrelation Check for White Noise

To Lag	Chi-Square	DF	Pr > ChiSq	Autocorrelations					
6	16.60	6	0.0109	-0.813	0.571	-0.376	0.134	-0.040	0.046

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n      ,                                          S
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s      ,                                                  S
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d -1.0 ˆ                                                          S
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        1988    1989    1990    1991    1992    1993    1994    1995    1996    1997

                                            year

NOTE: 6 obs out of range.
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i  0.5 ˆ                      P
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e -0.5 ˆ
s      ,    P
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      1.00           1.05           1.10           1.15           1.20           1.25

                                   Predicted Value of TRI

NOTE: 6 obs had missing values.
```

APPENDIX L

SAN ANGELO URBAN AREA REGRESSION ANALYSIS

Observations	10
Variables	16

Simple Statistics

	A_SING	B_MULTI	CNTYPOP	C_VACANT
Mean	0.4553267429	0.4776259040	0.5901688291	-.5851192721
StD	0.7313457509	0.2287944068	0.6438357451	0.2271774107

Simple Statistics

	D_FARM	EMPLOY	E_FARMIM	F_COMM
Mean	-.2748567247	0.284456870	-.2248491450	0.000000000
StD	0.8075476254	1.151027689	0.0766450135	1.000000000

Simple Statistics

	F_INDUS	INCOME	PERCAP	RETAIL
Mean	0.000000000	0.5901525885	0.5920110479	0.1975182522
StD	1.000000000	0.7780892507	0.7791323800	0.9807470162

Simple Statistics

	URBAREA	URBPOP	FWYLANMI	ARTLANMI
Mean	0.6065520632	0.6351724314	0.5383183661	-0.391674726
StD	0.7593263966	0.5951382489	0.8900236894	1.100963765

Correlation Matrix

	A_SING	B_MULTI	CNTYPOP	C_VACANT	D_FARM	EMPLOY	E_FARMIM	F_COMM
A_SING	1.0000	-.3741	0.9836	-.9004	-.3506	0.9870	0.7711	-.0575
B_MULTI	-.3741	1.0000	-.3788	0.6111	0.1353	-.4499	-.5939	0.3900
CNTYPOP	0.9836	-.3788	1.0000	-.8887	-.2139	0.9796	0.8283	-.0285
C_VACANT	-.9004	0.6111	-.8887	1.0000	0.4832	-.9222	-.7943	-.0780
D_FARM	-.3506	0.1353	-.2139	0.4832	1.0000	-.2996	0.0814	-.3054
EMPLOY	0.9870	-.4499	0.9796	-.9222	-.2996	1.0000	0.8521	-.1092
E_FARMIM	0.7711	-.5939	0.8283	-.7943	0.0814	0.8521	1.0000	-.2530
F_COMM	-.0575	0.3900	-.0285	-.0780	-.3054	-.1092	-.2530	1.0000
F_INDUS	-.3159	-.6507	-.2984	0.0273	0.1560	-.2400	0.0633	-.2078
INCOME	0.9749	-.2729	0.9685	-.8091	-.2098	0.9694	0.7888	-.1507
PERCAP	0.9763	-.2716	0.9677	-.8071	-.2184	0.9679	0.7789	-.1537
RETAIL	0.9484	-.3775	0.9655	-.8410	-.1253	0.9691	0.8885	-.1672
URBAREA	0.9410	-.3725	0.9238	-.7956	-.2123	0.9461	0.7625	-.2103
URBPOP	0.9660	-.3923	0.9504	-.8494	-.2510	0.9705	0.7787	-.1596
FWYLANMI	0.8056	-.2029	0.8325	-.5322	0.1877	0.8016	0.7325	-.4193
ARTLANMI	-.8273	0.2938	-.8864	0.7254	-.0414	-.8630	-.8591	0.1290

Correlation Matrix

	F_INDUS	INCOME	PERCAP	RETAIL	URBAREA	URBPOP	FWYLANMI	ARTLANMI
A_SING	-.3159	0.9749	0.9763	0.9484	0.9410	0.9660	0.8056	-.8273
B_MULTI	-.6507	-.2729	-.2716	-.3775	-.3725	-.3923	-.2029	0.2938
CNTYPOP	-.2984	0.9685	0.9677	0.9655	0.9238	0.9504	0.8325	-.8864
C_VACANT	0.0273	-.8091	-.8071	-.8410	-.7956	-.8494	-.5322	0.7254
D_FARM	0.1560	-.2098	-.2184	-.1253	-.2123	-.2510	0.1877	-.0414
EMPLOY	-.2400	0.9694	0.9679	0.9691	0.9461	0.9705	0.8016	-.8630
E_FARMIM	0.0633	0.7888	0.7789	0.8885	0.7625	0.7787	0.7325	-.8591
F_COMM	-.2078	-.1507	-.1537	-.1672	-.2103	-.1596	-.4193	0.1290
F_INDUS	1.0000	-.3918	-.3950	-.2982	-.2688	-.2849	-.3480	0.3981
INCOME	-.3918	1.0000	0.9998	0.9592	0.9597	0.9648	0.8880	-.8667
PERCAP	-.3950	0.9998	1.0000	0.9560	0.9597	0.9646	0.8887	-.8600
RETAIL	-.2982	0.9592	0.9560	1.0000	0.9174	0.9293	0.8741	-.9305
URBAREA	-.2688	0.9597	0.9597	0.9174	1.0000	0.9650	0.8505	-.8165
URBPOP	-.2849	0.9648	0.9646	0.9293	0.9650	1.0000	0.8316	-.8182
FWYLANMI	-.3480	0.8880	0.8887	0.8741	0.8505	0.8316	1.0000	-.8142
ARTLANMI	0.3981	-.8667	-.8600	-.9305	-.8165	-.8182	-.8142	1.0000

Eigenvalues of the Correlation Matrix

	Eigenvalue	Difference	Proportion	Cumulative
1	11.0565269	9.0149136	0.6910	0.6910
2	2.0416132	0.3777762	0.1276	0.8186
3	1.6638370	0.9330803	0.1040	0.9226
4	0.7307567	0.4592859	0.0457	0.9683
5	0.2714707	0.1693225	0.0170	0.9853
6	0.1021482	0.0268901	0.0064	0.9916
7	0.0752581	0.0365877	0.0047	0.9964
8	0.0386704	0.0189516	0.0024	0.9988
9	0.0197188	0.0197188	0.0012	1.0000
10	0.0000000	0.0000000	0.0000	1.0000
11	0.0000000	0.0000000	0.0000	1.0000
12	0.0000000	0.0000000	0.0000	1.0000
13	0.0000000	0.0000000	0.0000	1.0000
14	0.0000000	0.0000000	0.0000	1.0000
15	0.0000000	0.0000000	0.0000	1.0000
16	0.0000000		0.0000	1.0000

Eigenvectors

	Prin1	Prin2	Prin3	Prin4	Prin5	Prin6
A_SING	0.294685	0.068669	-.102544	-.061515	0.126987	-.023722
B_MULTI	-.126460	0.574840	0.253530	0.029686	0.196131	0.524823
CNTYPOP	0.295855	0.048590	-.042612	0.116829	0.097686	-.131522
C_VACANT	-.263713	0.077549	0.349186	-.116851	0.121362	-.022993
D_FARM	-.061164	-.195912	0.640161	0.495831	0.211150	-.229212
EMPLOY	0.298462	-.001303	-.089501	-.005243	0.011724	0.102900
E_FARMIM	0.259405	-.241844	0.063568	0.325908	-.248387	0.543174
F_COMM	-.050361	0.403212	-.413937	0.675538	0.265208	-.142231
F_INDUS	-.083489	-.614153	-.208442	0.159620	0.444387	0.252081
INCOME	0.295372	0.091526	0.046068	-.075616	0.138938	0.145962
PERCAP	0.294900	0.094175	0.043574	-.092774	0.150409	0.124990
RETAIL	0.295801	0.005503	0.056245	0.087254	-.131672	0.218327
URBAREA	0.287883	0.011713	0.019554	-.144862	0.290706	-.234288
URBPOP	0.292106	0.022919	-.027401	-.105455	0.222876	-.243334
FWYLANMI	0.259405	0.001679	0.361164	-.094761	0.251850	-.008925
ARTLANMI	-.270689	-.043481	-.161412	-.266620	0.538540	0.255846

	Prin7	Prin8	Prin9	Prin10	Prin11	Prin12
A_SING	-.269720	-.039864	-.003065	-.087705	0.891862	0.000000
B_MULTI	0.174695	0.016809	0.060295	-.007364	0.067822	-.238131
CNTYPOP	-.347925	-.054905	-.203918	-.051123	-.229147	0.185100
C_VACANT	0.108594	-.161569	0.003174	0.131907	0.133963	0.836867
D_FARM	-.005880	0.179239	-.052753	0.089094	0.121750	-.233880
EMPLOY	0.036714	0.106597	0.061721	0.935753	0.000000	0.000000
E_FARMIM	0.223988	0.176071	-.138716	-.151483	0.072747	0.191767
F_COMM	-.009992	-.079818	0.049920	-.000673	-.063433	0.167398
F_INDUS	0.057349	-.202356	0.035671	-.008107	0.012972	0.034900
INCOME	0.014547	-.013767	-.398062	-.080639	-.125976	0.068518
PERCAP	-.029487	-.036281	-.393347	-.074675	-.143405	0.067728
RETAIL	-.106784	-.172242	0.715776	-.134230	-.111853	0.123462
URBAREA	0.642801	-.445816	0.067027	-.047481	0.018642	-.152586
URBPOP	0.269764	0.719970	0.235077	-.180487	-.050089	0.187197
FWYLANMI	-.421010	-.175597	0.180188	-.026260	-.224083	-.059053
ARTLANMI	-.182340	0.260927	0.086206	0.006208	-.056609	-.040424

	Prin13	Prin14	Prin15	Prin16
A_SING	0.000000	0.000000	0.000000	0.000000
B_MULTI	0.100901	0.235760	-.336060	0.002099
CNTYPOP	0.241834	0.744504	0.000000	0.000000
C_VACANT	0.000000	0.000000	0.000000	0.000000
D_FARM	-.083343	0.052560	0.177978	0.226519
EMPLOY	0.000000	0.000000	0.000000	0.000000
E_FARMIM	0.182991	-.021721	0.288730	-.352816
F_COMM	-.038407	-.241522	0.075477	-.100551
F_INDUS	-.016096	0.044141	-.478393	0.088684
INCOME	-.818540	0.000000	0.000000	0.000000
PERCAP	0.402256	-.424898	0.021012	0.570078
RETAIL	-.187272	0.047402	0.149197	0.421824
URBAREA	0.102604	0.122116	0.269933	-.124866
URBPOP	0.030134	-.015414	-.273004	-.034608
FWYLANMI	0.104008	-.352493	-.115113	-.535273
ARTLANMI	0.005204	0.066547	0.595079	0.000000

```
                              Dependent Variable: TRI

                                Analysis of Variance
                                       Sum of           Mean
   Source                   DF        Squares         Square    F Value    Pr > F

   Model                     4     0.00000233    5.826748E-7      42.04    0.0005
   Error                     5    6.930081E-8    1.386016E-8
   Corrected Total           9     0.00000240

                Root MSE          0.00011773    R-Square     0.9711
                Dependent Mean       1.00040    Adj R-Sq     0.9480
                Coeff Var            0.01177

                                Parameter Estimates

                 Parameter     Standard
Variable   DF     Estimate        Error  t Value  Pr > |t|    Type I SS   Type II SS

Intercept   1      1.00040   0.00003723  26871.4    <.0001     10.00800     10.00800
Prin1       1   0.00013604   0.00001180    11.53    <.0001   0.00000184   0.00000184
Prin2       1   0.00004953   0.00002746     1.80    0.1312   4.50705E-8   4.50705E-8
Prin7       1   0.00068955   0.00014305     4.82    0.0048  3.220561E-7  3.220561E-7
Prin9       1   0.00082885   0.00027946     2.97    0.0313  1.219194E-7  1.219194E-7

                        Durbin-Watson D              1.775
                        Number of Observations          10
                        1st Order Autocorrelation    0.026

                         Mean of Working Series    2.22E-16
                         Standard Deviation        0.000083
                         Number of Observations          10

                                   Autocorrelations

Lag  Covariance  Correlation  -1 9 8 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 1    Std Error

  0  6.93008E-9      1.00000   |                   |********************|           0
  1  1.8123E-10      0.02615   |      .            |*          .       |    0.316228
  2  5.0379E-10      0.07270   |      .            |*          .       |    0.316444
  3  -2.0233E-9      -.29196   |      .      ******|           .       |    0.318110
  4  -1.7747E-9      -.25609   |     .        *****|            .      |    0.343863
  5  -2.5739E-9      -.37140   |     .      *******|            .      |    0.362434
  6  1.13829E-9      0.16425   |   .               |***           .    |    0.398681
  7  -9.839E-11      -.01420   |   .               |                .    |    0.405392
  8  1.57961E-9      0.22794   |   .               |*****           .    |    0.405441
  9  -3.977E-10      -.05738   |  .               *|                 .   |    0.418059

                            "." marks two standard errors

                        Autocorrelation Check for White Noise

 To        Chi-           Pr >
Lag      Square     DF    ChiSq   ------------------Autocorrelations-----------------

  6        6.98      6   0.3226    0.026    0.073   -0.292   -0.256   -0.371    0.164
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        1988    1989    1990    1991    1992    1993    1994    1995    1996    1997

                                            year

NOTE: 6 obs out of range.
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          1.00           1.05           1.10           1.15           1.20           1.25

                                   Predicted Value of TRI

NOTE: 6 obs had missing values.  3 obs hidden.
```

Dependent Variable: TRI

C(p) Selection Method

Number in Model	C(p)	R-Square	Variables in Model
3	2.1384	0.9523	Prin1 Prin7 Prin9
4	2.5076	0.9711	Prin1 Prin2 Prin7 Prin9
4	3.5804	0.9588	Prin1 Prin3 Prin7 Prin9
4	3.6544	0.9579	Prin1 Prin5 Prin7 Prin9
4	3.8393	0.9558	Prin1 Prin6 Prin7 Prin9
5	3.9496	0.9776	Prin1 Prin2 Prin3 Prin7 Prin9
4	3.9721	0.9543	Prin1 Prin4 Prin7 Prin9
5	4.0236	0.9767	Prin1 Prin2 Prin5 Prin7 Prin9
5	4.2084	0.9746	Prin1 Prin2 Prin6 Prin7 Prin9
5	4.3412	0.9730	Prin1 Prin2 Prin4 Prin7 Prin9
2	4.5500	0.9015	Prin1 Prin7
3	4.9191	0.9203	Prin1 Prin2 Prin7
5	5.0964	0.9643	Prin1 Prin3 Prin5 Prin7 Prin9
5	5.2812	0.9622	Prin1 Prin3 Prin6 Prin7 Prin9
5	5.3552	0.9614	Prin1 Prin5 Prin6 Prin7 Prin9
5	5.4140	0.9607	Prin1 Prin3 Prin4 Prin7 Prin9
6	5.4655	0.9831	Prin1 Prin2 Prin3 Prin5 Prin7 Prin9
5	5.4880	0.9598	Prin1 Prin4 Prin5 Prin7 Prin9
6	5.6504	0.9810	Prin1 Prin2 Prin3 Prin6 Prin7 Prin9
5	5.6729	0.9577	Prin1 Prin4 Prin6 Prin7 Prin9
6	5.7244	0.9801	Prin1 Prin2 Prin5 Prin6 Prin7 Prin9
6	5.7832	0.9795	Prin1 Prin2 Prin3 Prin4 Prin7 Prin9
6	5.8572	0.9786	Prin1 Prin2 Prin4 Prin5 Prin7 Prin9
3	5.9919	0.9080	Prin1 Prin3 Prin7
6	6.0421	0.9765	Prin1 Prin2 Prin4 Prin6 Prin7 Prin9
3	6.0660	0.9071	Prin1 Prin5 Prin7
3	6.2508	0.9050	Prin1 Prin6 Prin7
4	6.3611	0.9268	Prin1 Prin2 Prin3 Prin7
3	6.3836	0.9035	Prin1 Prin4 Prin7
4	6.4351	0.9259	Prin1 Prin2 Prin5 Prin7
4	6.6200	0.9238	Prin1 Prin2 Prin6 Prin7
4	6.7528	0.9222	Prin1 Prin2 Prin4 Prin7
6	6.7972	0.9678	Prin1 Prin3 Prin5 Prin6 Prin7 Prin9
6	6.9300	0.9663	Prin1 Prin3 Prin4 Prin5 Prin7 Prin9
6	7.1149	0.9641	Prin1 Prin3 Prin4 Prin6 Prin7 Prin9
7	7.1664	0.9866	Prin1 Prin2 Prin3 Prin5 Prin6 Prin7 Prin9
6	7.1889	0.9633	Prin1 Prin4 Prin5 Prin6 Prin7 Prin9
7	7.2992	0.9850	Prin1 Prin2 Prin3 Prin4 Prin5 Prin7 Prin9
7	7.4840	0.9829	Prin1 Prin2 Prin3 Prin4 Prin6 Prin7 Prin9
4	7.5079	0.9135	Prin1 Prin3 Prin5 Prin7
7	7.5580	0.9821	Prin1 Prin2 Prin4 Prin5 Prin6 Prin7 Prin9
4	7.6928	0.9114	Prin1 Prin3 Prin6 Prin7
4	7.7668	0.9106	Prin1 Prin5 Prin6 Prin7
4	7.8256	0.9099	Prin1 Prin3 Prin4 Prin7
5	7.8771	0.9323	Prin1 Prin2 Prin3 Prin5 Prin7
4	7.8996	0.9090	Prin1 Prin4 Prin5 Prin7

Dependent Variable: TRI

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	0.00000229	7.618762E-7	39.97	0.0002
Error	6	1.143713E-7	1.906189E-8		
Corrected Total	9	0.00000240			

Root MSE	0.00013806	R-Square	0.9523
Dependent Mean	1.00040	Adj R-Sq	0.9285
Coeff Var	0.01380		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Type I SS	Type II SS
Intercept	1	1.00040	0.00004366	22913.5	<.0001	10.00800	10.00800
Prin1	1	0.00013604	0.00001384	9.83	<.0001	0.00000184	0.00000184
Prin7	1	0.00068955	0.00016776	4.11	0.0063	3.220561E-7	3.220561E-7
Prin9	1	0.00082885	0.00032773	2.53	0.0447	1.219194E-7	1.219194E-7

Durbin-Watson D	1.545
Number of Observations	10
1st Order Autocorrelation	0.219

Mean of Working Series	2.22E-16
Standard Deviation	0.000107
Number of Observations	10

Autocorrelations

```
Lag  Covariance  Correlation  -1 9 8 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 1    Std Error

  0  1.14371E-8      1.00000  |                   |*******************|            0
  1  2.50709E-9      0.21921  |       .           |****       .       |     0.316228
  2   -3.321E-9      -.29037  |       .     ******|           .       |     0.331074
  3  -3.5355E-9      -.30912  |      .      ******|            .      |     0.355630
  4  -3.4162E-9      -.29869  |     .       ******|             .     |     0.381555
  5  -1.9623E-9      -.17157  |    .           ***|              .    |     0.404262
  6  2.99399E-9      0.26178  |    .              |*****         .    |     0.411479
  7  1.86132E-9      0.16274  |   .               |***            .   |     0.427809
  8  -9.299E-10      -.08130  |   .             **|               .   |     0.433956
  9  8.3793E-11      0.00733  |   .               |               .   |     0.435476
```

"." marks two standard errors

Autocorrelation Check for White Noise

To Lag	Chi-Square	DF	Pr > ChiSq	Autocorrelations					
6	8.09	6	0.2316	0.219	-0.290	-0.309	-0.299	-0.172	0.262

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t  1.5 ^                                                                  S
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n      ,
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i  0.5 ^
z      ,
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R      ,  S                                                                       S
e -0.5 ^                                                  S
s      ,
i      ,                                          S
d -1.0 ^                          S
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        1988    1989    1990    1991    1992    1993    1994    1995    1996    1997

                                            year
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NOTE: 6 obs out of range.

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d        ‚
e    1.0 ˆP
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t        ‚
i    0.5 ˆ
z        ‚
e        ‚
d    0.0 ˆP
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R        ‚P
e   -0.5 ˆP
s        ‚
i        ‚P
d   -1.0 ˆP
u        ‚P
a        ‚
l   -1.5 ˆ
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        1.00           1.05           1.10           1.15           1.20           1.25

                                  Predicted Value of TRI

NOTE: 6 obs had missing values.  1 obs hidden.
```

APPENDIX M

SAN ANTONIO URBAN AREA REGRESSION ANALYSIS

Observations	10
Variables	16

Simple Statistics

	A_SING	B_MULTI	CNTYPOP	C_VACANT
Mean	0.2181238290	-.0121304950	0.5943770058	-.5268171948
StD	0.9490934011	0.2898214124	0.6709699837	0.5452954780

Simple Statistics

	D_FARM	EMPLOY	E_FARMIM	F_COMM
Mean	0.0555555681	0.4687991487	0.029362282	0.000000000
StD	0.6556386764	0.9614900386	1.082255637	1.000000000

Simple Statistics

	F_INDUS	INCOME	PERCAP	RETAIL
Mean	0.000000000	0.5750646057	0.5838327405	0.2266090051
StD	1.000000000	0.7930715210	0.7679484008	0.9379795550

Simple Statistics

	URBAREA	URBPOP	FWYLANMI	ARTLANMI
Mean	0.6474568842	0.7204490346	0.6207451461	-0.177096074
StD	0.5025248935	0.2398237958	0.6929209791	1.214300148

Correlation Matrix

	A_SING	B_MULTI	CNTYPOP	C_VACANT	D_FARM	EMPLOY	E_FARMIM	F_COMM
A_SING	1.0000	0.2406	0.9324	-.6444	-.4950	0.8974	0.2737	0.0733
B_MULTI	0.2406	1.0000	-.0822	0.5172	0.1157	-.1100	0.0263	0.7641
CNTYPOP	0.9324	-.0822	1.0000	-.8252	-.5743	0.9874	0.2796	-.1926
C_VACANT	-.6444	0.5172	-.8252	1.0000	0.3764	-.7963	-.3954	0.4618
D_FARM	-.4950	0.1157	-.5743	0.3764	1.0000	-.6568	0.1100	0.2063
EMPLOY	0.8974	-.1100	0.9874	-.7963	-.6568	1.0000	0.1688	-.1954
E_FARMIM	0.2737	0.0263	0.2796	-.3954	0.1100	0.1688	1.0000	-.2362
F_COMM	0.0733	0.7641	-.1926	0.4618	0.2063	-.1954	-.2362	1.0000
F_INDUS	-.4184	0.5525	-.5970	0.7884	0.2559	-.5379	-.5729	0.8122
INCOME	0.8972	-.1244	0.9907	-.8237	-.6293	0.9960	0.2227	-.2298
PERCAP	0.8911	-.1300	0.9874	-.8230	-.6322	0.9938	0.2211	-.2392
RETAIL	0.9041	-.1683	0.9817	-.8752	-.5059	0.9479	0.3788	-.2581
URBAREA	0.8688	-.2060	0.9875	-.8578	-.6163	0.9918	0.2308	-.2920
URBPOP	0.9235	-.1114	0.9952	-.8279	-.5683	0.9851	0.2165	-.1833
FWYLANMI	0.7775	-.3326	0.8972	-.9392	-.3887	0.8419	0.5350	-.4532
ARTLANMI	-.8157	0.1606	-.8615	0.7302	0.3816	-.8121	-.3386	0.1753

Correlation Matrix

	F_INDUS	INCOME	PERCAP	RETAIL	URBAREA	URBPOP	FWYLANMI	ARTLANMI
A_SING	-.4184	0.8972	0.8911	0.9041	0.8688	0.9235	0.7775	-.8157
B_MULTI	0.5525	-.1244	-.1300	-.1683	-.2060	-.1114	-.3326	0.1606
CNTYPOP	-.5970	0.9907	0.9874	0.9817	0.9875	0.9952	0.8972	-.8615
C_VACANT	0.7884	-.8237	-.8230	-.8752	-.8578	-.8279	-.9392	0.7302
D_FARM	0.2559	-.6293	-.6322	-.5059	-.6163	-.5683	-.3887	0.3816
EMPLOY	-.5379	0.9960	0.9938	0.9479	0.9918	0.9851	0.8419	-.8121
E_FARMIM	-.5729	0.2227	0.2211	0.3788	0.2308	0.2165	0.5350	-.3386
F_COMM	0.8122	-.2298	-.2392	-.2581	-.2920	-.1833	-.4532	0.1753
F_INDUS	1.0000	-.5844	-.5882	-.6863	-.6293	-.5821	-.8545	0.5816
INCOME	-.5844	1.0000	0.9995	0.9563	0.9946	0.9865	0.8698	-.8055
PERCAP	-.5882	0.9995	1.0000	0.9514	0.9928	0.9834	0.8672	-.7957
RETAIL	-.6863	0.9563	0.9514	1.0000	0.9657	0.9773	0.9534	-.9181
URBAREA	-.6293	0.9946	0.9928	0.9657	1.0000	0.9846	0.8946	-.8271
URBPOP	-.5821	0.9865	0.9834	0.9773	0.9846	1.0000	0.8878	-.8639
FWYLANMI	-.8545	0.8698	0.8672	0.9534	0.8946	0.8878	1.0000	-.8498
ARTLANMI	0.5816	-.8055	-.7957	-.9181	-.8271	-.8639	-.8498	1.0000

Eigenvalues of the Correlation Matrix

	Eigenvalue	Difference	Proportion	Cumulative
1	11.0712462	8.6566721	0.6920	0.6920
2	2.4145741	1.0906442	0.1509	0.8429
3	1.3239299	0.7479924	0.0827	0.9256
4	0.5759374	0.3135408	0.0360	0.9616
5	0.2623966	0.0120288	0.0164	0.9780
6	0.2503678	0.1633228	0.0156	0.9937
7	0.0870450	0.0779267	0.0054	0.9991
8	0.0091183	0.0037336	0.0006	0.9997
9	0.0053847	0.0053847	0.0003	1.0000
10	0.0000000	0.0000000	0.0000	1.0000
11	0.0000000	0.0000000	0.0000	1.0000
12	0.0000000	0.0000000	0.0000	1.0000
13	0.0000000	0.0000000	0.0000	1.0000
14	0.0000000	0.0000000	0.0000	1.0000
15	0.0000000	0.0000000	0.0000	1.0000
16	0.0000000		0.0000	1.0000

Eigenvectors

	Prin1	Prin2	Prin3	Prin4	Prin5	Prin6
A_SING	0.262744	0.276311	0.132688	-.026532	0.160771	-.134713
B_MULTI	-.069806	0.531966	0.340180	-.340303	0.386668	-.090624
CNTYPOP	0.295345	0.112613	-.000662	0.027533	0.085560	0.029893
C_VACANT	-.268523	0.191088	-.023156	-.240900	0.210285	-.463206
D_FARM	-.173226	-.113159	0.484354	0.680957	0.455255	0.074104
EMPLOY	0.289741	0.128540	-.123333	-.006051	0.076014	0.097653
E_FARMIM	0.104606	-.191342	0.699355	-.406379	-.334003	0.198293
F_COMM	-.103066	0.551943	0.167397	0.263309	-.436392	0.244613
F_INDUS	-.216652	0.404434	-.147788	0.172347	-.265415	0.166959
INCOME	0.292945	0.100818	-.084235	-.020193	0.126090	0.163852
PERCAP	0.292307	0.095895	-.090162	-.030929	0.142841	0.182280
RETAIL	0.297496	0.036469	0.078593	0.088000	-.062546	-.101937
URBAREA	0.295928	0.052243	-.094621	0.025712	0.079574	0.118259
URBPOP	0.293652	0.114289	-.041067	0.107169	0.088716	0.006912
FWYLANMI	0.286348	-.136879	0.169859	0.056950	-.031844	0.014597
ARTLANMI	-.262172	-.045865	-.128342	-.268855	0.363584	0.728984

