HOW MACROECONOMIC VARIABLES AFFECT THE PUERTO RICO'S STOCK INDEX

by

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Resumen

Los efectos de variables macroeconómicas de Puerto Rico y Estados Unidos en el Índice Accionario de Puerto Rico (PRSI) fueron investigados utilizando un modelo de vector de corrección del error (VEC) para el periodo entre enero de 1996 y junio de 2010. El análisis permite determinar que existe una relación positiva y significativa entre el Indicador de Actividad Económica (EAI) de Puerto Rico y el PRSI, mientras que los precios del crudo demostraron una relación negativa y significativa con el Índice. El análisis de impulso respuesta se utilizó para determinar la relación entre las variables analizadas y el PRSI. Basado en este análisis se concluye que aumentos en el Índice de Actividad Económica (EAI), la cantidad de permisos de construcción privados y las exportaciones aumentan el PRSI, mientras que aumentos en la inflación de Puerto Rico y Estados Unidos, la cantidad de quiebras y los precios del crudo disminuyen el PRSI.

Abstract

The effects of macroeconomic variables of Puerto Rico and the United States in the Puerto Rico Stock Index (PRSI) were investigated using a Vector Error Correction model for the period between January 1996 and June 2010. The analysis led to the finding that there is a positive and significant relationship between Puerto Rico's Economic Activity Index and the PRSI, while crude oil prices showed a negative and significant relation with the Index. The impulse response analysis was employed to determine the type of relationship between all variables and the PRSI. Based on this analysis, we concluded that increases in the Economic Activity Index, the amount of private construction permits, and exports increased the Puerto Rico Stock Index, while increases in levels of inflation (both in Puerto Rico and the United States), the amount of bankruptcies, and crude oil prices decreased the PRSI.

To my sister Ileana…

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List of Abbreviations

AC	Autocorrelation
ADF	Augmented Dickey Fuller
AIC	Akaike Information Criterion
CPI	Consumer Price Index
GDB	Government Development Bank for Puerto Rico
GDP	Gross Domestic Product of United States
EAI	Economic Activity Index
FDIC	Federal Deposit Insurance Corporation
FPE	Final Prediction Error
GIRFs	Generalized Impulse Response Functions
HQ	Hannan-Quinn Information Criterion
IRF	Impulse Response Function
KPSS	Kwiatkowski-Phillips-Schmidt-Shin
LR	Likelihood Ratio
NYSE	New York Stock Exchange
NASDAQ	National Association of Securities Dealers Automated Quotation
OLS	Ordinary Least Squares
PAC	Partial Autocorrelation
PPI	Producer Price Index
PR	Puerto Rico
PRSI	Puerto Rico Stock Index
RSS	Residual Sums of Square
SC	Schwarz Information Criterion
S&P 500	Standard & Poor 500 Index
US	United States
VAR	Vector Autoregressive Model
VECM	Vector Error Correction Model

Chapter 1: Introduction

1.1 Introduction

The Puerto Rico Stock Index (PRSI) was created by the Government Development Bank for Puerto Rico to capture the total return history of all publicly traded stocks of corporations headquartered on the Island (Collins, Bosworth & Soto-Class 2006). It is a capitalization-weighted index composed of five companies as of June 30, 2010 (See Table 2.1 in Chapter 2, Section 2.2) with their main core of business in the financial and health care insurance industries. This index contains crucial data pertaining to the Puerto Rican publicly traded corporations traded in national stock exchanges (NYSE) and over the counter markets, which have rarely been studied from the macroeconomic perspective. This research will focus on how macroeconomic variables of Puerto Rico and the United States could affect the value of the PRSI.

This investigation aims to present to future foreign and local investors a tool to evaluate and forecast what impact, if any, economic changes have in the value of the PRSI and the price of its stocks. Another contribution is to offer investors information about local companies as a viable option to invest. This study may also serve as forerunner of future research on Puerto Rico as a viable investment market—a basis for persuading local companies to publicly trade their stock in an open market. It would give companies an opportunity to increase capital, which could potentially be invested in new lines of business; in addition, it would help counteract the effect of the economic crisis that started in 2008.

1.2 Justification

The study of the stock market and the economy has been one of the major topics in forums around the world. The reason is that because this subject represents the well-being of the future of any country and investors. This research will present how the stock market of a country

represented by an index might be analyzed to determine if it could be affected by changes in the economy of its own country and another related country. Even though there have been similar studies that analyze this relationship in different countries, this is an extended research on this topic using as an object of study both the economy of Puerto Rico and the United States. The reason for this selection was based on the close political and economic relationship between the aforementioned countries. This research will contribute to the development of the economic literature of Puerto Rico, as well as to disseminate the value of the PRSI as possible indicator of the Puerto Rican economy.

1.3 Objective

The main objective of this research is to empirically investigate the effects of macroeconomic variables, from both Puerto Rico and the United States, in the value of the Puerto Rico Stock Index (PRSI). Furthermore, we want to determine if there is a long-run equilibrium relationship among the variables under study and how the PRSI reacts to shocks received from macroeconomic variables.

With regard to Puerto Rico, the macroeconomic variables used in this study are unemployment rate, private construction permits approved, economic activity index, exports, imports, amount of bankruptcies, and inflation rate. For the United States, unemployment rate, inflation rate, interest rate of 3-months Treasury Bills, producer price index, Standard & Poor 500 Index, and crude oil prices will be analyzed.

1.4 Limitations

The main limitation of this research has been the lack of availability of other historical data for local macroeconomic variables like Gross Domestic Product (GDP) and other predictors

of the economy of Puerto Rico. Hence, this research was limited to the available data of the variables based on the period of study and the foundation of the Puerto Rico Stock Index.

1.5 Thesis Outline

This research is organized as follows. The second chapter presents a review of the existent literature in areas related to stock market performance and macroeconomic variables, stock markets and economic growth, in addition to a description of the Puerto Rico Stock Index (PRSI). The third chapter presents the methodology used to demonstrate if there is a relationship between the PRSI and the macroeconomic variables. In the fourth chapter, the empirical results and the corresponding analysis will be presented. Finally, chapter five presents the conclusions and recommendations for further research.

Chapter 2: Literature Review

2.1 Overview

In Puerto Rico research of the local economy is limited in scope, particularly when linking financial securities and the economy. This is a result of the scarcity of data to perform extensive research on this area. José Alameda (1999) developed one of the few known investigations using the Puerto Rico Stock Index. His study presented and analyzed the relationship between the Index and fluctuations in the economy of Puerto Rico and the United States by using market indicators solely. Years later, another study focused on determining if there was a mean reversion in the PRSI (Álvarez & Rodríguez, 2006). Of these studies, the one related to this research was the one authored by Alameda. This study differs from Alameda's in the time period analyzed and the variables used. Even though the methodology and the objectives of Alameda's research were different from those in this work, his paper was fundamental to determine the objectives of this research.

2.2 Stock Markets and Macroeconomic Variables

Stock markets around the world have been used in attempts to predict if the economy might in fact be affected by changes in the stock markets of several countries and vice versa. Several studies have been conducted using macroeconomic variables to analyze stock markets performance (Agrawalla & Tuteja, 2008; Hsing, 2006). This type of research can be useful not only because it helps to analyze the economy, but also, because it might be used as a tool to predict changes within the economy and the stock market (Chen, 2009). Analyzing the relationship within macroeconomic variables and different stock markets has become an important contribution for investors and economists.

Several studies analyzing the relation between stock markets and macroeconomic variables found dependency or lack of it between these two areas using as benchmark different economies like Latin America, Japan, Ghana, United States, Africa, among others. For example, Chen, Firth and Meng Rui (2002) analyzed the relation between the stock markets of six Latin American countries like: Argentina, Brazil, Chile, Colombia, Mexico, and Venezuela. They found that some of the markets' indexes for those countries behaved and reacted similar to others, although some of them like Colombia do not present a dependent behavior related to the other markets. One of the main objectives of their research was to analyze the relationship and the diversification risk of international markets. It was concluded that these particular markets offered limited risk diversification and showed a close relationship within them. If one of the markets moves the other reacts to it; still, Chen et al (2002) concluded that this type of relationship was only statistically proven within the market until 1999. Another research analyzing a stock market using macroeconomic variables was done by Mukherjee and Naka (1995) using the Japanese Stock Market. In their research, they concluded that the Tokyo Stock Market had a cointegration relationship with Japan's macroeconomic variables such as exchange rate, money supply, inflation, industrial production, long-term government bonds rate and call money rate. They also concluded that the importance of cointegration analysis among variables, even with non-stationary behavior, was defined as a method to examine co-movements to identify equilibrium in time series models.

Similar macroeconomic variables have been used in different stock market researches attempting to predict the behavior of local stock markets as compared to foreign stock markets. Most of the variables used are interest rates, unemployment rates, inflation rates, the stock market's value, crude oil prices, and GDP (Jefferis & Okeohalam, 2000; Patra & Poshakwale,

2006; Hsing, 2006; Kyereboah & Agyire, 2008; Chen, 2009; Agrawalla & Tuteja, 2008; Beltratti & Morana, 2010; Büyüşalvarci, 2010).

Chen, Roll and Ross (1986) identified a bidirectional relationship between macroeconomic variables and the changes in the stock market. They employed a set of macroeconomic variables (i.e. inflation rate, oil prices, consumption per capital) which are similar to the ones used in this research. Using the New York Stock Exchange and the United States economy, they concluded that both NYSE and the variables mentioned before could be used as sources of systematic asset risk and exposure to innovation in capital consumption.

Jefferis and Okeohalam (2000) compared the relationship of three stock markets in South Africa with macroeconomic variables of the United States. In their findings, they concluded that variables like Consumer Price Index, T-bills interest rate, and GDP do not present a direct relationship with all stock markets (i.e. Johannesburg Stock Exchange, Botswana Stock Exchange, and Zimbabwe Stock Exchange). Patra and Poshakwale (2006) conducted a research using the same relation of macroeconomic variables and a stock market using the Athena's Stock Exchange as reference. They concluded that variables such as money supply, inflation, and trading volume presented a short- and long-run relationship with Athena's Stock Market.

Hsing's (2006) contribution was the development of a macroeconomic model that can be used in studies for which the objective is to accomplish analysis in variations in stock prices and/or real depreciation impacts. He used interest rates and inflation rates, which are similar to variables that will be used in this research.

Kyereboah and Agyire (2008) analyzed the performance of the Ghana Stock Market using quarterly data from the following macroeconomic variables: inflation rate, real exchange rate, interest rates, in addition to a dummy variable to measure the structural effect of listing the

largest company in the market. Regarding the inflation rate, they found that such variable had a negative impact on the Ghana Stock Market. This means that an increase in the inflation rate will reduce the market's performance, but the market's reaction will not be immediate; it will take a long period of time to react to the variable's behavior.

While analyzing the Indian Stock Market (Share Price Index), Agrawalla and Tuteja (2008) found there was cointegration among the macroeconomic variables (i.e. industrial production, money supply, private sector's credit, exchange rate, money market rate, and wholesale price index) and the share price index. This means that there is a long-run relationship within all the variables and the index. They also explained how these variables were indicators of economic growth for India.

Existing research has concluded that, at some level, macroeconomic variables have an effect on the stock market (Lizardo & Mollick, 2009). In their research, they analyzed the impact of foreign purchases of United States corporations using as the dependent variable a market indicator, the S&P500. They concluded that variables such as long and short-term interest rates, consumer price index, purchases, and sales of US Corporations common stocks had a positive impact on the value of the stock market. Lizardo and Mollick's research shows the importance of analyzing both our local investors while considering how foreign ones study our markets to decide between investing or diversifying.

Another research performed to determine if there was any relationship between macroeconomic variables and stock performance was the one conducted by Büyüşalvarci (2010). In his research, he found that Turkey's economy had both positive and negative effects on the Istanbul Stock Exchange (used as a proxy for the Turkish Stock Market's performance). For example, variables like interest rate and international crude oil prices had an expected negative

effect on the stock exchange. On the other hand, money supply presented a positive relationship in the improvement on the Istanbul Stock Exchange.

2.3 Stock Market and Economic Growth

Pagán and Soydemir (2000) stated that, in recent years, the Latin American market has become a more attractive market to invest in order to diversify and lower the risk on portfolios; also, they explained that the particularities of these markets are the highest returns to investors and economic growth. Economic growth is defined as the increase in the productive capacity of the economy of a country. A study of the Nigerian Stock Market concluded that the stock market development of this country had a positive relation promoting economic growth (Osinubi, 2004). Osinubi explained that a stock market "serves as a relevant mechanism for effective and efficient mobilization and allocation of savings, a crucial function for an economy desirous of growth" (p.26). The industry of financial services promotes and moves the world economy, and it is responsible for stabilizing the well-being of any country. The link between stock indexes and changes in the economy has been previously identified and discussed in other countries but not in Puerto Rico. A country like Puerto Rico, which lacks a formal stock market, could use an index like the PRSI as base or predictor of its economy.

Shahbaz, Ahmed and Ali (2008) cited different outcomes of investigations, which tested the relationship between the stock market and the financial sector with economic growth (Atje & Jovanovic, 1993; Luintel & Khan, 1999; Bahadur & Neupane, 2006). They found that there was enough statistical evidence to prove a long-run correlation between the stock market and economic growth, something that is unusual to determine in developing countries like Pakistan. They also concluded that, contrary to what was expected, there was evidence to support a long-run correlation between stock market development and economic growth. It is important to note

that, according to existing literature, testing for this type of relationship has not been common for developing countries (Shahbaz, Ahmed & Ali, 2008).

Guha and Mukherjee (2008) examined the causal relationship between stock market development and economic growth for the Indian economy over a decade by using the hypothesis of supply lending. As final remark, they discovered that "the financial sector had an impact on the appreciable growth in the economy of India" (p.144). The presence of a stock market in countries with an unstable financial system as stated by Minier (2009) has had a positive relationship in their economic growth. He also described why it would be important for small countries such as Zambia to have a stock market, mainly because it would help them attract capital while improving their economic growth.

In their research, Enisan and Olufisayo (2008) concluded that the stock market promoted economic growth in the seven countries of Africa they analyzed: Cote D'Ivoire, Egypt, Kenya, Morocco, Nigeria, South Africa, and Zimbabwe. However, they only found a strong long-run cointegration relationship within Egypt and South Africa. They also established that stock development could be improved by using policies in areas like taxes and legal and regulatory environment in terms of barriers in the stock markets to gain stock market efficiency.

Mafizur and Salahuddin (2010) stated that the improvement of the economic growth of a country could be obtained with an efficient market no matter the size of the country or its market. They also found a positive relationship within the following variables: market capitalization, financial development, inflation rate, foreign direct investment, and the development of a stock market in Pakistan.

A study of economic growth in Taiwan presents a bi-directional causal relationship with the financial market (Hou & Chen, 2010). It is worthwhile to note they also criticized that most

of the research in these areas focused only on the banking sector and not on the financial area in general. The importance of analyzing all financial sectors is that economic growth could be affected by the banking area and different sectors of the economy.

2.4 Puerto Rico Stock Index

The Puerto Rico Stock Index was created by the Government Development Bank for Puerto Rico in the summer of 1995 (the initial value of the Index was published in October 1995) in order to present investors a financial market of Puerto Rico's publicly traded companies. The Puerto Rico Stock Index (PRSI) is the first index comprised of Puerto Rico's stocks traded in the United States stock markets; it was created to emphasize the performance of Puerto Rico's equity market and attract the attention of new equity investors abroad. It is expected that the PRSI would serve as a fundamental analytical tool to measure the strength and fluctuations of Puerto Rico's financial markets and economy by providing local and foreign investment communities with a benchmark to measure the returns of active portfolios of local stock. According to the Government Development Bank for Puerto Rico[1], "the PRSI shall provide market analysts the flexibility to evaluate the investment in Puerto Rico equity as a separate category and to compare its performance to other markets and asset categories."

The companies included in the PRSI need to meet different qualification requirements such as: (1) the companies' securities must trade in a national stock market, in over-the-counter markets, or international security exchanges; (2) the companies must have Puerto Rico as their principal place of business; (3) they do not have to be incorporated in Puerto Rico, but they must be registered to do business in Puerto Rico; (4) the companies must have total assets of at least $5 million (for continued inclusion, the company must have total assets of at least $3 million);

[1] Retrieved from http://www.gdb-pur.com/investors_resources/puerto-rico-stock-index.html

(5) their common stock needs to have a minimum bid price of three dollars ($3.00) per share; (6) they must be subject to the reporting requirements established by the Commission pursuant to the Securities Act of 1934. Even though at some point some companies might fail to meet the previous qualifications, a PRSI Committee could determine if firms might continue to qualify to be included as part of the value of the Puerto Rico Stock Index. Table 2.1 presents the composition of the Puerto Rico Stock Index as of June 30, 2010. It also includes the market in which trades and the average transactions volume.

Table 2.1: Composition of the Puerto Rico Stock Index

Quote	Description	Market	Average Volume (June 2010)
DRL	Doral Financial Corp.	NYSE	285,400
FBP	First BanCorp	NYSE	187,200
BPOP	Popular, Inc.	NASDAQ	32,528,200
OFG	Oriental Financial Group	NYSE	1,080,200
GTS	Triple S MGMT Corp - B	NYSE	115,400

2.4.1 Financial Institutions Dissolution and change in composition of PRSI

The original composition of the Puerto Rico Stock Index has been changing during the years since 1995. Changes in the financial situation of the companies caused them to be eliminated from the value of the Index. The companies that were part of the Index during the existence of the PRSI are shown in Table 2.2.