	Prin7	Prin8	Prin9	Prin10	Prin11	Prin12
A_SING	-.411434	-.354248	-.284020	0.013588	-.020850	0.103050
B_MULTI	-.117373	-.145515	0.178621	0.084513	-.041179	-.036833
CNTYPOP	0.100013	0.029589	0.188394	-.919101	0.000000	0.000000
C_VACANT	0.377078	0.433027	-.010476	-.012739	0.059640	-.013358
D_FARM	0.198888	-.023053	-.024086	0.011274	0.011770	0.006812
EMPLOY	0.264158	-.103592	0.285577	0.202961	-.172590	0.139145
E_FARMIM	0.315744	-.000572	-.052162	-.003504	-.015141	0.043870
F_COMM	-.202168	0.370919	-.064900	-.013755	-.053163	-.040719
F_INDUS	0.381314	-.362860	0.097243	0.015670	0.073272	0.043106
INCOME	0.222879	0.006779	-.307898	0.084370	0.027648	-.837475
PERCAP	0.231694	0.090410	-.623726	0.024317	0.133752	0.479347
RETAIL	-.050369	0.076147	0.272368	0.146307	0.882052	0.000000
URBAREA	0.254650	-.122605	0.356699	0.210465	-.196723	0.104165
URBPOP	-.009415	0.554722	0.075366	0.152371	-.200684	0.115734
FWYLANMI	-.265910	0.144511	0.210948	0.093295	-.220580	-.081747
ARTLANMI	-.167078	0.163657	0.133674	-.025783	0.177939	0.030521

	Prin13	Prin14	Prin15	Prin16
A_SING	-.057719	0.042730	0.632835	0.000000
B_MULTI	0.000241	-.106224	-.473983	-.099457
CNTYPOP	0.000000	0.000000	0.000000	0.000000
C_VACANT	0.229555	0.075625	0.373881	0.205240
D_FARM	-.012406	0.046754	0.048779	0.020949
EMPLOY	-.078119	0.781317	0.000000	0.000000
E_FARMIM	-.085425	0.001097	0.169620	-.081705
F_COMM	-.077547	0.120343	-.022280	0.358857
F_INDUS	0.334984	-.177875	0.180600	-.411294
INCOME	0.000000	0.000000	0.000000	0.000000
PERCAP	0.238888	-.051950	-.270674	0.102319
RETAIL	0.000000	0.000000	0.000000	0.000000
URBAREA	-.130517	-.518050	0.132329	0.525248
URBPOP	-.260343	-.224215	0.121105	-.597100
FWYLANMI	0.815974	0.000000	0.000000	0.000000
ARTLANMI	0.067057	0.032543	0.255672	0.006795

Dependent Variable: TRI

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	0.00607	0.00202	20.69	0.0014
Error	6	0.00058647	0.00009775		
Corrected Total	9	0.00665			

Root MSE	0.00989	R-Square	0.9119
Dependent Mean	1.09700	Adj R-Sq	0.8678
Coeff Var	0.90124		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Type I SS	Type II SS
Intercept	1	1.09700	0.00313	350.88	<.0001	12.03409	12.03409
Prin1	1	0.00634	0.00099044	6.40	0.0007	0.00401	0.00401
Prin2	1	0.00858	0.00212	4.05	0.0068	0.00160	0.00160
Prin3	1	-0.00623	0.00286	-2.17	0.0726	0.00046222	0.00046222

Durbin-Watson D	2.070
Number of Observations	10
1st Order Autocorrelation	-0.039

Mean of Working Series	1.29E-18
Standard Deviation	0.007658
Number of Observations	10

Autocorrelations

```
Lag  Covariance  Correlation  -1 9 8 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 1    Std Error

  0  0.00005865      1.00000  |                    |********************|           0
  1   -2.298E-6      -.03918  |        .          *|          .         |    0.316228
  2  -0.0000305      -.52087  |        .  **********|          .         |    0.316713
  3  -8.6562E-7      -.01476  |     .              |             .      |    0.393151
  4  4.92674E-6      0.08401  |     .              |**           .      |    0.393206
  5  -8.6755E-6      -.14793  |     .           ***|             .      |    0.394997
  6   8.4787E-6      0.14457  |     .              |***          .      |    0.400499
  7  2.18873E-6      0.03732  |     .              |*            .      |    0.405684
  8  -2.7531E-6      -.04694  |     .             *|             .      |    0.406027
  9  2.21855E-7      0.00378  |     .              |             .      |    0.406569
```

"." marks two standard errors

Autocorrelation Check for White Noise

To Lag	Chi-Square	DF	Pr > ChiSq	Autocorrelations					
6	5.39	6	0.4952	-0.039	-0.521	-0.015	0.084	-0.148	0.145

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d      ,                                  S
e  1.0 ^
n      ,
t      ,                  S
i  0.5 ^
z      ,
e      ,          S
d  0.0 ^                                                          S
       ,                                                                          S
R      ,
e -0.5 ^  S                       S
s      ,
i      ,                                          S
d -1.0 ^
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a      ,
l -1.5 ^
       ,                                                  S
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  -2.0 ^
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       Šff^fffffff^fffffff^fffffff^fffffff^fffffff^fffffff^fffffff^fffffff^fffffff^ff
        1988    1989    1990    1991    1992    1993    1994    1995    1996    1997

                                            year

NOTE: 6 obs out of range.
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   4.0 ˆ
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       ,
S      ,                                      P
t  1.5 ˆ
u      ,
d      ,                       P
e  1.0 ˆ
n      ,
t      ,                      P
i  0.5 ˆ
z      ,
e      ,                        P
d  0.0 ˆ                                      P
       ,                                             P
R      ,
e -0.5 ˆ                         P  P
s      ,
i      ,                           P
d -1.0 ˆ
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a      ,
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  -2.0 ˆ
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       Šˆffffffffffffffˆffffffffffffffˆffffffffffffffˆffffffffffffffˆffffffffffffffˆf
      1.00           1.05           1.10           1.15           1.20           1.25

                                   Predicted Value of TRI

NOTE: 6 obs had missing values.
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Dependent Variable: TRI

C(p) Selection Method

Number in Model	C(p)	R-Square	Variables in Model
4	4.2400	0.9436	Prin1 Prin2 Prin3 Prin7
5	4.3266	0.9691	Prin1 Prin2 Prin3 Prin6 Prin7
3	4.6269	0.9119	Prin1 Prin2 Prin3
4	4.7135	0.9373	Prin1 Prin2 Prin3 Prin6
5	4.9171	0.9612	Prin1 Prin2 Prin3 Prin5 Prin7
6	5.0038	0.9866	Prin1 Prin2 Prin3 Prin5 Prin6 Prin7
4	5.3040	0.9295	Prin1 Prin2 Prin3 Prin5
5	5.3907	0.9549	Prin1 Prin2 Prin3 Prin5 Prin6
5	6.2372	0.9436	Prin1 Prin2 Prin3 Prin4 Prin7
5	6.2389	0.9436	Prin1 Prin2 Prin3 Prin7 Prin8
6	6.3239	0.9691	Prin1 Prin2 Prin3 Prin4 Prin6 Prin7
6	6.3256	0.9691	Prin1 Prin2 Prin3 Prin6 Prin7 Prin8
4	6.6242	0.9119	Prin1 Prin2 Prin3 Prin4
4	6.6258	0.9119	Prin1 Prin2 Prin3 Prin8
5	6.7108	0.9373	Prin1 Prin2 Prin3 Prin4 Prin6
5	6.7125	0.9373	Prin1 Prin2 Prin3 Prin6 Prin8
6	6.9144	0.9612	Prin1 Prin2 Prin3 Prin4 Prin5 Prin7
6	6.9161	0.9612	Prin1 Prin2 Prin3 Prin5 Prin7 Prin8
7	7.0010	0.9867	Prin1 Prin2 Prin3 Prin4 Prin5 Prin6 Prin7
7	7.0027	0.9867	Prin1 Prin2 Prin3 Prin5 Prin6 Prin7 Prin8
5	7.3013	0.9295	Prin1 Prin2 Prin3 Prin4 Prin5
5	7.3030	0.9295	Prin1 Prin2 Prin3 Prin5 Prin8
6	7.3879	0.9549	Prin1 Prin2 Prin3 Prin4 Prin5 Prin6
6	7.3896	0.9549	Prin1 Prin2 Prin3 Prin5 Prin6 Prin8
3	7.4629	0.8741	Prin1 Prin2 Prin7
4	7.5495	0.8996	Prin1 Prin2 Prin6 Prin7
2	7.8498	0.8424	Prin1 Prin2
3	7.9364	0.8678	Prin1 Prin2 Prin6
4	8.1400	0.8917	Prin1 Prin2 Prin5 Prin7
5	8.2267	0.9172	Prin1 Prin2 Prin5 Prin6 Prin7
6	8.2362	0.9437	Prin1 Prin2 Prin3 Prin4 Prin7 Prin8
7	8.3228	0.9691	Prin1 Prin2 Prin3 Prin4 Prin6 Prin7 Prin8
3	8.5270	0.8600	Prin1 Prin2 Prin5
4	8.6136	0.8854	Prin1 Prin2 Prin5 Prin6
5	8.6231	0.9119	Prin1 Prin2 Prin3 Prin4 Prin8
6	8.7097	0.9374	Prin1 Prin2 Prin3 Prin4 Prin6 Prin8
7	8.9134	0.9613	Prin1 Prin2 Prin3 Prin4 Prin5 Prin7 Prin8
8	9.0000	0.9867	Prin1 Prin2 Prin3 Prin4 Prin5 Prin6 Prin7 Prin8
6	9.3003	0.9295	Prin1 Prin2 Prin3 Prin4 Prin5 Prin8
7	9.3869	0.9550	Prin1 Prin2 Prin3 Prin4 Prin5 Prin6 Prin8
4	9.4602	0.8742	Prin1 Prin2 Prin4 Prin7
4	9.4618	0.8742	Prin1 Prin2 Prin7 Prin8
5	9.5468	0.8996	Prin1 Prin2 Prin4 Prin6 Prin7
5	9.5485	0.8996	Prin1 Prin2 Prin6 Prin7 Prin8
3	9.8471	0.8424	Prin1 Prin2 Prin4
3	9.8487	0.8424	Prin1 Prin2 Prin8

Dependent Variable: TRI

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	4	0.00628	0.00157	20.92	0.0025
Error	5	0.00037523	0.00007505		
Corrected Total	9	0.00665			

Root MSE	0.00866	R-Square	0.9436
Dependent Mean	1.09700	Adj R-Sq	0.8985
Coeff Var	0.78969		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Type I SS	Type II SS
Intercept	1	1.09700	0.00274	400.44	<.0001	12.03409	12.03409
Prin1	1	0.00634	0.00086785	7.31	0.0008	0.00401	0.00401
Prin2	1	0.00858	0.00186	4.62	0.0058	0.00160	0.00160
Prin3	1	-0.00623	0.00251	-2.48	0.0557	0.00046222	0.00046222
Prin7	1	0.01642	0.00979	1.68	0.1542	0.00021124	0.00021124

Durbin-Watson D	1.548
Number of Observations	10
1st Order Autocorrelation	0.220

Mean of Working Series	6.29E-19
Standard Deviation	0.006126
Number of Observations	10

Autocorrelations

```
Lag  Covariance  Correlation  -1 9 8 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 1    Std Error

  0  0.00003752      1.00000  |                    |********************|            0
  1  8.24054E-6      0.21961  |       .            |****        .       |     0.316228
  2  -0.0000254      -.67723  |      **************|            .       |     0.331128
  3  -0.0000173      -.46182  |  .        *********|                 .  |     0.448746
  4  7.04053E-6      0.18763  |.                   |****               .|     0.493993
  5  0.00001063      0.28339  |.                   |******             .|     0.501069
  6  2.44527E-6      0.06517  |                    |*                   |     0.516847
  7  -3.1698E-6      -.08447  |                  **|                    |     0.517668
  8  -1.3874E-6      -.03697  |                   *|                    |     0.519045
  9   1.7633E-7      0.00470  |                    |                    |     0.519308
```

"." marks two standard errors

Autocorrelation Check for White Noise

To Lag	Chi-Square	DF	Pr > ChiSq	Autocorrelations					
6	13.94	6	0.0303	0.220	-0.677	-0.462	0.188	0.283	0.065

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R      ,
e -0.5 ˆ          S
s      ,  S
i      ,
d -1.0 ˆ
u      ,
a      ,                                          S
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        1988    1989    1990    1991    1992    1993    1994    1995    1996    1997

                                            year

NOTE: 6 obs out of range.
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i  0.5 ˆ
z      ,                      P
e      ,                                    P
d  0.0 ˆ
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R      ,
e -0.5 ˆ                        P
s      ,                           P
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d -1.0 ˆ
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a      ,                          P
l -1.5 ˆ                              P
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  -4.0 ˆ
       Šˆffffffffffffffˆffffffffffffffˆffffffffffffffˆffffffffffffffˆffffffffffffffˆf
      1.00           1.05           1.10           1.15           1.20           1.25

                                   Predicted Value of TRI

NOTE: 6 obs had missing values.
```

APPENDIX N

SHERMAN-DENISON URBAN AREA REGRESSION ANALYSIS

Observations	10
Variables	16

Simple Statistics

	A_SING	B_MULTI	CNTYPOP	C_VACANT
Mean	0.4434013390	0.4857091101	0.4492938617	-0.271885374
StD	0.7021716287	0.4591058784	0.9030439822	1.071824033

Simple Statistics

	D_FARM	EMPLOY	E_FARMIM	F_COMM
Mean	-0.161965285	0.4886618915	0.4435000883	0.000000000
StD	1.143324449	0.8911538240	0.3651791392	1.000000000

Simple Statistics

	F_INDUS	INCOME	PERCAP	RETAIL
Mean	0.000000000	0.5936568710	0.6179359923	0.1862041922
StD	1.000000000	0.7321774933	0.6749595571	0.9953591326

Simple Statistics

	URBAREA	URBPOP	FWYLANMI	ARTLANMI
Mean	0.6611499749	0.6573757351	0.6431218011	0.5750839716
StD	0.5579755527	0.5232681185	0.6217462397	0.7886463535

Correlation Matrix

	A_SING	B_MULTI	CNTYPOP	C_VACANT	D_FARM	EMPLOY	E_FARMIM	F_COMM
A_SING	1.0000	0.9095	0.9790	-.8590	-.4248	0.9653	-.7351	0.8832
B_MULTI	0.9095	1.0000	0.8520	-.9813	-.1503	0.9154	-.9337	0.8735
CNTYPOP	0.9790	0.8520	1.0000	-.7956	-.4683	0.9184	-.6368	0.8843
C_VACANT	-.8590	-.9813	-.7956	1.0000	0.1126	-.8596	0.9508	-.8702
D_FARM	-.4248	-.1503	-.4683	0.1126	1.0000	-.4659	0.0298	-.2207
EMPLOY	0.9653	0.9154	0.9184	-.8596	-.4659	1.0000	-.8025	0.8138
E_FARMIM	-.7351	-.9337	-.6368	0.9508	0.0298	-.8025	1.0000	-.7581
F_COMM	0.8832	0.8735	0.8843	-.8702	-.2207	0.8138	-.7581	1.0000
F_INDUS	0.9600	0.7963	0.9357	-.7236	-.5057	0.9318	-.5900	0.7337
INCOME	0.9598	0.9163	0.9513	-.8966	-.3104	0.9076	-.7804	0.9689
PERCAP	0.9366	0.8998	0.9307	-.8890	-.2838	0.8773	-.7743	0.9790
RETAIL	0.9428	0.9449	0.9035	-.9545	-.2976	0.9062	-.8456	0.9356
URBAREA	0.7930	0.8795	0.7968	-.9116	-.0737	0.7371	-.8135	0.9133
URBPOP	0.7930	0.8795	0.7968	-.9116	-.0737	0.7371	-.8135	0.9133
FWYLANMI	0.7951	0.8006	0.7982	-.8294	-.1114	0.7081	-.7079	0.9740
ARTLANMI	0.8143	0.9063	0.7902	-.9413	-.0754	0.7507	-.8518	0.9259

Correlation Matrix

	F_INDUS	INCOME	PERCAP	RETAIL	URBAREA	URBPOP	FWYLANMI	ARTLANMI
A_SING	0.9600	0.9598	0.9366	0.9428	0.7930	0.7930	0.7951	0.8143
B_MULTI	0.7963	0.9163	0.8998	0.9449	0.8795	0.8795	0.8006	0.9063
CNTYPOP	0.9357	0.9513	0.9307	0.9035	0.7968	0.7968	0.7982	0.7902
C_VACANT	-.7236	-.8966	-.8890	-.9545	-.9116	-.9116	-.8294	-.9413
D_FARM	-.5057	-.3104	-.2838	-.2976	-.0737	-.0737	-.1114	-.0754
EMPLOY	0.9318	0.9076	0.8773	0.9062	0.7371	0.7371	0.7081	0.7507
E_FARMIM	-.5900	-.7804	-.7743	-.8456	-.8135	-.8135	-.7079	-.8518
F_COMM	0.7337	0.9689	0.9790	0.9356	0.9133	0.9133	0.9740	0.9259
F_INDUS	1.0000	0.8615	0.8265	0.8379	0.6354	0.6354	0.6340	0.6410
INCOME	0.8615	1.0000	0.9970	0.9678	0.9090	0.9090	0.9222	0.9086
PERCAP	0.8265	0.9970	1.0000	0.9611	0.9218	0.9218	0.9440	0.9192
RETAIL	0.8379	0.9678	0.9611	1.0000	0.8996	0.8996	0.8972	0.9342
URBAREA	0.6354	0.9090	0.9218	0.8996	1.0000	1.0000	0.9169	0.9422
URBPOP	0.6354	0.9090	0.9218	0.8996	1.0000	1.0000	0.9169	0.9422
FWYLANMI	0.6340	0.9222	0.9440	0.8972	0.9169	0.9169	1.0000	0.9097
ARTLANMI	0.6410	0.9086	0.9192	0.9342	0.9422	0.9422	0.9097	1.0000

Eigenvalues of the Correlation Matrix

	Eigenvalue	Difference	Proportion	Cumulative
1	13.2099485	11.6408670	0.8256	0.8256
2	1.5690815	0.9765535	0.0981	0.9237
3	0.5925280	0.2544180	0.0370	0.9607
4	0.3381100	0.2024690	0.0211	0.9819
5	0.1356410	0.0577518	0.0085	0.9903
6	0.0778893	0.0307893	0.0049	0.9952
7	0.0471000	0.0227506	0.0029	0.9981
8	0.0243494	0.0189971	0.0015	0.9997
9	0.0053523	0.0053523	0.0003	1.0000
10	0.0000000	0.0000000	0.0000	1.0000
11	0.0000000	0.0000000	0.0000	1.0000
12	0.0000000	0.0000000	0.0000	1.0000
13	0.0000000	0.0000000	0.0000	1.0000
14	0.0000000	0.0000000	0.0000	1.0000
15	0.0000000	0.0000000	0.0000	1.0000
16	0.0000000		0.0000	1.0000

Eigenvectors

	Prin1	Prin2	Prin3	Prin4	Prin5	Prin6
A_SING	0.262289	-.205810	-.073601	0.244841	-.021027	0.106765
B_MULTI	0.263816	0.071257	-.332001	0.031291	0.033150	0.009417
CNTYPOP	0.255711	-.236154	0.122897	0.250561	0.221619	0.069894
C_VACANT	-.261440	-.147879	0.278453	0.156314	-.041937	-.237521
D_FARM	-.075947	0.693715	-.153069	0.676233	-.024967	-.026605
EMPLOY	0.252677	-.232781	-.310268	0.049954	-.104796	-.364218
E_FARMIM	-.233878	-.212709	0.514630	0.326745	0.200587	0.281094
F_COMM	0.263455	0.060343	0.286423	0.011831	-.383268	-.146893
F_INDUS	0.231731	-.355576	-.151477	0.441067	0.150940	0.096760
INCOME	0.272165	-.046116	0.131035	0.105279	-.061208	-.129829
PERCAP	0.270548	-.010424	0.195722	0.069568	-.102700	-.156395
RETAIL	0.271525	-.011891	-.030090	-.064433	-.142916	0.367025
URBAREA	0.255574	0.214826	0.176701	-.147651	0.515329	-.177851
URBPOP	0.255574	0.214826	0.176701	-.147651	0.515329	-.177851
FWYLANMI	0.249814	0.159846	0.421898	0.007617	-.396280	-.148328
ARTLANMI	0.257695	0.209647	0.073259	-.163999	-.056408	0.650084

	Prin7	Prin8	Prin9	Prin10	Prin11	Prin12
A_SING	0.065509	-.036475	-.132476	-.887958	0.000000	0.000000
B_MULTI	0.297407	-.308839	-.254531	0.170507	-.078657	0.333623
CNTYPOP	0.450486	-.243062	0.307336	0.189693	0.085803	-.037945
C_VACANT	0.168362	0.326005	0.050891	-.059058	0.145527	0.766652
D_FARM	-.001953	0.014207	0.104937	-.003064	0.017728	-.000159
EMPLOY	0.045582	-.027386	0.572461	0.045853	0.156821	-.037402
E_FARMIM	-.003752	-.269231	0.081218	0.055369	-.084654	-.146010
F_COMM	0.323754	-.193543	-.490824	0.139831	0.082954	-.032628
F_INDUS	-.396544	0.216238	-.309329	0.301109	0.158093	0.022612
INCOME	0.028849	0.309952	0.075719	0.073188	-.875758	0.000000
PERCAP	-.019801	0.460534	-.101414	0.063670	0.311535	-.288078
RETAIL	-.450254	-.209826	0.089177	0.077299	-.046585	0.417241
URBAREA	-.088170	-.018205	-.033709	-.063973	0.049543	0.082616
URBPOP	-.088170	-.018205	-.033709	-.063973	0.049543	0.082616
FWYLANMI	-.329865	-.251306	0.256177	-.056811	0.100539	0.032440
ARTLANMI	0.288968	0.405300	0.216418	0.028117	0.141888	0.058528

	Prin13	Prin14	Prin15	Prin16
A_SING	0.000000	0.000000	0.000000	0.000000
B_MULTI	-.049565	0.341417	0.311727	-.448948
CNTYPOP	-.061890	0.027997	-.584026	0.000000
C_VACANT	0.000000	0.000000	0.000000	0.000000
D_FARM	0.011102	0.005198	-.020014	0.137286
EMPLOY	0.080668	-.100737	0.452338	0.244274
E_FARMIM	0.037188	0.178122	0.513367	0.043554
F_COMM	0.081089	-.276225	0.103159	0.414848
F_INDUS	0.023097	-.356953	0.012802	-.162055
INCOME	0.000000	0.000000	0.000000	0.000000
PERCAP	-.070253	0.660864	0.000000	0.000000
RETAIL	0.000219	0.311827	-.127558	0.464212
URBAREA	-.674401	-.148033	0.140470	0.138696
URBPOP	0.718121	0.000000	0.000000	0.000000
FWYLANMI	-.041908	-.149866	-.054908	-.525105
ARTLANMI	0.037201	-.242244	0.208231	-.095945

```
                           Dependent Variable: TRI

                             Analysis of Variance
                                    Sum of           Mean
   Source                   DF     Squares         Square    F Value    Pr > F

   Model                     5  0.00000209    4.180166E-7     168.61    <.0001
   Error                     4  9.916965E-9   2.479241E-9
   Corrected Total           9  0.00000210

                Root MSE           0.00004979    R-Square     0.9953
                Dependent Mean        1.00130    Adj R-Sq     0.9894
                Coeff Var             0.00497

                             Parameter Estimates

                 Parameter     Standard
Variable   DF     Estimate        Error  t Value  Pr > |t|    Type I SS   Type II SS

Intercept   1      1.00130   0.00001575  63592.3    <.0001     10.02602     10.02602
Prin1       1  -0.00009317   0.00000457   -20.40    <.0001   0.00000103   0.00000103
Prin2       1  -0.00010241   0.00001325    -7.73    0.0015   1.48105E-7   1.48105E-7
Prin3       1  -0.00035818   0.00002156   -16.61    <.0001  6.841595E-7  6.841595E-7
Prin5       1  -0.00038911   0.00004507    -8.63    0.0010  1.848337E-7  1.848337E-7
Prin6       1   0.00024151   0.00005947     4.06    0.0153  4.088794E-8  4.088794E-8

                        Durbin-Watson D               2.733
                        Number of Observations           10
                        1st Order Autocorrelation    -0.427

                         Mean of Working Series    2.89E-16
                         Standard Deviation        0.000031
                         Number of Observations          10

                                Autocorrelations

Lag  Covariance  Correlation  -1 9 8 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 1    Std Error

  0   9.917E-10      1.00000  |                    |********************|            0
  1  -4.237E-10      -.42722  |       .   *********|            .       |     0.316228
  2  -1.062E-10      -.10706  |     .            **|              .     |     0.369464
  3  -2.649E-11      -.02671  |     .             *|              .     |     0.372554
  4  6.5961E-11      0.06651  |     .              |*             .     |     0.372745
  5  1.9472E-10      0.19635  |     .              |****          .     |     0.373930
  6   -2.06E-10      -.20770  |     .          ****|              .     |     0.384102
  7  -1.735E-10      -.17499  |    .            ***|               .    |     0.395173
  8  2.0838E-10      0.21013  |    .               |****           .    |     0.402848
  9  -2.906E-11      -.02930  |   .               *|                .   |     0.413663

                            "." marks two standard errors

                        Autocorrelation Check for White Noise

 To       Chi-           Pr >
Lag     Square     DF    ChiSq   ------------------Autocorrelations-----------------

  6       4.93      6   0.5534   -0.427   -0.107   -0.027    0.067    0.196   -0.208
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t  1.5 ^          S                                       S
u      ,
d      ,                                                                          S
e  1.0 ^
n      ,
t      ,
i  0.5 ^                          S               S
z      ,
e      ,
d  0.0 ^
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R      ,  S                                                               S
e -0.5 ^
s      ,                                  S
i      ,
d -1.0 ^                                                          S
u      ,
a      ,
l -1.5 ^
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       Šff^fffffff^fffffff^fffffff^fffffff^fffffff^fffffff^fffffff^fffffff^fffffff^ff
        1988    1989    1990    1991    1992    1993    1994    1995    1996    1997

                                             year

NOTE: 6 obs out of range.
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   4.0 ˆ
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          1.00           1.05           1.10           1.15           1.20           1.25

                                   Predicted Value of TRI

NOTE: 6 obs had missing values.  1 obs hidden.
```

Dependent Variable: TRI

C(p) Selection Method

Number in Model	C(p)	R-Square	Variables in Model
7	8.3410	0.9986	Prin1 Prin2 Prin3 Prin4 Prin5 Prin6 Prin8
6	8.4349	0.9974	Prin1 Prin2 Prin3 Prin5 Prin6 Prin8
8	9.0000	0.9994	Prin1 Prin2 Prin3 Prin4 Prin5 Prin6 Prin7 Prin8
7	9.0939	0.9982	Prin1 Prin2 Prin3 Prin5 Prin6 Prin7 Prin8
6	9.8326	0.9965	Prin1 Prin2 Prin3 Prin4 Prin5 Prin6
5	9.9265	0.9953	Prin1 Prin2 Prin3 Prin5 Prin6
7	10.4916	0.9973	Prin1 Prin2 Prin3 Prin4 Prin5 Prin6 Prin7
6	10.5855	0.9961	Prin1 Prin2 Prin3 Prin5 Prin6 Prin7
6	39.0221	0.9791	Prin1 Prin2 Prin3 Prin4 Prin5 Prin8
5	39.1160	0.9779	Prin1 Prin2 Prin3 Prin5 Prin8
7	39.6811	0.9799	Prin1 Prin2 Prin3 Prin4 Prin5 Prin7 Prin8
6	39.7750	0.9787	Prin1 Prin2 Prin3 Prin5 Prin7 Prin8
5	40.5137	0.9771	Prin1 Prin2 Prin3 Prin4 Prin5
4	40.6076	0.9758	Prin1 Prin2 Prin3 Prin5
6	41.1727	0.9779	Prin1 Prin2 Prin3 Prin4 Prin5 Prin7
5	41.2666	0.9766	Prin1 Prin2 Prin3 Prin5 Prin7
6	124.7191	0.9281	Prin1 Prin3 Prin4 Prin5 Prin6 Prin8
5	124.8130	0.9268	Prin1 Prin3 Prin5 Prin6 Prin8
7	125.3781	0.9289	Prin1 Prin3 Prin4 Prin5 Prin6 Prin7 Prin8
6	125.4720	0.9276	Prin1 Prin3 Prin5 Prin6 Prin7 Prin8
5	126.2107	0.9260	Prin1 Prin3 Prin4 Prin5 Prin6
4	126.3046	0.9248	Prin1 Prin3 Prin5 Prin6
6	126.8697	0.9268	Prin1 Prin3 Prin4 Prin5 Prin6 Prin7
5	126.9636	0.9256	Prin1 Prin3 Prin5 Prin6 Prin7
6	154.0758	0.9106	Prin1 Prin2 Prin3 Prin4 Prin6 Prin8
5	154.1697	0.9093	Prin1 Prin2 Prin3 Prin6 Prin8
7	154.7348	0.9114	Prin1 Prin2 Prin3 Prin4 Prin6 Prin7 Prin8
6	154.8287	0.9101	Prin1 Prin2 Prin3 Prin6 Prin7 Prin8
5	155.4002	0.9086	Prin1 Prin3 Prin4 Prin5 Prin8
4	155.4941	0.9074	Prin1 Prin3 Prin5 Prin8
5	155.5674	0.9085	Prin1 Prin2 Prin3 Prin4 Prin6
4	155.6613	0.9073	Prin1 Prin2 Prin3 Prin6
6	156.0592	0.9094	Prin1 Prin3 Prin4 Prin5 Prin7 Prin8
5	156.1531	0.9082	Prin1 Prin3 Prin5 Prin7 Prin8
6	156.2264	0.9093	Prin1 Prin2 Prin3 Prin4 Prin6 Prin7
5	156.3203	0.9081	Prin1 Prin2 Prin3 Prin6 Prin7
4	156.8918	0.9065	Prin1 Prin3 Prin4 Prin5
3	156.9857	0.9053	Prin1 Prin3 Prin5
5	157.5508	0.9073	Prin1 Prin3 Prin4 Prin5 Prin7
4	157.6447	0.9061	Prin1 Prin3 Prin5 Prin7
5	184.7569	0.8911	Prin1 Prin2 Prin3 Prin4 Prin8
4	184.8508	0.8899	Prin1 Prin2 Prin3 Prin8
6	185.4159	0.8919	Prin1 Prin2 Prin3 Prin4 Prin7 Prin8
5	185.5098	0.8907	Prin1 Prin2 Prin3 Prin7 Prin8
4	186.2485	0.8890	Prin1 Prin2 Prin3 Prin4
3	186.3424	0.8878	Prin1 Prin2 Prin3

Dependent Variable: TRI

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	7	0.00000210	2.995816E-7	204.57	0.0049
Error	2	2.928888E-9	1.464444E-9		
Corrected Total	9	0.00000210			

Root MSE	0.00003827	R-Square	0.9986
Dependent Mean	1.00130	Adj R-Sq	0.9937
Coeff Var	0.00382		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Type I SS	Type II SS
Intercept	1	1.00130	0.00001210	82742.4	<.0001	10.02602	10.02602
Prin1	1	-0.00009317	0.00000351	-26.55	0.0014	0.00000103	0.00000103
Prin2	1	-0.00010241	0.00001018	-10.06	0.0097	1.48105E-7	1.48105E-7
Prin3	1	-0.00035818	0.00001657	-21.61	0.0021	6.841595E-7	6.841595E-7
Prin4	1	0.00002934	0.00002194	1.34	0.3129	2.619676E-9	2.619676E-9
Prin5	1	-0.00038911	0.00003464	-11.23	0.0078	1.848337E-7	1.848337E-7
Prin6	1	0.00024151	0.00004571	5.28	0.0340	4.088794E-8	4.088794E-8
Prin8	1	-0.00014119	0.00008175	-1.73	0.2263	4.368401E-9	4.368401E-9

Durbin-Watson D	2.913
Number of Observations	10
1st Order Autocorrelation	-0.555

Mean of Working Series	2.89E-16
Standard Deviation	0.000017
Number of Observations	10

Autocorrelations

```
Lag  Covariance  Correlation  -1 9 8 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 1    Std Error

  0  2.9289E-10      1.00000  |                    |********************|           0
  1  -1.626E-10      -.55510  |      . ***********|            .       |    0.316228
  2  -3.037E-11      -.10369  |   .             **|               .    |    0.402030
  3  1.2144E-10      0.41461  |   .               |********       .    |    0.404696
  4  -1.464E-10      -.49994  | .       **********|                 .  |    0.445151
  5  1.0635E-10      0.36312  |.                  |*******            .|    0.498144
  6  -1.127E-12      -.00385  |                   |                    |    0.523946
  7  -9.924E-11      -.33885  |            *******|                    |    0.523949
  8  9.0399E-11      0.30865  |                   |******              |    0.545423
  9  -2.488E-11      -.08495  |                 **|                    |    0.562618
```

"." marks two standard errors

Autocorrelation Check for White Noise

To Lag	Chi-Square	DF	Pr > ChiSq	Autocorrelations					
6	15.38	6	0.0175	-0.555	-0.104	0.415	-0.500	0.363	-0.004

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i      ,                          S
d -1.0 ˆ                                          S
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        1988    1989    1990    1991    1992    1993    1994    1995    1996    1997

                                            year

NOTE: 6 obs out of range.
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R       ‚
e  -0.5 ˆPP
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       1.00           1.05           1.10           1.15           1.20           1.25

                               Predicted Value of TRI

NOTE: 6 obs had missing values.
```

APPENDIX O

TEXARKANA URBAN AREA REGRESSION ANALYSIS

Observations	10
Variables	16

Simple Statistics

	A_SING	B_MULTI	CNTYPOP	C_VACANT
Mean	0.5006042772	-.0370004910	0.6018768229	0.5914911338
StD	0.6386543296	0.6084008180	0.5866465252	0.1859936322

Simple Statistics

	D_FARM	EMPLOY	E_FARMIM	F_COMM
Mean	-.5265314887	-.3788608733	0.2695948956	0.000000000
StD	0.5827668799	0.6767030916	0.4130349027	1.000000000

Simple Statistics

	F_INDUS	INCOME	PERCAP	RETAIL
Mean	0.000000000	0.6033243883	0.6084798900	0.2276121137
StD	1.000000000	0.7214200765	0.7165012273	0.9361570926

Simple Statistics

	URBAREA	URBPOP	FWYLANMI	ARTLANMI
Mean	0.5217062577	0.5285843437	0.5979055573	-0.195217202
StD	0.7332355751	0.8721028496	0.5991446895	1.149997054

Correlation Matrix

	A_SING	B_MULTI	CNTYPOP	C_VACANT	D_FARM	EMPLOY	E_FARMIM	F_COMM
A_SING	1.0000	-.6302	0.7377	0.8861	-.9338	0.7768	-.3885	0.7496
B_MULTI	-.6302	1.0000	-.7349	-.4661	0.6844	-.2139	0.3108	-.9179
CNTYPOP	0.7377	-.7349	1.0000	0.6910	-.8058	0.2388	-.3866	0.7509
C_VACANT	0.8861	-.4661	0.6910	1.0000	-.8046	0.6256	-.4688	0.5441
D_FARM	-.9338	0.6844	-.8058	-.8046	1.0000	-.6878	0.2761	-.7866
EMPLOY	0.7768	-.2139	0.2388	0.6256	-.6878	1.0000	-.1395	0.4363
E_FARMIM	-.3885	0.3108	-.3866	-.4688	0.2761	-.1395	1.0000	-.2765
F_COMM	0.7496	-.9179	0.7509	0.5441	-.7866	0.4363	-.2765	1.0000
F_INDUS	0.0241	-.0382	-.2778	0.0894	0.0851	0.1233	-.2384	-.2011
INCOME	0.9960	-.6562	0.7685	0.8824	-.9395	0.7570	-.3757	0.7883
PERCAP	0.9944	-.6524	0.7613	0.8784	-.9396	0.7670	-.3648	0.7926
RETAIL	0.9695	-.6275	0.8163	0.9122	-.8816	0.6353	-.4889	0.7037
URBAREA	0.8352	-.6066	0.7343	0.8784	-.7381	0.4459	-.4707	0.5498
URBPOP	0.9207	-.3887	0.5893	0.8602	-.7784	0.7819	-.5894	0.5173
FWYLANMI	0.8875	-.7908	0.8832	0.8748	-.8915	0.4558	-.3647	0.8275
ARTLANMI	-.9411	0.4497	-.6609	-.9024	0.8122	-.7553	0.5624	-.5474

Correlation Matrix

	F_INDUS	INCOME	PERCAP	RETAIL	URBAREA	URBPOP	FWYLANMI	ARTLANMI
A_SING	0.0241	0.9960	0.9944	0.9695	0.8352	0.9207	0.8875	-.9411
B_MULTI	-.0382	-.6562	-.6524	-.6275	-.6066	-.3887	-.7908	0.4497
CNTYPOP	-.2778	0.7685	0.7613	0.8163	0.7343	0.5893	0.8832	-.6609
C_VACANT	0.0894	0.8824	0.8784	0.9122	0.8784	0.8602	0.8748	-.9024
D_FARM	0.0851	-.9395	-.9396	-.8816	-.7381	-.7784	-.8915	0.8122
EMPLOY	0.1233	0.7570	0.7670	0.6353	0.4459	0.7819	0.4558	-.7553
E_FARMIM	-.2384	-.3757	-.3648	-.4889	-.4707	-.5894	-.3647	0.5624
F_COMM	-.2011	0.7883	0.7926	0.7037	0.5498	0.5173	0.8275	-.5474
F_INDUS	1.0000	-.0315	-.0417	0.0266	0.3238	0.1151	-.0709	-.1576
INCOME	-.0315	1.0000	0.9996	0.9674	0.8253	0.8977	0.9082	-.9225
PERCAP	-.0417	0.9996	1.0000	0.9609	0.8132	0.8932	0.9041	-.9169
RETAIL	0.0266	0.9674	0.9609	1.0000	0.9116	0.9185	0.9133	-.9539
URBAREA	0.3238	0.8253	0.8132	0.9116	1.0000	0.7778	0.8646	-.8589
URBPOP	0.1151	0.8977	0.8932	0.9185	0.7778	1.0000	0.7109	-.9861
FWYLANMI	-.0709	0.9082	0.9041	0.9133	0.8646	0.7109	1.0000	-.7756
ARTLANMI	-.1576	-.9225	-.9169	-.9539	-.8589	-.9861	-.7756	1.0000

Eigenvalues of the Correlation Matrix

	Eigenvalue	Difference	Proportion	Cumulative
1	11.3732893	9.6463933	0.7108	0.7108
2	1.7268960	0.5239167	0.1079	0.8188
3	1.2029793	0.3850737	0.0752	0.8939
4	0.8179056	0.2637443	0.0511	0.9451
5	0.5541613	0.4055249	0.0346	0.9797
6	0.1486364	0.0307099	0.0093	0.9890
7	0.1179264	0.0793764	0.0074	0.9964
8	0.0385501	0.0188943	0.0024	0.9988
9	0.0196557	0.0196557	0.0012	1.0000
10	0.0000000	0.0000000	0.0000	1.0000
11	0.0000000	0.0000000	0.0000	1.0000
12	0.0000000	0.0000000	0.0000	1.0000
13	0.0000000	0.0000000	0.0000	1.0000
14	0.0000000	0.0000000	0.0000	1.0000
15	0.0000000	0.0000000	0.0000	1.0000
16	0.0000000		0.0000	1.0000

Eigenvectors

	Prin1	Prin2	Prin3	Prin4	Prin5	Prin6
A_SING	0.291915	0.040748	0.130186	0.054967	-.025085	-.055703
B_MULTI	-.207199	0.350399	0.350224	-.365898	0.249641	0.007877
CNTYPOP	0.242361	-.317864	-.171224	-.228454	0.223076	-.484925
C_VACANT	0.269672	0.140818	0.008611	-.129358	0.304324	0.643486
D_FARM	-.276303	0.116023	-.140859	-.105124	-.009799	0.260256
EMPLOY	0.202567	0.269544	0.498352	0.225169	-.316915	0.024284
E_FARMIM	-.141212	-.244057	0.500607	0.510160	0.518726	-.105784
F_COMM	0.232422	-.372239	-.062307	0.221373	-.398801	0.204980
F_INDUS	0.008254	0.538333	-.418608	0.587046	0.037669	-.121706
INCOME	0.292703	-.010740	0.131328	0.041569	-.029152	0.009426
PERCAP	0.291683	-.015207	0.147731	0.047245	-.042838	0.036811
RETAIL	0.291726	0.040302	-.014368	-.093039	0.122810	-.128942
URBAREA	0.260849	0.134593	-.258494	0.079958	0.422617	-.053133
URBPOP	0.266729	0.264130	0.108799	-.199827	-.139212	-.155086
FWYLANMI	0.277721	-.183868	-.111403	0.037700	0.221012	0.359726
ARTLANMI	-.277151	-.238725	-.052339	0.134782	-.002698	0.192145

	Prin7	Prin8	Prin9	Prin10	Prin11	Prin12
A_SING	0.104464	-.275757	-.063710	-.144234	0.881820	0.000000
B_MULTI	-.084135	0.000485	0.607952	-.074815	0.072905	-.121877
CNTYPOP	-.218352	0.542660	-.013686	0.055420	0.153331	0.090971
C_VACANT	-.268152	0.209727	-.305824	0.045642	0.043039	0.057846
D_FARM	0.702933	0.427283	-.085416	0.086303	0.187904	0.132934
EMPLOY	-.147298	0.491404	0.009245	-.084053	-.016565	-.154367
E_FARMIM	0.196174	0.017339	-.185325	-.018777	-.073887	-.026749
F_COMM	0.178195	0.154827	0.358904	-.178063	-.038624	-.278957
F_INDUS	-.157152	0.045132	0.077036	0.048208	0.037164	0.070400
INCOME	0.117248	-.098740	0.195746	0.912405	0.000000	0.000000
PERCAP	0.105769	-.052757	0.252256	-.192337	-.161765	0.864106
RETAIL	0.296336	-.140684	-.011077	-.132479	-.196734	-.186585
URBAREA	0.257907	0.071715	0.302828	-.124831	-.057392	-.176769
URBPOP	0.199961	-.228508	-.351801	-.066811	-.249356	-.090636
FWYLANMI	-.093432	-.141873	0.102166	-.098861	-.082419	-.148850
ARTLANMI	-.153950	-.159133	0.167834	0.051978	0.103267	0.073646

	Prin13	Prin14	Prin15	Prin16
A_SING	0.000000	0.000000	0.000000	0.000000
B_MULTI	-.019602	-.007088	0.033937	0.333664
CNTYPOP	0.161747	0.016765	0.117938	0.237160
C_VACANT	0.042374	-.089459	-.356651	0.173935
D_FARM	0.076716	-.006815	0.233948	0.080013
EMPLOY	0.215776	-.025940	0.188427	-.330252
E_FARMIM	-.051650	0.050213	-.035693	0.207934
F_COMM	-.085760	0.061307	-.268625	0.417907
F_INDUS	0.013964	-.103499	0.099756	0.334446
INCOME	0.000000	0.000000	0.000000	0.000000
PERCAP	0.000000	0.000000	0.000000	0.000000
RETAIL	0.229144	-.788286	0.000000	0.000000
URBAREA	0.138851	0.370627	-.282628	-.457374
URBPOP	0.341686	0.452628	0.060618	0.384413
FWYLANMI	-.089871	0.101602	0.774961	0.000000
ARTLANMI	0.844028	0.000000	0.000000	0.000000

```
                         Dependent Variable: TRI

                           Analysis of Variance
                                  Sum of           Mean
   Source                 DF     Squares         Square    F Value    Pr > F

   Model                   5     0.00000353    7.050772E-7      37.80    0.0018
   Error                   4    7.461412E-8    1.865353E-8
   Corrected Total         9     0.00000360

                Root MSE           0.00013658    R-Square     0.9793
                Dependent Mean        1.00620    Adj R-Sq     0.9534
                Coeff Var             0.01357

                           Parameter Estimates
                 Parameter     Standard
Variable   DF     Estimate        Error  t Value  Pr > |t|    Type I SS   Type II SS

Intercept   1      1.00620   0.00004319  23297.2    <.0001     10.12438     10.12438
Prin2       1  -0.00031341   0.00003464    -9.05    0.0008   0.00000153   0.00000153
Prin5       1  -0.00039325   0.00006116    -6.43    0.0030  7.712681E-7  7.712681E-7
Prin6       1   0.00026329   0.00011809     2.23    0.0896  9.273537E-8  9.273537E-8
Prin7       1  -0.00042738   0.00013257    -3.22    0.0322  1.938589E-7  1.938589E-7
Prin9       1     -0.00231   0.00032472    -7.10    0.0021  9.408438E-7  9.408438E-7

                        Durbin-Watson D               2.101
                        Number of Observations           10
                        1st Order Autocorrelation    -0.084

                         Mean of Working Series    -218E-19
                         Standard Deviation        0.000086
                         Number of Observations          10

                              Autocorrelations
Lag  Covariance  Correlation  -1 9 8 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 1    Std Error

  0  7.46141E-9      1.00000  |                    |********************|           0
  1  -6.231E-10      -.08351  |       .          **|          .         |    0.316228
  2  -9.188E-10      -.12314  |       .          **|          .         |    0.318425
  3  1.37343E-9      0.18407  |       .            |****      .         |    0.323152
  4  -4.348E-10      -.05828  |       .           *|          .         |    0.333472
  5  -7.042E-10      -.09437  |       .          **|          .         |    0.334489
  6  -1.5809E-9      -.21188  |       .        ****|          .         |    0.337141
  7  -1.0029E-9      -.13441  |      .          ***|           .        |    0.350204
  8  5.4404E-11      0.00729  |      .             |           .        |    0.355325
  9  1.0609E-10      0.01422  |      .             |           .        |    0.355340

                            "." marks two standard errors


                        Autocorrelation Check for White Noise

  To       Chi-           Pr >
 Lag     Square     DF    ChiSq   ------------------Autocorrelations-----------------

   6       2.53      6   0.8651   -0.084   -0.123    0.184   -0.058   -0.094   -0.212
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        1988    1989    1990    1991    1992    1993    1994    1995    1996    1997

                                            year
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NOTE: 6 obs out of range.

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      1.00           1.05           1.10           1.15           1.20           1.25

                                 Predicted Value of TRI

NOTE: 6 obs had missing values.  1 obs hidden.
```

Dependent Variable: TRI

C(p) Selection Method

Number in Model	C(p)	R-Square	Variables in Model
6	7.0775	0.9900	Prin2 Prin4 Prin5 Prin6 Prin7 Prin9
7	8.0172	0.9935	Prin1 Prin2 Prin4 Prin5 Prin6 Prin7 Prin9
7	8.0604	0.9933	Prin2 Prin3 Prin4 Prin5 Prin6 Prin7 Prin9
5	8.3955	0.9793	Prin2 Prin5 Prin6 Prin7 Prin9
8	9.0000	0.9968	Prin1 Prin2 Prin3 Prin4 Prin5 Prin6 Prin7 Prin9
6	9.3351	0.9827	Prin1 Prin2 Prin5 Prin6 Prin7 Prin9
6	9.3783	0.9826	Prin2 Prin3 Prin5 Prin6 Prin7 Prin9
7	10.3179	0.9860	Prin1 Prin2 Prin3 Prin5 Prin6 Prin7 Prin9
5	13.0262	0.9643	Prin2 Prin4 Prin5 Prin7 Prin9
6	13.9659	0.9677	Prin1 Prin2 Prin4 Prin5 Prin7 Prin9
6	14.0091	0.9676	Prin2 Prin3 Prin4 Prin5 Prin7 Prin9
4	14.3442	0.9535	Prin2 Prin5 Prin7 Prin9
7	14.9487	0.9710	Prin1 Prin2 Prin3 Prin4 Prin5 Prin7 Prin9
5	15.2838	0.9570	Prin1 Prin2 Prin5 Prin7 Prin9
5	15.3270	0.9568	Prin2 Prin3 Prin5 Prin7 Prin9
6	16.2667	0.9602	Prin1 Prin2 Prin3 Prin5 Prin7 Prin9
5	21.6939	0.9362	Prin2 Prin4 Prin5 Prin6 Prin9
6	22.6336	0.9396	Prin1 Prin2 Prin4 Prin5 Prin6 Prin9
6	22.6768	0.9395	Prin2 Prin3 Prin4 Prin5 Prin6 Prin9
4	23.0119	0.9254	Prin2 Prin5 Prin6 Prin9
7	23.6164	0.9429	Prin1 Prin2 Prin3 Prin4 Prin5 Prin6 Prin9
5	23.9515	0.9289	Prin1 Prin2 Prin5 Prin6 Prin9
5	23.9947	0.9287	Prin2 Prin3 Prin5 Prin6 Prin9
6	24.9344	0.9322	Prin1 Prin2 Prin3 Prin5 Prin6 Prin9
4	27.6426	0.9104	Prin2 Prin4 Prin5 Prin9
5	28.5823	0.9139	Prin1 Prin2 Prin4 Prin5 Prin9
5	28.6255	0.9137	Prin2 Prin3 Prin4 Prin5 Prin9
3	28.9606	0.8997	Prin2 Prin5 Prin9
6	29.5651	0.9171	Prin1 Prin2 Prin3 Prin4 Prin5 Prin9
4	29.9002	0.9031	Prin1 Prin2 Prin5 Prin9
4	29.9434	0.9030	Prin2 Prin3 Prin5 Prin9
5	30.8831	0.9064	Prin1 Prin2 Prin3 Prin5 Prin9
5	71.1859	0.7758	Prin2 Prin4 Prin6 Prin7 Prin9
6	72.1256	0.7792	Prin1 Prin2 Prin4 Prin6 Prin7 Prin9
6	72.1688	0.7791	Prin2 Prin3 Prin4 Prin6 Prin7 Prin9
4	72.5039	0.7650	Prin2 Prin6 Prin7 Prin9
7	73.1084	0.7825	Prin1 Prin2 Prin3 Prin4 Prin6 Prin7 Prin9
5	73.4435	0.7685	Prin1 Prin2 Prin6 Prin7 Prin9
5	73.4867	0.7683	Prin2 Prin3 Prin6 Prin7 Prin9
6	74.4264	0.7718	Prin1 Prin2 Prin3 Prin6 Prin7 Prin9
4	77.1347	0.7500	Prin2 Prin4 Prin7 Prin9
5	78.0743	0.7535	Prin1 Prin2 Prin4 Prin7 Prin9
5	78.1175	0.7533	Prin2 Prin3 Prin4 Prin7 Prin9
3	78.4526	0.7393	Prin2 Prin7 Prin9

Dependent Variable: TRI

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	6	0.00000356	5.940159E-7	49.63	0.0043
Error	3	3.590457E-8	1.196819E-8		
Corrected Total	9	0.00000360			

Root MSE	0.00010940	R-Square	0.9900
Dependent Mean	1.00620	Adj R-Sq	0.9701
Coeff Var	0.01087		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Type I SS	Type II SS
Intercept	1	1.00620	0.00003460	29085.1	<.0001	10.12438	10.12438
Prin2	1	-0.00031341	0.00002775	-11.29	0.0015	0.00000153	0.00000153
Prin4	1	0.00007252	0.00004032	1.80	0.1699	3.870955E-8	3.870955E-8
Prin5	1	-0.00039325	0.00004899	-8.03	0.0040	7.712681E-7	7.712681E-7
Prin6	1	0.00026329	0.00009459	2.78	0.0688	9.273537E-8	9.273537E-8
Prin7	1	-0.00042738	0.00010619	-4.02	0.0276	1.938589E-7	1.938589E-7
Prin9	1	-0.00231	0.00026010	-8.87	0.0030	9.408438E-7	9.408438E-7

Durbin-Watson D	1.421
Number of Observations	10
1st Order Autocorrelation	0.044

Mean of Working Series	-218E-19
Standard Deviation	0.00006
Number of Observations	10

Autocorrelations

```
Lag  Covariance  Correlation  -1 9 8 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 1    Std Error

  0  3.59046E-9      1.00000  |                    |********************|           0
  1  1.5969E-10      0.04448  |       .            |*         .         |    0.316228
  2  3.7096E-10      0.10332  |       .            |**        .         |    0.316853
  3  1.7703E-10      0.04931  |       .            |*         .         |    0.320204
  4  -9.364E-10      -.26080  |       .       *****|          .         |    0.320962
  5  6.4761E-10      0.18037  |      .             |****       .        |    0.341497
  6   -6.74E-10      -.18773  |      .         ****|           .        |    0.350894
  7  -6.008E-10      -.16733  |      .          ***|           .        |    0.360798
  8  -4.496E-10      -.12521  |     .           ***|            .       |    0.368476
  9  -4.897E-10      -.13640  |     .           ***|            .       |    0.372707
```

"." marks two standard errors

Autocorrelation Check for White Noise

To Lag	Chi-Square	DF	Pr > ChiSq	Autocorrelations					
6	3.43	6	0.7537	0.044	0.103	0.049	-0.261	0.180	-0.188

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        1988    1989    1990    1991    1992    1993    1994    1995    1996    1997

                                            year

NOTE: 6 obs out of range.
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      1.00          1.05          1.10          1.15          1.20          1.25