Table 2.2: Historical Composition of the Puerto Rico Stock Index (PRSI)

Description	Quote	Stock Market
Doral Financial Corp.	DRL	NYSE
First BanCorp	FBP	NYSE
R-G Financial Corp.	RGFC	Pink Sheets
W Holding Company, Inc.	WHI	NYSE
Popular, Inc.	BPOP	NASDAQ
Eurobancshares, Inc.	EUBK	NASDAQ
Oriental Financial Group	OFG	NYSE
Santander BanCorp.	SBP	NYSE
Triple S MGMT Corp - B	GTS	NYSE
Margo Caribe, Inc.	MRGO	Pink Sheets
Corecomm Inc.	COMM	NYSE
Interstate General	IGC	Pink Sheets
Margo Nursery	MRGO	Pink Sheets
Pepsi-Cola Bottling	PBG	NYSE
Ponce Bank	----	-----
Puerto Rican Cement	----	-----

As of June 30, 2010, the Puerto Rico Stock Index was composed of only five companies after the closing of three financial institutions by the Federal Deposit Insurance Corporation (FDIC) in April 30, 2010[2]. The following institutions were eliminated from the PRSI: W Holding, Inc., R-G Financial Corp., and Eurobankshares, Inc. Each of these financial institutions disappeared for different reasons—from management problems to failure following banking regulations on loans and credit lines. On that same day, 107 financial institutions all over the United States (Puerto Rico included) closed based on a report of the FDIC.

2.5 Summary

This chapter presented an overview of existent literature on how macroeconomic variables might affect stock market performance in different geographic regions. This area is

[2.] FDIC reports regarding the closing of the financial institutions have been included as Appendix A.

critical to this research whose main objective is to determine if macroeconomic variables affect the PRSI. Furthermore, a review of different studies analyzing how economic growth might impact stock market performance was also discussed. In a way, this area also contributes to provide empirical evidence that might be used when analyzing the research results. Finally, a brief narrative describing the Puerto Rico Stock Index (PRSI) was presented.

Chapter 3: Methodology

3.1 Introduction

This chapter presents the methodology used to evaluate the main objective of this research, which is to determine if there is a relationship between selected macroeconomic variables and the Puerto Rico Stock Index. Specific empirical tests were applied to the data to determine if variables within the time series were stationary or non-stationary. If the variables were to be non-stationary, a cointegration test will be performed. Based on the results of the first two steps, a modified Vector Autoregressive Analysis (known as a Vector Error Correction Model) will be conducted to achieve the goal of this research. The procedures shown in this research followed what has been done in previous studies (Pagán & Soydemir, 2001; Brooks, 2008; Ito, 2008; Lizardo & Mollick, 2009).

3.2 Data Description

For our model, the dependent variable will be the monthly value of the Puerto Rico Stock Index from January 1, 1996 to June 30, 2010. This period corresponded with the establishment of the Puerto Rico Stock Index (PRSI) and the first data documentation in the Government Development Bank for Puerto Rico (excluding October – December of 1995[3]). To present a more consistent data range of the PRSI, data analysis will not include December 1995. The independent variables to evaluate were divided in two categories: (1) endogenous variables or those directly related to the companies and the country where they are located (Puerto Rico) and (2) exogenous variables which are economic indicators from the United States.

[3] Although the index was available since October 1995, historical data provided by the Government Development Bank of Puerto Rico started on December 1995.

Puerto Rico's macroeconomic variables were obtained from the Economic Indicators of Puerto Rico database of the Puerto Rico Planning Board (as of January 2011). The secondary data sources were selected based on their authenticity and reliability. These variables were the following: unemployment rate, number of private construction permits, exports from Puerto Rico, imports to Puerto Rico, bankruptcy, and inflation rate. Data for the Economic Activity Index was obtained from the database of the Government Development Bank for Puerto Rico. Table 3.1 presents a description of Puerto Rico's macroeconomic variables.

Table 3.1: Macroeconomic Variables of Puerto Rico

Variable	Symbol	Variable Description
Unemployment Rate	*UNEMPR*	Percentage of total workforce who is unemployed and looking for a paid job
Construction	*CONSPR*	Number of private construction permits approved by the government of Puerto Rico
Economic Activity Index (EAI)	*EAIPR*	Indicator of Puerto Rico's economy based on four metrics: total payroll employment, cement sales, gasoline consumption, and electric power consumption
Exports	*EXPOPR*	Dollar amount of goods or services Puerto Rico's sales to other countries
Imports	*IMPOPR*	Dollar amount of products of foreign origin brought into Puerto Rico
Bankruptcy	*BANKPR*	Amount of bankruptcies in Puerto Rico under Federal Bankruptcy Law Chapters 7, 11, 12, and 13
Inflation rate (Based on CPI)	*INFLPR*	Percentage that represents the rise in prices of the goods and services calculated using the consumer price index

The macroeconomic variables for the United States were retrieved from different sources: the Federal Reserve Bank of St. Louis website, historical data in Yahoo! Finance, and Bloomberg.com. The U.S. variables are inflation rate, interest rate of 3-month Treasury Bills, unemployment rate, producer price index, Standard & Poor 500 Index, and crude oil prices. A description of these variables is on Table 3.2.

Table 3.2: Macroeconomic Variables of the United States

Variable	Symbol	Variable Description
Inflation rate (Based on CPI)	*INFLUS*	Percentage that represents the rise in prices of the goods and services calculated using the consumer price index
Interest Rate	*INTUS*	Three-month Treasury Bills Interest Rates
Unemployment Rate	*UNEMUS*	Percentage of total workforce that is unemployed and looking for a paid job
Producer Price Index	*PPIUS*	Measures the average change over time in the selling prices received by domestic producers for their output.
S&P500 Index	*SP500*	Leading indicator used as a benchmark of the United States equity
Crude Oil Price	*CRUDUS*	Dollar price paid for each barrel of crude oil

3.2.1 Expected Relationship among variables

When analyzing macroeconomic variables it is important to determine the type of relationship among the variables and the dependent variable to accomplish the research objectives. As mentioned previously, the variables in this study are classified as those related to the economies of Puerto Rico and the Unites States. Accordingly, it is expected that local macroeconomic variables, such as the economic activity index, might have a positive impact on the PRSI. As stated by Büyüşalvarci (2010) and Chen and Ross (1986), it is expected for variables such as inflation rate to present a negative effect on stock prices, therefore in stock market indexes. Also, unemployment rate seems to have a negative impact on an index's value. Furthermore, considering that PRSI's is mostly comprised of companies in the financial sector, it could be argued that variables such as Treasury Bills interest rates, construction permits, imports, and exports might present a positive impact on the value of the Index. Even though the S&P500 is a market indicator, we do not expect any major impact on the PRSI because none of the companies in the PRSI are included in S&P500.

3.3 Theoretical Framework

A time series is defined as a sequence of data during a specific period of time (t) used to accomplish a research objective. Time series methodology is constantly used in econometric and macroeconomic analysis when trying to predict the behavior of the stock markets and a country's economy. Macroeconomic and industry circumstances might have a greater influence on profits than the firm's relative performance within its industry (The Conference Board, Business Cycle Indicators, 2006). One of the main goals of this research is to establish how the identified variables behave in relation to the real economy based on Puerto Rico's local index (i.e. PRSI).

One of the main problems faced when analyzing time series has been the different types of assumptions and methods used by statisticians and econometricians. These might arise when one of the groups (econometricians) assumes no distinction in the series based on the behavior of the variables on the model; then, the other group completely disregards the macroeconomic effect of the variables under study (Kennedy, 2008). Econometric models like Vector Autoregressive (VAR) and Error Correction (VEC) assume characteristics of the two different approaches mentioned above. This research will employ both VAR and VEC models. These are based on the assumption that macroeconomic variables present a non-stationary behavior in nature which can be explained by how the economy behaves as stated by Kennedy (2008) and Brooks (2008).

3.4 Stationarity Test

The Augmented Dickey-Fuller (ADF) unit root test and the Kwiatkowski, Phillips, Schmidt, and Shin Test (KPSS) were conducted to evaluate the behavior of macroeconomic variables and determine if they were stationary or non-stationary at level. The purpose of the unit root test is to examine the autocorrelation function and the mean of the individual variables in the time series. As in many other studies, the ADF unit root test will be applied to the data to establish the behavior and relationship of the variables in the time series (Pagán & Soydemir, 2001; Guha & Mukherjee, 2008; Shahbaz, Ahmed, & Ali, 2008; Lizardo & Mollick, 2009). The results of the ADF unit root test and the KPSS will help determine which methodology will be applied to the data and any further analysis that needs to be performed before estimating the empirical model.

The null hypothesis (H_o) of the Augmented Dickey Fuller under the stationarity test is that there is a unit root problem, which means that the variables' behavior is non-stationary. The alternate hypothesis (H_i) is that the variable does not have a unit root problem, which means the behavior of the variable is stationary.

Something that differs from the ADF test to the KPSS test is, in addition to the statistic used, the hypothesis used to analyze the behavior of the variables. The null hypothesis (H_o) of the Kwiatkowski, Phillips, Schmidt, and Shin (KPSS) test assumes that the series are stationary, which means that the variable does not have a unit root problem. The alternate hypothesis (H_i) is that the variable is non-stationary, which means that the variable has a unit root problem.

For the Augmented Dickey Fuller test, if t-statistic[4] is greater than critical value at significant levels of 1%, 5%, or 10%, we fail to reject the null hypothesis and conclude that the

[4] This statistic is calculated as the ratio of an estimated coefficient to its standard error, and it is used to test the hypothesis that a coefficient is equal to zero (Eviews User Manual).

behavior of the series (variable) is non-stationary. The same rule applies for the KPSS test for stationary behavior: if the Lagrange Multiplier (LM) statistic is greater than the critical value, we cannot reject the null hypothesis and the behavior of the series presents a stationary pattern. The formulas for these tests are shown below[5]:

Augmented Dickey-Fuller (ADF) after subtracting Y_{t-1}:

$$\Delta Y_t = \alpha Y_{t-1} + X_t^{'} \delta + \varepsilon_t \qquad \text{Equation 3.1}$$

Where Y_t is the dependent regressor, X_t are optional independent regressors which may consist of a constant, or a constant and trend, α (where α = p-1) and δ are parameters to be estimated, and the ε_t is assumed to be white noise.

Kwiatkowski, Phillips, Schmidt, and Shin (KPSS):

$$LM^5 = \sum_t S(t)^2 / (T^2 fo) \qquad \text{Equation 3.2}$$

Where *fo* is an estimator of the residuals spectrum at frequency zero, and S(t) is a cumulative residuals function of

$$S(t) - \sum uS \sum_{r-1}^{t} \mu_r \qquad \text{Equation 3.3}$$

Kwiatkowski introduced a test for unit roots which adopts stationarity as the null hypothesis. This was done by modeling a time series as sum of a deterministic trend, a random walk, and a stationary error; then, testing for the random walk has zero variance.

3.5 Johansen Cointegration Test

Variable's behavior is crucial to determine the analysis to perform. As stated by Juselius (2003) and Kennedy (2008), historically, macroeconomic variables have presented a non-stationary behavior. This led us to perform a cointegration test to analyze if a long-run

[5] The formulas of this chapter were obtained from the user manual of the software Eviews 6.0 Student Edition.

relationship existed before establishing the model. The cointegration test is performed only to those variables that showed a non-stationary behavior after performing the unit root test (Agrawalla & Tuteja, 2008). The formula for the Johansen Cointegration Test[6] when the level data Y_t has linear trends, but the cointegrating equations have only intercept is the following:

$$H_1(r): IIy_{t-1} + \mathrm{B}\chi_t = \partial(\beta' Y_{t-1} + \rho_o) + \partial \perp \gamma_o \qquad \text{Equation 3.4}$$

r is the number of cointegrating relations, *II* is a coefficient matrix, β' is a column of vectors, ρ is identified as the parameter, $\partial \perp$ are the deterministic terms "outside" the cointegrating relations, and γo is a cointegrating efficient.

The first analysis under the cointegration test is to determine the number of relations of those independent variables with non-stationary behavior with regard to the dependent variable (PRSI). This analysis is done using two different statistics: Trace Statistic and Maximum Eigenvalue. The hypotheses that need to be evaluated under these statistics are shown below:

Trace Statistic:

H_o: Number of *r* cointegrating relations

H_i: Number of k cointegration relations

Where k is the number of endogenous variables, for r=0, 1..., k-1

Maximum Eigenvalue:

H_o: Number of *r* cointegration relations

H_i: Number of r+1 cointegration relations

[6] Eviews software Student edition 6.0 uses a different identification method so that the error correction term has a sample mean of zero.

3.6 Lag Length Criteria

The lag length criterion is used to determine the number of lags to be used to estimate the time series model. The criterions used in this research are Akaike Information Criterion (AIC), Likelihood Ratio (LR), Final Prediction Error (FPE), and Schwarz Information Criterion (SC).

The Akaike Information Criterion is often used in model selection for non-nested alternatives. The AIC formula is presented below.

$$AIC = -2l/T + 2n/T \qquad \text{Equation 3.5}$$

Where l is the log likelihood, $n = k\,(d + pk)$ is the number of estimated parameters in the VAR and the modification factor τ is computed as

$$\tau = \partial^2 \sum_t \tilde{y}_{t-1}^2 / \hat{\sigma}_\mu^2 \qquad \text{Equation 3.6}$$

The likelihood ratio is a lag length method used to identify a uniform amount of lags in each equation and determine the model order.

$$LR = T\left[\log|\hat{\sum}_r| - \log|\hat{\sum}_u|\right] \qquad \text{Equation 3.7}$$

Where $\left|\hat{\sum}_r\right|$ is the determinant of the variance-covariance matrix of the residuals for the restricted model, $\left|\hat{\sum}_u\right|$ is the determinant of the variance-covariance matrix of the residuals for the unrestricted VAR, and T is the sample size.

The Schwarz Criterion is an alternative to the AIC that imposes a larger penalty for additional coefficients. This criterion was selected and used in the performance of the stationarity

test based on the research performed by Lizardo and Mollick (2009). The Schwarz Criterion (SC) formula is presented as follows:

$$SC = -2l/\mathrm{T} + (k \log \mathrm{T})/\mathrm{T} \qquad \text{Equation 3.8}$$

Where *l* is the log likelihood and *n = k (d + pk)* is the number of estimated parameters in the VAR.

The Final Prediction Error is a lag length criterion method developed by Akaike (1974) used in Vector Autoregressive Models to determine the efficient number of lag to be established in the model. Its equation is shown below:

$$FPE(m) = (T + m + 1)/T - m - 1ESS(m)/T \qquad \text{Equation 3.9}$$

Here, *T* is the sample size and *FPE*(*m*) and *ESS*(*m*) are the final prediction error and the sum of squared errors, respectively. The optimal lag length, *m**, is the lag length which produces the lowest *FPE*.

The *FPE* criterion has a certain optimality property that "balances the risk due to bias when a lower order is selected and the risk due increases in the variance when a higher order is selected" (Hsiao, 1979, p. 340). An intuitive reason for using the FPE criterion is that longer lags increase the first term but decrease the residual sum of squares (RSS) of the second term; thus, the two opposing forces optimally balance when their product reaches its minimum.

3.7 Residual Analysis

The residual analysis is performed to evaluate the behavior of the residuals (white noise) and determine the cointegration relations of the residuals model. This analysis is conducted to verify if the model estimates, in this case VAR, is appropriate. One of the tests performed to the

residuals is the autoregression (AR) roots analysis to report the inverse roots of the characteristic AR polynomial. This test is done to determine if the estimated VAR is stable (stationary), if all roots have modulus less than one and if they lie inside the unit circle. If VAR is not stable, certain results are not valid. There will be *kp* roots, where k is the number of endogenous variables and *p* is the largest lag. If someone estimated a VEC with *r* cointegrating relations, *k-r* roots should be equal to unity (EViews User Manual, 2009).

3.8 Vector Autoregressive Model

The Vector Autoregressive (VAR) model is commonly used for forecasting systems of interrelated time series and analyzing the dynamic impact of random disturbances on the system of variables. One of the main advantages of using the VAR model is to offer a very rich structure, implying that it might be able to capture more features of the data. After the results of the unit root test, those variables with a non-stationary behavior (if any) will be differentiated to transform them to stationary. Theoretically, if variables are non-stationary when conducting the test on the original variable in a time series, the next step is to apply a cointegration analysis to determine the relationship within the variables and also an error correction model (which is a modified version of Vector Autoregressive analysis) to model the interdependencies (Chen, Firth & Meng, 2000).

The Vector Autoregressive Model formula is:

$$y_t = \mathrm{A}_1 y_{t-1} + \ldots + \mathrm{A}_p y_{t-p} + \mathrm{B}\chi_t + e_t \qquad \text{Equation 3.10}$$

Where y_t is a *k* vector of endogenous variables, χ_t is a *d* vector of exogenous variables, $\mathrm{A}_1 \ldots$, A_p and B are matrices of coefficients to be estimated, and ℓ_t is a vector of innovations that may

be contemporaneously correlated but are uncorrelated with their own lagged values and uncorrelated with all of the right-hand side variables.

When the original series presents a non-stationary behavior, a restricted VAR could be used to create a better model, taking in consideration the error and the behavior of the variables under study. One of the main reasons to apply the Vector Error Correction Model (VECM) is to prevent the lack of accurate long-run relationship analysis and short-term relationship in cointegrated time series by the Vector Autoregressive Method (EViews Manual, 2009). To take the simplest possible example, consider a two variable system with one cointegrating equation and no lagged difference terms. The cointegrating equation is

$$y2, t = by1, t \qquad \text{Equation 3.11}$$

The corresponding VEC model is the following:

$$\Delta y_{1,t} = \alpha_1(y_{2,t-1} - by_{1,t-1}) + \varepsilon_{1,t} \qquad \text{Equation 3.12}$$

$$\Delta y_{2,t} = \alpha_2(y_{2,t-1} - by_{1,t-}1) + \varepsilon_{2,t} \qquad \text{Equation 3.13}$$

In this simple model, only the right-hand side variable is the error correction term. In long run equilibrium, this term is zero. However, if it deviates from the long run equilibrium, the error correction term will be nonzero and each variable adjusts to partially restore the equilibrium relation. The coefficient measures the speed of adjustment of the i-th endogenous variable towards the equilibrium (Eviews User Manual, 2009).

3.9 Impulse Response Analysis

The Impulse Response Function (IRF) trace the effect of a one-standard-deviation shock/innovation in a variable on current and future values of the variables. As proposed by Pesaran and Shin (1998), generalized impulse response functions (GIRFs) will be used, not those based on a Cholesky decomposition, which is sensitive to the ordering of the variables. The

innovations will be analyzed graphically and through the accumulated responses. Basically, not only will it be examining if variables react within them, but also how long (period of time) it would take for the effect to be perceived (Brooks, 2008).

3.10 Summary

This chapter described the variables to be used in this research and discussed the theoretical background behind the methodology. Furthermore, it included a detailed description of the statistical tests that need to be conducted to the data in order to estimate the final model.

Chapter 4: Results and Analysis

4.1 Introduction

This chapter will present the time series analysis used to determine if changes in the economy of Puerto Rico and United States can affect or have an influence in the value of the Puerto Rico Stock Index (PRSI). First, descriptive statistics for the data are presented. Secondly, the empirical tests applied to the data to determine its behavior, as explained in Chapter 3, are shown. Lastly, interpretation of the VEC model is presented along with the interpretation of the Impulse Response Functions.

4.2 Statistics

The descriptive statistics for the variables used in this research are shown on Table 4.1. We analyzed a total of 174 monthly observations from the period of January 1, 1996 to June 30, 2010. The dependent variable for this study is the Puerto Rico Stock Index with a mean value of 7,619.10 and a standard deviation of 4,095.49. As per macroeconomics variables, Puerto Rico shows, on average, a higher unemployment rate (UNEMPR) than the United States (UNEMUS) with a 12.16% and 5.47%, respectively. Regarding, inflation levels, both Puerto Rico's economy and the United States' economy, presented an inflation rate of approximately 2.46%. The inflation rate was calculated using the change in the Consumer Price Index (CPI). It is worthwhile to note that the mean price for crude oil prices during the period was $43.21—with the highest price being $133.85 per barrel and the minimum being $11.35. As shown on the table, the average short-term interest rate in the United States (INTUS) was about 3.20%. The lowest interest rate during the period of study was 0.03%.

Table 4.1: Descriptive Statistics

	PRSI	UNEMPR	INFLPR	CONSPR	EXPOPR	IMPOPR	BANKPR	EAIPR
Mean	7619.1	12.16092	0.024488	705.8448	4058689	2810473	1061.172	144.6944
Median	7371.885	12	0.061258	716.5	4387903	2812123	1077	145.61
Maximum	20207.8	19.8	0.805	1060	6130334	4409801	3078	154.1
Minimum	1368.25	8.9	-0.808264	315	1497817	1486420	117	128.8
Std. Dev.	4095.488	1.873228	0.211366	147.3059	1180174	754246.6	367.9938	5.966513
Skewness	0.751702	0.83589	-2.454578	-0.272799	-0.446505	0.009014	0.712127	-0.638176
Kurtosis	3.288303	3.934803	10.77745	2.555147	2.061003	1.83793	7.20817	2.789286
Jarque-Bera	16.98921	26.59813	613.2674	3.592887	12.17408	9.7928	143.0946	12.13271
Probability	0.000205	0.000002	0	0.165888	0.002272	0.007473	0	0.00232
Sum	1325723	2116	4.260955	122817	7.06E+08	4.89E+08	184644	25176.82
Sum Sq. Dev.	2.90E+09	607.0543	7.728851	3753933	2.41E+14	9.84E+13	23427563	6158.675
Observations	174	174	174	174	174	174	174	174

Table 4.1 (continuation)

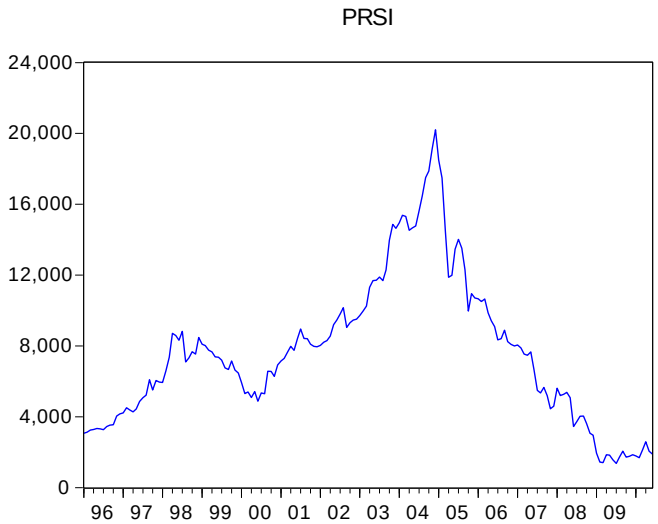
	UNEMUS	INFLUS	PPIUS	CRUDUS	SP500	INTUS
Mean	5.468966	0.024681	147.3741	43.20782	1130.178	3.205402
Median	5.1	0.025556	137.65	31.415	1136.645	3.875
Maximum	10.1	0.0544	205.5	133.88	1549.38	6.17
Minimum	3.8	-0.017547	122.3	11.35	636.02	0.03
Std. Dev.	1.497498	0.012249	21.77052	26.61026	227.9994	1.915246
Skewness	1.844558	-0.783145	0.694909	1.153839	-0.301273	-0.291181
Kurtosis	5.75669	4.68336	2.21568	3.915989	2.359318	1.557014
Jarque-Bera	153.7647	38.3305	18.46394	44.69198	5.608135	17.55483
Probability	0	0	0.000098	0	0.060563	0.000154
Sum	951.6	4.29457	25643.1	7518.16	196650.9	557.74
Sum Sq. Dev.	387.9524	0.025958	81994.27	122502.4	8993186	634.5929
Observations	174	174	174	174	174	174

4.3 Stationarity Tests

In general, since many economic time series have non-stationary characteristics, the variable must be tested for stationary behavior. The problem with non-stationary data is that the Ordinary Least Squares (OLS) regression procedures can easily result in incorrect conclusions. Initially, a researcher can perform a graphical analysis of each variable to see if its behavior is stationary or not. It is recommended to apply the statistical tests to the data to reach an accurate conclusion. In cases of non-stationary behavior, its transformation occurred when applying the first difference to the variables. Figures 4.1 to 4.4 present graphically the behavior of all the variables under study from January 1, 1996 to June 30, 2010.

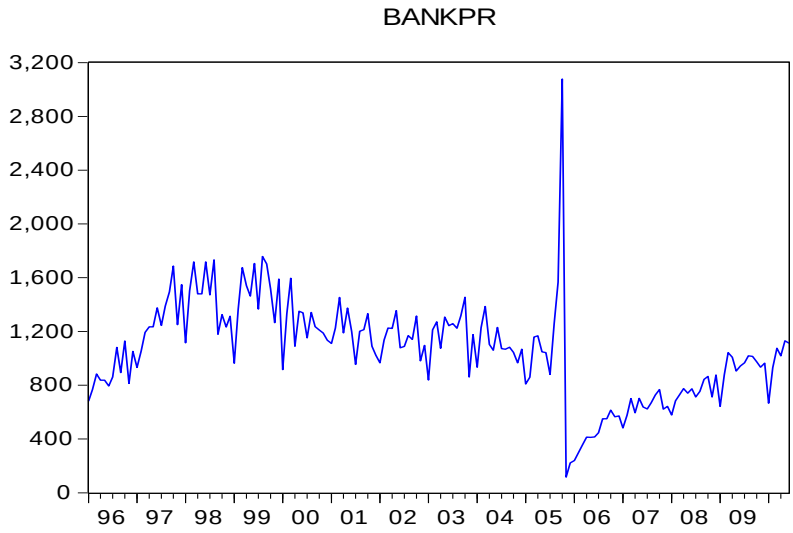
Figure 4.1 presents the behavior of the Puerto Rico Stock Index. According to this, PRSI has a non-stationary behavior. To be stationary, there should be a horizontal trend. As shown in Table 4.1, when statistical tests are applied, the conclusion is far from different after testing the original series (at level). The results show that PRSI is stationary when differencing the series using the ADF test and testing at level with the KPSS.

Figure 4.1: Value of the Puerto Rico Stock Index



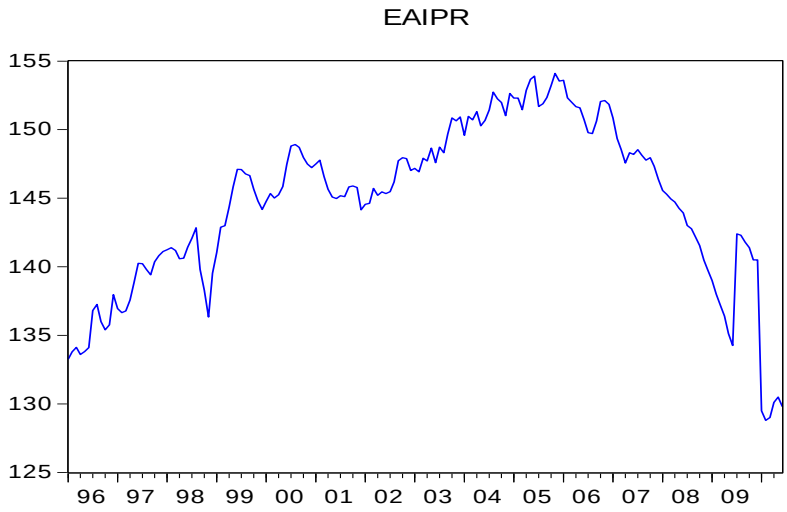
The behavior of BANKPR (Number of Bankruptcies in Puerto Rico) is shown in Figure 4.2. The graph reflects a stationary behavior most of the time, except after the year 2005. Notice also that the largest amount of bankruptcies occurred close to year 2005. The variable's behavior could be confirmed with the results on the theoretical test for unit root under the ADF (at level and 1st Difference) and KPSS, which showed with empirical evidence that BANKPR was in fact stationary.

Figure 4.2: Bankruptcy of Puerto Rico



On the other hand, the Economic Activity Index (EAIPR) presents that the variable has a non-stationary behavior. The results confirmed this but, only with the original series with ADF. The graph also shows a decreasing trend for the EAIPR after the year 2006.

Figure 4.3: Economic Activity Index



As shown in Figure 4.4, the variable INFLPR presents for a larger period of time is stationary. However, the tests results show that the behavior of the variable INFLPR is non-stationary when testing at level (ADF). After 2006, INFLPR resembles what has been going on in the local economy. The irregular trend that emerged at the end of 2006 reflects the recession period Puerto Rico's economy suffered between 2006 and 2008.

Figure 4.4: Inflation Rate of Puerto Rico

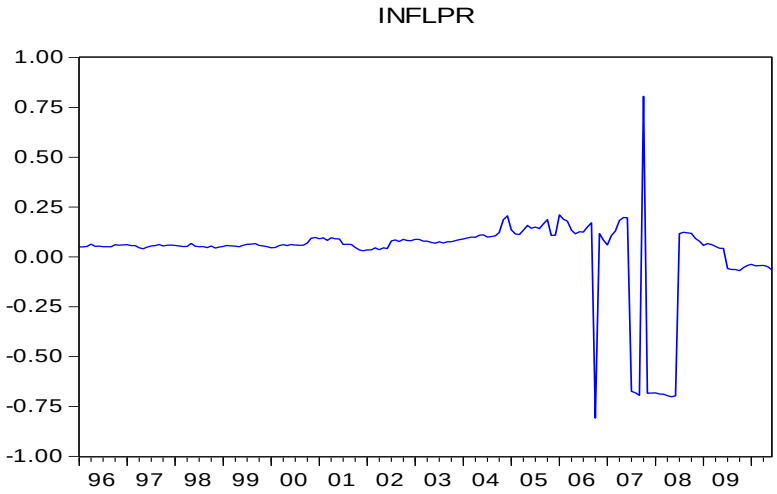


Table 4.2: Summary of Unit Root Tests

	ADF at level			ADF 1st Diff.			KPSS at level			
Variables[1]	t-statistic	Critical value[2]	H_0 Decision	t-statistic	Critical value[2]	H_0 Decision	t-statistic	Critical value[3]	H_0 Decision	Final Decision
BANKPR	-4.246143	-2.878212	R-S	-9.443946	-2.878618	R-S	15.29575	0.463000	NR-S	S
CONSPR	1.400124	-2.879267	NR-NS	-9.958666	-2.879267	R-S	396.3003	0.463000	NR-S	S
CRUDUS	-2.261106	-2.878311	NR-NS	-5.735046	-2.878311	R-S	95.51099	0.463000	NR-S	S
EIAPR	-0.661306	-2.878723	NR-NS	-7.876014	-2.878723	R-S	170.9781	0.463000	NR-S	S
EXPOPR	-1.720659	-2.878311	NR-NS	-16.26619	-2.878311	R-S	360.2578	0.463000	NR-S	S
IMPOPR	-1.383028	-2.878515	NR-NS	-10.72098	-2.878515	R-S	815.0552	0.463000	NR-S	S
INFLPR	-5.235219	-2.878212	R-S	-12.74219	-2.878413	R-S	2.966042	0.463000	NR-S	S
INFLUS	-0.585599	-2.87938	NR-NS	-8.613178	-2.87938	R-S	13.74618	0.463000	NR-S	S
INTUS	-1.365368	-2.878413	NR-NS	-4.462888	-2.878413	R-S	110.8054	0.463000	NR-S	S
PPIUS	-0.49935	-2.878212	NR-NS	-8.752348	-2.878212	R-S	757.3674	0.463000	NR-S	S
PRSI	-1.243076	-2.878212	NR-NS	-9.813091	-2.878212	R-S	71.56359	0.463000	NR-S	S
SP500	-2.276952	-2.878113	NR-NS	-11.59527	-2.878212	R-S	56.55107	0.463000	NR-S	S
UNEMPR	-3.168258	-2.878212	R-S	-11.14373	-2.878413	R-S	6.11189	0.463000	NR-S	S
UNEMUS	-1.090027	-2.878413	NR-NS	-3.643984	-2.878413	R-S	62.76729	0.463000	NR-S	S

Note:

[1.] BANKPR= bankruptcy of PR, CONSPR = construction private permits of PR, CRUDUS= Crude Oil Price, EAIPR = Economic Activity Index, EXPOPR = exports from PR, IMPOPR = imports to PR, INFLPR = inflation rate of PR, INFLUS = inflation rate of US, INTUS = interest rate 3-month T-bills, PPIUS = producer price index of US, PRSI = Puerto Rico Stock Index, SP500 = Standard & Poors 500 Index, UNEMPR = unemployment of PR and UNEMUS = unemployment of US.

[2] Critical T-Values for ADF at levels: 1% = -3.468, 5% = -2.878 and 10% =-2.575.

[3] Critical Values for KPSS at levels: 1% =.739, 5% =.463 and 10% =.347

[4] R-S: Reject Null: variable is stationary

[5] NR-NS: Don not reject Null: variable is non-stationary

As shown above, all variables were analyzed with the ADF at level, ADF first Difference, and KPSS. Note that at level, most of the variables were non-stationary, so they were differentiated to see if their behavior changed. KPSS was applied to the variables to confirm if its

behavior was in fact stationary. The results provided by ADF at first level were used to determine the model to employ in the empirical analysis.

As shown in Table 4.3, using the Augmented Dickey Fuller at level unit root test of the original series, three of the variables proved to have a stationary behavior, and eleven were not stationary (including the dependent variable - PRSI).

Table 4.3: ADF results at level (Original Series)

Variables Behavior: Stationary Test	
Non – Stationary	
1	Construction based on the number of private construction permits - Puerto Rico
2	Crude Oil Price - United States
3	Export based on total exports - Puerto Rico
4	Imports based on total imports - Puerto Rico
5	Producer Price Index - United States
6	Economic Activity Index - Puerto Rico
7	Inflation Rate - United States
8	Interest Rate: Treasury Bills - United States
9	Puerto Rico Stock Index
10	S&P 500 - United States
11	Unemployment Rate of United States
Stationary	
1	Bankruptcy based on total bankruptcies - Puerto Rico
2	Inflation Rate - Puerto Rico
3	Unemployment Rate - Puerto Rico

4.4 Cointegration

As stated in the third chapter, the cointegration test is applied to those variables that show a non-stationary behavior as a result of the ADF test (refer to Table 4.2). It is also used to determine if there is a long-run relationship between the dependent variable (PRSI) and the independent variables in the research. The dependent variable is the PRSI and the independent variables are in Tables 3.1 and 3.2.

According to the results shown in Table 4.4 (Johansen Cointegration Test Analysis), there are at most three cointegration relations among the variables with non-stationary behavior: CONSPR, CRUDUS, EAIPR, EXPOPR, IMPOPR, INFLUS INTUS, PPIUS, SP500, UNEMUS and the dependent variable, PRSI. This means, there is a long-term relationship among the variables. We accept the H_o under the Trace Statistic and concluded that there are at most three cointegration relations (r=3) between the variables. We reached the same conclusion when Max-Eigenvalue statistics is used. Thus, the null hypothesis cannot be rejected; therefore, there are at most three relations (r=3) between the dependent and independent variables.

Table 4.4: Johansen Cointegration Test Analysis

Johansen Cointegration Test Results				
Trace				
Hypothesized No. of CE (s)	Eigenvalues	Trace Statistic	Critical Value 5%	Decision
r=0	0.450674	384.3555	239.2354	R
r≥1	0.399796	283.1137	197.3709	R
r≥2	0.371900	196.8415	159.5297	R
r≥3	0.209038	118.2470	125.6154	NR
Maximum Eigenvalue				
Hypothesized No. of CE (s)	Eigenvalue	Max-Eigen Statistic	Critical Value 5%	Decision
r=0	0.450674	101.2418	64.50472	R
r≥1	0.399796	86.27221	58.43354	R
r≥2	0.371900	78.59445	52.36261	R
r≥3	0.209038	39.63150	46.23142	NR

Note: NR = No Reject of H_o, R= Reject

r = number of cointegration relations

r=0 means that show there is no evidence of cointegration

4.5 Lag Criterion Analysis

This analysis, as discussed in Chapter 3, will help determine the number of lags to use in the model. Considering the statistics provided by the Akaike Information Criterion, the Final Prediction Error and the Likelihood Ratio, the number of lags to be applied to the model is eight. The corresponding statistics are shown on Table 4.5

Table 4.5: Lag Order Selection Criteria

VAR Lag Order Selection Criteria
Endogenous variables: LOG(PRSI)
Exogenous variables: C BANKPR D(CONSPR) D(CRUDUS) D(EAIPR) D(LOG(EXPOPR)) D(LOG(IMPOPR)) INFLPR D(INFLUS) D(INTUS) D(PPIUS) D(LOG(SP500)) UNEMPR D(UNEMUS)

Sample: 1996M01 2010M06
Included observations: 164

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-94.68913	NA	0.220472	1.325477	1.590100	1.432904
1	170.3856	481.6603	0.008806	-1.894947	-1.611423*	-1.779847
2	172.6697	4.122517	0.008670	-1.910607	-1.608181	-1.787833*
3	173.3849	1.282102	0.008701	-1.907133	-1.585806	-1.776686
4	173.4592	0.132259	0.008801	-1.895844	-1.555615	-1.757724
5	176.2451	4.926204	0.008613	-1.917623	-1.558492	-1.771829
6	176.2984	0.093590	0.008715	-1.906078	-1.528045	-1.752611
7	176.3753	0.134121	0.008815	-1.894820	-1.497886	-1.733680
8	179.6659	5.698347*	0.008574*	-1.922754*	-1.506919	-1.753941
9	179.6876	0.037339	0.008679	-1.910824	-1.476087	-1.734337
10	179.7508	0.107952	0.008781	-1.899400	-1.445761	-1.715240

Note:
* indicates lag order selected by the criterion
LogL: Log likelihood
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike Information criterion
SC: Schwarz information criterion
HQ: -Hannan-Quinn information criterion

4.6 Residuals Analysis

When analyzing the residuals of the model, the first step is to determine the behavior of the series. As shown in Table 4.6, to identify the residuals pattern within each test (ADF and KPSS) the *t*-statistic is compared to the critical value. For the first two tests, if the statistic is greater than the critical value, the residuals are stationary. After performing the unit root test of

the residual we concluded that the behavior of the residuals is stationary, as shown by the ADF at level and ADF 1st difference.