                              Predicted Value of TRI

NOTE: 6 obs had missing values.  3 obs hidden.
```

APPENDIX P

TYLER URBAN AREA REGRESSION ANALYSIS

Observations	9
Variables	15

Simple Statistics

	A_SING	B_MULTI	CNTYPOP	C_VACANT	D_FARM
Mean	0.4888109500	0.5109823330	0.5562860312	-.4990561113	-.5282788924
StD	0.6978309541	0.3788265886	0.7051889589	0.7281288792	0.6229004115

Simple Statistics

	EMPLOY	E_FARMIM	F_COMM	F_INDUS	INCOME
Mean	0.502746019	0.4235980574	0.000000000	0.000000000	0.5832205851
StD	1.037007061	0.8855480725	1.000000000	1.000000000	0.8655539392

Simple Statistics

	PERCAP	RETAIL	URBAREA	URBPOP	ARTLANMI
Mean	0.5883429055	0.243111858	0.6077259110	0.6273105439	0.6032252460
StD	0.8459406707	1.021877326	0.6993010483	0.6733731303	0.7396496156

Correlation Matrix

	A_SING	B_MULTI	CNTYPOP	C_VACANT	D_FARM	EMPLOY	E_FARMIM	F_COMM
A_SING	1.0000	0.7443	0.9677	-.9301	-.7008	0.9976	0.9826	0.9925
B_MULTI	0.7443	1.0000	0.6286	-.5177	-.7611	0.7683	0.6923	0.7142
CNTYPOP	0.9677	0.6286	1.0000	-.9431	-.5407	0.9620	0.9796	0.9554
C_VACANT	-.9301	-.5177	-.9431	1.0000	0.5024	-.9301	-.9670	-.9396
D_FARM	-.7008	-.7611	-.5407	0.5024	1.0000	-.6991	-.5928	-.6780
EMPLOY	0.9976	0.7683	0.9620	-.9301	-.6991	1.0000	0.9845	0.9912
E_FARMIM	0.9826	0.6923	0.9796	-.9670	-.5928	0.9845	1.0000	0.9807
F_COMM	0.9925	0.7142	0.9554	-.9396	-.6780	0.9912	0.9807	1.0000
F_INDUS	0.8803	0.8488	0.8555	-.7578	-.5608	0.8930	0.8709	0.8423
INCOME	0.9958	0.7132	0.9722	-.9548	-.6478	0.9952	0.9929	0.9938
PERCAP	0.9927	0.7010	0.9701	-.9619	-.6358	0.9925	0.9942	0.9930
RETAIL	0.9732	0.6944	0.9679	-.9416	-.5679	0.9751	0.9861	0.9820
URBAREA	0.9056	0.6375	0.8884	-.8945	-.4828	0.9062	0.9337	0.9334
URBPOP	0.9079	0.6185	0.9186	-.9548	-.4170	0.9214	0.9555	0.9119
ARTLANMI	0.9818	0.6376	0.9616	-.9634	-.6219	0.9743	0.9810	0.9840

Correlation Matrix

	F_INDUS	INCOME	PERCAP	RETAIL	URBAREA	URBPOP	ARTLANMI
A_SING	0.8803	0.9958	0.9927	0.9732	0.9056	0.9079	0.9818
B_MULTI	0.8488	0.7132	0.7010	0.6944	0.6375	0.6185	0.6376
CNTYPOP	0.8555	0.9722	0.9701	0.9679	0.8884	0.9186	0.9616
C_VACANT	-.7578	-.9548	-.9619	-.9416	-.8945	-.9548	-.9634
D_FARM	-.5608	-.6478	-.6358	-.5679	-.4828	-.4170	-.6219
EMPLOY	0.8930	0.9952	0.9925	0.9751	0.9062	0.9214	0.9743
E_FARMIM	0.8709	0.9929	0.9942	0.9861	0.9337	0.9555	0.9810
F_COMM	0.8423	0.9938	0.9930	0.9820	0.9334	0.9119	0.9840
F_INDUS	1.0000	0.8751	0.8675	0.8422	0.7544	0.8625	0.8179
INCOME	0.8751	1.0000	0.9995	0.9834	0.9266	0.9389	0.9896
PERCAP	0.8675	0.9995	1.0000	0.9841	0.9324	0.9450	0.9913
RETAIL	0.8422	0.9834	0.9841	1.0000	0.9658	0.9361	0.9734
URBAREA	0.7544	0.9266	0.9324	0.9658	1.0000	0.8925	0.9362
URBPOP	0.8625	0.9389	0.9450	0.9361	0.8925	1.0000	0.9214
ARTLANMI	0.8179	0.9896	0.9913	0.9734	0.9362	0.9214	1.0000

Eigenvalues of the Correlation Matrix

	Eigenvalue	Difference	Proportion	Cumulative
1	13.2391208	12.2380337	0.8826	0.8826
2	1.0010871	0.5655904	0.0667	0.9493
3	0.4354967	0.2504120	0.0290	0.9784
4	0.1850847	0.0983838	0.0123	0.9907
5	0.0867009	0.0541088	0.0058	0.9965
6	0.0325920	0.0171526	0.0022	0.9987
7	0.0154394	0.0109611	0.0010	0.9997
8	0.0044783	0.0044783	0.0003	1.0000
9	0.0000000	0.0000000	0.0000	1.0000
10	0.0000000	0.0000000	0.0000	1.0000
11	0.0000000	0.0000000	0.0000	1.0000
12	0.0000000	0.0000000	0.0000	1.0000
13	0.0000000	0.0000000	0.0000	1.0000
14	0.0000000	0.0000000	0.0000	1.0000
15	0.0000000		0.0000	1.0000

Eigenvectors

	Prin1	Prin2	Prin3	Prin4	Prin5
A_SING	0.273343	-.045022	-.086967	-.092783	0.190524
B_MULTI	0.205462	-.577857	0.442009	0.303584	-.129617
CNTYPOP	0.265986	0.137577	-.000341	-.243234	0.554006
C_VACANT	-.259682	-.258247	0.181757	0.205829	0.421428
D_FARM	-.179949	0.659986	0.545886	0.124064	0.165074
EMPLOY	0.273972	-.057896	-.031755	-.074631	0.038803
E_FARMIM	0.273030	0.088771	0.003620	-.043383	-.011925
F_COMM	0.272437	0.001687	-.143107	0.083221	0.071164
F_INDUS	0.244687	-.166673	0.584021	-.352606	0.138152
INCOME	0.274325	0.029868	-.056017	-.057371	0.034489
PERCAP	0.274101	0.050602	-.062542	-.038212	-.034265
RETAIL	0.270777	0.101148	0.005730	0.254661	0.174245
URBAREA	0.255795	0.168293	-.004545	0.744940	0.001891
URBPOP	0.258394	0.228326	0.249156	-.137914	-.610854
ARTLANMI	0.270000	0.098488	-.185133	0.006284	0.058803

	Prin6	Prin7	Prin8	Prin9	Prin10
A_SING	0.111355	0.139115	0.111868	-.097295	-.144205
B_MULTI	-.304755	-.074940	0.164309	0.067481	0.059548
CNTYPOP	-.433564	-.208635	0.096424	0.007521	-.037186
C_VACANT	0.231490	0.254458	0.136675	0.084368	0.035049
D_FARM	-.011087	0.124438	0.046493	0.061240	0.058040
EMPLOY	-.054492	0.273285	0.113496	-.081341	-.125265
E_FARMIM	-.257064	-.333029	-.463563	-.057103	0.001881
F_COMM	0.127297	0.589918	-.429310	-.162620	-.173855
F_INDUS	0.422712	-.128973	-.237934	-.101825	-.102800
INCOME	0.127771	0.109804	0.038814	-.108950	0.935134
PERCAP	0.138634	0.055612	-.057948	0.943447	0.000000
RETAIL	-.300492	0.264494	0.295417	-.020362	-.077758
URBAREA	0.203367	-.271630	-.207212	-.080003	-.031665
URBPOP	-.065868	0.188946	0.245511	-.084951	-.087375
ARTLANMI	0.466432	-.326265	0.516051	-.111219	-.155022

	Prin11	Prin12	Prin13	Prin14	Prin15
A_SING	-.184621	0.873024	0.000000	0.000000	0.000000
B_MULTI	-.055712	0.045786	-.025207	0.246556	-.345423
CNTYPOP	-.096298	-.172450	-.289119	0.350117	0.238351
C_VACANT	-.000235	-.056446	0.451912	0.205073	0.466951
D_FARM	0.089477	0.132878	0.062847	0.132497	-.345467
EMPLOY	0.894797	0.000000	0.000000	0.000000	0.000000
E_FARMIM	0.059102	0.069147	0.715624	0.000000	0.000000
F_COMM	-.241616	-.259318	-.022544	0.310993	-.255481
F_INDUS	-.028713	-.131930	-.149747	-.329166	0.077317
INCOME	0.000000	0.000000	0.000000	0.000000	0.000000
PERCAP	0.000000	0.000000	0.000000	0.000000	0.000000
RETAIL	-.211762	-.191522	0.143540	-.681976	0.000000
URBAREA	0.104379	0.058717	-.281430	0.018290	0.303193
URBPOP	-.153326	-.035146	0.086107	0.227735	0.477148
ARTLANMI	-.054109	-.233139	0.255598	0.186180	-.309252

Dependent Variable: TRI

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	0.00005318	0.00001773	7.16	0.0293
Error	5	0.00001237	0.00000247		
Corrected Total	8	0.00006556			

Root MSE	0.00157	R-Square	0.8112
Dependent Mean	1.02822	Adj R-Sq	0.6980
Coeff Var	0.15300		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Type I SS	Type II SS
Intercept	1	1.02822	0.00052438	1960.82	<.0001	9.51517	9.51517
Prin5	1	0.00584	0.00189	3.09	0.0271	0.00002366	0.00002366
Prin6	1	-0.00808	0.00308	-2.62	0.0469	0.00001702	0.00001702
Prin7	1	0.01006	0.00448	2.25	0.0746	0.00001249	0.00001249

Durbin-Watson D	1.587
Number of Observations	9
1st Order Autocorrelation	0.150

Mean of Working Series	2E-17
Standard Deviation	0.001173
Number of Observations	10
Embedded missing values in working series	1

Autocorrelations

```
Lag  Covariance  Correlation  -1 9 8 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 1    Std Error

  0  1.37489E-6      1.00000  |                    |********************|           0
  1  1.88986E-7      0.13746  |       .            |***         .       |    0.316228
  2  9.59343E-7      0.69776  |       .            |**************      |    0.322147
  3  -2.8967E-7      -.21069  |  .             ****|                 .  |    0.448500
  4  -7.6134E-8      -.05537  |  .                *|                 .  |    0.458291
  5  -1.0198E-6      -.74172  |  .  ***************|                 .  |    0.458960
  6  -8.6561E-7      -.62958  |       *************|                    |    0.566281
  7  -5.1836E-7      -.37702  |            ********|                    |    0.632416
  8  -1.0201E-6      -.74198  |     ***************|                    |    0.654506
  9  -3.7611E-7      -.27355  |               *****|                    |    0.733816
```

"." marks two standard errors

Autocorrelation Check for White Noise

To Lag	Chi-Square	DF	Pr > ChiSq	Autocorrelations					
6	33.47	6	<.0001	0.137	0.698	-0.211	-0.055	-0.742	-0.630

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        1988    1989    1990    1991    1992    1993    1994    1995    1996    1997

                                            year

NOTE: 1 obs had missing values.  6 obs out of range.
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      1.00           1.05           1.10           1.15           1.20           1.25

                                   Predicted Value of TRI

NOTE: 7 obs had missing values.
```

Dependent Variable: TRI

C(p) Selection Method

Number in Model	C(p)	R-Square	Variables in Model
3	2.3817	0.8112	Prin5 Prin6 Prin7
4	2.9624	0.8905	Prin1 Prin5 Prin6 Prin7
4	3.4939	0.8608	Prin4 Prin5 Prin6 Prin7
2	3.7959	0.6207	Prin5 Prin6
5	4.0747	0.9400	Prin1 Prin4 Prin5 Prin6 Prin7
4	4.3078	0.8154	Prin2 Prin5 Prin6 Prin7
3	4.3767	0.6999	Prin1 Prin5 Prin6
4	4.3808	0.8113	Prin3 Prin5 Prin6 Prin7
5	4.8886	0.8946	Prin1 Prin2 Prin5 Prin6 Prin7
3	4.9082	0.6702	Prin4 Prin5 Prin6
5	4.9616	0.8905	Prin1 Prin3 Prin5 Prin6 Prin7
2	5.0340	0.5516	Prin5 Prin7
5	5.4201	0.8649	Prin2 Prin4 Prin5 Prin6 Prin7
4	5.4889	0.7494	Prin1 Prin4 Prin5 Prin6
5	5.4931	0.8608	Prin3 Prin4 Prin5 Prin6 Prin7
3	5.6148	0.6308	Prin1 Prin5 Prin7
3	5.7221	0.6248	Prin2 Prin5 Prin6
3	5.7951	0.6207	Prin3 Prin5 Prin6
6	6.0008	0.9441	Prin1 Prin2 Prin4 Prin5 Prin6 Prin7
6	6.0738	0.9401	Prin1 Prin3 Prin4 Prin5 Prin6 Prin7
3	6.1463	0.6011	Prin4 Prin5 Prin7
4	6.3028	0.7040	Prin1 Prin2 Prin5 Prin6
5	6.3070	0.8154	Prin2 Prin3 Prin5 Prin6 Prin7
4	6.3758	0.6999	Prin1 Prin3 Prin5 Prin6
1	6.4483	0.3610	Prin5
4	6.7270	0.6803	Prin1 Prin4 Prin5 Prin7
4	6.8343	0.6743	Prin2 Prin4 Prin5 Prin6
2	6.8489	0.4503	Prin6 Prin7
6	6.8877	0.8946	Prin1 Prin2 Prin3 Prin5 Prin6 Prin7
4	6.9073	0.6703	Prin3 Prin4 Prin5 Prin6
3	6.9602	0.5557	Prin2 Prin5 Prin7
2	7.0290	0.4402	Prin1 Prin5
3	7.0332	0.5516	Prin3 Prin5 Prin7
5	7.4151	0.7536	Prin1 Prin2 Prin4 Prin5 Prin6
6	7.4192	0.8650	Prin2 Prin3 Prin4 Prin5 Prin6 Prin7
3	7.4296	0.5295	Prin1 Prin6 Prin7
5	7.4881	0.7495	Prin1 Prin3 Prin4 Prin5 Prin6
4	7.5409	0.6349	Prin1 Prin2 Prin5 Prin7
2	7.5605	0.4105	Prin4 Prin5
4	7.6139	0.6308	Prin1 Prin3 Prin5 Prin7
4	7.7212	0.6248	Prin2 Prin3 Prin5 Prin6
3	7.9612	0.4998	Prin4 Prin6 Prin7
7	8.0000	0.9442	Prin1 Prin2 Prin3 Prin4 Prin5 Prin6 Prin7
4	8.0724	0.6052	Prin2 Prin4 Prin5 Prin7
3	8.1413	0.4898	Prin1 Prin4 Prin5
4	8.1454	0.6012	Prin3 Prin4 Prin5 Prin7
1	8.2631	0.2597	Prin6

Dependent Variable: TRI

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	0.00005318	0.00001773	7.16	0.0293
Error	5	0.00001237	0.00000247		
Corrected Total	8	0.00006556			

Root MSE	0.00157	R-Square	0.8112
Dependent Mean	1.02822	Adj R-Sq	0.6980
Coeff Var	0.15300		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Type I SS	Type II SS
Intercept	1	1.02822	0.00052438	1960.82	<.0001	9.51517	9.51517
Prin5	1	0.00584	0.00189	3.09	0.0271	0.00002366	0.00002366
Prin6	1	-0.00808	0.00308	-2.62	0.0469	0.00001702	0.00001702
Prin7	1	0.01006	0.00448	2.25	0.0746	0.00001249	0.00001249

Durbin-Watson D	1.587
Number of Observations	9
1st Order Autocorrelation	0.150

Mean of Working Series	2E-17
Standard Deviation	0.001173
Number of Observations	10
Embedded missing values in working series	1

Autocorrelations

```
Lag  Covariance  Correlation  -1 9 8 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 1    Std Error

  0  1.37489E-6      1.00000  |                    |********************|            0
  1  1.88986E-7      0.13746  |       .            |***        .        |     0.316228
  2  9.59343E-7      0.69776  |       .            |**************      |     0.322147
  3  -2.8967E-7      -.21069  |  .             ****|                .   |     0.448500
  4  -7.6134E-8      -.05537  |  .                *|                .   |     0.458291
  5  -1.0198E-6      -.74172  |  .  ***************|                .   |     0.458960
  6  -8.6561E-7      -.62958  |       *************|                    |     0.566281
  7  -5.1836E-7      -.37702  |            ********|                    |     0.632416
  8  -1.0201E-6      -.74198  |     ***************|                    |     0.654506
  9  -3.7611E-7      -.27355  |               *****|                    |     0.733816
```

"." marks two standard errors

Autocorrelation Check for White Noise

To Lag	Chi-Square	DF	Pr > ChiSq	Autocorrelations					
6	33.47	6	<.0001	0.137	0.698	-0.211	-0.055	-0.742	-0.630

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        1988    1989    1990    1991    1992    1993    1994    1995    1996    1997

                                            year

NOTE: 1 obs had missing values.  6 obs out of range.
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        1.00           1.05           1.10           1.15           1.20           1.25

                                 Predicted Value of TRI

NOTE: 7 obs had missing values.
```

APPENDIX Q

VICTORIA URBAN AREA REGRESSION ANALYSIS

Observations	10
Variables	16

Simple Statistics

	A_SING	B_MULTI	CNTYPOP	C_VACANT
Mean	0.4186689991	-.3838403594	0.334593920	-.4583603010
StD	0.8144914890	0.8349932427	1.133916830	0.7814986014

Simple Statistics

	D_FARM	EMPLOY	E_FARMIM	F_COMM
Mean	-0.103575183	0.295989118	0.324647354	0.000000000
StD	1.154431986	1.095449026	1.012661275	1.000000000

Simple Statistics

	F_INDUS	INCOME	PERCAP	RETAIL
Mean	0.000000000	0.5499752335	0.5797927138	0.1891530891
StD	1.000000000	0.8736723987	0.8141333127	0.9903075207

Simple Statistics

	URBAREA	URBPOP	FWYLANMI	ARTLANMI
Mean	0.5500000000	0.5761715753	15.00000000	-0.084168776
StD	0.6885303727	0.7677718959	0.00000000	1.203285610

Correlation Matrix

	A_SING	B_MULTI	CNTYPOP	C_VACANT	D_FARM	EMPLOY	E_FARMIM	F_COMM
A_SING	1.0000	0.1536	0.9489	-.8446	-.7578	0.9416	0.3393	0.3370
B_MULTI	0.1536	1.0000	0.2440	-.0555	-.1793	0.1324	-.2363	0.2675
CNTYPOP	0.9489	0.2440	1.0000	-.9207	-.5420	0.9850	0.3092	0.4602
C_VACANT	-.8446	-.0555	-.9207	1.0000	0.3756	-.9567	-.3050	-.4030
D_FARM	-.7578	-.1793	-.5420	0.3756	1.0000	-.5095	-.2138	-.0413
EMPLOY	0.9416	0.1324	0.9850	-.9567	-.5095	1.0000	0.2958	0.4385
E_FARMIM	0.3393	-.2363	0.3092	-.3050	-.2138	0.2958	1.0000	0.1111
F_COMM	0.3370	0.2675	0.4602	-.4030	-.0413	0.4385	0.1111	1.0000
F_INDUS	-.3231	-.2709	-.4517	0.3976	0.0222	-.4304	-.0952	-.9997
INCOME	0.9634	0.1150	0.9806	-.9528	-.5906	0.9910	0.3210	0.3867
PERCAP	0.9469	0.0868	0.9761	-.9653	-.5503	0.9918	0.3260	0.3930
RETAIL	0.9797	0.1038	0.9576	-.9246	-.6760	0.9711	0.2927	0.3550
URBAREA	0.7807	0.4929	0.8843	-.8399	-.4556	0.8380	0.1680	0.3828
URBPOP	0.9238	0.0282	0.8921	-.8908	-.6424	0.9210	0.3255	0.1907
FWYLANMI	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
ARTLANMI	-.8359	-.4785	-.8131	0.7661	0.6709	-.8179	-.0478	-.3217

Correlation Matrix

	F_INDUS	INCOME	PERCAP	RETAIL	URBAREA	URBPOP	FWYLANMI	ARTLANMI
A_SING	-.3231	0.9634	0.9469	0.9797	0.7807	0.9238	0.0000	-.8359
B_MULTI	-.2709	0.1150	0.0868	0.1038	0.4929	0.0282	0.0000	-.4785
CNTYPOP	-.4517	0.9806	0.9761	0.9576	0.8843	0.8921	0.0000	-.8131
C_VACANT	0.3976	-.9528	-.9653	-.9246	-.8399	-.8908	0.0000	0.7661
D_FARM	0.0222	-.5906	-.5503	-.6760	-.4556	-.6424	0.0000	0.6709
EMPLOY	-.4304	0.9910	0.9918	0.9711	0.8380	0.9210	0.0000	-.8179
E_FARMIM	-.0952	0.3210	0.3260	0.2927	0.1680	0.3255	0.0000	-.0478
F_COMM	-.9997	0.3867	0.3930	0.3550	0.3828	0.1907	0.0000	-.3217
F_INDUS	1.0000	-.3769	-.3838	-.3437	-.3787	-.1795	0.0000	0.3137
INCOME	-.3769	1.0000	0.9981	0.9903	0.8513	0.9490	0.0000	-.8280
PERCAP	-.3838	0.9981	1.0000	0.9825	0.8502	0.9463	0.0000	-.8105
RETAIL	-.3437	0.9903	0.9825	1.0000	0.8150	0.9543	0.0000	-.8521
URBAREA	-.3787	0.8513	0.8502	0.8150	1.0000	0.7572	0.0000	-.8027
URBPOP	-.1795	0.9490	0.9463	0.9543	0.7572	1.0000	0.0000	-.8295
FWYLANMI	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
ARTLANMI	0.3137	-.8280	-.8105	-.8521	-.8027	-.8295	0.0000	1.0000

Eigenvalues of the Correlation Matrix

	Eigenvalue	Difference	Proportion	Cumulative
1	9.99515881	8.06039611	0.6663	0.6663
2	1.93476270	0.52648323	0.1290	0.7953
3	1.40827947	0.64565595	0.0939	0.8892
4	0.76262352	0.16310277	0.0508	0.9401
5	0.59952075	0.44427691	0.0400	0.9800
6	0.15524385	0.05710826	0.0103	0.9904
7	0.09813558	0.06023826	0.0065	0.9969
8	0.03789733	0.02951934	0.0025	0.9994
9	0.00837799	0.00837799	0.0006	1.0000
10	0.00000000	0.00000000	0.0000	1.0000
11	0.00000000	0.00000000	0.0000	1.0000
12	0.00000000	0.00000000	0.0000	1.0000
13	0.00000000	0.00000000	0.0000	1.0000
14	0.00000000	0.00000000	0.0000	1.0000
15	0.00000000	0.00000000	0.0000	1.0000
16	0.00000000		0.0000	1.0000

Eigenvectors

	Prin1	Prin2	Prin3	Prin4	Prin5	Prin6
A_SING	0.305327	0.107032	-.013706	0.128775	-.156425	0.192139
B_MULTI	0.071350	-.357222	-.612581	0.289466	0.411756	-.033901
CNTYPOP	0.310666	-.026763	0.021014	-.048444	0.098708	0.274651
C_VACANT	-.295409	-.016809	-.132222	0.288983	-.166124	0.173287
D_FARM	-.197917	-.238582	0.249110	-.559217	0.512392	-.209227
EMPLOY	0.310252	0.008740	0.074019	-.152141	0.029558	0.017302
E_FARMIM	0.098403	0.177227	0.518442	0.643824	0.488644	-.171380
F_COMM	0.142801	-.589330	0.245393	0.115326	-.217644	-.030486
F_INDUS	-.139572	0.596566	-.241735	-.095602	0.210593	0.030769
INCOME	0.313183	0.061381	0.054285	-.092213	0.000097	0.090726
PERCAP	0.311328	0.056851	0.083214	-.133987	0.024876	0.072262
RETAIL	0.311259	0.093952	0.016552	-.040512	-.126842	0.033680
URBAREA	0.278069	-.094065	-.194346	-.070120	0.388399	0.413542
URBPOP	0.294705	0.208113	0.013707	-.080888	-.043910	-.314376
FWYLANMI	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
ARTLANMI	-.277230	0.018522	0.321803	-.037310	0.072444	0.704778

	Prin7	Prin8	Prin9	Prin10	Prin11	Prin12
A_SING	0.352249	-.119516	-.033913	0.00000	-.140245	-.113452
B_MULTI	0.269935	0.043789	-.311690	0.00000	0.049423	0.158810
CNTYPOP	0.374539	0.069159	0.067098	0.00000	-.161322	-.181217
C_VACANT	0.309667	0.411378	0.472377	0.00000	0.098653	0.048392
D_FARM	0.287597	0.062542	0.020459	0.00000	0.012572	-.025806
EMPLOY	0.322389	-.114019	0.366109	0.00000	-.150837	-.235396
E_FARMIM	-.006829	-.047718	0.036803	0.00000	0.005337	-.002249
F_COMM	-.073879	0.070713	0.003230	0.00000	-.003254	-.012643
F_INDUS	0.071518	-.076299	0.017999	0.00000	0.003437	0.009624
INCOME	0.066386	-.007286	0.003983	0.00000	0.934875	0.000000
PERCAP	0.003334	0.032592	0.189163	0.00000	-.133880	0.902411
RETAIL	0.022229	-.181890	-.464572	0.00000	-.119670	-.033927
URBAREA	-.596317	0.120584	0.279047	0.00000	-.080686	-.198934
URBPOP	-.044457	0.824571	-.217782	0.00000	-.080140	-.097527
FWYLANMI	0.000000	0.000000	0.000000	1.00000	0.000000	0.000000
ARTLANMI	0.084461	0.226087	-.401239	0.00000	-.001640	0.076215

	Prin13	Prin14	Prin15	Prin16
A_SING	0.803187	0.000000	0.000000	0.000000
B_MULTI	-.042048	-.073939	0.005930	0.175203
CNTYPOP	-.357786	-.226877	0.004111	-.653357
C_VACANT	-.038447	0.500391	-.011184	-.038691
D_FARM	0.233374	0.269118	0.011974	-.088933
EMPLOY	-.294316	-.075018	-.009993	0.672596
E_FARMIM	-.021176	0.056533	-.010104	-.003731
F_COMM	0.015557	0.005183	0.706740	0.009589
F_INDUS	-.021583	0.002249	0.707051	0.000000
INCOME	0.000000	0.000000	0.000000	0.000000
PERCAP	0.000000	0.000000	0.000000	0.000000
RETAIL	-.238944	0.743762	0.000000	0.000000
URBAREA	0.140529	0.188231	-.002332	-.000113
URBPOP	0.045324	-.083418	0.005478	0.089706
FWYLANMI	0.000000	0.000000	0.000000	0.000000
ARTLANMI	-.049958	-.125769	0.006291	0.269228

Dependent Variable: TRI

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	6	0.00001856	0.00000309	27.42	0.0103
Error	3	3.384639E-7	1.128213E-7		
Corrected Total	9	0.00001890			

Root MSE	0.00033589	R-Square	0.9821
Dependent Mean	1.00310	Adj R-Sq	0.9463
Coeff Var	0.03349		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Type I SS	Type II SS
Intercept	1	1.00310	0.00010622	9443.84	<.0001	10.06210	10.06210
Prin1	1	0.00018964	0.00003541	5.35	0.0127	0.00000324	0.00000324
Prin4	1	0.00113	0.00012821	8.80	0.0031	0.00000875	0.00000875
Prin5	1	-0.00056502	0.00014460	-3.91	0.0298	0.00000172	0.00000172
Prin6	1	0.00065757	0.00028416	2.31	0.1036	6.041379E-7	6.041379E-7
Prin7	1	0.00160	0.00035741	4.47	0.0209	0.00000225	0.00000225
Prin8	1	-0.00242	0.00057514	-4.21	0.0244	0.00000200	0.00000200

Durbin-Watson D	1.814
Number of Observations	10
1st Order Autocorrelation	-0.060

Mean of Working Series	8.9E-17
Standard Deviation	0.000184
Number of Observations	10

```
                                    Autocorrelations
Lag  Covariance  Correlation  -1 9 8 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 1    Std Error

  0  3.38464E-8      1.00000  |                    |********************|           0
  1  -2.0255E-9      -.05984  |       .           *|            .       |    0.316228
  2  -6.902E-10      -.02039  |       .            |            .       |    0.317358
  3  -1.3613E-8      -.40220  |       .    ********|            .       |    0.317489
  4  -8.2136E-9      -.24267  |     .         *****|              .     |    0.364901
  5   -1.387E-9      -.04098  |     .             *|              .     |    0.380698
  6   1.8878E-9      0.05578  |     .              |*             .     |    0.381139
  7  1.01339E-8      0.29941  |     .              |******        .     |    0.381954
  8  1.86898E-9      0.05522  |    .               |*              .    |    0.404744
  9  -4.8845E-9      -.14431  |    .            ***|               .    |    0.405497

                         "." marks two standard errors
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Autocorrelation Check for White Noise

To Lag	Chi-Square	DF	Pr > ChiSq	Autocorrelations					
6	4.14	6	0.6579	-0.060	-0.020	-0.402	-0.243	-0.041	0.056

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        1988    1989    1990    1991    1992    1993    1994    1995    1996    1997

                                            year

NOTE: 6 obs out of range.
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          1.00           1.05           1.10           1.15           1.20           1.25