Table 4.6: Residuals Unit Root Test

ADF at level			ADF 1st Difference			KPSS at level		
T-statistic	Critical value	H_0 Decision	T-statistic	Critical value	H_0 Decision	T-statistic	Critical value	H_0 Decision
-3.678022	-3.470934 -2.879267 -2.576301	R-S	-10.86981	-3.470934 -2.879267 -2.576301	R-S	.020626	.739000 .463000 .347000	R-NS
Note Critical values: -3.470934 (1%), -2.879267 (5%), -2.576301 (10%)								

4.6.1 Correlogram

Theoretically, the assumption for the residuals in a time series model would imply that such residuals are not correlated within their own lag values. The autocorrelation and partial autocorrelation test is performed to analyze if there is correlation between the model residuals. Table 4.7 presents the Q-statistic results for the residuals with 8 lags (as shown in Table 4.5) to determine if the series are white noise. The results showed that the AC and PAC coefficients were close to zero, which means there is no correlation between the residuals at 8 lags. To determine if the residuals are white noise, we analyzed at what k lags the *p*-value is less than alpha. Using the Q-Statistic, we can conclude there is no autocorrelation up to the lag 4; based on the results, the residuals are white noise up to lag 4.

Table 4.7: Residuals Autocorrelation

Sample: 1996M01 2010M06
Included observations: 174

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
.|. |	.|. |	1	0.004	0.004	0.0028	0.957
.|* |	.|* |	2	0.100	0.100	1.7833	0.410
.|. |	.|. |	3	0.011	0.011	1.8067	0.613
*|. |	*|. |	4	-0.132	-0.143	4.9399	0.294
**|. |	**|. |	5	-0.258	-0.267	16.984	0.005
.|. |	.|. |	6	-0.000	0.024	16.984	0.009
**|. |	**|. |	7	-0.292	-0.253	32.642	0.000
*|. |	*|. |	8	-0.081	-0.121	33.839	0.000

Note:
AC = Autocorrelation
PAC = Partial Autocorrelation

4.7 Vector Autoregressive Model

An unrestricted VAR model was estimated to determine whether this methodology was appropriate to accomplish the research objective. Considering that the results showed that most of the variables presented a non-stationary behavior, it was expected that the VAR model would not met the stability condition check. The purpose of this test is to determine if the inverse unit root lies inside the unit circle. Given that at least one unit root lies outside the unit root circle, it is recommended to estimate a restricted VAR model, which is the Vector Correction Model (VECM). Estimates for the unrestricted VAR are presented in Appendix B.

4.7.1 Vector Error Correction Model

The Vector Error Correction Model is a modified Vector Autoregressive Model used when the variables' behavior is non-stationary as stated in Chapter 3. To estimate the model, it is necessary to: first, identify the variables' behavior; second, identify the number of cointegration equations (relations) when variables present a non-stationary behavior; third, the amount of lags to be used in the model estimation; fourth, run the stability check of the unit root;

and finally, analyze the residuals of the series. One of the peculiarities of the VEC is that all variables are considered endogenous when estimating the model. Also, the order of the variables is crucial to get a robust model. The basic VEC Model equation for this research could be expressed as follows:

$$D(Log(PRSI)) = \beta_0 + \beta_1 Log(BANKPR_t) + \beta_2 INFLPR_t + \beta_3 UNEMPR_t + \beta_4 Log(CONSPR_t) + \beta_5 Log(CRUDUS_t) + \beta_6 Log(EAIPR_t) + \beta_7 Log(EXPOPR_t) + \beta_8 Log(IMPOPR_t) + \beta_9 INFLUS_t + \beta_{10} INTUS_t + \beta_{11} Log(PPIUS_t) + \beta_{12} Log(SP500_t) + \beta_{13} UNEMUS_t + \varepsilon_t$$

Table 4.8 present the estimates of the error correction for the first cointegration equation, which identifies the PRSI as the dependent variable. After comparing the results of the *t*-test with the critical values, it can be concluded that crude oil prices (CRUDUS) have a significant and negative effect on the PRSI, while the economic activity index (EAIPR) has a positive and significant impact on the PRSI. Our result is similar to Büyüşalvarci (2010) where he found that crude oil prices had a negative effect on the market's performance. The VEC estimates also validate the expected relationship regarding EAIPR and PRSI, as stated in section 3.2.1.

These findings show that variables like inflation rate (measured by the Consumer Price Index) and T-bills rate do not present a direct relationship with the PRSI, this is similar to Jefferis and Okeohalam (2000). Although Alameda (1999), found that S&P500 might have some impact on PRSI, no relationship between the PRSI and S&P500 was found in this study.

Table 4.8 Vector Correction Estimates Equation

Vector Error Correction Estimates
Sample (adjusted): 1996M10 2010M06
Included observations: 165 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegration Equation 1			
Variables	Coefficient	Standard Errors	t-statistic
D(LOG(PRSI))	-0.323957	(0.22270)	[-1.45466]
D(LOG(BANKPR))	0.043692	(0.61765)	[0.07074]
D(INFLPR)	0.72526	(0.46892)	[1.54665]
D(UNEMPR)	2.011866	(2.33439)	[0.86184]
D(LOG(CONSPR))	0.441393	(0.30606)	[1.44217]
D(LOG(CRUDUS))**	-0.628682	(0.18131)	[-3.46736]
D(LOG(EAIPR))*	0.046767	(0.01716)	[2.72596]
D(LOG(EXPOPR))	-0.259461	(0.26050)	[-0.99602]
D(LOG(IMPOPR))	0.367077	(0.18578)	[1.97588]
D(INFLUS)	0.006344	(0.00810)	[0.78303]
D(INTUS)	1.103691	(0.44878)	[2.45932]
D(LOG(PPIUS))	-0.011672	(0.01950)	[-0.59848]
D(LOG(SP500))	-0.112634	(0.15881)	[-0.70922]
D(UNEMUS)	0.278426	(0.25205)	[1.10466]
D(RESID)	290.7133	(204.72300)	[1.42004]
Note **, * significance at 5% and 10% level, respectively			

The error correction terms provides information regarding the effect (positive or negative) variables could have among each other. Table 4.9 presents a summary of the relations different lags of PRSI have on the variables. As shown, D(LOG(PRSI(-2))) had a positive significant impact on crude oil prices D(LOG(CRUDUS)) and the producer price index D(LOG(PPIUS)). On the other hand, a negative significant impact is shown on the 3-months Treasury Bills interest rates. At lag 6, PRSI presents a positive and significant relationship with U.S. inflation rate. According to the results, we might conclude that at lag 8 the PRSI presented a positive significant impact on only two variables, inflation of the United States and the producer price index. Therefore, PRSI has more significant effect on variables in the short-run than in the long run.

Table 4.9 Error Correction Results

Error Correction:	D(LOG (PRSI))	D(LOG (CRUDUS))	D(LOG (EAIPR))	D(LOG (EXPOPR))	D(LOG (IMPOPR))	D(INFLUS)	D(INTUS)	D(LOG (PPIUS))	D(UNEMUS)	D(RESID)
D(LOG(PRSI(-2)))	-0.333749	0.553475*	-0.042703	0.213046	-0.386804	0.015845	-1.347023*	0.054287*	-0.310553	37.50675
	-0.23678	-0.19278	-0.01824	-0.27697	-0.19753	-0.00861	-0.47716	-0.02074	-0.26798	-217.668
	[-1.40950]	**[2.87103]**	[-2.34103]	[0.76920]	[-1.95824]	[1.83929]	**[-2.82303]**	**[2.61812]**	[-1.15885]	[0.17231]
D(LOG(PRSI(-6)))	-0.479887	0.428675	-0.03261	0.246314	0.210606	0.034436**	-0.362406	0.031458	0.583197	-101.6542
	-0.31806	-0.25895	-0.0245	-0.37204	-0.26533	-0.01157	-0.64093	-0.02785	-0.35997	-292.379
	[-1.50880]	[1.65544]	[-1.33091]	[0.66207]	[0.79377]	**[2.97594]**	[-0.56544]	[1.12944]	[1.62014]	[-0.34768]
D(LOG(PRSI(-8)))	-0.415081	0.375875	-0.013736	-0.583936	0.163191	0.037815***	-0.093059	0.066677**	-0.045822	134.0222
	-0.25593	-0.20837	-0.01972	-0.29937	-0.2135	-0.00931	-0.51574	-0.02241	-0.28966	-235.27
	[-1.62183]	[1.80389]	[-0.69670]	[-1.95057]	[0.76436]	**[4.06116]**	[-0.18044]	**[2.97502]**	[-0.15819]	[0.56965]
*****,** and * significant at 1%, 5% or 10%, respectively**										

In addition, the error correction terms provided evidence regarding which variables (within their respective lags) could have an effect on the Puerto Rico Stock Index. According to Table 4.10, only three variables present significant effects on the PRSI. Interestingly, in lag 8, Puerto Rico's unemployment rate presented a positive and significant impact on the PRSI while, in shorter lags, U.S. short-term interest rates and the economic activity index showed a negative and significant impact on PRSI. Detailed information regarding the coefficients and their significance levels are presented in Appendix D.

Table 4.10: PRSI Significance

Error Correction	D(LOG(PRSI))
D(UNEMPR(-8))	0.04735*
	-0.01697
	[2.79066]
D(LOG(EAIPR(-3)))	-10.69594*
	-3.72733
	[-2.86960]
D(INTUS(-2))	-0.248086*
	-0.09619
	[-2.57901]
*** significant at 10%**	

4.7.2 Impulse Response Functions

A generalized impulse response analysis was used to analyze the impact of innovations to the dependent variable (PRSI). This analysis, as opposed to Cholesky decomposition, is not sensitive to the ordering of variables in the model. The impulse response analysis is performed based on a Vector Error Correction Model with eight lags and three cointegration equations. Estimations for the GIRFs were conducted for 12 periods ahead. Figure 4.5 and Table 4.11 indicate, respectively, the impulse response and accumulated responses of the VEC model.

The results suggested that PRSI responds symmetrically to an increase in construction permits (CONSPR), level of exports (EXPOPR), in addition to the level of the economic activity index (EAIPR) as expected. Additionally, the accumulated response up to the 12^{th} month was estimated to be 0.279%, 0.402%, and 0.579%, respectively. This validates what is shown by the cointegration equation presented in Table 4.8. Also, it was confirmed that increases in the amount of bankruptcies (BANKPR), local unemployment rates (UNEMPR), crude oil prices (CRUDUS) and U.S. interest rates (INTUS) led to a decrease in the PRSI in the short-run. According to the accumulated response, the largest negative impact in PRSI was caused by the amount of bankruptcies (BANKPR) with a -0.627%. Intuitively, this will make sense given the fact that companies in the PRSI are the capital providers of most of the firms on the Island. Thus, if firms failed, then financial institutions might be affected because they will not necessarily receive their funds back. It is pivotal to note that increases in the S&P500 market index caused a positive effect on the PRSI, with a 0.2074%.

Figure 4.5 Impulse Response Functions

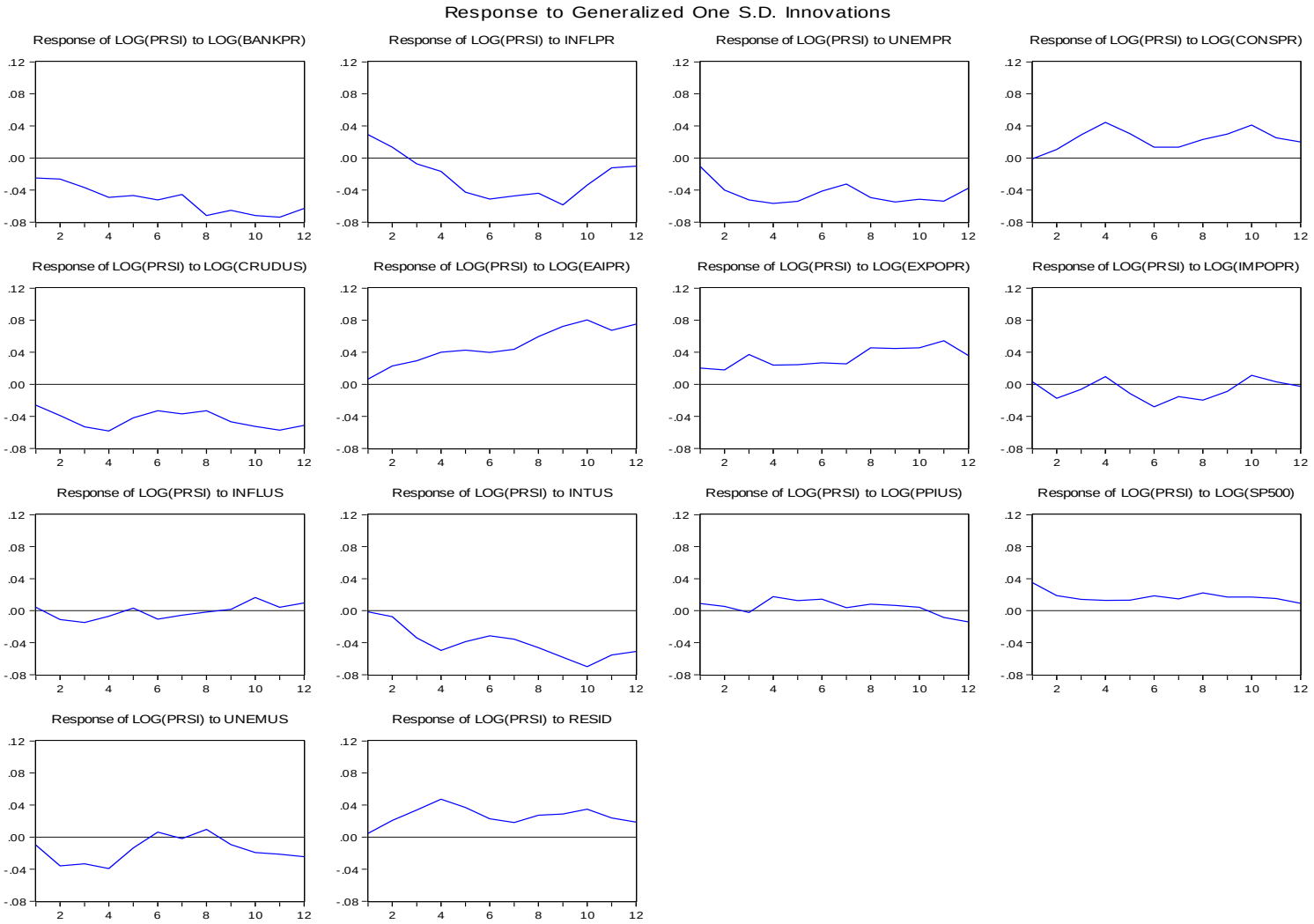


Table 4.11: Impulse Response Analysis Results

Accumulated Response of LOG(PRSI) to Generalized One S.D. Innovations							
Period	LOG (BANKPR)	INFLPR	UNEMPR	LOG (CONSPR)	LOG (CRUDUS)	LOG (EAIPR)	LOG (EXPOPR)
1	-0.025082	0.028982	-0.010584	-0.001074	-0.026098	0.00642	0.020323
2	-0.051333	0.042559	-0.050551	0.009517	-0.065237	0.029201	0.038262
3	-0.088293	0.035347	-0.102895	0.038459	-0.118255	0.05844	0.075554
4	-0.137559	0.018607	-0.15962	0.082883	-0.176454	0.098474	0.099359
5	-0.184445	-0.023952	-0.213752	0.113236	-0.21825	0.141077	0.123745
6	-0.236798	-0.075268	-0.255198	0.126819	-0.251301	0.180826	0.150486
7	-0.282211	-0.122611	-0.287718	0.140366	-0.288256	0.224487	0.176068
8	-0.354012	-0.166517	-0.337214	0.163542	-0.321279	0.284067	0.221662
9	-0.419346	-0.225027	-0.392197	0.193327	-0.368053	0.356338	0.266425
10	-0.491048	-0.258945	-0.443616	0.234459	-0.420523	0.436611	0.311993
11	-0.564933	-0.271181	-0.497508	0.25954	-0.477757	0.50402	0.366273
12	-0.627967	-0.281349	-0.535183	0.279531	-0.528999	0.579251	0.402205

Table 4.11: Impulse Response Analysis Results (continued)

Accumulated Response of LOG(PRSI) to Generalized One S.D. Innovations						
Period	LOG (IMPOPR)	INFLUS	INTUS	LOG (PPIUS)	LOG (SP500)	UNEMUS
1	0.003106	0.004242	-0.001544	0.008899	0.034902	-0.009826
2	-0.014468	-0.006872	-0.009041	0.014227	0.053683	-0.045665
3	-0.020724	-0.021577	-0.043059	0.011881	0.067949	-0.078871
4	-0.011256	-0.028458	-0.092591	0.029395	0.080691	-0.118187
5	-0.02279	-0.02527	-0.131299	0.041962	0.093883	-0.131639
6	-0.050997	-0.035753	-0.162705	0.056473	0.112567	-0.125472
7	-0.066368	-0.041478	-0.198375	0.060105	0.127137	-0.127241
8	-0.086126	-0.043189	-0.244657	0.068318	0.14924	-0.117758
9	-0.094884	-0.041445	-0.302892	0.075025	0.166132	-0.127182
10	-0.083717	-0.025088	-0.372956	0.079226	0.18306	-0.146554
11	-0.080713	-0.020799	-0.428433	0.070804	0.198294	-0.167821
12	-0.083228	-0.011018	-0.479413	0.056869	0.207487	-0.192305

Chapter 5: Conclusions and Recommendations

5.1 Conclusions

The main objective of this research was to empirically investigate the effects of macroeconomic variables from Puerto Rico and the United States, in the value of the Puerto Rico Stock Index (PRSI). The research was also conducted to determine if there was a long-run equilibrium relationship among the variables under study and whether the PRSI would react to shocks received from macroeconomic variables. Using a monthly time series from January 1996 to June 2010, a Vector Error Correction Model (VECM) was employed to determine the relationship (if any) between the PRSI and the macroeconomic variables.

The results showed that crude oil prices (CRUDUS) had a significant and negative effect on the PRSI, while the economic activity index (EAIPR) had a positive and significant impact on the PRSI. The relationship between the crude oil prices and a market indicator was similar to Büyüşalvarci (2010). The VEC model also showed that variables like inflation rate (measured by the Consumer Price Index) and T-bills rates did not present a direct relationship with the PRSI, this finding was similar to Jefferis and Okeohalam (2000). In contrast to Alameda's findings (1999), the model used for this research did not present any relationship between the PRSI and S&P500.

The impulse response analysis was employed to determine the type of relationship between all variables and the PRSI. Based on this analysis, we concluded that increases in the Economic Activity Index, the amount of private construction permits, and exports increased the Puerto Rico Stock Index, while increases in levels of inflation (both in Puerto Rico and the United States), amount of bankruptcies, and crude oil prices decreased the PRSI.

Another interesting conclusion of this research is that empirically we can demonstrate that based on our political relationship with the United States, Puerto Rico's economy will follow the United States' economy.

Analyzing the variables with a positive impact on the PRSI, it could be argued that the reason private construction permits showed a positive impact on the PRSI was because this financial industry provides most of the financing for construction development. It is worthwhile to mention, that there was an inverse relationship between U.S. short-term interest rates and the PRSI.

This research may offer some insight on the current relationships between specific macroeconomic variables and the PRSI and also contribute to the development of further research in the area. Additionally, this research might be used to present more information to current and prospective investors, as suggested by Pagán and Soydemir (2001).

5.2 Future Research

In order to use a more accurate measure of Puerto Rico's economy, this analysis could be replicated in the future using the new Puerto Rico Manufacturing- Purchasing Managers Index (PRM-PMI) based on the manufacturing industry, which was developed by the Institute of Statistics of Puerto Rico in collaboration with the Puerto Rico Manufacturers Association and the Scotiabank of Puerto Rico. The PRM-PMI measures short-run business conditions in Puerto Rico's manufacturing sector and provides a broad-based metric for the productive side of Puerto Rico's economy. Data gathering for this index is currently in a pilot phase to ensure a reliable methodology. Additionally, a forecast of the performance of the PRSI could be conducted in order to identify possible improvements in public policy.

Bibliography

Agrawalla, R. K., & Tuteja, S. K. (2008). Share Prices and Macroeconomic Variables in India: An approach to investigate the relationship between stock markets. *Journal of Management Research , 8(3),* 136-146.

Agung, I. G. (2009). *Times Series Data Analysis: Using Eviews* (1st ed.). Wiley.

Alameda Lozada, J. I. (1999). *Do* Stock Price Associate with Real Economy?, *Forum Empresarial*. *4(1),* 19-33.

Álvarez, M., & Rodríguez, Z. (2006). ¿Existe Reversion a la medida en el Puerto Rico Stock Index? Un enfoque bayesiano. *Forum Empresarial , 11*(002), 30-50.

Atje, R., & Jovanovic, B. (1993), Stock Markets and Development, *European Economic Review, 37(2),* 632-640.

Bahadur G.C., S., & Neupane, S., (2006), Stock Market and Economic Development: a Causality Test, *The Journal of Nepalese Business Studies, 3(1),* 36-44.

Beltratti, A., & Morana, C. (2010). International house prices and macroeconomic fluctuations. *Journal of Banking & Finance , 34(3),* 533-545.

Bloomberg. (2010, June). Retrieved January 2011, from Bloomberg Market Data: http://www.bloomberg.com/energy/

Brooks, C. (2008). *Introductory Econometrics for Finance* (2nd ed.). Cambridge.

Büyüşalvarci, A. (2010). The Effect of Macroeconomic Variables on Stock Returns: Evidence from Turkey. *European Journal of Social Sciences , 14(3),* 404-416.

Chen, N.-F., Roll, R., & Ross, S. A. (1986). Economic Forces and the Stock Market. *Journal of Business, 59(3),* 383-403.

Chen, G.-m., Firth, M., & Meng Rui, O. (2002). Stock market linkages: Evidence from Latin America. *Journal of Banking & Finance , 26(6),* 1113-1141.

Chen, S.-S. (2009). Predicting the bear stock market: Macroeconomic variables as leading indicators. *Journal of Banking & Finance , 33(2),* 211-223.

Collins, S. M., Bosworth, B. P., & Soto-Class, M. A. (2006). *The Economy of Puerto Rico.* Washington DC: Brooking Institution Press .

Enisan, A. A., & Olufisayo, A. O. (2009). Stock market development and economic growth: Evidence from seven sub-Sahara African countries. *Journal of Economics and Business , 61(2),* 162-171.

Federal Reserve Bank. (2010, June). *Federal Reserve Bank of St. Louis*. Retrieved January 2011, from Economic Data.

Government Development Bank for Puerto Rico. (December, 2010). Retrieved from http://www.gdb-pur.com/

Gursoy, T. and Muslumov, A. (1998) Stock Markets and Economic Growth: A Causality Test, MBA thesis, *Institute of Social Sciences,* Instabul.

Guha Deb, S., & Mukherjee, J. (2008). Does stock Market Development Cause Economic Growth? A Times Series Analysis for Indian Economy. *International Research Journal of Finance and Economics, 21*, 142-148.

Hsiao, C. (1979). Causality Test in Econometrics. *Journal of Economic Dynamic and Control, 1(4)*, 321-346.

Hsing, Y. (2006). Responses of output in Poland to shocks to the exchange, the stock price, and other macroeconomic variables: a VAR Model. *Applied Economics Letters , 13(15)*, 1017-1022.

Hou, H., & Cheng, S.-Y. (2010). The roles of stock market in the finance-growth nexus: times series cointegration and causality evidence from Taiwan. *Applied Financial Economics, 20(12)*, 975-981.

Instituto de Estadisticas de Puerto Rico. (2011, April). Retrieved from Instituto de Estadisticas de Puerto Rico Estado Libre Asociado de Puerto Rico: http://www.estadisticas.gobierno.pr/iepr/Estadisticas.aspx

Ito, K. (2008). Oil Price and the Russian Economy: A VEC Model Approach. *International Research Journal of Finance and Economics (17),* 68-74.

Jefferis, K. R., & Okeahalam, C. C. (2000). The impact of economic fundamentals on stock market in southern Africa. *Development Southern Africa, 17(1),* 23-51.

Juselius, K. (2003, July 20). *Clark University.* Retrieved March 18, 2010, from www.clarku.edu/faculty/mcallan/econ366/readings/VAR_VEC_Juselius_Johansen.pdf.

Kennedy, P. (2008). *A Guide to Econometrics* (6 ed.). Wiley-Blackwell.

Kyereboah-Coleman, A., & Agyire-Tettey, K. F. (2008). Impact of macroeconomic indicators on stock market preformance: The case of the Ghana Stock Exchange. *The Journal of Risk Finance ,* 9(4), 365-378.

Lizardo, R. A., & Mollick, A. V. (2009). Do foreign purchases of US stocks help the US stock market?. *Journal of International Financial Markets, Institutions & Money, 19(5),* 969-986.

Luintel, K. & Khan, M. (1999), A Quantitative Reassessment of the Finance-Growth Nexus: Evidence from a Multivariate VAR, *Journal of Development Economics, 60(2),* 381-405.

Mafizur Rahman, M., & Salahuddin, M. (2010). The determinants of economic growth in Pakistan: Does stock market development play a major role? *Economic Issues, 15(2),* 69-86.

Minier, J. (2009). Opening a stock exhange. *Jornal of Development Economics , 90(1),* 135-143.

Mukherje, T. K., & Naka, A. (1995). Dynamic relations between macroeconomic varaibles and the Japanese Stock Market: An application of the Vector Error Correction Model. *The Journal of Financial Research , 28*(2), 223-237.

Osinubi, T. S. (2004) Does *Stock Market* Promote Economic Growth in Nigeria?. *The ICFAI Journal of Applied Finance*, 10(3), 17-35.

Pagán, J. A., & Soydemir, G. A. (2001). Response asymmetries in the Latin American equity markets. *International Review of Financial Analysis,* 10(2), 175-185.

Pagán, J. A., & Soydemir, G. (2000). On the linkages between equity markets in Latin America. *Applied Economics Letters ,* 7(3), 207-210.

Patra, T., & Poshakwale, S. (2006). Economic variables and stock market returns: evidence from Athens stock exchange. *Applied Financial Economics ,* 16(13), 993-1005.

Pesaran, H. H., & Shin,Y.. (1998). Generalized Impulse Response Analysis in Linear Multivariate Models. *Economic Letters,* 58(1), 17-29.

Puerto Rico Planning Board. (January, 2011). Retrived from http://www.jp.gobierno.pr/

Quantitative Micro Software, LLC (2007). Eviews 6.0 (Student Version) [computer software]. Irvine, CA. Available information on: www.eviews.com

Quantitative Micro Software. (2009). *Eviews 6.0 User Manuals I & II.*

Shahbaz, M., Ahmed, N., & Ali, L. (2008). Stock Market Development and Economic Growth: Ardl Causality in Pakistan. International Research Journal of Finance and Economics, 14, 182-195.

The Conference Board. (2010). Business Cycle Indicators. 15(3), 1-6.

Yahoo! Finance. Retrieved January 2011, from http://finance.yahoo.com/

Appendixes

Appendix A: Federal Deposit Insurance Corporations Press Release Fail Banks

Press Releases

Banco Popular de Puerto Rico, San Juan, Puerto Rico, Assumes All of the Deposits of Westernbank Puerto Rico, Mayaguez, Puerto Rico

FOR IMMEDIATE RELEASE
April 30, 2010

Media Contact:
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Phone: (571) 481-1917
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En Español

Westernbank Puerto Rico, Mayaguez, Puerto Rico, was closed today by the Office of the Commissioner of Financial Institutions of the Commonwealth of Puerto Rico, which appointed the Federal Deposit Insurance Corporation (FDIC) as receiver. To protect the depositors, the FDIC entered into a purchase and assumption agreement with Banco Popular de Puerto Rico, San Juan, Puerto Rico, to assume all of the deposits of Westernbank Puerto Rico.

The 46 branches of Westernbank Puerto Rico will reopen during normal business hours as branches of Banco Popular de Puerto Rico. Depositors of Westernbank Puerto Rico will automatically become depositors of Banco Popular de Puerto Rico. Deposits will continue to be insured by the FDIC, so there is no need for customers to change their banking relationship to retain their deposit insurance coverage. Customers should continue to use their former Westernbank Puerto Rico branch until they receive notice from Banco Popular de Puerto Rico that it has completed systems changes to allow other Banco Popular de Puerto Rico branches to process their accounts as well.

This evening and over the weekend, depositors of Westernbank Puerto Rico can access their money by writing checks or using ATM or debit cards. Checks drawn on the bank will continue to be processed. Loan customers should continue to make their payments as usual.

As of December 31, 2009, Westernbank Puerto Rico had approximately $11.94 billion in total assets and $8.62 billion in total deposits. Banco Popular de Puerto Rico did not pay the FDIC a premium to assume all of the deposits of Westernbank Puerto Rico. In addition to assuming all of the deposits, Banco Popular de Puerto Rico agreed to purchase approximately $9.39 billion of the failed bank's assets. The FDIC will retain the remaining assets for later disposition.

The FDIC and Banco Popular de Puerto Rico entered into a loss-share transaction on $8.77 billion of Westernbank Puerto Rico's assets. Banco Popular de Puerto Rico will share in the losses on the asset pools covered under the loss-share agreement. The loss-share transaction is projected to maximize returns on the assets covered by keeping them in the private sector. The transaction also is expected to minimize disruptions for loan customers. For more information on loss share, please visit: http://www.fdic.gov/bank/individual/failed/lossshare/index.html.

Customers who have questions about today's transaction can call the FDIC

toll-free at 1-800-591-2909. The phone number will be operational this evening until 9:00 p.m., Atlantic Standard Time (AST); on Saturday from 9:00 a.m. to 6:00 p.m., AST; on Sunday from noon to 6:00 p.m. AST; and thereafter from 8:00 a.m. to 8:00 p.m., AST. Interested parties also can visit the FDIC's Web site at http://www.fdic.gov/bank/individual/failed/westernbank-puertorico.html or http://www.fdic.gov/bank/individual/failed/westernbank-puertorico_spanish.html.

The FDIC encourages all bank customers to review more information about the transaction by visiting www.fdicseguro.gov.

As part of this transaction, the FDIC will acquire a value appreciation instrument. This instrument serves as additional consideration for the transaction.

The FDIC estimates that the cost to the Deposit Insurance Fund (DIF) will be $3.31 billion. Banco Popular de Puerto Rico's acquisition of all the deposits was the "least costly" resolution for the FDIC's DIF compared to all alternatives. Westernbank Puerto Rico is the 60th FDIC-insured institution to fail in the nation this year. Western Bank was one of three institutions closed in Puerto Rico today.

###

Congress created the Federal Deposit Insurance Corporation in 1933 to restore public confidence in the nation's banking system. The FDIC insures deposits at the nation's 8,012 banks and savings associations and it promotes the safety and soundness of these institutions by identifying, monitoring and addressing risks to which they are exposed. The FDIC receives no federal tax dollars – insured financial institutions fund its operations.

FDIC press releases and other information are available on the Internet at www.fdic.gov, by subscription electronically (go to www.fdic.gov/about/subscriptions/index.html) and may also be obtained through the FDIC's Public Information Center (877-275-3342 or 703-562-2200). **PR-97-2010**

Press Releases

Oriental Bank and Trust, San Juan, Puerto Rico, Assumes All of the Deposits of Eurobank, San Juan, Puerto Rico

FOR IMMEDIATE RELEASE
April 30, 2010

Media Contact:
Andrew Gray
Phone: (571) 481-1917
Email: angray@fdic.gov

En Español

Eurobank, San Juan, Puerto Rico, was closed today by the Office of the Commissioner of Financial Institutions of the Commonwealth of Puerto Rico, which appointed the Federal Deposit Insurance Corporation (FDIC) as receiver. To protect the depositors, the FDIC entered into a purchase and assumption agreement with Oriental Bank and Trust, San Juan, Puerto Rico, to assume all of the deposits of Eurobank.

The 22 branches of Eurobank will reopen during normal business hours as branches of Oriental Bank and Trust. Depositors of Eurobank will automatically become depositors of Oriental Bank and Trust. Deposits will continue to be insured by the FDIC, so there is no need for customers to change their banking relationship to retain their deposit insurance coverage. Customers should continue to use their former Eurobank branch until they receive notice from Oriental Bank and Trust that it has completed systems changes to allow other Oriental Bank and Trust branches to process their accounts as well.

This evening and over the weekend, depositors of Eurobank can access their money by writing checks or using ATM or debit cards. Checks drawn on the bank will continue to be processed. Loan customers should continue to make their payments as usual.

As of December 31, 2009, Eurobank had approximately $2.56 billion in total assets and $1.97 billion in total deposits. Oriental Bank and Trust paid the FDIC a premium of 1.25 percent to assume all of the deposits of Eurobank. In addition to assuming all of the deposits, Oriental Bank and Trust agreed to purchase essentially all of the failed bank's assets.

The FDIC and Oriental Bank and Trust entered into a loss-share transaction on $1.58 billion of Eurobank's assets. Oriental Bank and Trust will share in the losses on the asset pools covered under the loss-share agreement. The loss-share transaction is projected to maximize returns on the assets covered by keeping them in the private sector. The transaction also is expected to minimize disruptions for loan customers. For more information on loss share, please visit: http://www.fdic.gov/bank/individual/failed/lossshare/index.html.

Customers who have questions about today's transaction can call the FDIC toll-free at 1-800-591-2903. The phone number will be operational this evening until 9:00 p.m., Atlantic Standard Time (AST); on Saturday from 9:00 a.m. to 6:00 p.m., AST; on Sunday from noon to 6:00 p.m. AST; and

thereafter from 8:00 a.m. to 8:00 p.m., AST. Interested parties also can visit the FDIC's Web site at http://www.fdic.gov/bank/individual/failed/eurobank-puertorico.html or http://www.fdic.gov/bank/individual/failed/eurobank-puertorico_spanish.html.

The FDIC encourages all bank customers to review more information about the transaction by visiting www.fdicseguro.gov.

As part of this transaction, the FDIC will acquire a value appreciation instrument. This instrument serves as additional consideration for the transaction.

The FDIC estimates that the cost to the Deposit Insurance Fund (DIF) will be $743.9 million. Oriental Bank and Trust's acquisition of all the deposits was the "least costly" resolution for the FDIC's DIF compared to all alternatives. Eurobank is the 58th FDIC-insured institution to fail in the nation this year. Eurobank is one of three institutions closed in Puerto Rico today.

# # #

Congress created the Federal Deposit Insurance Corporation in 1933 to restore public confidence in the nation's banking system. The FDIC insures deposits at the nation's 8,012 banks and savings associations and it promotes the safety and soundness of these institutions by identifying, monitoring and addressing risks to which they are exposed. The FDIC receives no federal tax dollars – insured financial institutions fund its operations.