                                   Predicted Value of TRI

NOTE: 6 obs had missing values.  2 obs hidden.
```

Dependent Variable: TRI

C(p) Selection Method

Number in Model	C(p)	R-Square	Variables in Model
6	6.1219	0.9821	Prin1 Prin4 Prin5 Prin6 Prin7 Prin8
7	7.0017	0.9915	Prin1 Prin3 Prin4 Prin5 Prin6 Prin7 Prin8
5	7.9093	0.9501	Prin1 Prin4 Prin5 Prin7 Prin8
7	8.1202	0.9821	Prin1 Prin2 Prin4 Prin5 Prin6 Prin7 Prin8
6	8.7891	0.9596	Prin1 Prin3 Prin4 Prin5 Prin7 Prin8
8	9.0000	0.9916	Prin1 Prin2 Prin3 Prin4 Prin5 Prin6 Prin7 Prin8
6	9.9076	0.9501	Prin1 Prin2 Prin4 Prin5 Prin7 Prin8
7	10.7874	0.9596	Prin1 Prin2 Prin3 Prin4 Prin5 Prin7 Prin8
5	14.9209	0.8910	Prin1 Prin4 Prin6 Prin7 Prin8
6	15.8007	0.9004	Prin1 Prin3 Prin4 Prin6 Prin7 Prin8
5	16.6695	0.8762	Prin1 Prin4 Prin5 Prin6 Prin7
4	16.7084	0.8590	Prin1 Prin4 Prin7 Prin8
6	16.9192	0.8910	Prin1 Prin2 Prin4 Prin6 Prin7 Prin8
6	17.5493	0.8856	Prin1 Prin3 Prin4 Prin5 Prin6 Prin7
5	17.5882	0.8684	Prin1 Prin3 Prin4 Prin7 Prin8
7	17.7990	0.9004	Prin1 Prin2 Prin3 Prin4 Prin6 Prin7 Prin8
5	18.2396	0.8629	Prin1 Prin4 Prin5 Prin6 Prin8
4	18.4570	0.8442	Prin1 Prin4 Prin5 Prin7
6	18.6678	0.8762	Prin1 Prin2 Prin4 Prin5 Prin6 Prin7
5	18.7067	0.8590	Prin1 Prin2 Prin4 Prin7 Prin8
6	19.1193	0.8724	Prin1 Prin3 Prin4 Prin5 Prin6 Prin8
5	19.3368	0.8537	Prin1 Prin3 Prin4 Prin5 Prin7
7	19.5476	0.8857	Prin1 Prin2 Prin3 Prin4 Prin5 Prin6 Prin7
6	19.5865	0.8685	Prin1 Prin2 Prin3 Prin4 Prin7 Prin8
4	20.0270	0.8310	Prin1 Prin4 Prin5 Prin8
6	20.2379	0.8630	Prin1 Prin2 Prin4 Prin5 Prin6 Prin8
5	20.4553	0.8442	Prin1 Prin2 Prin4 Prin5 Prin7
5	20.9068	0.8404	Prin1 Prin3 Prin4 Prin5 Prin8
7	21.1177	0.8724	Prin1 Prin2 Prin3 Prin4 Prin5 Prin6 Prin8
6	21.3351	0.8537	Prin1 Prin2 Prin3 Prin4 Prin5 Prin7
5	22.0253	0.8310	Prin1 Prin2 Prin4 Prin5 Prin8
6	22.9051	0.8404	Prin1 Prin2 Prin3 Prin4 Prin5 Prin8
5	24.4038	0.8109	Prin4 Prin5 Prin6 Prin7 Prin8
6	25.2836	0.8204	Prin3 Prin4 Prin5 Prin6 Prin7 Prin8
4	25.4686	0.7851	Prin1 Prin4 Prin6 Prin7
4	26.1912	0.7790	Prin4 Prin5 Prin7 Prin8
5	26.3484	0.7945	Prin1 Prin3 Prin4 Prin6 Prin7
6	26.4021	0.8109	Prin2 Prin4 Prin5 Prin6 Prin7 Prin8
4	27.0386	0.7718	Prin1 Prin4 Prin6 Prin8
5	27.0710	0.7884	Prin3 Prin4 Prin5 Prin7 Prin8
3	27.2560	0.7531	Prin1 Prin4 Prin7
7	27.2819	0.8204	Prin2 Prin3 Prin4 Prin5 Prin6 Prin7 Prin8
5	27.4669	0.7851	Prin1 Prin2 Prin4 Prin6 Prin7
5	27.9184	0.7813	Prin1 Prin3 Prin4 Prin6 Prin8
4	28.1358	0.7625	Prin1 Prin3 Prin4 Prin7
5	28.1895	0.7790	Prin2 Prin4 Prin5 Prin7 Prin8
6	28.3467	0.7945	Prin1 Prin2 Prin3 Prin4 Prin6 Prin7
4	28.7872	0.7570	Prin1 Prin4 Prin5 Prin6
3	28.8260	0.7398	Prin1 Prin4 Prin8

Dependent Variable: TRI

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	6	0.00001856	0.00000309	27.42	0.0103
Error	3	3.384639E-7	1.128213E-7		
Corrected Total	9	0.00001890			

Root MSE	0.00033589	R-Square	0.9821
Dependent Mean	1.00310	Adj R-Sq	0.9463
Coeff Var	0.03349		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Type I SS	Type II SS
Intercept	1	1.00310	0.00010622	9443.84	<.0001	10.06210	10.06210
Prin1	1	0.00018964	0.00003541	5.35	0.0127	0.00000324	0.00000324
Prin4	1	0.00113	0.00012821	8.80	0.0031	0.00000875	0.00000875
Prin5	1	-0.00056502	0.00014460	-3.91	0.0298	0.00000172	0.00000172
Prin6	1	0.00065757	0.00028416	2.31	0.1036	6.041379E-7	6.041379E-7
Prin7	1	0.00160	0.00035741	4.47	0.0209	0.00000225	0.00000225
Prin8	1	-0.00242	0.00057514	-4.21	0.0244	0.00000200	0.00000200

Durbin-Watson D	1.814
Number of Observations	10
1st Order Autocorrelation	-0.060

Mean of Working Series	8.9E-17
Standard Deviation	0.000184
Number of Observations	10

```
                                   Autocorrelations
Lag  Covariance  Correlation  -1 9 8 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 1    Std Error

  0  3.38464E-8      1.00000  |                    |********************|            0
  1  -2.0255E-9      -.05984  |       .           *|         .          |     0.316228
  2  -6.902E-10      -.02039  |       .            |         .          |     0.317358
  3  -1.3613E-8      -.40220  |       .    ********|         .          |     0.317489
  4  -8.2136E-9      -.24267  |     .         *****|           .        |     0.364901
  5   -1.387E-9      -.04098  |     .             *|           .        |     0.380698
  6   1.8878E-9      0.05578  |     .              |*          .        |     0.381139
  7  1.01339E-8      0.29941  |     .              |******     .        |     0.381954
  8  1.86898E-9      0.05522  |    .               |*           .       |     0.404744
  9  -4.8845E-9      -.14431  |    .            ***|            .       |     0.405497
```

"." marks two standard errors

Autocorrelation Check for White Noise

To Lag	Chi-Square	DF	Pr > ChiSq	Autocorrelations					
6	4.14	6	0.6579	-0.060	-0.020	-0.402	-0.243	-0.041	0.056

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        1988    1989    1990    1991    1992    1993    1994    1995    1996    1997

                                            year

NOTE: 6 obs out of range.
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        1.00           1.05           1.10           1.15           1.20           1.25

                               Predicted Value of TRI

NOTE: 6 obs had missing values.  2 obs hidden.
```

APPENDIX R

WACO URBAN AREA REGRESSION ANALYSIS

Observations	10
Variables	16

Simple Statistics

	A_SING	B_MULTI	CNTYPOP	C_VACANT
Mean	0.4644926318	0.059387679	0.5842336374	0.0876749752
StD	0.6964644386	1.137166895	0.7180760455	0.8838829956

Simple Statistics

	D_FARM	EMPLOY	E_FARMIM	F_COMM
Mean	0.5062269462	0.4661892792	0.1878572355	0.000000000
StD	0.2314454742	0.9750933023	0.9817788143	1.000000000

Simple Statistics

	F_INDUS	INCOME	PERCAP	RETAIL
Mean	0.000000000	0.042009428	0.6254212246	0.2129269738
StD	1.000000000	1.275928014	0.6550738052	0.9590305616

Simple Statistics

	URBAREA	URBPOP	FWYLANMI	ARTLANMI
Mean	0.6358333410	0.6309613656	0.4714404496	0.6583545896
StD	0.5741792355	0.6066524630	0.3472696445	0.6073236530

Correlation Matrix

	A_SING	B_MULTI	CNTYPOP	C_VACANT	D_FARM	EMPLOY	E_FARMIM	F_COMM
A_SING	1.0000	0.2935	0.7852	-.7291	0.7202	0.8235	0.2860	0.2929
B_MULTI	0.2935	1.0000	-.2795	0.3206	0.5152	-.2905	0.9990	0.9994
CNTYPOP	0.7852	-.2795	1.0000	-.9487	0.3832	0.9686	-.2892	-.2842
C_VACANT	-.7291	0.3206	-.9487	1.0000	-.2488	-.9242	0.3194	0.3188
D_FARM	0.7202	0.5152	0.3832	-.2488	1.0000	0.4549	0.5034	0.5101
EMPLOY	0.8235	-.2905	0.9686	-.9242	0.4549	1.0000	-.2982	-.2922
E_FARMIM	0.2860	0.9990	-.2892	0.3194	0.5034	-.2982	1.0000	0.9996
F_COMM	0.2929	0.9994	-.2842	0.3188	0.5101	-.2922	0.9996	1.0000
F_INDUS	0.4238	0.9584	-.0728	0.1718	0.5897	-.1222	0.9489	0.9515
INCOME	-.7321	0.0388	-.5908	0.6387	-.2741	-.7093	0.0322	0.0308
PERCAP	0.6087	-.4070	0.9454	-.8538	0.3278	0.8851	-.4234	-.4169
RETAIL	0.7845	-.3494	0.9703	-.9486	0.3273	0.9867	-.3567	-.3514
URBAREA	0.6275	-.4564	0.9554	-.8897	0.2367	0.9127	-.4709	-.4650
URBPOP	0.6922	-.4213	0.9859	-.9519	0.2564	0.9549	-.4291	-.4250
FWYLANMI	-.3981	0.5512	-.7725	0.8257	0.1043	-.7149	0.5528	0.5562
ARTLANMI	0.7262	-.2795	0.9571	-.8613	0.3225	0.9131	-.2929	-.2877

Correlation Matrix

	F_INDUS	INCOME	PERCAP	RETAIL	URBAREA	URBPOP	FWYLANMI	ARTLANMI
A_SING	0.4238	-.7321	0.6087	0.7845	0.6275	0.6922	-.3981	0.7262
B_MULTI	0.9584	0.0388	-.4070	-.3494	-.4564	-.4213	0.5512	-.2795
CNTYPOP	-.0728	-.5908	0.9454	0.9703	0.9554	0.9859	-.7725	0.9571
C_VACANT	0.1718	0.6387	-.8538	-.9486	-.8897	-.9519	0.8257	-.8613
D_FARM	0.5897	-.2741	0.3278	0.3273	0.2367	0.2564	0.1043	0.3225
EMPLOY	-.1222	-.7093	0.8851	0.9867	0.9127	0.9549	-.7149	0.9131
E_FARMIM	0.9489	0.0322	-.4234	-.3567	-.4709	-.4291	0.5528	-.2929
F_COMM	0.9515	0.0308	-.4169	-.3514	-.4650	-.4250	0.5562	-.2877
F_INDUS	1.0000	0.0176	-.1701	-.1782	-.2319	-.2207	0.4018	-.0469
INCOME	0.0176	1.0000	-.3363	-.7164	-.4465	-.5660	0.3508	-.5811
PERCAP	-.1701	-.3363	1.0000	0.8847	0.9776	0.9523	-.7656	0.9223
RETAIL	-.1782	-.7164	0.8847	1.0000	0.9362	0.9718	-.7929	0.9206
URBAREA	-.2319	-.4465	0.9776	0.9362	1.0000	0.9771	-.8467	0.9350
URBPOP	-.2207	-.5660	0.9523	0.9718	0.9771	1.0000	-.8340	0.9504
FWYLANMI	0.4018	0.3508	-.7656	-.7929	-.8467	-.8340	1.0000	-.6871
ARTLANMI	-.0469	-.5811	0.9223	0.9206	0.9350	0.9504	-.6871	1.0000

Eigenvalues of the Correlation Matrix

	Eigenvalue	Difference	Proportion	Cumulative
1	9.76232935	5.22091340	0.6101	0.6101
2	4.54141595	3.72305316	0.2838	0.8940
3	0.81836279	0.29588584	0.0511	0.9451
4	0.52247695	0.28960359	0.0327	0.9778
5	0.23287335	0.14858057	0.0146	0.9923
6	0.08429278	0.06092859	0.0053	0.9976
7	0.02336419	0.01369119	0.0015	0.9991
8	0.00967301	0.00446138	0.0006	0.9997
9	0.00521163	0.00521163	0.0003	1.0000
10	0.00000000	0.00000000	0.0000	1.0000
11	0.00000000	0.00000000	0.0000	1.0000
12	0.00000000	0.00000000	0.0000	1.0000
13	0.00000000	0.00000000	0.0000	1.0000
14	0.00000000	0.00000000	0.0000	1.0000
15	0.00000000	0.00000000	0.0000	1.0000
16	0.00000000		0.0000	1.0000

Eigenvectors

	Prin1	Prin2	Prin3	Prin4	Prin5	Prin6
A_SING	0.219117	0.331391	-.158231	0.027146	-.123876	0.146178
B_MULTI	-.148535	0.410553	0.030477	-.186925	-.011322	-.025995
CNTYPOP	0.311701	0.089535	0.091155	-.034319	0.071839	-.195440
C_VACANT	-.303217	-.052051	0.072637	0.219352	0.243245	0.732544
D_FARM	0.078762	0.370802	0.183018	0.689862	-.385901	0.088109
EMPLOY	0.308991	0.095144	-.091452	0.179982	-.083279	0.014667
E_FARMIM	-.151015	0.407673	0.007151	-.199501	-.042181	-.100176
F_COMM	-.149685	0.409558	0.010812	-.186625	-.027153	-.088196
F_INDUS	-.088574	0.431181	0.209828	-.222961	0.233446	0.188916
INCOME	-.195015	-.143656	0.801448	-.032830	-.144645	-.155682
PERCAP	0.299082	0.013830	0.376972	0.086784	0.132921	-.075491
RETAIL	0.314933	0.059258	-.121360	0.002021	-.049679	0.112667
URBAREA	0.311177	-.007659	0.223245	-.041487	0.093782	0.273245
URBPOP	0.318032	0.017350	0.075536	-.058571	0.072735	-.150714
FWYLANMI	-.268908	0.115148	-.101892	0.517832	0.531590	-.441115
ARTLANMI	0.298566	0.080887	0.096509	-.021676	0.607946	0.084068

	Prin7	Prin8	Prin9	Prin10	Prin11	Prin12
A_SING	0.499538	0.156693	0.212292	-.094555	-.268752	-.351994
B_MULTI	0.006345	-.065412	-.005889	0.876559	0.000000	0.000000
CNTYPOP	0.017896	0.482215	-.441567	0.028416	-.047377	-.258316
C_VACANT	0.135706	0.357896	0.026282	0.068017	0.052137	-.057401
D_FARM	-.389841	-.087202	0.002928	-.025614	0.051929	-.122457
EMPLOY	0.160969	0.290003	0.034665	0.069425	-.145102	0.842897
E_FARMIM	-.088144	0.013528	0.244695	-.259547	0.096348	0.090371
F_COMM	0.067454	0.015944	0.229055	-.258088	0.043736	0.049515
F_INDUS	-.025897	-.047241	-.507964	-.269935	-.013912	0.135878
INCOME	0.233183	0.195134	0.216074	0.007212	0.174744	0.079020
PERCAP	0.096401	-.216441	-.275501	0.030380	-.127417	-.031432
RETAIL	0.285174	-.131880	-.073683	0.020561	0.873409	0.000000
URBAREA	0.240536	-.544455	0.192675	0.007946	-.255161	0.013267
URBPOP	-.041298	0.323313	0.330209	0.053762	0.007251	-.208143
FWYLANMI	0.355341	-.101215	0.015537	-.001765	0.030981	-.004046
ARTLANMI	-.458242	0.051478	0.336489	0.024494	0.109252	0.027875

	Prin13	Prin14	Prin15	Prin16
A_SING	-.208627	-.267482	0.076413	-.366801
B_MULTI	0.000000	0.000000	0.000000	0.000000
CNTYPOP	0.127377	-.262196	-.260505	0.437647
C_VACANT	0.105817	0.087308	0.164305	0.229166
D_FARM	0.010242	0.030467	-.105487	-.010822
EMPLOY	0.000000	0.000000	0.000000	0.000000
E_FARMIM	-.454224	-.078796	0.302213	0.550298
F_COMM	0.798843	0.000000	0.000000	0.000000
F_INDUS	-.209885	0.282561	-.226329	-.307804
INCOME	-.101187	-.162395	-.142451	-.141076
PERCAP	0.154221	0.032299	0.749892	0.000000
RETAIL	0.000000	0.000000	0.000000	0.000000
URBAREA	0.033900	0.057322	-.390349	0.393100
URBPOP	-.045950	0.773150	0.000000	0.000000
FWYLANMI	-.052155	0.071529	-.098589	0.058641
ARTLANMI	-.020562	-.362668	-.029897	-.214122

Dependent Variable: TRI

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	0.00007344	0.00001469	378.83	<.0001
Error	4	1.550991E-7	3.877478E-8		
Corrected Total	9	0.00007360			

Root MSE	0.00019691	R-Square	0.9979
Dependent Mean	1.00320	Adj R-Sq	0.9953
Coeff Var	0.01963		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Type I SS	Type II SS
Intercept	1	1.00320	0.00006227	16110.6	<.0001	10.06410	10.06410
Prin1	1	0.00073124	0.00002101	34.81	<.0001	0.00004698	0.00004698
Prin2	1	0.00065108	0.00003080	21.14	<.0001	0.00001733	0.00001733
Prin4	1	0.00133	0.00009081	14.70	0.0001	0.00000838	0.00000838
Prin7	1	-0.00122	0.00042942	-2.85	0.0466	3.13974E-7	3.13974E-7
Prin9	1	0.00309	0.00090922	3.40	0.0272	4.48582E-7	4.48582E-7

Durbin-Watson D	1.725
Number of Observations	10
1st Order Autocorrelation	0.102

Mean of Working Series	8.88E-17
Standard Deviation	0.000125
Number of Observations	10

Autocorrelations

```
Lag  Covariance  Correlation  -1 9 8 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 1    Std Error

  0  1.55099E-8      1.00000  |                    |********************|            0
  1  1.58122E-9      0.10195  |       .            |**          .       |     0.316228
  2  -1.0183E-8      -.65656  |       *************|            .       |     0.319498
  3  -5.7665E-9      -.37180  |   .         *******|                .   |     0.433926
  4  4.64669E-9      0.29959  | .                  |******            . |     0.464692
  5  5.20454E-9      0.33556  | .                  |*******           . |     0.483622
  6   -2.113E-9      -.13623  |.                ***|                   .|     0.506370
  7   -1.646E-9      -.10612  |.                 **|                   .|     0.510022
  8  -2.638E-11      -.00170  |.                   |                   .|     0.512225
  9  5.4761E-10      0.03531  |.                   |*                  .|     0.512226
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"." marks two standard errors

Autocorrelation Check for White Noise

To Lag	Chi-Square	DF	Pr > ChiSq	Autocorrelations					
6	14.03	6	0.0293	0.102	-0.657	-0.372	0.300	0.336	-0.136

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        1988    1989    1990    1991    1992    1993    1994    1995    1996    1997

                                            year

NOTE: 6 obs out of range.
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      1.00           1.05           1.10           1.15           1.20           1.25

                                   Predicted Value of TRI

NOTE: 6 obs had missing values.
```

Dependent Variable: TRI

C(p) Selection Method

Number in Model	C(p)	R-Square	Variables in Model
5	4.4439	0.9979	Prin1 Prin2 Prin4 Prin7 Prin9
6	5.1700	0.9990	Prin1 Prin2 Prin4 Prin5 Prin7 Prin9
6	6.3326	0.9980	Prin1 Prin2 Prin3 Prin4 Prin7 Prin9
6	6.3853	0.9979	Prin1 Prin2 Prin4 Prin6 Prin7 Prin9
7	7.0586	0.9991	Prin1 Prin2 Prin3 Prin4 Prin5 Prin7 Prin9
7	7.1113	0.9990	Prin1 Prin2 Prin4 Prin5 Prin6 Prin7 Prin9
4	7.3913	0.9936	Prin1 Prin2 Prin4 Prin9
5	8.1174	0.9947	Prin1 Prin2 Prin4 Prin5 Prin9
7	8.2740	0.9980	Prin1 Prin2 Prin3 Prin4 Prin6 Prin7 Prin9
8	9.0000	0.9991	Prin1 Prin2 Prin3 Prin4 Prin5 Prin6 Prin7 Prin9
5	9.2800	0.9937	Prin1 Prin2 Prin3 Prin4 Prin9
5	9.3327	0.9937	Prin1 Prin2 Prin4 Prin6 Prin9
4	9.5124	0.9918	Prin1 Prin2 Prin4 Prin7
6	10.0060	0.9948	Prin1 Prin2 Prin3 Prin4 Prin5 Prin9
6	10.0587	0.9948	Prin1 Prin2 Prin4 Prin5 Prin6 Prin9
5	10.2384	0.9929	Prin1 Prin2 Prin4 Prin5 Prin7
6	11.2214	0.9938	Prin1 Prin2 Prin3 Prin4 Prin6 Prin9
5	11.4010	0.9919	Prin1 Prin2 Prin3 Prin4 Prin7
5	11.4538	0.9918	Prin1 Prin2 Prin4 Prin6 Prin7
7	11.9474	0.9949	Prin1 Prin2 Prin3 Prin4 Prin5 Prin6 Prin9
6	12.1271	0.9930	Prin1 Prin2 Prin3 Prin4 Prin5 Prin7
6	12.1798	0.9929	Prin1 Prin2 Prin4 Prin5 Prin6 Prin7
3	12.4598	0.9875	Prin1 Prin2 Prin4
4	13.1858	0.9886	Prin1 Prin2 Prin4 Prin5
6	13.3424	0.9919	Prin1 Prin2 Prin3 Prin4 Prin6 Prin7
7	14.0684	0.9930	Prin1 Prin2 Prin3 Prin4 Prin5 Prin6 Prin7
4	14.3484	0.9876	Prin1 Prin2 Prin3 Prin4
4	14.4011	0.9876	Prin1 Prin2 Prin4 Prin6
5	15.0745	0.9887	Prin1 Prin2 Prin3 Prin4 Prin5
5	15.1272	0.9887	Prin1 Prin2 Prin4 Prin5 Prin6
5	16.2898	0.9877	Prin1 Prin2 Prin3 Prin4 Prin6
6	17.0158	0.9888	Prin1 Prin2 Prin3 Prin4 Prin5 Prin6
4	134.4245	0.8841	Prin1 Prin2 Prin7 Prin9
5	135.1505	0.8852	Prin1 Prin2 Prin5 Prin7 Prin9
5	136.3131	0.8842	Prin1 Prin2 Prin3 Prin7 Prin9
5	136.3659	0.8841	Prin1 Prin2 Prin6 Prin7 Prin9
6	137.0392	0.8853	Prin1 Prin2 Prin3 Prin5 Prin7 Prin9
6	137.0919	0.8852	Prin1 Prin2 Prin5 Prin6 Prin7 Prin9
3	137.3719	0.8798	Prin1 Prin2 Prin9
4	138.0979	0.8809	Prin1 Prin2 Prin5 Prin9
6	138.2545	0.8842	Prin1 Prin2 Prin3 Prin6 Prin7 Prin9
7	138.9805	0.8853	Prin1 Prin2 Prin3 Prin5 Prin6 Prin7 Prin9
4	139.2605	0.8799	Prin1 Prin2 Prin3 Prin9
4	139.3132	0.8799	Prin1 Prin2 Prin6 Prin9
3	139.4929	0.8780	Prin1 Prin2 Prin7

Dependent Variable: TRI

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	0.00007344	0.00001469	378.83	<.0001
Error	4	1.550991E-7	3.877478E-8		
Corrected Total	9	0.00007360			

Root MSE	0.00019691	R-Square	0.9979
Dependent Mean	1.00320	Adj R-Sq	0.9953
Coeff Var	0.01963		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Type I SS	Type II SS
Intercept	1	1.00320	0.00006227	16110.6	<.0001	10.06410	10.06410
Prin1	1	0.00073124	0.00002101	34.81	<.0001	0.00004698	0.00004698
Prin2	1	0.00065108	0.00003080	21.14	<.0001	0.00001733	0.00001733
Prin4	1	0.00133	0.00009081	14.70	0.0001	0.00000838	0.00000838
Prin7	1	-0.00122	0.00042942	-2.85	0.0466	3.13974E-7	3.13974E-7
Prin9	1	0.00309	0.00090922	3.40	0.0272	4.48582E-7	4.48582E-7

Durbin-Watson D	1.725
Number of Observations	10
1st Order Autocorrelation	0.102

Mean of Working Series	8.88E-17
Standard Deviation	0.000125
Number of Observations	10

Autocorrelations

```
Lag  Covariance  Correlation  -1 9 8 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 1    Std Error

  0  1.55099E-8      1.00000  |                    |********************|           0
  1  1.58122E-9      0.10195  |       .            |**         .        |    0.316228
  2  -1.0183E-8      -.65656  |       *************|           .        |    0.319498
  3  -5.7665E-9      -.37180  |   .         *******|               .   |    0.433926
  4  4.64669E-9      0.29959  | .                  |******            . |    0.464692
  5  5.20454E-9      0.33556  | .                  |*******           . |    0.483622
  6   -2.113E-9      -.13623  |.                ***|                   .|    0.506370
  7   -1.646E-9      -.10612  |.                 **|                   .|    0.510022
  8  -2.638E-11      -.00170  |.                   |                   .|    0.512225
  9  5.4761E-10      0.03531  |.                   |*                  .|    0.512226
```

"." marks two standard errors

Autocorrelation Check for White Noise

To Lag	Chi-Square	DF	Pr > ChiSq	Autocorrelations					
6	14.03	6	0.0293	0.102	-0.657	-0.372	0.300	0.336	-0.136

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        1988    1989    1990    1991    1992    1993    1994    1995    1996    1997

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NOTE: 6 obs out of range.
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       1.00           1.05           1.10           1.15           1.20           1.25