FDIC press releases and other information are available on the Internet at www.fdic.gov, by subscription electronically (go to www.fdic.gov/about/subscriptions/index.html) and may also be obtained through the FDIC's Public Information Center (877-275-3342 or 703-562-2200). **PR-95-2010**

Press Releases

Scotiabank de Puerto Rico, San Juan, Puerto Rico, Assumes All of the Deposits of R-G Premier Bank of Puerto Rico, Hato Rey, Puerto Rico

FOR IMMEDIATE RELEASE
April 30, 2010

Media Contact:
Andrew Gray
Phone: (571) 481-1917
Email: angray@fdic.gov

En Español

R-G Premier Bank of Puerto Rico, Hato Rey, Puerto Rico, was closed today by the Office of the Commissioner of Financial Institutions of the Commonwealth of Puerto Rico, which appointed the Federal Deposit Insurance Corporation (FDIC) as receiver. To protect the depositors, the FDIC entered into a purchase and assumption agreement with Scotiabank de Puerto Rico, San Juan, Puerto Rico, to assume all of the deposits of R-G Premier Bank of Puerto Rico.

The 29 branches of R-G Premier Bank of Puerto Rico will reopen during normal business hours as branches of Scotiabank de Puerto Rico. Depositors of R-G Premier Bank of Puerto Rico will automatically become depositors of Scotiabank de Puerto Rico. Deposits will continue to be insured by the FDIC, so there is no need for customers to change their banking relationship to retain their deposit insurance coverage. Customers should continue to use their former R-G Premier Bank of Puerto Rico branch until they receive notice from Scotiabank de Puerto Rico that it has completed systems changes to allow other Scotiabank de Puerto Rico branches to process their accounts as well.

This evening and over the weekend, depositors of R-G Premier Bank of Puerto Rico can access their money by writing checks or using ATM or debit cards. Checks drawn on the bank will continue to be processed. Loan customers should continue to make their payments as usual.

As of December 31, 2009, R-G Premier Bank of Puerto Rico had approximately $5.92 billion in total assets and $4.25 billion in total deposits. Scotiabank de Puerto Rico paid the FDIC a premium of 1.35 percent to assume all of the deposits of R-G Premier Bank of Puerto Rico. In addition to assuming all of the deposits, Scotiabank de Puerto Rico agreed to purchase essentially all of the failed bank's assets.

The FDIC and Scotiabank de Puerto Rico entered into a loss-share transaction on $5.41 billion of R-G Premier Bank of Puerto Rico's assets. Scotiabank de Puerto Rico will share in the losses on the asset pools covered under the loss-share agreement. The loss-share transaction is projected to maximize returns on the assets covered by keeping them in the private sector. The transaction also is expected to minimize disruptions for loan customers. For more information on loss share, please visit: http://www.fdic.gov/bank/individual/failed/lossshare/index.html.

Customers who have questions about today's transaction can call the FDIC toll-free at 1-800-591-2904. The phone number will be operational this evening until 9:00 p.m., Atlantic Standard Time (AST); on Saturday from 9:00 a.m. to 6:00 p.m., AST; on Sunday from noon to 6:00 p.m. AST; and thereafter from 8:00 a.m. to 8:00 p.m., AST. Interested parties also can visit the FDIC's Web site at http://www.fdic.gov/bank/individual/failed/r-gpremier-puertorico.html or http://www.fdic.gov/bank/individual/failed/r-gpremier-puertorico_spanish.html.

The FDIC encourages all bank customers to review more information about the transaction by visiting www.fdicseguro.gov.

The FDIC estimates that the cost to the Deposit Insurance Fund (DIF) will be $1.23 billion. Scotiabank de Puerto Rico's acquisition of all the deposits was the "least costly" resolution for the FDIC's DIF compared to all alternatives. R-G Premier Bank of Puerto Rico is the 59th FDIC-insured institution to fail in the nation this year. R-G Premier Bank of Puerto Rico is one of three institutions closed in Puerto Rico today.

###

Congress created the Federal Deposit Insurance Corporation in 1933 to restore public confidence in the nation's banking system. The FDIC insures deposits at the nation's 8,012 banks and savings associations and it promotes the safety and soundness of these institutions by identifying, monitoring and addressing risks to which they are exposed. The FDIC receives no federal tax dollars – insured financial institutions fund its operations.

FDIC press releases and other information are available on the Internet at www.fdic.gov, by subscription electronically (go to www.fdic.gov/about/subscriptions/index.html) and may also be obtained through the FDIC's Public Information Center (877-275-3342 or 703-562-2200). **PR-96-2010**

Appendix B: Vector Autoregressive Estimates

Vector Autoregression Estimates

Date: 03/11/11 Time: 02:49

Sample (adjusted): 1996M10 2010M06

Included observations: 165 after adjustments

Standard errors in ( ) & t-statistics in [ ]

	D(LOG(PRSI))
D(LOG(PRSI(-1)))	0.148365
	(0.07534)
	[1.96930]
D(LOG(PRSI(-2)))	-0.050476
	(0.08062)
	[-0.62613]
D(LOG(PRSI(-3)))	-0.079448
	(0.08248)
	[-0.96320]
D(LOG(PRSI(-4)))	0.160448
	(0.08015)
	[2.00174]
D(LOG(PRSI(-5)))	-0.008291
	(0.07975)
	[-0.10397]
D(LOG(PRSI(-6)))	-0.069951
	(0.08218)
	[-0.85125]
D(LOG(PRSI(-7)))	0.183241
	(0.08098)
	[2.26285]
D(LOG(PRSI(-8)))	-0.000962
	(0.08022)
	[-0.01200]
C	-0.013086
	(0.04892)
	[-0.26751]
BANKPR	-5.75E-06
	(2.1E-05)
	[-0.27275]
D(CONSPR)	-7.34E-06
	(5.0E-05)
	[-0.14559]
D(CRUDUS)	-0.000681
	(0.00235)
	[-0.29008]

D(EAIPR)	-0.001139
	(0.00546)
	[-0.20870]
D(LOG(EXPOPR))	0.091927
	(0.05380)
	[1.70875]
D(LOG(IMPOPR))	-0.07162
	(0.07348)
	[-0.97467]
INFLPR	0.034650
	(0.03614)
	[0.95878]
D(INFLUS)	-0.100236
	(1.93430)
	[-0.05182]
D(INTUS)	-0.087562
	(0.03555)
	[-2.46293]
D(PPIUS)	4.36E-06
	(0.00627)
	[0.00069]
D(LOG(SP500))	0.881767
	(0.15606)
	[5.65014]
UNEMPR	0.001026
	(0.00385)
	[0.26670]
D(UNEMUS)	-0.056136
	(0.04777)
	[-1.17507]
R-squared	0.332698
Adj. R-squared	0.234703
Sum sq. resids	1.083018
S.E. equation	0.087026
F-statistic	3.395043
Log likelihood	180.5362
Akaike AIC	-1.92165
Schwarz SC	-1.507524
Mean dependent	-0.00379
S.D. dependent	0.099480

VAR Stability Check

Roots of Characteristic Polynomial
Endogenous variables: LOG(PRSI) LOG(BANKPR) INFLPR UNEMPR LOG(CONSPR) LOG(CRUDUS) LOG(EAIPR) LOG(EXPOPR) LOG(IMPOPR) INFLUS INTUS LOG(PPIUS) LOG(SP500) UNEMUS RESID
Exogenous variables: C
Lag specification: 1 8

Root	Modulus
-0.900563 + 0.544468i	1.052359
-0.900563 - 0.544468i	1.052359
0.873379 - 0.550122i	1.032195
0.873379 + 0.550122i	1.032195
-1.026029	1.026029
-0.038202 + 1.019722i	1.020437
-0.038202 - 1.019722i	1.020437
0.917591 - 0.405881i	1.003351
0.917591 + 0.405881i	1.003351
0.997302 - 0.066254i	0.999500
0.997302 + 0.066254i	0.999500
0.996899 + 0.035895i	0.997545
0.996899 - 0.035895i	0.997545
0.474464 - 0.876692i	0.996848
0.474464 + 0.876692i	0.996848
0.957991 - 0.267153i	0.994544
0.957991 + 0.267153i	0.994544
0.957235 + 0.230852i	0.984678
0.957235 - 0.230852i	0.984678
0.752845 + 0.628999i	0.981028
0.752845 - 0.628999i	0.981028
-0.641828 + 0.732549i	0.973946
-0.641828 - 0.732549i	0.973946
-0.427055 + 0.874221i	0.972953
-0.427055 - 0.874221i	0.972953
-0.028775 + 0.971323i	0.971749
-0.028775 - 0.971323i	0.971749
0.319833 + 0.914617i	0.968926
0.319833 - 0.914617i	0.968926
-0.953537 - 0.167981i	0.968220
-0.953537 + 0.167981i	0.968220
-0.558625 + 0.790412i	0.967891
-0.558625 - 0.790412i	0.967891
-0.207984 + 0.944717i	0.967340
-0.207984 - 0.944717i	0.967340
0.235742 + 0.937367i	0.966557
0.235742 - 0.937367i	0.966557
0.948887 + 0.181712i	0.966129
0.948887 - 0.181712i	0.966129
-0.283089 + 0.918912i	0.961529
-0.283089 - 0.918912i	0.961529
0.540661 + 0.794997i	0.961423
0.540661 - 0.794997i	0.961423
0.649466 - 0.706686i	0.959798
0.649466 + 0.706686i	0.959798

-0.876547 - 0.385560i	0.957596
-0.876547 + 0.385560i	0.957596
-0.712043 - 0.637336i	0.955616
-0.712043 + 0.637336i	0.955616
0.208102 + 0.932159i	0.955106
0.208102 - 0.932159i	0.955106
0.949128 + 0.094529i	0.953823
0.949128 - 0.094529i	0.953823
0.584476 - 0.748600i	0.949744
0.584476 + 0.748600i	0.949744
0.948355	0.948355
-0.449553 - 0.831568i	0.945306
-0.449553 + 0.831568i	0.945306
0.892102 - 0.311308i	0.944859
0.892102 + 0.311308i	0.944859
-0.579176 - 0.744303i	0.943097
-0.579176 + 0.744303i	0.943097
-0.905112 + 0.252560i	0.939688
-0.905112 - 0.252560i	0.939688
0.331414 + 0.877885i	0.938359
0.331414 - 0.877885i	0.938359
0.712309 - 0.606035i	0.935234
0.712309 + 0.606035i	0.935234
-0.876034 - 0.325405i	0.934518
-0.876034 + 0.325405i	0.934518
0.835040 - 0.416938i	0.933343
0.835040 + 0.416938i	0.933343
-0.756409 + 0.546603i	0.933236
-0.756409 - 0.546603i	0.933236
-0.913077 - 0.183572i	0.931348
-0.913077 + 0.183572i	0.931348
0.084029 + 0.926585i	0.930388
0.084029 - 0.926585i	0.930388
-0.365458 + 0.852776i	0.927786
-0.365458 - 0.852776i	0.927786
-0.924855	0.924855
0.903420 - 0.181501i	0.921472
0.903420 + 0.181501i	0.921472
-0.068655 + 0.914014i	0.916589
-0.068655 - 0.914014i	0.916589
-0.232265 - 0.886637i	0.916555
-0.232265 + 0.886637i	0.916555
0.772481 + 0.491971i	0.915840
0.772481 - 0.491971i	0.915840
-0.625151 - 0.653280i	0.904206
-0.625151 + 0.653280i	0.904206
0.534747 + 0.717317i	0.894705
0.534747 - 0.717317i	0.894705
0.673946 - 0.578101i	0.887921
0.673946 + 0.578101i	0.887921
0.126957 - 0.877035i	0.886177
0.126957 + 0.877035i	0.886177
-0.786998 + 0.379786i	0.873844
-0.786998 - 0.379786i	0.873844
0.422095 - 0.755882i	0.865750

0.422095 + 0.755882i	0.865750
0.714338 + 0.479520i	0.860359
0.714338 - 0.479520i	0.860359
-0.699437 - 0.499294i	0.859364
-0.699437 + 0.499294i	0.859364
-0.816184 + 0.026230i	0.816605
-0.816184 - 0.026230i	0.816605
-0.378612 + 0.642428i	0.745694
-0.378612 - 0.642428i	0.745694
0.338453 + 0.588581i	0.678954
0.338453 - 0.588581i	0.678954
-0.480038 - 0.479417i	0.678437
-0.480038 + 0.479417i	0.678437
-0.640771 + 0.206695i	0.673283
-0.640771 - 0.206695i	0.673283
0.352277 - 0.452739i	0.573648
0.352277 + 0.452739i	0.573648
-0.226116 + 0.419066i	0.476177
-0.226116 - 0.419066i	0.476177
-0.153246	0.153246
Note: Warning: At least one root outside the unit circle. VAR does not satisfy the stability condition.	

Appendix C: Vector Error Correction Model – Stability Check

Vector Error Correction
Stability Check

Roots of Characteristic Polynomial
Endogenous variables: LOG(PRSI) LOG(BANKPR) INFLPR UNEMPR LOG(CONSPR) LOG(CRUDUS) LOG(EAIPR) LOG(EXPOPR) LOG(IMPOPR) INFLUS INTUS LOG(PPIUS) LOG(SP500) UNEMUS RESID
Exogenous variables: @SEAS(1) @SEAS(2) @SEAS(3) @SEAS(4) @SEAS(5) @SEAS(6) @SEAS(7) @SEAS(8) @SEAS(9) @SEAS(10) @SEAS(11)
Lag specification: 1 8

Root	Modulus
-0.944718 + 0.559539i	1.097987
-0.944718 - 0.559539i	1.097987
-1.048117	1.048117
0.861383 + 0.564582i	1.029919
0.861383 - 0.564582i	1.029919
-0.059513 + 1.024712i	1.026439
-0.059513 - 1.024712i	1.026439
1.000000	1.000000
1.000000 - 1.28e-14i	1.000000
1.000000 + 1.28e-14i	1.000000
1.000000	1.000000
1.000000	1.000000
1.000000	1.000000
1.000000	1.000000
1.000000	1.000000
1.000000 - 4.90e-15i	1.000000
1.000000 + 4.90e-15i	1.000000
1.000000 - 7.24e-14i	1.000000
1.000000 + 7.24e-14i	1.000000
0.958732 + 0.269300i	0.995836
0.958732 - 0.269300i	0.995836
0.462081 + 0.874080i	0.988704
0.462081 - 0.874080i	0.988704
-0.499678 - 0.849104i	0.985218
-0.499678 + 0.849104i	0.985218
0.764962 + 0.617340i	0.982993
0.764962 - 0.617340i	0.982993
0.208010 - 0.957550i	0.979883
0.208010 + 0.957550i	0.979883
0.909973 - 0.362213i	0.979413
0.909973 + 0.362213i	0.979413
0.326245 - 0.922401i	0.978396
0.326245 + 0.922401i	0.978396
-0.204691 + 0.954030i	0.975742
-0.204691 - 0.954030i	0.975742
-0.635265 + 0.739536i	0.974923
-0.635265 - 0.739536i	0.974923
0.269920 - 0.935330i	0.973499
0.269920 + 0.935330i	0.973499
0.971265 + 0.064954i	0.973435
0.971265 - 0.064954i	0.973435
-0.579709 - 0.781190i	0.972790

-0.579709 + 0.781190i	0.972790
-0.096326 - 0.967375i	0.972159
-0.096326 + 0.967375i	0.972159
0.676787 + 0.695353i	0.970339
0.676787 - 0.695353i	0.970339
0.147792 + 0.956258i	0.967611
0.147792 - 0.956258i	0.967611
-0.258736 + 0.931064i	0.966346
-0.258736 - 0.931064i	0.966346
-0.934640 - 0.240193i	0.965010
-0.934640 + 0.240193i	0.965010
-0.377523 + 0.887938i	0.964861
-0.377523 - 0.887938i	0.964861
-0.917458 - 0.298165i	0.964692
-0.917458 + 0.298165i	0.964692
-0.887310 - 0.377372i	0.964224
-0.887310 + 0.377372i	0.964224
-0.286737 - 0.920058i	0.963703
-0.286737 + 0.920058i	0.963703
-0.948807 + 0.168550i	0.963662
-0.948807 - 0.168550i	0.963662
-0.673138 + 0.689087i	0.963305
-0.673138 - 0.689087i	0.963305
0.619992 + 0.733199i	0.960194
0.619992 - 0.733199i	0.960194
-0.447546 - 0.848874i	0.959628
-0.447546 + 0.848874i	0.959628
-0.765293 - 0.573005i	0.956038
-0.765293 + 0.573005i	0.956038
0.543123 + 0.785608i	0.955072
0.543123 - 0.785608i	0.955072
-0.702090 - 0.645194i	0.953523
-0.702090 + 0.645194i	0.953523
0.522847 - 0.797070i	0.953252
0.522847 + 0.797070i	0.953252
0.065633 - 0.950704i	0.952967
0.065633 + 0.950704i	0.952967
0.866121 + 0.394182i	0.951601
0.866121 - 0.394182i	0.951601
-0.948676	0.948676
-0.562583 + 0.762117i	0.947271
-0.562583 - 0.762117i	0.947271
0.911195 - 0.223487i	0.938202
0.911195 + 0.223487i	0.938202
0.809685 + 0.471855i	0.937143
0.809685 - 0.471855i	0.937143
0.265525 - 0.896422i	0.934920
0.265525 + 0.896422i	0.934920
0.727621 + 0.581844i	0.931652
0.727621 - 0.581844i	0.931652
-0.838582 - 0.405009i	0.931263
-0.838582 + 0.405009i	0.931263
-0.915964 - 0.157869i	0.929469
-0.915964 + 0.157869i	0.929469
0.676983 + 0.630343i	0.925008

0.676983 - 0.630343i	0.925008
0.920928 - 0.085251i	0.924866
0.920928 + 0.085251i	0.924866
-0.916801 + 0.039668i	0.917658
-0.916801 - 0.039668i	0.917658
0.398617 + 0.823104i	0.914546
0.398617 - 0.823104i	0.914546
-0.727094 - 0.534618i	0.902487
-0.727094 + 0.534618i	0.902487
0.055921 + 0.896146i	0.897889
0.055921 - 0.896146i	0.897889
-0.118040 + 0.889457i	0.897255
-0.118040 - 0.889457i	0.897255
-0.769937 - 0.460625i	0.897206
-0.769937 + 0.460625i	0.897206
0.739933 - 0.476260i	0.879957
0.739933 + 0.476260i	0.879957
0.843452 - 0.158408i	0.858198
0.843452 + 0.158408i	0.858198
-0.409717 - 0.724084i	0.831965
-0.409717 + 0.724084i	0.831965
-0.763569 + 0.329831i	0.831761
-0.763569 - 0.329831i	0.831761
0.616035 + 0.554467i	0.828814
0.616035 - 0.554467i	0.828814
-0.377942 + 0.724185i	0.816875
-0.377942 - 0.724185i	0.816875
0.749588 - 0.289881i	0.803687
0.749588 + 0.289881i	0.803687
0.352628 - 0.703140i	0.786608
0.352628 + 0.703140i	0.786608
-0.694587 + 0.253244i	0.739313
-0.694587 - 0.253244i	0.739313
0.002662 - 0.608683i	0.608688
0.002662 + 0.608683i	0.608688
-0.545104	0.545104
0.193074 - 0.499973i	0.535958
0.193074 + 0.499973i	0.535958
Note: VEC specification imposes 12 unit root(s).	