                              Predicted Value of TRI

NOTE: 6 obs had missing values.
```

APPENDIX S

CLUSTER 1
Corpus Christi
Lubbock

Observations	20
Variables	16

Simple Statistics

	A_SING	B_MULTI	CNTYPOP	C_VACANT
Mean	0.015895643	0.2013057134	-.0808152422	-0.099642717
StD	1.066628116	0.7906333388	0.8640935553	1.034700129

Simple Statistics

	D_FARM	EMPLOY	E_FARMIM	F_COMM
Mean	-0.013515123	0.1060348669	-.1476018806	0.000000000
StD	1.005198821	0.9583400379	0.7354207147	1.000000000

Simple Statistics

	F_INDUS	INCOME	PERCAP	RETAIL
Mean	0.000000000	0.5183498970	0.5827723123	0.2183144165
StD	1.000000000	0.8766484695	0.7814364718	0.9418631589

Simple Statistics

	URBAREA	URBPOP	FWYLANMI	ARTLANMI
Mean	0.2079677396	0.177903364	0.431485300	0.073677437
StD	0.9147807206	1.050485498	1.046474334	1.111106416

Correlation Matrix

	A_SING	B_MULTI	CNTYPOP	C_VACANT	D_FARM	EMPLOY	E_FARMIM	F_COMM
A_SING	1.0000	-.6546	0.5073	0.9351	0.6655	0.6836	-.0614	0.9672
B_MULTI	-.6546	1.0000	-.9411	-.8544	-.9933	-.9263	0.3936	-.6095
CNTYPOP	0.5073	-.9411	1.0000	0.7357	0.9465	0.8161	-.4866	0.4817
C_VACANT	0.9351	-.8544	0.7357	1.0000	0.8670	0.8036	-.1442	0.8767
D_FARM	0.6655	-.9933	0.9465	0.8670	1.0000	0.9141	-.3779	0.6241
EMPLOY	0.6836	-.9263	0.8161	0.8036	0.9141	1.0000	-.4974	0.7009
E_FARMIM	-.0614	0.3936	-.4866	-.1442	-.3779	-.4974	1.0000	-.2224
F_COMM	0.9672	-.6095	0.4817	0.8767	0.6241	0.7009	-.2224	1.0000
F_INDUS	-.0445	0.1612	-.0325	-.0529	-.1313	-.3399	0.4257	-.1509
INCOME	0.6235	-.6320	0.4766	0.5956	0.6076	0.8712	-.5244	0.7174
PERCAP	0.1602	0.2114	-.3788	-.0787	-.2362	0.1593	-.2304	0.3166
RETAIL	0.5565	-.5403	0.4068	0.5022	0.5183	0.8079	-.5612	0.6801
URBAREA	0.6979	-.9140	0.8629	0.8115	0.9145	0.9669	-.6154	0.7459
URBPOP	0.7044	-.9864	0.9032	0.8667	0.9802	0.9721	-.4333	0.6839
FWYLANMI	0.7103	-.8579	0.6754	0.7999	0.8478	0.9542	-.3510	0.7082
ARTLANMI	-.6552	0.9138	-.7830	-.8375	-.9072	-.8200	0.0942	-.5484

Correlation Matrix

	F_INDUS	INCOME	PERCAP	RETAIL	URBAREA	URBPOP	FWYLANMI	ARTLANMI
A_SING	-.0445	0.6235	0.1602	0.5565	0.6979	0.7044	0.7103	-.6552
B_MULTI	0.1612	-.6320	0.2114	-.5403	-.9140	-.9864	-.8579	0.9138
CNTYPOP	-.0325	0.4766	-.3788	0.4068	0.8629	0.9032	0.6754	-.7830
C_VACANT	-.0529	0.5956	-.0787	0.5022	0.8115	0.8667	0.7999	-.8375
D_FARM	-.1313	0.6076	-.2362	0.5183	0.9145	0.9802	0.8478	-.9072
EMPLOY	-.3399	0.8712	0.1593	0.8079	0.9669	0.9721	0.9542	-.8200
E_FARMIM	0.4257	-.5244	-.2304	-.5612	-.6154	-.4333	-.3510	0.0942
F_COMM	-.1509	0.7174	0.3166	0.6801	0.7459	0.6839	0.7082	-.5484
F_INDUS	1.0000	-.5325	-.5347	-.5572	-.3206	-.2253	-.4264	0.0760
INCOME	-.5325	1.0000	0.6162	0.9863	0.8295	0.7423	0.8653	-.5128
PERCAP	-.5347	0.6162	1.0000	0.6817	0.1132	-.0596	0.2424	0.2520
RETAIL	-.5572	0.9863	0.6817	1.0000	0.7846	0.6611	0.7918	-.3920
URBAREA	-.3206	0.8295	0.1132	0.7846	1.0000	0.9554	0.8862	-.7448
URBPOP	-.2253	0.7423	-.0596	0.6611	0.9554	1.0000	0.9161	-.8952
FWYLANMI	-.4264	0.8653	0.2424	0.7918	0.8862	0.9161	1.0000	-.8472
ARTLANMI	0.0760	-.5128	0.2520	-.3920	-.7448	-.8952	-.8472	1.0000

Eigenvalues of the Correlation Matrix

	Eigenvalue	Difference	Proportion	Cumulative
1	10.5679290	7.8061227	0.6605	0.6605
2	2.7618063	1.3110149	0.1726	0.8331
3	1.4507914	0.7701144	0.0907	0.9238
4	0.6806770	0.2999706	0.0425	0.9663
5	0.3807064	0.2822992	0.0238	0.9901
6	0.0984072	0.0773323	0.0062	0.9963
7	0.0210750	0.0026310	0.0013	0.9976
8	0.0184440	0.0102166	0.0012	0.9987
9	0.0082273	0.0030502	0.0005	0.9993
10	0.0051771	0.0025048	0.0003	0.9996
11	0.0026724	0.0003538	0.0002	0.9997
12	0.0023185	0.0014424	0.0001	0.9999
13	0.0008762	0.0001731	0.0001	0.9999
14	0.0007031	0.0005595	0.0000	1.0000
15	0.0001436	0.0000980	0.0000	1.0000
16	0.0000455		0.0000	1.0000

Eigenvectors

	Prin1	Prin2	Prin3	Prin4	Prin5	Prin6
A_SING	0.242089	-.036448	0.474742	0.166653	-.263917	-.068897
B_MULTI	-.288164	0.178712	0.131590	0.077563	-.019814	-.065796
CNTYPOP	0.254841	-.244583	-.274004	0.164728	-.023469	0.402846
C_VACANT	0.273280	-.157583	0.274457	0.045478	-.261870	-.072143
D_FARM	0.286596	-.195690	-.115346	-.047372	-.008960	0.110604
EMPLOY	0.302143	0.033112	-.083047	-.062065	0.213101	0.062142
E_FARMIM	-.142514	-.221209	0.531711	-.537119	0.199094	0.536490
F_COMM	0.244956	0.074431	0.417423	0.300347	-.290716	0.019928
F_INDUS	-.095563	-.405037	0.240711	0.531308	0.671599	-.153863
INCOME	0.257984	0.309220	0.031036	-.008743	0.267514	0.118120
PERCAP	0.035953	0.569643	0.214047	0.011671	0.226976	-.123255
RETAIL	0.237105	0.363495	0.009094	0.065639	0.260748	0.292042
URBAREA	0.300049	0.024958	-.122693	0.164705	-.018751	0.132258
URBPOP	0.300760	-.097237	-.087955	-.055237	0.081613	0.037365
FWYLANMI	0.291090	0.069562	0.030941	-.303546	0.151118	-.323119
ARTLANMI	-.258009	0.238757	-.034475	0.378256	-.138621	0.507661

	Prin7	Prin8	Prin9	Prin10	Prin11	Prin12
A_SING	-.252235	-.114236	0.474664	0.049906	-.333596	0.389164
B_MULTI	0.143907	0.390417	0.033207	0.271245	0.275028	0.380191
CNTYPOP	-.303473	0.260773	-.020676	0.567127	-.000795	-.064951
C_VACANT	0.141971	-.392746	-.108281	0.198209	0.687825	0.012432
D_FARM	0.408762	-.022715	-.194282	0.055155	-.071974	0.037950
EMPLOY	0.081970	-.258381	-.092530	-.025341	-.014633	0.274888
E_FARMIM	0.066837	0.071418	-.083390	0.001392	-.057767	0.038473
F_COMM	0.047264	0.375988	-.315790	-.165861	-.113754	-.464202
F_INDUS	0.080403	-.012519	0.020845	0.008545	0.018955	-.037329
INCOME	-.254789	-.166053	0.053621	0.303525	-.059997	-.168094
PERCAP	0.027818	-.154463	-.438286	0.247537	-.170919	0.085211
RETAIL	-.150233	0.230283	0.291195	-.410218	0.475743	-.010872
URBAREA	0.299437	0.289497	-.173023	-.153579	-.124113	0.518040
URBPOP	0.001909	-.217041	0.010734	-.332690	-.159252	-.080927
FWYLANMI	0.466846	0.251560	0.465986	0.264331	-.061964	-.265590
ARTLANMI	0.469652	-.315770	0.284712	0.076980	-.119123	-.152264

	Prin13	Prin14	Prin15	Prin16
A_SING	0.085728	-.049528	-.090570	0.165238
B_MULTI	0.522969	0.225402	0.159743	-.197868
CNTYPOP	-.044999	0.075129	0.229157	0.252241
C_VACANT	-.175062	0.138948	0.010393	-.023978
D_FARM	0.500462	-.144383	-.545104	0.261245
EMPLOY	0.200170	-.563684	0.538871	-.202336
E_FARMIM	-.084970	0.043818	0.028439	-.028148
F_COMM	0.113449	-.145195	0.159289	-.162821
F_INDUS	-.040019	0.016237	-.026092	0.020879
INCOME	0.085716	0.092835	-.376883	-.611487
PERCAP	-.105149	0.133642	0.066072	0.462379
RETAIL	0.036558	-.085671	-.097170	0.284152
URBAREA	-.480105	0.185058	-.110176	-.248341
URBPOP	0.315594	0.700904	0.317085	0.004001
FWYLANMI	-.152940	0.016561	0.147183	0.046275
ARTLANMI	-.032079	0.018262	0.095307	-.011540

Dependent Variable: TRI

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	7	0.00371	0.00052936	5.58	0.0048
Error	12	0.00114	0.00009481		
Corrected Total	19	0.00484			

Root MSE	0.00974	R-Square	0.7651
Dependent Mean	1.02780	Adj R-Sq	0.6281
Coeff Var	0.94736		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Type I SS	Type II SS
Intercept	1	1.02780	0.00218	472.06	<.0001	21.12746	21.12746
Prin2	1	-0.00348	0.00134	-2.59	0.0236	0.00063640	0.00063640
Prin3	1	0.00315	0.00185	1.70	0.1152	0.00027348	0.00027348
Prin4	1	-0.00716	0.00271	-2.64	0.0214	0.00066286	0.00066286
Prin5	1	0.00602	0.00362	1.66	0.1223	0.00026198	0.00026198
Prin6	1	0.01516	0.00712	2.13	0.0547	0.00042966	0.00042966
Prin7	1	0.04533	0.01539	2.95	0.0122	0.00082293	0.00082293
Prin13	1	0.19270	0.07547	2.55	0.0253	0.00061818	0.00061818

Durbin-Watson D	2.504
Number of Observations	20
1st Order Autocorrelation	-0.265

Mean of Working Series	1.55E-16
Standard Deviation	0.007542
Number of Observations	26
Embedded missing values in working series	6

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                            Autocorrelations

Lag  Covariance  Correlation  -1 9 8 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 1    Std Error

  0  0.00005689      1.00000  |                    |********************|            0
  1  -0.0000167      -.29318  |            . ******|       .            |     0.196116
  2  -0.0000150      -.26334  |            .  *****|       .            |     0.212305
  3   -3.461E-7      -.00608  |           .        |        .           |     0.224517
  4  0.00002277      0.40029  |           .        |********.           |     0.224523
  5  -0.0000351      -.61648  |        ************|         .          |     0.250472
  6  2.83315E-6      0.04980  |        .           |*          .        |     0.303266
  7  0.00002519      0.44286  |        .           |*********  .        |     0.303581
  8   -4.161E-6      -.07315  |       .           *|            .       |     0.327487
  9  0.00002441      0.42916  |       .            |*********   .       |     0.328115
 10  -0.0000597      -1.0000  |********************|             .      |     0.349037
 11  3.86228E-7      0.00679  |  .                 |                 .  |     0.445814
 12  6.24019E-6      0.10970  |  .                 |**               .  |     0.445818

                        "." marks two standard errors


                 Autocorrelation Check for White Noise

 To        Chi-          Pr >
Lag      Square     DF   ChiSq    ------------------Autocorrelations-----------------

  6       23.18      6   0.0007   -0.293   -0.263   -0.006    0.400   -0.616    0.050
 12       89.50     12   <.0001    0.443   -0.073    0.429   -1.049    0.007    0.110
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                                            year

NOTE: 12 obs out of range.
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      1.00           1.05           1.10           1.15           1.20           1.25

                                   Predicted Value of TRI

NOTE: 12 obs had missing values.  2 obs hidden.
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Dependent Variable: TRI

C(p) Selection Method

Number in Model	C(p)	R-Square	Variables in Model
4	-0.5584	0.5658	Prin2 Prin4 Prin7 Prin13
5	-0.4875	0.6545	Prin2 Prin4 Prin6 Prin7 Prin13
5	0.2137	0.6223	Prin2 Prin3 Prin4 Prin7 Prin13
3	0.2172	0.4382	Prin2 Prin4 Prin7
5	0.2653	0.6199	Prin2 Prin4 Prin5 Prin7 Prin13
6	0.2845	0.7110	Prin2 Prin3 Prin4 Prin6 Prin7 Prin13
4	0.2880	0.5269	Prin2 Prin4 Prin6 Prin7
3	0.2990	0.4344	Prin4 Prin7 Prin13
6	0.3362	0.7086	Prin2 Prin4 Prin5 Prin6 Prin7 Prin13
4	0.3699	0.5231	Prin4 Prin6 Prin7 Prin13
3	0.4178	0.4290	Prin2 Prin7 Prin13
4	0.4887	0.5177	Prin2 Prin6 Prin7 Prin13
5	0.7227	0.5989	Prin2 Prin4 Prin7 Prin9 Prin13
6	0.7935	0.6876	Prin2 Prin4 Prin6 Prin7 Prin9 Prin13
5	0.8243	0.5942	Prin2 Prin4 Prin7 Prin12 Prin13
6	0.8951	0.6829	Prin2 Prin4 Prin6 Prin7 Prin12 Prin13
5	0.9870	0.5867	Prin2 Prin4 Prin7 Prin13 Prin14
4	0.9893	0.4946	Prin2 Prin3 Prin4 Prin7
6	1.0374	0.6764	Prin2 Prin3 Prin4 Prin5 Prin7 Prin13
4	1.0409	0.4923	Prin2 Prin4 Prin5 Prin7
6	1.0579	0.6754	Prin2 Prin4 Prin6 Prin7 Prin13 Prin14
5	1.0601	0.5834	Prin2 Prin3 Prin4 Prin6 Prin7
4	1.0711	0.4909	Prin3 Prin4 Prin7 Prin13
2	1.0746	0.3068	Prin4 Prin7

Dependent Variable: TRI

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	4	0.00274	0.00068509	4.89	0.0101
Error	15	0.00210	0.00014019		
Corrected Total	19	0.00484			

Root MSE	0.01184	R-Square	0.5658
Dependent Mean	1.02780	Adj R-Sq	0.4500
Coeff Var	1.15199		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Type I SS	Type II SS
Intercept	1	1.02780	0.00265	388.21	<.0001	21.12746	21.12746
Prin2	1	-0.00348	0.00163	-2.13	0.0501	0.00063640	0.00063640
Prin4	1	-0.00716	0.00329	-2.17	0.0461	0.00066286	0.00066286
Prin7	1	0.04533	0.01871	2.42	0.0285	0.00082293	0.00082293
Prin13	1	0.19270	0.09177	2.10	0.0531	0.00061818	0.00061818

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                    Durbin-Watson D                1.491
                    Number of Observations            20
                    1st Order Autocorrelation      0.247

            Mean of Working Series                      1.56E-16
            Standard Deviation                          0.010254
            Number of Observations                            26
            Embedded missing values in working series          6


                              Autocorrelations

 Lag  Covariance  Correlation  -1 9 8 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 1    Std Error

   0  0.00010514      1.00000  |                    |********************|            0
   1  0.00001895      0.18023  |            .       |****   .            |     0.196116
   2  5.45258E-6      0.05186  |            .       |*      .            |     0.202386
   3  -0.0000188      -.17889  |            .   ****|       .            |     0.202897
   4  -0.0000118      -.11185  |            .     **|       .            |     0.208875
   5  -0.0000424      -.40330  |            ********|       .            |     0.211166
   6  -0.0000814      -.77426  |     ***************|         .          |     0.238961
   7  -1.8887E-6      -.01796  |       .            |            .       |     0.321272
   8  0.00011450      1.00000  |       .            |********************|     0.321310
   9  0.00003595      0.34194  |   .                |*******         .   |     0.424457
  10  -0.0000666      -.63376  |   .   *************|                .   |     0.434922
  11  -0.0000281      -.26768  | .            *****|                  . |     0.469099
  12  -0.0000484      -.46000  | .        *********|                  . |     0.474938

                          "." marks two standard errors


                    Autocorrelation Check for White Noise

  To      Chi-          Pr >
 Lag    Square    DF    ChiSq    ------------------Autocorrelations-----------------

   6     29.91     6   <.0001    0.180     0.052    -0.179    -0.112    -0.403    -0.774
  12    115.66    12   <.0001   -0.018     1.089     0.342    -0.634    -0.268    -0.460
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NOTE: 12 obs out of range.
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      1.00           1.05           1.10           1.15           1.20           1.25

                                   Predicted Value of TRI

NOTE: 12 obs had missing values.
```

APPENDIX T

CLUSTER 2
Abilene
Amarillo
Longview
San Angelo
Victoria

Observations	50
Variables	16

Simple Statistics

	A_SING	B_MULTI	CNTYPOP	C_VACANT
Mean	0.0139701088	-.0227693564	0.037076141	-0.044515979
StD	0.9982644864	0.9475431016	1.018025033	1.040818622

Simple Statistics

	D_FARM	EMPLOY	E_FARMIM	F_COMM
Mean	-0.024137118	0.039268300	0.110148636	0.000000000
StD	1.041429107	1.031904501	1.035572873	1.000000000

Simple Statistics

	F_INDUS	INCOME	PERCAP	RETAIL
Mean	0.000000000	0.316629062	0.6039129861	0.094248948
StD	1.000000000	1.039207932	0.7647737297	1.028711119

Simple Statistics

	URBAREA	URBPOP	FWYLANMI	ARTLANMI
Mean	0.107595805	0.1275648752	0.094283775	0.020753290
StD	1.015290906	0.9723633463	1.049400578	1.203581276

Correlation Matrix

	A_SING	B_MULTI	CNTYPOP	C_VACANT	D_FARM	EMPLOY	E_FARMIM	F_COMM
A_SING	1.0000	0.9234	0.9615	0.9327	0.5763	0.9471	-.3890	0.9562
B_MULTI	0.9234	1.0000	0.9502	0.9570	0.2587	0.9486	-.1415	0.9292
CNTYPOP	0.9615	0.9502	1.0000	0.9424	0.4305	0.9893	-.3278	0.9480
C_VACANT	0.9327	0.9570	0.9424	1.0000	0.3409	0.9536	-.1049	0.9233
D_FARM	0.5763	0.2587	0.4305	0.3409	1.0000	0.3762	-.7093	0.4823
EMPLOY	0.9471	0.9486	0.9893	0.9536	0.3762	1.0000	-.2325	0.9395
E_FARMIM	-.3890	-.1415	-.3278	-.1049	-.7093	-.2325	1.0000	-.2908
F_COMM	0.9562	0.9292	0.9480	0.9233	0.4823	0.9395	-.2908	1.0000
F_INDUS	0.0357	0.1291	0.0503	0.1847	-.1354	0.0876	0.3330	0.0051
INCOME	0.8907	0.8588	0.9324	0.8655	0.3748	0.9602	-.2205	0.8716
PERCAP	0.0807	0.0435	0.1036	0.0429	-.0403	0.1968	0.2185	0.0918
RETAIL	0.8987	0.8835	0.9372	0.8771	0.3528	0.9639	-.1955	0.8879
URBAREA	0.4391	0.4837	0.5094	0.3697	0.0420	0.4671	-.2354	0.4159
URBPOP	0.7592	0.6291	0.7708	0.5609	0.5624	0.7130	-.6623	0.7006
FWYLANMI	0.4526	0.2973	0.4470	0.1989	0.4721	0.3692	-.7069	0.3742
ARTLANMI	0.7676	0.8062	0.7798	0.7937	0.2479	0.7868	-.1904	0.7627

Correlation Matrix

	F_INDUS	INCOME	PERCAP	RETAIL	URBAREA	URBPOP	FWYLANMI	ARTLANMI
A_SING	0.0357	0.8907	0.0807	0.8987	0.4391	0.7592	0.4526	0.7676
B_MULTI	0.1291	0.8588	0.0435	0.8835	0.4837	0.6291	0.2973	0.8062
CNTYPOP	0.0503	0.9324	0.1036	0.9372	0.5094	0.7708	0.4470	0.7798
C_VACANT	0.1847	0.8655	0.0429	0.8771	0.3697	0.5609	0.1989	0.7937
D_FARM	-.1354	0.3748	-.0403	0.3528	0.0420	0.5624	0.4721	0.2479
EMPLOY	0.0876	0.9602	0.1968	0.9639	0.4671	0.7130	0.3692	0.7868
E_FARMIM	0.3330	-.2205	0.2185	-.1955	-.2354	-.6623	-.7069	-.1904
F_COMM	0.0051	0.8716	0.0918	0.8879	0.4159	0.7006	0.3742	0.7627
F_INDUS	1.0000	0.0240	-.1220	0.0536	-.1830	-.2193	-.3530	0.1626
INCOME	0.0240	1.0000	0.4333	0.9929	0.4565	0.7323	0.4223	0.7432
PERCAP	-.1220	0.4333	1.0000	0.4081	0.0366	0.1297	0.0772	0.0018
RETAIL	0.0536	0.9929	0.4081	1.0000	0.4592	0.7268	0.4114	0.7608
URBAREA	-.1830	0.4565	0.0366	0.4592	1.0000	0.7394	0.7619	0.1568
URBPOP	-.2193	0.7323	0.1297	0.7268	0.7394	1.0000	0.9024	0.4709
FWYLANMI	-.3530	0.4223	0.0772	0.4114	0.7619	0.9024	1.0000	0.1628
ARTLANMI	0.1626	0.7432	0.0018	0.7608	0.1568	0.4709	0.1628	1.0000

Eigenvalues of the Correlation Matrix

	Eigenvalue	Difference	Proportion	Cumulative
1	9.56495920	7.01229070	0.5978	0.5978
2	2.55266849	1.12844012	0.1595	0.7574
3	1.42422838	0.35686481	0.0890	0.8464
4	1.06736357	0.37678973	0.0667	0.9131
5	0.69057384	0.31833634	0.0432	0.9562
6	0.37223750	0.23461879	0.0233	0.9795
7	0.13761871	0.06715508	0.0086	0.9881
8	0.07046363	0.02417928	0.0044	0.9925
9	0.04628436	0.01511607	0.0029	0.9954
10	0.03116829	0.01233108	0.0019	0.9973
11	0.01883721	0.00945564	0.0012	0.9985
12	0.00938156	0.00151165	0.0006	0.9991
13	0.00786991	0.00372533	0.0005	0.9996
14	0.00414458	0.00293525	0.0003	0.9999
15	0.00120933	0.00021791	0.0001	0.9999
16	0.00099142		0.0001	1.0000

Eigenvectors

	Prin1	Prin2	Prin3	Prin4	Prin5	Prin6
A_SING	0.314890	0.027647	-.121010	-.051424	-.021312	0.166015
B_MULTI	0.299290	0.169354	-.034730	0.167327	-.134403	0.060691
CNTYPOP	0.318443	0.060182	-.033403	0.046267	-.041466	0.044467
C_VACANT	0.293995	0.212406	-.100306	0.061608	-.094570	0.220893
D_FARM	0.160847	-.284797	-.375442	-.453110	0.216665	0.414975
EMPLOY	0.314400	0.121408	0.023753	-.002755	-.026591	0.045993
E_FARMIM	-.126737	0.476754	0.319160	0.150370	-.061311	0.337752
F_COMM	0.306618	0.074550	-.082762	-.033889	-.141066	0.206608
F_INDUS	-.001204	0.377297	-.239469	0.204340	0.856578	-.079848
INCOME	0.305155	0.090515	0.181872	-.152268	0.058859	-.077018
PERCAP	0.052885	0.079187	0.650329	-.537743	0.232935	-.060663
RETAIL	0.306670	0.108577	0.170473	-.118042	0.058833	-.082257
URBAREA	0.177520	-.239639	0.339437	0.575572	0.079259	0.184499
URBPOP	0.270067	-.312489	0.088346	0.086214	0.158404	-.100264
FWYLANMI	0.176072	-.478306	0.153389	0.164052	0.207362	-.161295
ARTLANMI	0.251435	0.201634	-.183788	-.025974	-.173855	-.702879

	Prin7	Prin8	Prin9	Prin10	Prin11	Prin12
A_SING	0.062597	0.103250	-.400463	0.257204	-.226985	-.365681
B_MULTI	-.057437	0.334641	-.387040	0.272941	0.581563	0.088072
CNTYPOP	-.249635	-.143945	0.213563	0.072303	0.214950	0.311164
C_VACANT	-.027734	-.249100	-.201546	0.173990	-.572203	0.313127
D_FARM	0.416861	-.203643	-.045501	-.159308	0.253820	0.056455
EMPLOY	-.252537	-.214971	0.162871	-.074408	0.076597	0.094849
E_FARMIM	0.570744	-.099341	0.300302	0.251308	0.088648	0.003750
F_COMM	0.055598	0.690253	0.368352	-.379260	-.246347	-.001397
F_INDUS	-.050493	0.110284	-.007540	-.047516	-.028451	0.015577
INCOME	-.122838	-.328872	0.115375	-.134294	-.057853	-.054149
PERCAP	0.004318	0.207320	-.278029	-.063756	-.030255	0.255884
RETAIL	-.064840	-.124806	0.181091	0.024492	0.108132	-.716951
URBAREA	0.151271	-.146071	-.280694	-.533540	0.055244	-.022219
URBPOP	0.048647	0.042488	0.363590	0.247341	0.136002	0.233352
FWYLANMI	0.235422	0.119789	0.076934	0.420753	-.243840	-.029436
ARTLANMI	0.510660	-.064915	-.093645	-.195211	0.006012	0.113871

	Prin13	Prin14	Prin15	Prin16
A_SING	-.417725	0.488488	-.083005	0.091784
B_MULTI	0.200778	-.177772	0.051813	-.265786
CNTYPOP	0.122411	0.220988	-.534569	0.511403
C_VACANT	0.050119	-.484450	0.021773	-.001062
D_FARM	0.107862	-.068542	0.028777	0.011850
EMPLOY	0.072681	0.308652	0.781657	0.120699
E_FARMIM	-.008850	0.131873	0.004494	-.004291
F_COMM	0.077464	0.002640	-.029726	-.056581
F_INDUS	0.009394	0.013084	-.010177	-.001183
INCOME	0.129641	0.236643	-.285420	-.719642
PERCAP	-.040659	-.025662	0.026947	0.164633
RETAIL	0.066705	-.449792	-.018040	0.234454
URBAREA	-.066398	-.022391	-.034757	0.083058
URBPOP	-.658800	-.219355	0.053903	-.153282
FWYLANMI	0.531036	0.143070	0.065914	0.030052
ARTLANMI	-.035761	0.025654	0.019729	0.101063

Dependent Variable: TRI

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	10	0.00076318	0.00007632	36.57	<.0001
Error	39	0.00008140	0.00000209		
Corrected Total	49	0.00084458			

Root MSE	0.00144	R-Square	0.9036
Dependent Mean	1.00478	Adj R-Sq	0.8789
Coeff Var	0.14378		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Type I SS	Type II SS
Intercept	1	1.00478	0.00020431	4917.89	<.0001	50.47914	50.47914
Prin1	1	0.00104	0.00006673	15.59	<.0001	0.00050756	0.00050756
Prin2	1	0.00077115	0.00012918	5.97	<.0001	0.00007438	0.00007438
Prin4	1	-0.00060529	0.00019977	-3.03	0.0043	0.00001916	0.00001916
Prin5	1	-0.00087968	0.00024836	-3.54	0.0010	0.00002618	0.00002618
Prin6	1	-0.00199	0.00033827	-5.88	<.0001	0.00007222	0.00007222
Prin7	1	-0.00111	0.00055634	-2.00	0.0529	0.00000832	0.00000832
Prin9	1	-0.00157	0.00095932	-1.64	0.1088	0.00000562	0.00000562
Prin11	1	0.00225	0.00150	1.50	0.1418	0.00000469	0.00000469
Prin13	1	0.00788	0.00233	3.39	0.0016	0.00002397	0.00002397
Prin15	1	-0.01886	0.00593	-3.18	0.0029	0.00002107	0.00002107

Durbin-Watson D	1.656
Number of Observations	50
1st Order Autocorrelation	0.143

Mean of Working Series	-499E-18
Standard Deviation	0.001276
Number of Observations	74
Embedded missing values in working series	24

Autocorrelations

```
Lag  Covariance  Correlation  -1 9 8 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 1    Std Error

  0  1.62798E-6      1.00000  |                    |********************|            0
  1  2.25012E-7      0.13822  |               .    |*** .               |     0.116248
  2  -1.6896E-7      -.10379  |               .  **|    .               |     0.118448
  3  -3.3862E-7      -.20800  |               .****|    .               |     0.119670
  4  -2.6485E-7      -.16269  |               . ***|    .               |     0.124460
  5  -2.2817E-7      -.14015  |               . ***|    .               |     0.127301
  6  -4.5817E-7      -.28143  |              ******|    .               |     0.129370
  7  -2.8259E-7      -.17358  |               . ***|    .               |     0.137394
  8  1.28371E-7      0.07885  |              .     |**   .              |     0.140326
  9  4.29783E-7      0.26400  |              .     |*****.              |     0.140924
 10  1.68818E-7      0.10370  |              .     |**   .              |     0.147456
 11  -6.5402E-7      -.40174  |            ********|     .              |     0.148438
 12  -2.6063E-7      -.16009  |              .  ***|     .              |     0.162468
```

"." marks two standard errors

Autocorrelation Check for White Noise

To Lag	Chi-Square	DF	Pr > ChiSq	Autocorrelations					
6	16.02	6	0.0137	0.138	-0.104	-0.208	-0.163	-0.140	-0.281
12	42.79	12	<.0001	-0.174	0.079	0.264	0.104	-0.402	-0.160

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   2.0 ^
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S      ,
t  1.5 ^
u      ,  S                                                       S       S       S
d      ,  S
e  1.0 ^  S       S                       S
n      ,                  S                                                       S
t      ,                                                                  S
i  0.5 ^                                                  S       S               S
z      ,                                          S               S               S
e      ,          S                                               S
d  0.0 ^          S                                       S
       ,                                  S       S               S               S
R      ,                          S       S
e -0.5 ^                  S                       S
s      ,  S                                       S
i      ,                  S       S       S               S
d -1.0 ^                                          S
u      ,                                                  S
a      ,                                                                  S
l -1.5 ^
       ,                                  S
       ,                                                  S
  -2.0 ^                  S
       ,          S
       ,
  -2.5 ^
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  -3.0 ^
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  -3.5 ^
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  -4.0 ^
       Šff^fffffff^fffffff^fffffff^fffffff^fffffff^fffffff^fffffff^fffffff^fffffff^ff
        1988    1989    1990    1991    1992    1993    1994    1995    1996    1997

                                             year

NOTE: 7 obs hidden.  30 obs out of range.
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R      ,PP P
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s      ,  PP
i      ,PPP
d -1.0 ˆP
u      , P
a      ,  P
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  -2.0 ˆ  P
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  -3.0 ˆ
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       ,
  -3.5 ˆ
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  -4.0 ˆ
       Šˆffffffffffffffˆffffffffffffffˆffffffffffffffˆffffffffffffffˆffffffffffffffˆf
      1.00           1.05           1.10           1.15           1.20           1.25

                               Predicted Value of TRI

NOTE: 30 obs had missing values.  9 obs hidden.
```

Dependent Variable: TRI

C(p) Selection Method

Number in Model	C(p)	R-Square	Variables in Model
8	7.8716	0.8914	Prin1 Prin2 Prin4 Prin5 Prin6 Prin7 Prin13 Prin15
8	9.0441	0.8882	Prin1 Prin2 Prin4 Prin5 Prin6 Prin9 Prin13 Prin15
8	9.4477	0.8871	Prin1 Prin2 Prin4 Prin5 Prin6 Prin11 Prin13 Prin15
7	9.4876	0.8816	Prin1 Prin2 Prin4 Prin5 Prin6 Prin13 Prin15
8	9.9267	0.8858	Prin1 Prin2 Prin4 Prin5 Prin6 Prin8 Prin13 Prin15
8	10.9776	0.8830	Prin1 Prin2 Prin3 Prin4 Prin5 Prin6 Prin13 Prin15
8	11.2962	0.8821	Prin1 Prin2 Prin4 Prin5 Prin6 Prin10 Prin13 Prin15
8	11.3816	0.8819	Prin1 Prin2 Prin4 Prin5 Prin6 Prin13 Prin14 Prin15
8	11.4678	0.8816	Prin1 Prin2 Prin4 Prin5 Prin6 Prin13 Prin15 Prin16
8	11.4876	0.8816	Prin1 Prin2 Prin4 Prin5 Prin6 Prin12 Prin13 Prin15
8	13.7587	0.8754	Prin1 Prin2 Prin5 Prin6 Prin7 Prin9 Prin13 Prin15
8	14.1623	0.8743	Prin1 Prin2 Prin5 Prin6 Prin7 Prin11 Prin13 Prin15
7	14.2022	0.8687	Prin1 Prin2 Prin5 Prin6 Prin7 Prin13 Prin15
8	14.5886	0.8731	Prin1 Prin2 Prin4 Prin5 Prin6 Prin7 Prin9 Prin13
8	14.6413	0.8730	Prin1 Prin2 Prin5 Prin6 Prin7 Prin8 Prin13 Prin15
8	14.9922	0.8720	Prin1 Prin2 Prin4 Prin5 Prin6 Prin7 Prin11 Prin13
7	15.0321	0.8665	Prin1 Prin2 Prin4 Prin5 Prin6 Prin7 Prin13
8	15.3348	0.8711	Prin1 Prin2 Prin5 Prin6 Prin9 Prin11 Prin13 Prin15
7	15.3747	0.8655	Prin1 Prin2 Prin5 Prin6 Prin9 Prin13 Prin15
8	15.4712	0.8707	Prin1 Prin2 Prin4 Prin5 Prin6 Prin7 Prin8 Prin13
8	15.6922	0.8701	Prin1 Prin2 Prin3 Prin5 Prin6 Prin7 Prin13 Prin15
7	15.7783	0.8644	Prin1 Prin2 Prin5 Prin6 Prin11 Prin13 Prin15
8	15.8138	0.8698	Prin1 Prin2 Prin5 Prin6 Prin8 Prin9 Prin13 Prin15
6	15.8182	0.8589	Prin1 Prin2 Prin5 Prin6 Prin13 Prin15

Dependent Variable: TRI

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	8	0.00075287	0.00009411	42.07	<.0001
Error	41	0.00009171	0.00000224		
Corrected Total	49	0.00084458			

Root MSE	0.00150	R-Square	0.8914
Dependent Mean	1.00478	Adj R-Sq	0.8702
Coeff Var	0.14885		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Type I SS	Type II SS
Intercept	1	1.00478	0.00021151	4750.46	<.0001	50.47914	50.47914
Prin1	1	0.00104	0.00006908	15.06	<.0001	0.00050756	0.00050756
Prin2	1	0.00077115	0.00013373	5.77	<.0001	0.00007438	0.00007438
Prin4	1	-0.00060529	0.00020681	-2.93	0.0056	0.00001916	0.00001916
Prin5	1	-0.00087968	0.00025711	-3.42	0.0014	0.00002618	0.00002618
Prin6	1	-0.00199	0.00035020	-5.68	<.0001	0.00007222	0.00007222
Prin7	1	-0.00111	0.00057595	-1.93	0.0608	0.00000832	0.00000832
Prin13	1	0.00788	0.00241	3.27	0.0022	0.00002397	0.00002397
Prin15	1	-0.01886	0.00614	-3.07	0.0038	0.00002107	0.00002107

Durbin-Watson D	1.653
Number of Observations	50
1st Order Autocorrelation	0.140

Mean of Working Series	-499E-18
Standard Deviation	0.001354
Number of Observations	74
Embedded missing values in working series	24

Autocorrelations

```
Lag  Covariance  Correlation  -1 9 8 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 1    Std Error

  0  1.83423E-6      1.00000  |                    |********************|            0
  1  2.31075E-7      0.12598  |               .    |*** .               |     0.116248
  2  -5.6734E-8      -.03093  |               .   *|    .               |     0.118078
  3  -3.0231E-8      -.01648  |               .    |    .               |     0.118188
  4  -5.7849E-7      -.31539  |              ******|    .               |     0.118219
  5  -3.6304E-7      -.19792  |               .****|    .               |     0.129089
  6  -2.7663E-7      -.15082  |               . ***|    .               |     0.133127
  7  -5.5813E-7      -.30428  |              ******|    .               |     0.135416
  8   -5.683E-8      -.03098  |              .    *|     .              |     0.144360
  9  2.90936E-7      0.15861  |              .     |***  .              |     0.144450
 10  3.89175E-7      0.21217  |              .     |**** .              |     0.146785
 11  -5.1281E-7      -.27958  |              ******|     .              |     0.150872
 12  -4.5353E-7      -.24726  |              .*****|     .              |     0.157718
```

"." marks two standard errors

Autocorrelation Check for White Noise

To Lag	Chi-Square	DF	Pr > ChiSq	Autocorrelations					
6	14.38	6	0.0256	0.126	-0.031	-0.016	-0.315	-0.198	-0.151
12	40.89	12	<.0001	-0.304	-0.031	0.159	0.212	-0.280	-0.247

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   4.0 ^
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   3.5 ^
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       ,
   3.0 ^
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       ,
   2.5 ^                          S
       ,
       ,
   2.0 ^
       ,
S      ,                                                                  S       S
t  1.5 ^
u      ,                                                          S               S
d      ,  S
e  1.0 ^  S       S
n      ,  S       S       S               S               S               S
t      ,  S
i  0.5 ^                  S                                               S
z      ,                                                  S       S               S
e      ,          S                               S
d  0.0 ^  S                               S                       S
       ,          S               S               S                               S
R      ,                          S               S
e -0.5 ^                          S
s      ,                  S                               S
i      ,                          S                       S       S
d -1.0 ^                  S               S                       S
u      ,                                          S
a      ,                                                  S
l -1.5 ^                                  S                               S
       ,
       ,
  -2.0 ^          S       S
       ,
       ,
  -2.5 ^
       ,
       ,
  -3.0 ^
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  -3.5 ^
       ,
       ,
  -4.0 ^
       Šff^fffffff^fffffff^fffffff^fffffff^fffffff^fffffff^fffffff^fffffff^fffffff^fffffff^ff
        1988    1989    1990    1991    1992    1993    1994    1995    1996    1997

                                            year

NOTE: 4 obs hidden.  30 obs out of range.
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   4.0 ˆ
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       ‚
   3.5 ˆ
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   3.0 ˆ
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   2.5 ˆ   P
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S      ‚ P  P
t  1.5 ˆ
u      ‚ P  P
d      ‚  P
e  1.0 ˆPP
n      ‚PPP
t      ‚ P
i  0.5 ˆP P
z      ‚P P
e      ‚   P
d  0.0 ˆPPP
       ‚PP P
R      ‚ P
e -0.5 ˆP
s      ‚PP
i      ‚ PP P
d -1.0 ˆPPPP
u      ‚P  P
a      ‚ P
l -1.5 ˆ PP
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  -2.0 ˆ  P
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  -2.5 ˆ
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  -3.0 ˆ
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  -3.5 ˆ
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  -4.0 ˆ
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      1.00           1.05           1.10           1.15           1.20           1.25

                                   Predicted Value of TRI

NOTE: 30 obs had missing values.  10 obs hidden.
```

APPENDIX U

CLUSTER 3

Bryan-College Station
Texarkana
Waco

Observations	30
Variables	16

Simple Statistics

	A_SING	B_MULTI	CNTYPOP	C_VACANT
Mean	0.033685642	0.010652935	0.077267204	0.0538120128
StD	1.016699281	1.017700260	1.033418121	0.9612281770

Simple Statistics

	D_FARM	EMPLOY	E_FARMIM	F_COMM
Mean	0.042840662	0.113241716	0.2612881260	0.000000000
StD	1.071445247	1.076550852	0.6772770445	1.000000000

Simple Statistics

	F_INDUS	INCOME	PERCAP	RETAIL
Mean	0.000000000	0.222944250	0.5775043627	0.119518138
StD	1.000000000	1.054821125	0.7618191723	1.010190610

Simple Statistics

	URBAREA	URBPOP	FWYLANMI	ARTLANMI
Mean	0.172499952	0.178434593	0.2277985351	0.199517801
StD	1.056918696	1.068622592	0.9344294803	1.164544052

Correlation Matrix

	A_SING	B_MULTI	CNTYPOP	C_VACANT	D_FARM	EMPLOY	E_FARMIM	F_COMM
A_SING	1.0000	0.5627	0.9353	0.9574	0.7640	0.8745	0.5634	0.9802
B_MULTI	0.5627	1.0000	0.7964	0.3567	-.0779	0.8313	0.1614	0.5089
CNTYPOP	0.9353	0.7964	1.0000	0.8075	0.4898	0.9826	0.3857	0.8751
C_VACANT	0.9574	0.3567	0.8075	1.0000	0.8891	0.7064	0.6030	0.9712
D_FARM	0.7640	-.0779	0.4898	0.8891	1.0000	0.3744	0.6678	0.8162
EMPLOY	0.8745	0.8313	0.9826	0.7064	0.3744	1.0000	0.3083	0.7930
E_FARMIM	0.5634	0.1614	0.3857	0.6030	0.6678	0.3083	1.0000	0.6843
F_COMM	0.9802	0.5089	0.8751	0.9712	0.8162	0.7930	0.6843	1.0000
F_INDUS	0.9234	0.6819	0.9038	0.8585	0.6300	0.8550	0.6665	0.9370
INCOME	0.4076	0.3917	0.4405	0.3724	0.1849	0.3879	0.2116	0.4010
PERCAP	0.0644	-.4217	-.0858	0.0864	0.3213	-.0487	0.1232	0.0491
RETAIL	0.8680	0.6240	0.9103	0.7209	0.4988	0.9362	0.3198	0.7819
URBAREA	0.9730	0.6826	0.9831	0.8776	0.6185	0.9529	0.4345	0.9193
URBPOP	0.9310	0.7739	0.9951	0.7979	0.4903	0.9876	0.3522	0.8614
FWYLANMI	0.9068	0.5432	0.8735	0.8194	0.6452	0.8418	0.5537	0.8755
ARTLANMI	0.4549	0.5300	0.5404	0.4190	0.1562	0.5248	0.0132	0.4163

Correlation Matrix

	F_INDUS	INCOME	PERCAP	RETAIL	URBAREA	URBPOP	FWYLANMI	ARTLANMI
A_SING	0.9234	0.4076	0.0644	0.8680	0.9730	0.9310	0.9068	0.4549
B_MULTI	0.6819	0.3917	-.4217	0.6240	0.6826	0.7739	0.5432	0.5300
CNTYPOP	0.9038	0.4405	-.0858	0.9103	0.9831	0.9951	0.8735	0.5404
C_VACANT	0.8585	0.3724	0.0864	0.7209	0.8776	0.7979	0.8194	0.4190
D_FARM	0.6300	0.1849	0.3213	0.4988	0.6185	0.4903	0.6452	0.1562
EMPLOY	0.8550	0.3879	-.0487	0.9362	0.9529	0.9876	0.8418	0.5248
E_FARMIM	0.6665	0.2116	0.1232	0.3198	0.4345	0.3522	0.5537	0.0132
F_COMM	0.9370	0.4010	0.0491	0.7819	0.9193	0.8614	0.8755	0.4163
F_INDUS	1.0000	0.4308	-.0324	0.7962	0.9135	0.8865	0.8543	0.4877
INCOME	0.4308	1.0000	0.0354	0.2610	0.4188	0.4117	0.5160	-.0314
PERCAP	-.0324	0.0354	1.0000	0.2600	0.0282	-.0201	0.2355	-.4334
RETAIL	0.7962	0.2610	0.2600	1.0000	0.9283	0.9404	0.8592	0.4055
URBAREA	0.9135	0.4188	0.0282	0.9283	1.0000	0.9857	0.8954	0.5247
URBPOP	0.8865	0.4117	-.0201	0.9404	0.9857	1.0000	0.8687	0.5404
FWYLANMI	0.8543	0.5160	0.2355	0.8592	0.8954	0.8687	1.0000	0.1157
ARTLANMI	0.4877	-.0314	-.4334	0.4055	0.5247	0.5404	0.1157	1.0000

Eigenvalues of the Correlation Matrix

	Eigenvalue	Difference	Proportion	Cumulative
1	10.6199035	8.3824738	0.6637	0.6637
2	2.2374297	1.0436046	0.1398	0.8036
3	1.1938251	0.2151264	0.0746	0.8782
4	0.9786987	0.4190281	0.0612	0.9394
5	0.5596706	0.2524769	0.0350	0.9743
6	0.3071937	0.2582238	0.0192	0.9935
7	0.0489699	0.0182988	0.0031	0.9966
8	0.0306711	0.0179914	0.0019	0.9985
9	0.0126798	0.0088433	0.0008	0.9993
10	0.0038365	0.0008257	0.0002	0.9996
11	0.0030108	0.0007218	0.0002	0.9997
12	0.0022890	0.0013718	0.0001	0.9999
13	0.0009173	0.0004204	0.0001	0.9999
14	0.0004969	0.0001693	0.0000	1.0000
15	0.0003276	0.0002480	0.0000	1.0000
16	0.0000796		0.0000	1.0000

Eigenvectors

	Prin1	Prin2	Prin3	Prin4	Prin5	Prin6
A_SING	0.302457	0.070356	-.069173	0.025967	0.088913	-.130424
B_MULTI	0.207371	-.434448	0.164140	-.156814	-.301981	0.099644
CNTYPOP	0.298255	-.139245	0.071984	0.041018	-.004613	-.096967
C_VACANT	0.277703	0.179073	-.214617	-.028809	0.264662	-.157938
D_FARM	0.203243	0.424732	-.307921	0.027483	0.248823	-.150453
EMPLOY	0.285370	-.185231	0.155164	0.133798	-.108392	-.032166
E_FARMIM	0.168279	0.327657	-.264872	-.395107	-.559247	0.356423
F_COMM	0.293985	0.127477	-.156138	-.087742	0.025547	-.056768
F_INDUS	0.293081	0.002370	-.086530	-.136496	-.158484	0.230918
INCOME	0.138152	0.014701	0.469061	-.604207	0.523318	0.268453
PERCAP	0.009183	0.485375	0.402248	0.444933	0.010385	0.516211
RETAIL	0.275455	-.019712	0.191925	0.370858	-.122672	0.032149
URBAREA	0.303253	-.044071	0.029105	0.100301	0.075301	-.060290
URBPOP	0.296606	-.128315	0.096720	0.122571	0.008496	-.054729
FWYLANMI	0.281060	0.142709	0.242384	-.041518	-.127067	-.278380
ARTLANMI	0.148586	-.376244	-.456627	0.209169	0.328238	0.554761

	Prin7	Prin8	Prin9	Prin10	Prin11	Prin12
A_SING	0.077189	0.167475	0.026766	0.077230	0.076902	-.021974
B_MULTI	-.238908	0.499260	0.003361	-.064094	0.118990	0.100261
CNTYPOP	0.118860	0.004120	0.094393	-.032899	-.034009	-.083999
C_VACANT	-.198515	0.284102	0.254098	0.217254	-.447972	-.481394
D_FARM	0.065032	-.059133	-.304562	0.086579	0.323380	0.250317
EMPLOY	0.227070	-.113450	-.026623	0.742456	0.114262	0.179185
E_FARMIM	0.411042	-.001685	0.100996	-.001573	-.113419	-.073008
F_COMM	-.163970	0.427781	-.089382	-.226623	0.347734	0.180300
F_INDUS	-.679514	-.448333	-.320592	0.097621	-.108179	-.037958
INCOME	0.158138	-.053493	-.097468	-.018194	0.059689	-.080211
PERCAP	-.160395	0.223870	0.149136	0.072350	-.053021	0.143967
RETAIL	0.228569	-.101577	-.381945	-.311019	0.184158	-.585234
URBAREA	0.146213	-.142076	-.042090	-.421131	-.531642	0.481536
URBPOP	0.146672	0.055017	-.113225	0.079656	-.250739	0.122217
FWYLANMI	-.132489	-.370849	0.650049	-.173849	0.304419	0.009862
ARTLANMI	0.081459	-.132486	0.310776	-.076155	0.191060	-.007372

	Prin13	Prin14	Prin15	Prin16
A_SING	-.100090	-.513288	0.088944	0.738049
B_MULTI	0.350767	0.324213	0.113907	0.199510
CNTYPOP	-.336500	0.305132	-.787436	0.128937
C_VACANT	0.214592	0.080607	0.045050	-.173348
D_FARM	0.230613	0.497337	0.038797	0.144672
EMPLOY	0.228076	-.201619	-.076712	-.263426
E_FARMIM	-.009993	0.020612	0.018482	-.006470
F_COMM	-.235766	-.347391	-.097421	-.502947
F_INDUS	-.098678	-.075185	-.047671	0.060687
INCOME	0.024680	-.013812	0.023650	-.025081
PERCAP	-.022683	0.043860	-.070651	0.060733
RETAIL	0.185295	-.039842	0.087766	-.089834
URBAREA	0.344728	-.152022	-.072813	-.058528
URBPOP	-.617672	0.290044	0.526295	-.063025
FWYLANMI	0.034292	0.075365	0.192724	-.043454
ARTLANMI	0.007041	0.021161	0.069641	-.011297

Dependent Variable: TRI

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	8	0.00701	0.00087564	26.47	<.0001
Error	21	0.00069477	0.00003308		
Corrected Total	29	0.00770			

Root MSE	0.00575	R-Square	0.9098
Dependent Mean	1.01207	Adj R-Sq	0.8754
Coeff Var	0.56833		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Type I SS	Type II SS
Intercept	1	1.01207	0.00105	963.74	<.0001	30.72837	30.72837
Prin1	1	-0.00160	0.00032776	-4.89	<.0001	0.00079052	0.00079052
Prin2	1	-0.00691	0.00071406	-9.67	<.0001	0.00310	0.00310
Prin6	1	-0.00476	0.00193	-2.47	0.0222	0.00020156	0.00020156
Prin7	1	0.01071	0.00483	2.22	0.0376	0.00016304	0.00016304
Prin8	1	0.05003	0.00610	8.20	<.0001	0.00223	0.00223
Prin9	1	-0.01800	0.00949	-1.90	0.0716	0.00011907	0.00011907
Prin14	1	0.14792	0.04791	3.09	0.0056	0.00031530	0.00031530
Prin16	1	-0.20185	0.11971	-1.69	0.1066	0.00009406	0.00009406

Durbin-Watson D	1.723
Number of Observations	30
1st Order Autocorrelation	0.126

Mean of Working Series	-196E-19
Standard Deviation	0.004812
Number of Observations	42
Embedded missing values in working series	12

```
                              Autocorrelations

Lag  Covariance  Correlation  -1 9 8 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 1    Std Error

  0  0.00002316      1.00000  |                    |********************|           0
  1  2.10945E-6      0.09109  |              .     |**   .              |    0.154303
  2  -7.6956E-6      -.33229  |             *******|     .              |    0.155578
  3  -6.0629E-6      -.26180  |             . *****|      .             |    0.171647
  4  -0.0000118      -.51005  |          **********|      .             |    0.180904
  5  4.57675E-7      0.01976  |            .       |       .            |    0.212402
  6  0.00001200      0.51817  |            .       |**********          |    0.212446
  7  5.70815E-6      0.24648  |          .         |*****    .          |    0.240663
  8  -3.3953E-6      -.14661  |          .      ***|         .          |    0.246600
  9  7.98826E-6      0.34493  |          .         |*******  .          |    0.248667
 10  -0.0000119      -.51593  |          **********|         .          |    0.259809
 11  -0.0000131      -.56498  |         ***********|          .         |    0.283154
 12  6.40051E-6      0.27637  |        .           |******     .        |    0.308831

                         "." marks two standard errors
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```
                       Autocorrelation Check for White Noise

 To       Chi-          Pr >
Lag     Square    DF    ChiSq    ------------------Autocorrelations-----------------

  6      35.18     6    <.0001    0.091    -0.332    -0.262    -0.510     0.020     0.518
 12      85.32    12    <.0001    0.246    -0.147     0.345    -0.516    -0.565     0.276
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   2.5 ˆ
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   2.0 ˆ
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S      ,                                                  S
t  1.5 ˆ
u      ,          S
d      ,                  S                       S
e  1.0 ˆ  S                       S                                       S
n      ,
t      ,                          S       S               S
i  0.5 ˆ
z      ,                  S                                               S
e      ,          S                                               S               S
d  0.0 ˆ                                          S
       ,                                                                          S
R      ,                                                                  S
e -0.5 ˆ          S               S       S                                       S
s      ,  S
i      ,
d -1.0 ˆ                  S                       S
u      ,                                                  S
a      ,
l -1.5 ˆ                                  S                       S
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  -2.0 ˆ
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  -2.5 ˆ
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  -3.0 ˆ
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  -3.5 ˆ
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  -4.0 ˆ
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        1988    1989    1990    1991    1992    1993    1994    1995    1996    1997

                                            year

NOTE: 1 obs hidden.  18 obs out of range.
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   4.0 ˆ
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   3.5 ˆ
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   3.0 ˆ
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   2.5 ˆ
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   2.0 ˆ
       ,
S      ,   P
t  1.5 ˆ
u      ,                   P
d      ,P
e  1.0 ˆP                  P
n      ,
t      ,PP
i  0.5 ˆ
z      , P    P
e      ,PP P  P
d  0.0 ˆ P
       ,      P
R      ,  P
e -0.5 ˆ  PP P
s      ,   P
i      ,
d -1.0 ˆ     P
u      ,   P
a      ,
l -1.5 ˆ    P P
       ,
       ,
  -2.0 ˆ
       ,
       ,
  -2.5 ˆ
       ,
       ,
  -3.0 ˆ
       ,    P
       ,
  -3.5 ˆ
       ,
       ,
  -4.0 ˆ
       Šˆfffffffffffffˆfffffffffffffˆfffffffffffffˆfffffffffffffˆfffffffffffffˆf
      1.00           1.05           1.10           1.15           1.20           1.25

                                   Predicted Value of TRI

NOTE: 18 obs had missing values.  4 obs hidden.  1 obs out of range.
```

Dependent Variable: TRI

C(p) Selection Method

Number in Model	C(p)	R-Square	Variables in Model
8	4.1410	0.9098	Prin1 Prin2 Prin6 Prin7 Prin8 Prin9 Prin14 Prin16
7	4.3263	0.8976	Prin1 Prin2 Prin6 Prin7 Prin8 Prin9 Prin14
8	4.7707	0.9062	Prin1 Prin2 Prin6 Prin7 Prin8 Prin9 Prin10 Prin14
7	4.9074	0.8943	Prin1 Prin2 Prin6 Prin7 Prin8 Prin14 Prin16
6	5.0927	0.8821	Prin1 Prin2 Prin6 Prin7 Prin8 Prin14
8	5.3518	0.9030	Prin1 Prin2 Prin6 Prin7 Prin8 Prin10 Prin14 Prin16
8	5.3825	0.9028	Prin1 Prin2 Prin5 Prin6 Prin7 Prin8 Prin9 Prin14
7	5.5371	0.8908	Prin1 Prin2 Prin6 Prin7 Prin8 Prin10 Prin14
7	5.9288	0.8886	Prin1 Prin2 Prin6 Prin8 Prin9 Prin14 Prin16
8	5.9636	0.8996	Prin1 Prin2 Prin5 Prin6 Prin7 Prin8 Prin14 Prin16
8	6.0152	0.8993	Prin1 Prin2 Prin6 Prin7 Prin8 Prin9 Prin12 Prin14
8	6.1105	0.8988	Prin1 Prin2 Prin6 Prin7 Prin8 Prin9 Prin13 Prin14
6	6.1141	0.8764	Prin1 Prin2 Prin6 Prin8 Prin9 Prin14
7	6.1489	0.8874	Prin1 Prin2 Prin5 Prin6 Prin7 Prin8 Prin14
8	6.2320	0.8981	Prin1 Prin2 Prin6 Prin7 Prin8 Prin9 Prin14 Prin15
8	6.3141	0.8976	Prin1 Prin2 Prin6 Prin7 Prin8 Prin9 Prin11 Prin14
8	6.3207	0.8976	Prin1 Prin2 Prin4 Prin6 Prin7 Prin8 Prin9 Prin14
8	6.3238	0.8976	Prin1 Prin2 Prin3 Prin6 Prin7 Prin8 Prin9 Prin14
8	6.3732	0.8973	Prin1 Prin2 Prin6 Prin8 Prin9 Prin10 Prin14 Prin16
7	6.5585	0.8851	Prin1 Prin2 Prin6 Prin8 Prin9 Prin10 Prin14
8	6.5933	0.8961	Prin1 Prin2 Prin5 Prin6 Prin7 Prin8 Prin10 Prin14
8	6.5963	0.8960	Prin1 Prin2 Prin6 Prin7 Prin8 Prin12 Prin14 Prin16
8	6.6915	0.8955	Prin1 Prin2 Prin6 Prin7 Prin8 Prin13 Prin14 Prin16
6	6.6952	0.8731	Prin1 Prin2 Prin6 Prin8 Prin14 Prin16
7	6.7816	0.8838	Prin1 Prin2 Prin6 Prin7 Prin8 Prin12 Prin14
8	6.8131	0.8948	Prin1 Prin2 Prin6 Prin7 Prin8 Prin14 Prin15 Prin16
7	6.8238	0.8836	Prin1 Prin2 Prin7 Prin8 Prin9 Prin14 Prin16
7	6.8768	0.8833	Prin1 Prin2 Prin6 Prin7 Prin8 Prin13 Prin14
5	6.8804	0.8609	Prin1 Prin2 Prin6 Prin8 Prin14

Dependent Variable: TRI

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	8	0.00701	0.00087564	26.47	<.0001
Error	21	0.00069477	0.00003308		
Corrected Total	29	0.00770			

Root MSE	0.00575	R-Square	0.9098
Dependent Mean	1.01207	Adj R-Sq	0.8754
Coeff Var	0.56833		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Type I SS	Type II SS
Intercept	1	1.01207	0.00105	963.74	<.0001	30.72837	30.72837
Prin1	1	-0.00160	0.00032776	-4.89	<.0001	0.00079052	0.00079052
Prin2	1	-0.00691	0.00071406	-9.67	<.0001	0.00310	0.00310
Prin6	1	-0.00476	0.00193	-2.47	0.0222	0.00020156	0.00020156
Prin7	1	0.01071	0.00483	2.22	0.0376	0.00016304	0.00016304
Prin8	1	0.05003	0.00610	8.20	<.0001	0.00223	0.00223
Prin9	1	-0.01800	0.00949	-1.90	0.0716	0.00011907	0.00011907
Prin14	1	0.14792	0.04791	3.09	0.0056	0.00031530	0.00031530
Prin16	1	-0.20185	0.11971	-1.69	0.1066	0.00009406	0.00009406