Appendix D: Error Correction Relations

Error Correction:	D(LOG(PRSI))	D(LOG(CRUDUS))	D(LOG(EAIPR))	D(LOG(EXPOPR))	D(LOG(IMPOPR))	D(INFLUS)	D(INTUS)	D(LOG(PPIUS))	D(UNEMUS)	D(RESID)
D(LOG(PRSI(-2)))	-0.333749	0.553475	-0.042703	0.213046	-0.386804	0.015845	-1.347023	0.054287	-0.310553	37.50675
	-0.23678	-0.19278	-0.01824	-0.27697	-0.19753	-0.00861	-0.47716	-0.02074	-0.26798	-217.668
	[-1.40950]	**[2.87103]**	[-2.34103]	[0.76920]	[-1.95824]	[1.83929]	**[-2.82303]**	**[2.61812]**	[-1.15885]	[0.17231]
D(LOG(PRSI(-6)))	-0.479887	0.428675	-0.03261	0.246314	0.210606	0.034436	-0.362406	0.031458	0.583197	-101.6542
	-0.31806	-0.25895	-0.0245	-0.37204	-0.26533	-0.01157	-0.64093	-0.02785	-0.35997	-292.379
	[-1.50880]	[1.65544]	[-1.33091]	[0.66207]	[0.79377]	[2.97594]	[-0.56544]	[1.12944]	[1.62014]	[-0.34768]
D(LOG(PRSI(-8)))	-0.415081	0.375875	-0.013736	-0.583936	0.163191	0.037815	-0.093059	0.066677	-0.045822	134.0222
	-0.25593	-0.20837	-0.01972	-0.29937	-0.2135	-0.00931	-0.51574	-0.02241	-0.28966	-235.27
	[-1.62183]	[1.80389]	[-0.69670]	[-1.95057]	[0.76436]	[4.06116]	[-0.18044]	[2.97502]	[-0.15819]	[0.56965]
D(LOG(BANKPR(-1)))	0.217601	-0.286616	0.020807	-0.250378	0.081175	-0.01354	0.576674	-0.019672	0.083144	-45.51487
	-0.13634	-0.111	-0.0105	-0.15948	-0.11373	-0.00496	-0.27474	-0.01194	-0.1543	-125.332
	[1.59602]	[-2.58210]	[1.98104]	[-1.57000]	[0.71373]	[-2.72959]	[2.09896]	[-1.64765]	[0.53883]	[-0.36315]
D(LOG(BANKPR(-2)))	0.223463	-0.183315	0.016596	-0.242176	0.125199	-0.012461	0.492671	-0.009596	-0.077857	-56.01234
	-0.12931	-0.10528	-0.00996	-0.15125	-0.10787	-0.0047	-0.26058	-0.01132	-0.14635	-118.87
	[1.72812]	[-1.74124]	[1.66601]	[-1.60111]	[1.16064]	[-2.64875]	[1.89068]	[-0.84746]	[-0.53200]	[-0.47121]
D(LOG(BANKPR(-4)))	0.352317	-0.085997	0.007034	-0.322383	-0.026189	-0.015222	0.191783	-0.01054	-0.295564	129.1587
	-0.14444	-0.11759	-0.01113	-0.16895	-0.12049	-0.00525	-0.29106	-0.01265	-0.16347	-132.777
	[2.43922]	[-0.73129]	[0.63215]	[-1.90815]	[-0.21735]	[-2.89677]	[0.65890]	[-0.83332]	[-1.80807]	[0.97275]
D(LOG(BANKPR(-5)))	0.326246	-0.159057	0.016307	-0.267658	0.071126	-0.013448	0.143434	-0.009565	-0.324682	134.0987
	-0.14048	-0.11437	-0.01082	-0.16432	-0.11719	-0.00511	-0.28309	-0.0123	-0.15899	-129.138
	[2.32237]	[-1.39070]	[1.50685]	[-1.62888]	[0.60694]	[-2.63131]	[0.50668]	[-0.77755]	[-2.04216]	[1.03842]
D(LOG(BANKPR(-7)))	0.122846	-0.40725	0.021756	-0.026139	0.05603	-0.012502	0.291154	-0.011755	-0.033986	12.75335
	-0.13472	-0.10968	-0.01038	-0.15759	-0.11239	-0.0049	-0.27148	-0.0118	-0.15247	-123.845
	[0.91185]	[-3.71292]	[2.09626]	[-0.16587]	[0.49856]	[-2.55064]	[1.07245]	[-0.99642]	[-0.22290]	[0.10298]
D(LOG(BANKPR(-8)))	0.05583	-0.242344	0.020737	-0.126179	-0.056335	0.001566	0.159136	-0.008275	0.216589	88.35344
	-0.08557	-0.06967	-0.00659	-0.10009	-0.07138	-0.00311	-0.17243	-0.00749	-0.09684	-78.6603
	[0.65246]	[-3.47863]	[3.14579]	[-1.26065]	[-0.78920]	[0.50316]	[0.92288]	[-1.10429]	[2.23648]	[1.12323]

D(INFLPR(-3))	0.265451	-0.223615	0.012016	-0.164123	0.041427	-0.004983	0.473932	-0.014464	0.343075	-72.45174
	-0.11641	-0.09478	-0.00897	-0.13617	-0.09711	-0.00424	-0.23459	-0.01019	-0.13175	-107.013
	[2.28027]	[-2.35937]	[1.33989]	[-1.20530]	[0.42659]	[-1.17656]	[2.02028]	[-1.41885]	[2.60397]	[-0.67703]
D(INFLPR(-4))	0.024802	-0.141143	0.025808	-0.141436	0.142599	-0.010178	0.270563	-0.025594	0.260248	-23.54153
	-0.12215	-0.09945	-0.00941	-0.14288	-0.1019	-0.00444	-0.24615	-0.0107	-0.13824	-112.287
	[0.20304]	[-1.41926]	[2.74265]	[-0.98990]	[1.39944]	[-2.29030]	[1.09919]	[-2.39273]	[1.88253]	[-0.20965]
D(INFLPR(-5))	-0.033567	-0.164952	0.035131	-0.270141	0.093488	-0.008216	0.592061	-0.000545	0.430933	-96.3158
	-0.14831	-0.12075	-0.01143	-0.17348	-0.12372	-0.0054	-0.29887	-0.01299	-0.16786	-136.34
	[-0.22633]	[-1.36606]	[3.07474]	[-1.55716]	[0.75562]	[-1.52259]	[1.98097]	[-0.04199]	[2.56728]	[-0.70644]
D(INFLPR(-6))	-0.067334	-0.315945	0.04298	-0.136464	-0.026769	-0.015643	0.563925	-0.02367	0.260205	-153.2364
	-0.16219	-0.13205	-0.01249	-0.18972	-0.1353	-0.0059	-0.32684	-0.0142	-0.18356	-149.097
	[-0.41515]	[-2.39263]	[3.43990]	[-0.71931]	[-0.19785]	[-2.65105]	[1.72539]	[-1.66655]	[1.41753]	[-1.02776]
D(INFLPR(-8))	-0.201404	-0.007624	0.020182	0.08045	-0.040206	-0.006893	0.393383	-0.019988	0.252796	-184.6698
	-0.08894	-0.07241	-0.00685	-0.10403	-0.07419	-0.00324	-0.17923	-0.00779	-0.10066	-81.7587
	[-2.26451]	[-0.10529]	[2.94555]	[0.77331]	[-0.54191]	[-2.13017]	[2.19490]	[-2.56643]	[2.51143]	[-2.25872]
D(UNEMPR(-4))	0.032761	0.058823	-0.005287	0.023777	-0.028648	-0.000682	-0.102989	0.000942	-0.014567	-26.89733
	-0.02555	-0.0208	-0.00197	-0.02989	-0.02131	-0.00093	-0.05149	-0.00224	-0.02892	-23.4884
	[1.28216]	[2.82765]	[-2.68593]	[0.79556]	[-1.34405]	[-0.73374]	[-2.00019]	[0.42078]	[-0.50374]	[-1.14513]
D(UNEMPR(-6))	0.01004	0.051866	-0.002988	-0.0048	-0.012895	-0.000678	-0.039359	-0.000206	-0.052395	8.929612
	-0.02087	-0.01699	-0.00161	-0.02441	-0.01741	-0.00076	-0.04206	-0.00183	-0.02362	-19.1859
	[0.48103]	[3.05235]	[-1.85818]	[-0.19660]	[-0.74064]	[-0.89246]	[-0.93583]	[-0.11280]	[-2.21817]	[0.46543]
D(UNEMPR(-8))	0.04735	-0.014224	-0.000291	0.009486	-0.012971	-0.001241	0.051649	-0.003105	-0.009326	-10.61071
	-0.01697	-0.01381	-0.00131	-0.01985	-0.01415	-0.00062	-0.03419	-0.00149	-0.0192	-15.5974
	[2.79066]	[-1.02969]	[-0.22289]	[0.47798]	[-0.91638]	[-2.01080]	[1.51057]	[-2.08994]	[-0.48568]	[-0.68029]
D(LOG(CONSPR(-1)))	1.709996	-5.775794	0.650953	-3.965949	3.188189	-0.027032	3.930963	-0.005209	5.967885	919.1618
	-2.1424	-1.74425	-0.16504	-2.50598	-1.7872	-0.07794	-4.31725	-0.18761	-2.42469	-1969.43
	[0.79817]	[-3.31134]	[3.94414]	[-1.58259]	[1.78390]	[-0.34681]	[0.91052]	[-0.02777]	[2.46130]	[0.46671]

D(LOG(CONSPR(-2)))	1.044742	-4.740872	0.534983	-5.235143	2.707592	-0.041092	3.80623	-0.036685	6.84533	153.0983
	-1.96585	-1.6005	-0.15144	-2.29946	-1.63992	-0.07152	-3.96146	-0.17215	-2.22487	-1807.13
	[0.53145]	[-2.96212]	[3.53261]	[-2.27668]	[1.65106]	[-0.57454]	[0.96081]	[-0.21310]	[3.07673]	[0.08472]
D(LOG(CONSPR(-3)))	1.691418	-5.238824	0.429097	-2.848759	2.610243	-0.137701	5.088209	0.00318	4.230499	-1006.276
	-2.10687	-1.71532	-0.16231	-2.46442	-1.75756	-0.07665	-4.24565	-0.1845	-2.38448	-1936.77
	[0.80281]	[-3.05414]	[2.64376]	[-1.15595]	[1.48515]	[-1.79644]	[1.19845]	[0.01724]	[1.77418]	[-0.51956]
D(LOG(CONSPR(-4)))	0.705827	-3.378941	0.393989	-2.752699	1.976652	-0.044851	2.480663	0.080102	3.961209	-869.0356
	-1.68231	-1.36966	-0.1296	-1.96781	-1.40339	-0.06121	-3.3901	-0.14732	-1.90398	-1546.49
	[0.41956]	[-2.46699]	[3.04006]	[-1.39886]	[1.40848]	[-0.73279]	[0.73174]	[0.54372]	[2.08049]	[-0.56194]
D(LOG(CONSPR(-5)))	1.170929	-2.536499	0.348227	-2.757492	0.832518	-0.040494	-0.49427	0.028562	3.465601	-223.3091
	-1.22557	-0.9978	-0.09441	-1.43356	-1.02238	-0.04459	-2.4697	-0.10732	-1.38706	-1126.62
	[0.95541]	[-2.54208]	[3.68831]	[-1.92353]	[0.81430]	[-0.90817]	[-0.20013]	[0.26613]	[2.49853]	[-0.19821]
D(LOG(CONSPR(-6)))	1.413759	-2.21432	0.226542	-2.589503	-0.386069	-0.036749	-0.032307	0.028011	1.945223	26.32304
	-1.02256	-0.83252	-0.07877	-1.1961	-0.85303	-0.0372	-2.06061	-0.08955	-1.1573	-940.004
	[1.38256]	[-2.65977]	[2.87583]	[-2.16496]	[-0.45259]	[-0.98780]	[-0.01568]	[0.31281]	[1.68083]	[0.02800]
D(LOG(CONSPR(-8)))	1.233315	-1.920371	0.05969	-0.353293	0.155526	-0.055212	0.27929	0.033061	1.149263	-176.1652
	-0.78397	-0.63827	-0.06039	-0.91701	-0.65399	-0.02852	-1.5798	-0.06865	-0.88726	-720.67
	[1.57318]	[-3.00872]	[0.98834]	[-0.38527]	[0.23781]	[-1.93575]	[0.17679]	[0.48158]	[1.29529]	[-0.24445]
D(LOG(CRUDUS(-1)))	0.700391	1.044375	-0.094511	0.161539	-0.554935	-0.014862	-0.907013	0.020348	-1.624009	-521.2035
	-0.47129	-0.3837	-0.03631	-0.55127	-0.39315	-0.01715	-0.94971	-0.04127	-0.53338	-433.235
	[1.48613]	[2.72186]	[-2.60318]	[0.29303]	[-1.41152]	[-0.86675]	[-0.95504]	[0.49305]	[-3.04473]	[-1.20305]
D(LOG(CRUDUS(-2)))	0.570927	1.359619	-0.099389	0.274418	-0.899426	-0.012568	-0.934892	0.026344	-0.697608	-192.7276
	-0.46568	-0.37913	-0.03587	-0.54471	-0.38847	-0.01694	-0.93841	-0.04078	-0.52704	-428.081
	[1.22601]	[3.58612]	[-2.77050]	[0.50379]	[-2.31530]	[-0.74180]	[-0.99625]	[0.64600]	[-1.32364]	[-0.45021]
D(LOG(CRUDUS(-3)))	0.54468	1.394557	-0.085983	0.311361	-0.805202	0.004299	-1.608588	0.009884	-0.561343	-206.5902
	-0.51986	-0.42325	-0.04005	-0.60809	-0.43367	-0.01891	-1.0476	-0.04552	-0.58836	-477.892
	[1.04774]	[3.29488]	[-2.14697]	[0.51203]	[-1.85670]	[0.22732]	[-1.53550]	[0.21712]	[-0.95408]	[-0.43229]

D(LOG(CRUDUS(-4)))	0.726146	0.446527	-0.068265	0.829826	-0.697761	-0.035088	-1.579265	-0.06947	-1.553323	-303.649
	-0.48688	-0.3964	-0.03751	-0.56951	-0.40616	-0.01771	-0.98114	-0.04264	-0.55104	-447.574
	[1.49142]	[1.12646]	[-1.82004]	[1.45709]	[-1.71795]	[-1.98084]	[-1.60962]	[-1.62936]	[-2.81891]	[-0.67843]
D(LOG(CRUDUS(-5)))	0.109971	0.726207	-0.020366	0.207632	-0.220372	0.012733	-0.843416	0.037666	-1.041917	-270.1359
	-0.31451	-0.25606	-0.02423	-0.36788	-0.26236	-0.01144	-0.63377	-0.02754	-0.35595	-289.114
	[0.34966]	[2.83612]	[-0.84060]	[0.56440]	[-0.83995]	[1.11281]	[-1.33078]	[1.36762]	[-2.92718]	[-0.93436]
D(LOG(CRUDUS(-6)))	-0.123118	0.559334	-0.014931	0.118888	-0.450354	-0.001502	-0.609778	-0.005304	0.113949	32.97664
	-0.24962	-0.20323	-0.01923	-0.29198	-0.20824	-0.00908	-0.50302	-0.02186	-0.28251	-229.468
	[-0.49322]	[2.75221]	[-0.77647]	[0.40717]	[-2.16272]	[-0.16539]	[-1.21222]	[-0.24263]	[0.40334]	[0.14371]
D(LOG(EAIPR(-1)))	-10.49926	-1.227771	0.169704	6.05804	6.701787	0.472902	7.71223	0.110996	8.177624	2613.138
	-4.15452	-3.38242	-0.32005	-4.85957	-3.46571	-0.15115	-8.37194	-0.36381	-4.70192	-3819.09
	[-2.52719]	[-0.36299]	[0.53024]	[1.24662]	[1.93374]	[3.12871]	[0.92120]	[0.30509]	[1.73921]	[0.68423]
D(LOG(EAIPR(-3)))	-10.69594	-5.782155	0.169879	-2.496476	3.742184	0.469119	12.4059	0.056243	7.188801	3226.996
	-3.72733	-3.03462	-0.28714	-4.35988	-3.10935	-0.13561	-7.5111	-0.3264	-4.21845	-3426.39
	[-2.86960]	[-1.90540]	[0.59162]	[-0.57260]	[1.20353]	[3.45939]	[1.65168]	[0.17231]	[1.70413]	[0.94181]
D(LOG(EAIPR(-6)))	-3.961502	-1.061497	-0.501816	4.586364	5.792046	0.144783	7.499737	-0.057811	8.905459	-535.5244
	-2.96316	-2.41247	-0.22827	-3.46603	-2.47188	-0.10781	-5.97119	-0.25948	-3.3536	-2723.93
	[-1.33692]	[-0.44000]	[-2.19833]	[1.32323]	[2.34318]	[1.34300]	[1.25599]	[-0.22279]	[2.65550]	[-0.19660]
D(LOG(EXPOPR(-1)))	-0.106719	0.674498	-0.106622	-0.390697	-0.472477	-0.021448	1.518413	-0.044239	-2.253583	-112.3863
	-0.40817	-0.33231	-0.03144	-0.47744	-0.34049	-0.01485	-0.82252	-0.03574	-0.46195	-375.213
	[-0.26146]	[2.02972]	[-3.39088]	[-0.81832]	[-1.38762]	[-1.44430]	[1.84606]	[-1.23770]	[-4.87843]	[-0.29953]
D(LOG(EXPOPR(-2)))	0.274621	0.521798	-0.079012	0.013959	-0.275947	-0.011295	1.544757	-0.026016	-2.398754	31.99566
	-0.41261	-0.33593	-0.03179	-0.48264	-0.3442	-0.01501	-0.83147	-0.03613	-0.46698	-379.3
	[0.66556]	[1.55329]	[-2.48573]	[0.02892]	[-0.80170]	[-0.75242]	[1.85785]	[-0.72003]	[-5.13674]	[0.08435]
D(LOG(EXPOPR(-3)))	-0.087424	0.849092	-0.081278	-0.34052	-0.324847	0.007288	1.017433	-0.010655	-1.717769	372.7145
	-0.4911	-0.39983	-0.03783	-0.57445	-0.40968	-0.01787	-0.98964	-0.04301	-0.55581	-451.453
	[-0.17802]	[2.12361]	[-2.14835]	[-0.59278]	[-0.79293]	[0.40790]	[1.02808]	[-0.24776]	[-3.09055]	[0.82559]