Durbin-Watson D	1.723
Number of Observations	30
1st Order Autocorrelation	0.126

Mean of Working Series	-196E-19
Standard Deviation	0.004812
Number of Observations	42
Embedded missing values in working series	12

```
                                Autocorrelations

Lag  Covariance  Correlation  -1 9 8 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 1    Std Error

  0  0.00002316      1.00000  |                    |********************|            0
  1  2.10945E-6      0.09109  |              .     |**   .              |     0.154303
  2  -7.6956E-6      -.33229  |             *******|     .              |     0.155578
  3  -6.0629E-6      -.26180  |             . *****|      .             |     0.171647
  4  -0.0000118      -.51005  |          **********|      .             |     0.180904
  5  4.57675E-7      0.01976  |            .       |       .            |     0.212402
  6  0.00001200      0.51817  |            .       |**********          |     0.212446
  7  5.70815E-6      0.24648  |          .         |*****    .          |     0.240663
  8  -3.3953E-6      -.14661  |          .      ***|         .          |     0.246600
  9  7.98826E-6      0.34493  |          .         |*******  .          |     0.248667
 10  -0.0000119      -.51593  |          **********|         .          |     0.259809
 11  -0.0000131      -.56498  |         ***********|          .         |     0.283154
 12  6.40051E-6      0.27637  |        .           |******     .        |     0.308831

                           "." marks two standard errors
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```
                     Autocorrelation Check for White Noise

 To        Chi-            Pr >
Lag      Square     DF    ChiSq    ------------------Autocorrelations-----------------

  6       35.18      6   <.0001     0.091    -0.332    -0.262    -0.510     0.020     0.518
 12       85.32     12   <.0001     0.246    -0.147     0.345    -0.516    -0.565     0.276
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   2.5 ˆ
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   2.0 ˆ
       ,
S      ,                                                  S
t  1.5 ˆ
u      ,          S
d      ,                  S                       S
e  1.0 ˆ  S                       S                                       S
n      ,
t      ,                          S       S               S
i  0.5 ˆ
z      ,                  S                                               S
e      ,          S                                               S               S
d  0.0 ˆ                                          S
       ,                                                                          S
R      ,                                                                  S
e -0.5 ˆ          S               S       S                                       S
s      ,  S
i      ,
d -1.0 ˆ                  S                       S
u      ,                                                  S
a      ,
l -1.5 ˆ                                  S                       S
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  -2.0 ˆ
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  -3.0 ˆ
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  -3.5 ˆ
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        1988    1989    1990    1991    1992    1993    1994    1995    1996    1997

                                            year

NOTE: 1 obs hidden.  18 obs out of range.
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   4.0 ˆ
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   2.5 ˆ
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   2.0 ˆ
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S      ,   P
t  1.5 ˆ
u      ,                   P
d      ,P
e  1.0 ˆP                  P
n      ,
t      ,PP
i  0.5 ˆ
z      , P    P
e      ,PP P  P
d  0.0 ˆ P
       ,      P
R      ,  P
e -0.5 ˆ  PP P
s      ,   P
i      ,
d -1.0 ˆ     P
u      ,   P
a      ,
l -1.5 ˆ    P P
       ,
       ,
  -2.0 ˆ
       ,
       ,
  -2.5 ˆ
       ,
       ,
  -3.0 ˆ
       ,    P
       ,
  -3.5 ˆ
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       ,
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      1.00           1.05           1.10           1.15           1.20           1.25

                                 Predicted Value of TRI

NOTE: 18 obs had missing values.  4 obs hidden.  1 obs out of range.
```

APPENDIX V

CLUSTER 4
Denton
Sherman-Denison
Tyler

Observations	19
Variables	16

Simple Statistics

	A_SING	B_MULTI	CNTYPOP	C_VACANT
Mean	0.134520634	0.455058731	0.293441499	-0.557321885
StD	1.170422170	1.176910586	1.375446219	1.003994660

Simple Statistics

	D_FARM	EMPLOY	E_FARMIM	F_COMM
Mean	-0.360385173	-0.008433870	0.2386799287	-0.364744771
StD	1.265650847	1.270257907	0.7771251401	1.068277296

Simple Statistics

	F_INDUS	INCOME	PERCAP	RETAIL
Mean	0.3597975115	0.415940042	0.5470103713	0.014865189
StD	0.9030703291	1.339534255	0.8158462428	1.253255893

Simple Statistics

	URBAREA	URBPOP	FWYLANMI	ARTLANMI
Mean	0.6412132694	-.0731373841	0.5494284222	-.6386838571
StD	0.9343794815	0.5027367748	0.9117444304	0.1891918606

Correlation Matrix

	A_SING	B_MULTI	CNTYPOP	C_VACANT	D_FARM	EMPLOY	E_FARMIM	F_COMM
A_SING	1.0000	-.9492	0.9999	0.7832	-.9040	0.9854	-.3503	0.9973
B_MULTI	-.9492	1.0000	-.9491	-.8450	0.8014	-.8832	0.4202	-.9443
CNTYPOP	0.9999	-.9491	1.0000	0.7835	-.9080	0.9854	-.3540	0.9970
C_VACANT	0.7832	-.8450	0.7835	1.0000	-.6852	0.7281	-.0821	0.7593
D_FARM	-.9040	0.8014	-.9080	-.6852	1.0000	-.9245	0.4016	-.8957
EMPLOY	0.9854	-.8832	0.9854	0.7281	-.9245	1.0000	-.2883	0.9830
E_FARMIM	-.3503	0.4202	-.3540	-.0821	0.4016	-.2883	1.0000	-.3374
F_COMM	0.9973	-.9443	0.9970	0.7593	-.8957	0.9830	-.3374	1.0000
F_INDUS	0.7417	-.6753	0.7407	0.3123	-.6928	0.7409	-.4899	0.7566
INCOME	0.9781	-.8657	0.9785	0.7185	-.9264	0.9977	-.2599	0.9775
PERCAP	0.6844	-.4422	0.6845	0.2134	-.7225	0.7808	-.1297	0.7023
RETAIL	0.9027	-.7233	0.9029	0.5912	-.8984	0.9612	-.1665	0.9024
URBAREA	-.7058	0.8777	-.7046	-.8090	0.5416	-.5907	0.4265	-.6903
URBPOP	-.4199	0.6592	-.4203	-.6487	0.3191	-.2816	0.4395	-.4027
FWYLANMI	-.6757	0.8303	-.6763	-.8488	0.5722	-.5729	0.3407	-.6548
ARTLANMI	0.9749	-.8736	0.9740	0.6680	-.8705	0.9850	-.3125	0.9769

Correlation Matrix

	F_INDUS	INCOME	PERCAP	RETAIL	URBAREA	URBPOP	FWYLANMI	ARTLANMI
A_SING	0.7417	0.9781	0.6844	0.9027	-.7058	-.4199	-.6757	0.9749
B_MULTI	-.6753	-.8657	-.4422	-.7233	0.8777	0.6592	0.8303	-.8736
CNTYPOP	0.7407	0.9785	0.6845	0.9029	-.7046	-.4203	-.6763	0.9740
C_VACANT	0.3123	0.7185	0.2134	0.5912	-.8090	-.6487	-.8488	0.6680
D_FARM	-.6928	-.9264	-.7225	-.8984	0.5416	0.3191	0.5722	-.8705
EMPLOY	0.7409	0.9977	0.7808	0.9612	-.5907	-.2816	-.5729	0.9850
E_FARMIM	-.4899	-.2599	-.1297	-.1665	0.4265	0.4395	0.3407	-.3125
F_COMM	0.7566	0.9775	0.7023	0.9024	-.6903	-.4027	-.6548	0.9769
F_INDUS	1.0000	0.7261	0.7072	0.6858	-.4522	-.2355	-.3409	0.7590
INCOME	0.7261	1.0000	0.8002	0.9707	-.5529	-.2412	-.5435	0.9838
PERCAP	0.7072	0.8002	1.0000	0.8952	-.0064	0.3102	0.0431	0.7998
RETAIL	0.6858	0.9707	0.8952	1.0000	-.3551	-.0254	-.3554	0.9476
URBAREA	-.4522	-.5529	-.0064	-.3551	1.0000	0.9264	0.9419	-.5561
URBPOP	-.2355	-.2412	0.3102	-.0254	0.9264	1.0000	0.8905	-.2284
FWYLANMI	-.3409	-.5435	0.0431	-.3554	0.9419	0.8905	1.0000	-.5093
ARTLANMI	0.7590	0.9838	0.7998	0.9476	-.5561	-.2284	-.5093	1.0000

Eigenvalues of the Correlation Matrix

	Eigenvalue	Difference	Proportion	Cumulative
1	11.3729090	8.5203422	0.7108	0.7108
2	2.8525668	1.7242637	0.1783	0.8891
3	1.1283031	0.7927506	0.0705	0.9596
4	0.3355525	0.1680423	0.0210	0.9806
5	0.1675101	0.1057625	0.0105	0.9911
6	0.0617476	0.0134447	0.0039	0.9949
7	0.0483030	0.0281101	0.0030	0.9979
8	0.0201928	0.0127298	0.0013	0.9992
9	0.0074630	0.0049936	0.0005	0.9997
10	0.0024694	0.0005907	0.0002	0.9998
11	0.0018786	0.0012348	0.0001	0.9999
12	0.0006439	0.0003482	0.0000	1.0000
13	0.0002956	0.0001815	0.0000	1.0000
14	0.0001141	0.0000699	0.0000	1.0000
15	0.0000442	0.0000380	0.0000	1.0000
16	0.0000062		0.0000	1.0000

Eigenvectors

	Prin1	Prin2	Prin3	Prin4	Prin5	Prin6
A_SING	0.295347	0.027782	0.036138	0.012077	0.151330	-.055212
B_MULTI	-.283676	0.146979	-.004444	-.111820	-.275614	-.050235
CNTYPOP	0.295450	0.027663	0.033937	-.001277	0.137821	-.053653
C_VACANT	0.235337	-.223504	0.395178	-.177836	-.096344	0.729530
D_FARM	-.272776	-.087969	0.039509	0.403773	0.649920	0.043700
EMPLOY	0.289587	0.115470	0.064472	-.044093	0.041477	-.094261
E_FARMIM	-.116380	0.138425	0.790568	0.477268	-.202199	-.149403
F_COMM	0.293992	0.041745	0.030083	0.073079	0.167420	-.121115
F_INDUS	0.224675	0.133971	-.407529	0.684718	-.367865	0.160675
INCOME	0.286657	0.137922	0.086619	-.073149	0.030390	-.079910
PERCAP	0.195087	0.439369	-.063143	0.047024	-.092152	0.120018
RETAIL	0.261992	0.258616	0.111402	-.149722	-.069255	-.097565
URBAREA	-.218549	0.388394	0.015565	-.204310	-.117697	-.068187
URBPOP	-.139660	0.510640	0.091707	-.116948	0.203916	-.053898
FWYLANMI	-.210224	0.395097	-.104191	0.046568	0.193868	0.589439
ARTLANMI	0.283847	0.142571	0.015776	0.034863	0.370504	-.020792

	Prin7	Prin8	Prin9	Prin10	Prin11	Prin12
A_SING	0.003184	-.053236	-.070358	0.054152	0.130964	0.115569
B_MULTI	0.021414	0.521748	0.106007	0.321924	-.178217	0.470389
CNTYPOP	0.004961	-.106428	-.083918	0.006901	0.186930	-.072541
C_VACANT	0.356432	0.050784	0.163494	0.056857	-.033001	0.048461
D_FARM	0.177711	0.304863	0.321045	0.217220	0.185696	-.129464
EMPLOY	-.002927	0.291062	-.026360	-.142285	0.271813	0.381084
E_FARMIM	-.156089	-.096319	-.106315	-.027229	-.056111	-.005762
F_COMM	-.105757	-.332503	0.210457	0.333751	0.056111	0.556273
F_INDUS	0.340927	0.024536	-.117357	0.056833	0.026292	0.015148
INCOME	0.014376	0.008402	0.030942	0.197844	0.274835	-.187675
PERCAP	-.317558	0.050649	0.712615	-.238915	-.170949	-.181059
RETAIL	-.038246	0.489191	-.231451	0.248789	0.144260	-.374517
URBAREA	0.339007	-.401230	0.120257	0.512299	0.027955	-.178766
URBPOP	0.505999	-.023431	-.091239	-.512342	0.078196	0.182932
FWYLANMI	-.457972	-.083543	-.369228	0.103274	0.152802	0.108131
ARTLANMI	0.076695	0.049848	-.235468	0.116759	-.802427	-.026424

	Prin13	Prin14	Prin15	Prin16
A_SING	-.118126	0.639033	0.187787	-.621113
B_MULTI	0.189421	0.152337	0.324145	0.046670
CNTYPOP	0.324687	0.428619	0.264528	0.686411
C_VACANT	-.041846	-.003056	0.001211	0.024270
D_FARM	0.000343	0.024130	-.046394	0.014123
EMPLOY	0.301302	-.006239	-.685811	-.012985
E_FARMIM	0.036864	0.029057	-.013749	-.006906
F_COMM	-.401709	-.273594	0.092242	0.167743
F_INDUS	-.009141	-.024613	0.007420	0.003434
INCOME	0.500994	-.500635	0.366236	-.302902
PERCAP	-.007036	0.097127	-.001982	-.000050
RETAIL	-.525090	-.049320	-.035210	0.136509
URBAREA	0.101136	0.175481	-.337845	-.013263
URBPOP	-.151555	-.105084	0.227140	0.024143
FWYLANMI	0.049947	-.016398	-.002101	-.011635
ARTLANMI	0.164140	-.056339	-.085667	-.021155

Dependent Variable: TRI

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	13	0.01518	0.00117	1449.46	<.0001
Error	5	0.00000403	8.056544E-7		
Corrected Total	18	0.01518			

Root MSE	0.00089758	R-Square	0.9997
Dependent Mean	1.02405	Adj R-Sq	0.9990
Coeff Var	0.08765		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Type I SS	Type II SS
Intercept	1	1.02405	0.00020592	4973.07	<.0001	19.92499	19.92499
Prin1	1	0.00807	0.00006273	128.68	<.0001	0.01334	0.01334
Prin2	1	0.00442	0.00012526	35.25	<.0001	0.00100	0.00100
Prin3	1	0.00420	0.00019917	21.09	<.0001	0.00035840	0.00035840
Prin4	1	-0.00611	0.00036522	-16.74	<.0001	0.00022580	0.00022580
Prin5	1	0.00135	0.00051691	2.61	0.0480	0.00000547	0.00000547
Prin7	1	0.00535	0.00096261	5.56	0.0026	0.00002487	0.00002487
Prin8	1	0.01308	0.00149	8.78	0.0003	0.00006214	0.00006214
Prin9	1	-0.02171	0.00245	-8.86	0.0003	0.00006329	0.00006329
Prin10	1	-0.01895	0.00426	-4.45	0.0067	0.00001597	0.00001597
Prin11	1	0.02194	0.00488	4.49	0.0064	0.00001627	0.00001627
Prin12	1	-0.03963	0.00834	-4.75	0.0051	0.00001820	0.00001820
Prin13	1	0.09098	0.01230	7.39	0.0007	0.00004404	0.00004404

Durbin-Watson D	2.328
Number of Observations	19
1st Order Autocorrelation	-0.171

Mean of Working Series	-231E-18
Standard Deviation	0.00046
Number of Observations	26
Embedded missing values in working series	7

```
                              Autocorrelations

Lag  Covariance  Correlation  -1 9 8 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 1    Std Error

  0  2.12014E-7      1.00000  |                    |********************|           0
  1  -4.7417E-8      -.22365  |            .   ****|       .            |    0.196116
  2  -8.2368E-8      -.38850  |            ********|       .            |    0.205692
  3  -4.7178E-9      -.02225  |           .        |        .           |    0.232205
  4  -7.9147E-8      -.37331  |           . *******|        .           |    0.232287
  5  1.30276E-7      0.61447  |          .         |************        |    0.254318
  6  -2.3947E-8      -.11295  |        .         **|           .        |    0.306140
  7  -6.0462E-8      -.28518  |        .     ******|           .        |    0.307738
  8  2.63279E-8      0.12418  |       .            |**           .      |    0.317740
  9  -2.4984E-8      -.11784  |       .          **|            .       |    0.319601
 10  4.05841E-8      0.19142  |       .            |****        .       |    0.321268
 11  5.80492E-9      0.02738  |       .            |*           .       |    0.325625
 12  -3.7417E-9      -.01765  |       .            |            .       |    0.325714

                        "." marks two standard errors


                   Autocorrelation Check for White Noise

 To       Chi-          Pr >
Lag     Square    DF    ChiSq   ------------------Autocorrelations-----------------

  6      24.22     6   0.0005   -0.224   -0.389   -0.022   -0.373    0.614   -0.113
 12      30.27    12   0.0025   -0.285    0.124   -0.118    0.191    0.027   -0.018
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   3.5 ˆ
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   3.0 ˆ
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   2.5 ˆ
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   2.0 ˆ                  S
       ,
S      ,
t  1.5 ˆ
u      ,                          S
d      ,                                                          S
e  1.0 ˆ
n      ,
t      ,
i  0.5 ˆ          S
z      ,
e      ,                                  S                       S       S
d  0.0 ˆ                                  S               S                       S
       ,                  S
R      ,
e -0.5 ˆ  S
s      ,          S                               S       S               S
i      ,
d -1.0 ˆ
u      ,  S                                                                       S
a      ,                          S
l -1.5 ˆ
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  -2.5 ˆ
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  -3.0 ˆ
       ,
       ,
  -3.5 ˆ
       ,
       ,
  -4.0 ˆ
       Šffˆfffffffˆfffffffˆfffffffˆfffffffˆfffffffˆfffffffˆfffffffˆfffffffˆfffffffˆff
        1988    1989    1990    1991    1992    1993    1994    1995    1996    1997

                                              year
```

NOTE: 11 obs had missing values. 18 obs out of range.

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       ,
   4.0 ˆ
       ,
       ,
   3.5 ˆ
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   3.0 ˆ
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       ,
   2.5 ˆ
       ,
       ,
   2.0 ˆP
       ,
S      ,
t  1.5 ˆ
u      ,           P
d      ,P
e  1.0 ˆ
n      ,
t      ,
i  0.5 ˆ P
z      ,
e      ,P                  P P
d  0.0 ˆP          P        P
       ,           P
R      ,
e -0.5 ˆ       P
s      ,P       P
i      ,
d -1.0 ˆ
u      , P                         P
a      ,P
l -1.5 ˆ
       ,
       ,
  -2.0 ˆ
       ,
       ,
  -2.5 ˆ
       ,
       ,
  -3.0 ˆ
       ,
       ,
  -3.5 ˆ
       ,
       ,
  -4.0 ˆ
       Šˆƒƒƒƒƒƒƒƒƒƒƒƒƒƒˆƒƒƒƒƒƒƒƒƒƒƒƒƒƒˆƒƒƒƒƒƒƒƒƒƒƒƒƒƒˆƒƒƒƒƒƒƒƒƒƒƒƒƒƒˆƒƒƒƒƒƒƒƒƒƒƒƒƒƒˆƒ
      1.00           1.05           1.10           1.15           1.20           1.25

                                   Predicted Value of TRI

NOTE: 29 obs had missing values.  2 obs hidden.
```

Dependent Variable: TRI

C(p) Selection Method

Number in Model	C(p)	R-Square	Variables in Model
8	103.8145	0.9957	Prin1 Prin2 Prin3 Prin4 Prin7 Prin8 Prin9 Prin13
8	114.5234	0.9953	Prin1 Prin2 Prin3 Prin4 Prin8 Prin9 Prin12 Prin13
8	117.6188	0.9951	Prin1 Prin2 Prin3 Prin4 Prin8 Prin9 Prin11 Prin13
8	118.1100	0.9951	Prin1 Prin2 Prin3 Prin4 Prin8 Prin9 Prin10 Prin13
8	134.9580	0.9944	Prin1 Prin2 Prin3 Prin4 Prin5 Prin8 Prin9 Prin13
8	135.1048	0.9944	Prin1 Prin2 Prin3 Prin4 Prin8 Prin9 Prin13 Prin15
8	140.9589	0.9942	Prin1 Prin2 Prin3 Prin4 Prin8 Prin9 Prin13 Prin16
7	141.7329	0.9941	Prin1 Prin2 Prin3 Prin4 Prin8 Prin9 Prin13
8	142.0429	0.9941	Prin1 Prin2 Prin3 Prin4 Prin8 Prin9 Prin13 Prin14
8	143.7318	0.9941	Prin1 Prin2 Prin3 Prin4 Prin6 Prin8 Prin9 Prin13
8	145.2927	0.9940	Prin1 Prin2 Prin3 Prin4 Prin7 Prin8 Prin9 Prin12
8	148.3882	0.9939	Prin1 Prin2 Prin3 Prin4 Prin7 Prin8 Prin9 Prin11
8	148.8793	0.9939	Prin1 Prin2 Prin3 Prin4 Prin7 Prin8 Prin9 Prin10
8	159.0971	0.9934	Prin1 Prin2 Prin3 Prin4 Prin8 Prin9 Prin11 Prin12
8	159.5882	0.9934	Prin1 Prin2 Prin3 Prin4 Prin8 Prin9 Prin10 Prin12
8	162.6836	0.9933	Prin1 Prin2 Prin3 Prin4 Prin8 Prin9 Prin10 Prin11
8	165.7274	0.9932	Prin1 Prin2 Prin3 Prin4 Prin5 Prin7 Prin8 Prin9
8	165.8742	0.9932	Prin1 Prin2 Prin3 Prin4 Prin7 Prin8 Prin9 Prin15
8	171.7283	0.9929	Prin1 Prin2 Prin3 Prin4 Prin7 Prin8 Prin9 Prin16
7	172.5022	0.9928	Prin1 Prin2 Prin3 Prin4 Prin7 Prin8 Prin9
8	172.8122	0.9929	Prin1 Prin2 Prin3 Prin4 Prin7 Prin8 Prin9 Prin14
8	174.3319	0.9928	Prin1 Prin2 Prin3 Prin4 Prin7 Prin9 Prin12 Prin13
8	174.5012	0.9928	Prin1 Prin2 Prin3 Prin4 Prin6 Prin7 Prin8 Prin9
8	176.1881	0.9927	Prin1 Prin2 Prin3 Prin4 Prin7 Prin8 Prin12 Prin13
8	176.4363	0.9927	Prin1 Prin2 Prin3 Prin4 Prin5 Prin8 Prin9 Prin12
8	176.5831	0.9927	Prin1 Prin2 Prin3 Prin4 Prin8 Prin9 Prin12 Prin15
8	177.4273	0.9927	Prin1 Prin2 Prin3 Prin4 Prin7 Prin9 Prin11 Prin13
8	177.9184	0.9927	Prin1 Prin2 Prin3 Prin4 Prin7 Prin9 Prin10 Prin13
8	179.2836	0.9926	Prin1 Prin2 Prin3 Prin4 Prin7 Prin8 Prin11 Prin13
8	179.5317	0.9926	Prin1 Prin2 Prin3 Prin4 Prin5 Prin8 Prin9 Prin11
8	179.6785	0.9926	Prin1 Prin2 Prin3 Prin4 Prin8 Prin9 Prin11 Prin15
8	179.7747	0.9926	Prin1 Prin2 Prin3 Prin4 Prin7 Prin8 Prin10 Prin13
8	180.0228	0.9926	Prin1 Prin2 Prin3 Prin4 Prin5 Prin8 Prin9 Prin10
8	180.1696	0.9926	Prin1 Prin2 Prin3 Prin4 Prin8 Prin9 Prin10 Prin15
8	182.4372	0.9925	Prin1 Prin2 Prin3 Prin4 Prin8 Prin9 Prin12 Prin16
7	183.2112	0.9924	Prin1 Prin2 Prin3 Prin4 Prin8 Prin9 Prin12
8	183.5211	0.9924	Prin1 Prin2 Prin3 Prin4 Prin8 Prin9 Prin12 Prin14
8	185.2101	0.9924	Prin1 Prin2 Prin3 Prin4 Prin6 Prin8 Prin9 Prin12
8	185.5326	0.9923	Prin1 Prin2 Prin3 Prin4 Prin8 Prin9 Prin11 Prin16
8	186.0237	0.9923	Prin1 Prin2 Prin3 Prin4 Prin8 Prin9 Prin10 Prin16
7	186.3066	0.9922	Prin1 Prin2 Prin3 Prin4 Prin8 Prin9 Prin11
8	186.6165	0.9923	Prin1 Prin2 Prin3 Prin4 Prin8 Prin9 Prin11 Prin14
7	186.7977	0.9922	Prin1 Prin2 Prin3 Prin4 Prin8 Prin9 Prin10
8	187.1077	0.9923	Prin1 Prin2 Prin3 Prin4 Prin8 Prin9 Prin10 Prin14
8	188.1362	0.9922	Prin1 Prin2 Prin3 Prin4 Prin9 Prin11 Prin12 Prin13
8	188.3055	0.9922	Prin1 Prin2 Prin3 Prin4 Prin6 Prin8 Prin9 Prin11
8	188.6274	0.9922	Prin1 Prin2 Prin3 Prin4 Prin9 Prin10 Prin12 Prin13
8	188.7966	0.9922	Prin1 Prin2 Prin3 Prin4 Prin6 Prin8 Prin9 Prin10
8	189.9925	0.9922	Prin1 Prin2 Prin3 Prin4 Prin8 Prin11 Prin12 Prin13

Dependent Variable: TRI

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	8	0.01512	0.00189	289.39	<.0001
Error	10	0.00006531	0.00000653		
Corrected Total	18	0.01518			

Root MSE	0.00256	R-Square	0.9957
Dependent Mean	1.02405	Adj R-Sq	0.9923
Coeff Var	0.24955		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Type I SS	Type II SS
Intercept	1	1.02405	0.00058628	1746.69	<.0001	19.92499	19.92499
Prin1	1	0.00807	0.00017861	45.20	<.0001	0.01334	0.01334
Prin2	1	0.00442	0.00035664	12.38	<.0001	0.00100	0.00100
Prin3	1	0.00420	0.00056707	7.41	<.0001	0.00035840	0.00035840
Prin4	1	-0.00611	0.00104	-5.88	0.0002	0.00022580	0.00022580
Prin7	1	0.00535	0.00274	1.95	0.0795	0.00002487	0.00002487
Prin8	1	0.01308	0.00424	3.08	0.0116	0.00006214	0.00006214
Prin9	1	-0.02171	0.00697	-3.11	0.0110	0.00006329	0.00006329
Prin13	1	0.09098	0.03503	2.60	0.0266	0.00004404	0.00004404

Durbin-Watson D	2.380
Number of Observations	19
1st Order Autocorrelation	-0.220

Mean of Working Series	-236E-18
Standard Deviation	0.001854
Number of Observations	26
Embedded missing values in working series	7

Autocorrelations

```
Lag  Covariance  Correlation  -1 9 8 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 1    Std Error

  0  3.43726E-6      1.00000  |                    |********************|            0
  1  -4.9353E-7      -.14358  |            .    ***|       .            |     0.196116
  2  -2.4808E-6      -.72175  |      **************|       .            |     0.200118
  3  2.58531E-7      0.07521  |         .          |**        .         |     0.283051
  4  1.43535E-6      0.41758  |         .          |********  .         |     0.283819
  5  4.05111E-7      0.11786  |        .           |**         .        |     0.306540
  6   -1.559E-6      -.45355  |        .  *********|           .        |     0.308278
  7  -3.6492E-7      -.10617  |       .          **|            .       |     0.332954
  8   5.0942E-7      0.14821  |       .            |***         .       |     0.334254
  9  2.33076E-7      0.06781  |       .            |*           .       |     0.336772
 10  -1.6756E-6      -.48748  |       .  **********|            .       |     0.337297
 11  -2.1259E-7      -.06185  |     .             *|              .     |     0.363385
 12  2.68207E-6      0.78029  |     .              |****************    |     0.363790
```

"." marks two standard errors

Autocorrelation Check for White Noise

To Lag	Chi-Square	DF	Pr > ChiSq	------------------Autocorrelations-----------------					
6	30.32	6	<.0001	-0.144	-0.722	0.075	0.418	0.118	-0.454
12	74.50	12	<.0001	-0.106	0.148	0.068	-0.487	-0.062	0.780

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   2.0 ˆ
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S      ,                  S
t  1.5 ˆ                          S                       S
u      ,
d      ,
e  1.0 ˆ
n      ,                                                          S
t      ,
i  0.5 ˆ                          S                       S
z      ,                  S               S                               S
e      ,
d  0.0 ˆ                                                          S
       ,          S
R      ,  S                                       S
e -0.5 ˆ                                                                  S
s      ,
i      ,                                                                          S
d -1.0 ˆ
u      ,  S       S                                                               S
a      ,
l -1.5 ˆ
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  -2.0 ˆ                                  S
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        1988    1989    1990    1991    1992    1993    1994    1995    1996    1997

                                          year

NOTE: 11 obs had missing values.  18 obs out of range.
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   4.0 ˆ
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   3.5 ˆ
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   3.0 ˆ
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   2.5 ˆ
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       ,
   2.0 ˆ
       ,
S      ,         P
t  1.5 ˆ          P        P
u      ,
d      ,
e  1.0 ˆ
n      ,                   P
t      ,
i  0.5 ˆP
z      ,P
e      ,
d  0.0 ˆP
       , P
R      ,P      P
e -0.5 ˆ                     P
s      ,
i      ,                           P
d -1.0 ˆ
u      , P      P
a      ,
l -1.5 ˆ
       ,
       ,
  -2.0 ˆ            P
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  -2.5 ˆ
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  -3.0 ˆ
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  -3.5 ˆ
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       ,
  -4.0 ˆ
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      1.00           1.05           1.10           1.15           1.20           1.25

                                   Predicted Value of TRI

NOTE: 29 obs had missing values.  4 obs hidden.
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