D(LOG(EXPOPR(-4)))	0.276033	0.536381	-0.065111	-0.296328	-0.492635	-0.009072	0.767667	-0.041949	-1.439485	321.5435
	-0.44449	-0.36188	-0.03424	-0.51992	-0.3708	-0.01617	-0.89571	-0.03892	-0.50306	-408.605
	[0.62101]	[1.48219]	[-1.90149]	[-0.56994]	[-1.32859]	[-0.56097]	[0.85705]	[-1.07770]	[-2.86147]	[0.78693]
D(LOG(EXPOPR(-5)))	0.220174	0.666761	-0.055353	-0.112773	-0.452846	-0.01246	0.672771	-0.017416	-1.674313	143.688
	-0.34133	-0.27789	-0.02629	-0.39925	-0.28474	-0.01242	-0.68783	-0.02989	-0.3863	-313.771
	[0.64505]	[2.39934]	[-2.10509]	[-0.28246]	[-1.59040]	[-1.00334]	[0.97811]	[-0.58268]	[-4.33420]	[0.45794]
D(LOG(EXPOPR(-6)))	0.053599	0.396923	-0.025137	-0.113577	-0.546584	-0.015277	0.260218	-0.015463	-1.24918	239.7052
	-0.31192	-0.25396	-0.02403	-0.36486	-0.26021	-0.01135	-0.62857	-0.02732	-0.35302	-286.741
	[0.17183]	[1.56297]	[-1.04610]	[-0.31129]	[-2.10056]	[-1.34614]	[0.41398]	[-0.56608]	[-3.53850]	[0.83596]
D(LOG(EXPOPR(-7)))	0.297796	0.10352	-0.032132	-0.225057	-0.567011	-0.016647	-0.611058	-0.032874	-1.14965	237.6574
	-0.27922	-0.22733	-0.02151	-0.3266	-0.23292	-0.01016	-0.56266	-0.02445	-0.31601	-256.674
	[1.06654]	[0.45538]	[-1.49382]	[-0.68909]	[-2.43432]	[-1.63873]	[-1.08601]	[-1.34446]	[-3.63804]	[0.92591]
D(LOG(EXPOPR(-8)))	0.118647	0.006644	-0.026248	-0.124542	-0.365246	-0.012184	-0.475429	-0.041695	-0.786375	141.2331
	-0.19236	-0.15661	-0.01482	-0.22501	-0.16047	-0.007	-0.38764	-0.01685	-0.21771	-176.831
	[0.61679]	[0.04243]	[-1.77128]	[-0.55350]	[-2.27611]	[-1.74088]	[-1.22648]	[-2.47518]	[-3.61206]	[0.79869]
D(LOG(IMPOPR(-1)))	-0.298812	2.582655	-0.250662	1.897495	-2.172563	-0.00917	-4.288305	0.033802	-1.57271	-795.9919
	-0.97858	-0.79672	-0.07539	-1.14466	-0.81634	-0.0356	-1.97199	-0.08569	-1.10752	-899.576
	[-0.30535]	[3.24162]	[-3.32502]	[1.65770]	[-2.66135]	[-0.25758]	[-2.17461]	[0.39445]	[-1.42002]	[-0.88485]
D(LOG(IMPOPR(-2)))	-0.262551	2.264462	-0.209821	2.532961	-1.884189	0.004425	-4.211514	0.036514	-2.110825	-469.1141
	-0.99065	-0.80654	-0.07632	-1.15877	-0.82641	-0.03604	-1.99631	-0.08675	-1.12118	-910.67
	[-0.26503]	[2.80761]	[-2.74937]	[2.18590]	[-2.27998]	[0.12279]	[-2.10965]	[0.42090]	[-1.88268]	[-0.51513]
D(LOG(IMPOPR(-3)))	-0.563197	2.537289	-0.171299	2.105018	-1.437564	0.043802	-4.851631	0.011304	-1.283548	-42.73017
	-0.9946	-0.80976	-0.07662	-1.16339	-0.8297	-0.03619	-2.00427	-0.0871	-1.12565	-914.302
	[-0.56625]	[3.13338]	[-2.23568]	[1.80938]	[-1.73263]	[1.21048]	[-2.42065]	[0.12978]	[-1.14027]	[-0.04674]
D(LOG(IMPOPR(-8)))	-0.593534	0.999779	-0.024958	0.387145	0.080522	0.020782	-0.271478	0.010589	-0.680613	-12.27027
	-0.41146	-0.33499	-0.0317	-0.48129	-0.34324	-0.01497	-0.82915	-0.03603	-0.46567	-378.239
	[-1.44251]	[2.98450]	[-0.78738]	[0.80440]	[0.23459]	[1.38826]	[-0.32742]	[0.29387]	[-1.46157]	[-0.03244]

D(INFLUS(-1))	-5.213385	15.7536	-2.078416	23.8418	-8.05592	0.59271	-23.9577	0.907889	-6.746399	-17251.77
	-7.23183	-5.88782	-0.55711	-8.45912	-6.03281	-0.26311	-14.5732	-0.63329	-8.18471	-6647.95
	[-0.72089]	[2.67562]	[-3.73069]	[2.81847]	[-1.33535]	[2.25273]	[-1.64396]	[1.43360]	[-0.82427]	[-2.59505]
D(INFLUS(-3))	-19.99955	28.83951	-1.845699	-3.312288	-12.64952	1.17139	-41.04127	2.369757	-3.038119	-2688.703
	-10.3958	-8.46381	-0.80086	-12.1601	-8.67224	-0.37822	-20.9491	-0.91036	-11.7656	-9556.5
	[-1.92381]	[3.40739]	[-2.30466]	[-0.27239]	[-1.45862]	[3.09711]	[-1.95910]	[2.60309]	[-0.25822]	[-0.28135]
D(INFLUS(-5))	-19.88008	17.77376	-2.650727	6.588452	-8.201648	0.55712	-4.69185	2.141086	-3.276169	-4877.12
	-7.77355	-6.32887	-0.59885	-9.09277	-6.48472	-0.28282	-15.6648	-0.68073	-8.79781	-7145.93
	[-2.55740]	[2.80836]	[-4.42640]	[0.72458]	[-1.26477]	[1.96990]	[-0.29952]	[3.14528]	[-0.37238]	[-0.68250]
D(INFLUS(-6))	6.462006	9.345215	-1.328785	31.02692	0.184942	-0.223703	-8.43242	-1.211832	-18.34146	-11478.87
	-9.11604	-7.42186	-0.70227	-10.6631	-7.60463	-0.33166	-18.3701	-0.79829	-10.3172	-8380.04
	[0.70886]	[1.25915]	[-1.89214]	[2.90975]	[0.02432]	[-0.67450]	[-0.45903]	[-1.51803]	[-1.77776]	[-1.36979]
D(INFLUS(-7))	-5.444169	26.82702	-1.305697	3.941843	3.570964	0.855885	-32.52305	2.146995	-8.740842	7210.975
	-8.89747	-7.24391	-0.68543	-10.4074	-7.4223	-0.32371	-17.9297	-0.77915	-10.0698	-8179.12
	[-0.61188]	[3.70339]	[-1.90494]	[0.37875]	[0.48111]	[2.64401]	[-1.81392]	[2.75555]	[-0.86802]	[0.88163]
D(INTUS(-2))	-0.248086	-0.007949	-0.002161	-0.084504	-0.051949	0.003778	-0.048307	0.00651	0.136086	50.02677
	-0.09619	-0.07832	-0.00741	-0.11252	-0.08025	-0.0035	-0.19385	-0.00842	-0.10887	-88.428
	[-2.57901]	[-0.10149]	[-0.29157]	[-0.75102]	[-0.64738]	[1.07943]	[-0.24921]	[0.77285]	[1.25000]	[0.56573]
D(INTUS(-6))	-0.02019	-0.232466	0.015922	0.121465	0.211926	-0.004098	0.309545	-0.012209	-0.090465	-79.6301
	-0.09348	-0.07611	-0.0072	-0.10934	-0.07798	-0.0034	-0.18837	-0.00819	-0.10579	-85.9304
	[-0.21599]	[-3.05455]	[2.21105]	[1.11088]	[2.71773]	[-1.20505]	[1.64328]	[-1.49153]	[-0.85510]	[-0.92668]
D(INTUS(-7))	-0.002528	-0.206268	0.019724	-0.13729	0.079117	0.012086	0.405329	0.009526	0.193727	-65.29248
	-0.11589	-0.09435	-0.00893	-0.13556	-0.09667	-0.00422	-0.23353	-0.01015	-0.13116	-106.532
	[-0.02181]	[-2.18617]	[2.20927]	[-1.01279]	[0.81838]	[2.86650]	[1.73564]	[0.93869]	[1.47705]	[-0.61289]
D(INTUS(-8))	-0.111941	0.040519	-0.000595	-0.167897	0.07456	0.010707	-0.004538	0.019937	0.335734	98.51607
	-0.09469	-0.07709	-0.00729	-0.11076	-0.07899	-0.00345	-0.19082	-0.00829	-0.10717	-87.0461
	[-1.18217]	[0.52559]	[-0.08154]	[-1.51585]	[0.94390]	[3.10795]	[-0.02378]	[2.40430]	[3.13279]	[1.13177]

D(LOG(PPIUS(-1)))	-1.811556	-12.17255	1.352613	-9.262601	9.327516	0.073715	20.94819	0.210665	7.772844	7586.171
	-4.95868	-4.03713	-0.382	-5.80021	-4.13655	-0.18041	-9.99246	-0.43423	-5.61205	-4558.33
	[-0.36533]	[-3.01515]	[3.54088]	[-1.59694]	[2.25490]	[0.40861]	[2.09640]	[0.48514]	[1.38503]	[1.66424]
D(LOG(PPIUS(-3)))	4.020696	-15.66767	0.628576	-4.090997	8.977998	-0.386441	27.75542	-0.442528	4.641124	-1384.709
	-5.35221	-4.35753	-0.41231	-6.26052	-4.46483	-0.19472	-10.7855	-0.46869	-6.05743	-4920.09
	[0.75122]	[-3.59554]	[1.52450]	[-0.65346]	[2.01082]	[-1.98456]	[2.57341]	[-0.94417]	[0.76619]	[-0.28144]
D(LOG(PPIUS(-6)))	3.126064	-7.727281	0.682441	-7.507462	0.873235	-0.18993	5.605772	-0.427989	-2.539572	2153.681
	-3.22662	-2.62697	-0.24857	-3.7742	-2.69166	-0.11739	-6.5021	-0.28256	-3.65177	-2966.11
	[0.96884]	[-2.94152]	[2.74550]	[-1.98915]	[0.32442]	[-1.61793]	[0.86215]	[-1.51471]	[-0.69544]	[0.72610]
D(LOG(PPIUS(-7)))	0.57527	-7.932401	0.617146	-5.704676	1.687906	-0.092004	18.71076	-0.323168	1.359206	1118.728
	-3.0413	-2.47609	-0.23429	-3.55744	-2.53707	-0.11065	-6.12866	-0.26633	-3.44203	-2795.76
	[0.18915]	[-3.20360]	[2.63410]	[-1.60359]	[0.66530]	[-0.83149]	[3.05299]	[-1.21342]	[0.39488]	[0.40015]
D(LOG(PPIUS(-8)))	-0.924365	-8.585373	0.216788	-3.958214	0.659004	-0.109659	5.62494	0.08655	3.47914	1666.879
	-2.94673	-2.39909	-0.22701	-3.44681	-2.45817	-0.10721	-5.93808	-0.25805	-3.335	-2708.82
	[-0.31369]	[-3.57859]	[0.95499]	[-1.14837]	[0.26809]	[-1.02286]	[0.94727]	[0.33541]	[1.04322]	[0.61535]
D(LOG(SP500(-1)))	0.435715	-0.469541	0.164369	-0.614391	0.53637	0.004282	-0.431116	0.05293	1.965991	-20.65349
	-0.52141	-0.42451	-0.04017	-0.6099	-0.43496	-0.01897	-1.05072	-0.04566	-0.59011	-479.314
	[0.83565]	[-1.10608]	[4.09208]	[-1.00737]	[1.23314]	[0.22573]	[-0.41031]	[1.15922]	[3.33155]	[-0.04309]
D(LOG(SP500(-2)))	0.680638	-0.380553	0.079066	-0.967319	0.226199	-0.014768	0.054722	0.001572	2.102552	-142.854
	-0.49081	-0.39959	-0.03781	-0.5741	-0.40943	-0.01786	-0.98904	-0.04298	-0.55548	-451.179
	[1.38678]	[-0.95236]	[2.09114]	[-1.68494]	[0.55247]	[-0.82705]	[0.05533]	[0.03657]	[3.78514]	[-0.31662]
D(LOG(SP500(-5)))	0.55013	-1.154137	0.129939	-1.269728	0.372327	-0.006867	-1.307272	0.032955	0.963764	-102.0526
	-0.47409	-0.38598	-0.03652	-0.55455	-0.39549	-0.01725	-0.95536	-0.04152	-0.53656	-435.814
	[1.16039]	[-2.99013]	[3.55782]	[-2.28967]	[0.94144]	[-0.39810]	[-1.36836]	[0.79380]	[1.79620]	[-0.23417]
D(UNEMUS(-1))	-0.454398	-0.413249	0.05085	-0.37214	0.185176	0.013511	0.108054	0.019744	0.418699	346.5295
	-0.19737	-0.16069	-0.0152	-0.23086	-0.16465	-0.00718	-0.39773	-0.01728	-0.22337	-181.434
	[-2.30228]	[-2.57174]	[3.34441]	[-1.61195]	[1.12470]	[1.88152]	[0.27168]	[1.14236]	[1.87442]	[1.90995]

D(UNEMUS(-2))	-0.326245	-0.543111	0.043042	-0.361564	0.124101	0.001858	0.344309	-0.013475	0.681246	94.28827
	-0.16782	-0.13663	-0.01293	-0.1963	-0.14	-0.00611	-0.33818	-0.0147	-0.18993	-154.271
	[-1.94402]	[-3.97501]	[3.32931]	[-1.84190]	[0.88646]	[0.30425]	[1.01812]	[-0.91693]	[3.58678]	[0.61119]
D(UNEMUS(-3))	-0.073428	-0.752588	0.016468	-0.139353	0.148024	-0.006517	0.65797	-0.026331	0.198193	-84.2298
	-0.19906	-0.16207	-0.01534	-0.23285	-0.16606	-0.00724	-0.40114	-0.01743	-0.22529	-182.993
	[-0.36887]	[-4.64362]	[1.07386]	[-0.59847]	[0.89138]	[-0.89980]	[1.64024]	[-1.51046]	[0.87971]	[-0.46029]
D(UNEMUS(-6))	-0.079193	-0.298872	0.007857	-0.327125	0.127692	-0.000969	0.67441	-0.017151	0.168209	188.8707
	-0.12707	-0.10345	-0.00979	-0.14863	-0.106	-0.00462	-0.25606	-0.01113	-0.14381	-116.809
	[-0.62323]	[-2.88897]	[0.80269]	[-2.20091]	[1.20464]	[-0.20961]	[2.63380]	[-1.54132]	[1.16966]	[1.61693]
D(RESID(-1))	-0.003367	0.006798	-0.000804	0.005755	-0.003816	7.22E-05	-0.004599	9.38E-06	-0.007169	-2.085252
	-0.00276	-0.00224	-0.00021	-0.00322	-0.0023	-0.0001	-0.00555	-0.00024	-0.00312	-2.53326
	[-1.22170]	[3.03004]	[-3.78838]	[1.78529]	[-1.66009]	[0.72042]	[-0.82808]	[0.03888]	[-2.29849]	[-0.82315]
D(RESID(-2))	-0.002543	0.005796	-0.000674	0.007084	-0.003357	0.000111	-0.004648	0.000133	-0.007796	-0.791768
	-0.00248	-0.00202	-0.00019	-0.0029	-0.00207	-9.00E-05	-0.005	-0.00022	-0.00281	-2.28198
	[-1.02457]	[2.86765]	[-3.52283]	[2.43963]	[-1.62123]	[1.23230]	[-0.92917]	[0.61045]	[-2.77476]	[-0.34697]
D(RESID(-3))	-0.003157	0.006929	-0.000557	0.004079	-0.003357	0.000225	-0.007433	6.79E-05	-0.004326	0.912487
	-0.00282	-0.00229	-0.00022	-0.00329	-0.00235	-0.0001	-0.00568	-0.00025	-0.00319	-2.58894
	[-1.12085]	[3.02193]	[-2.56728]	[1.23829]	[-1.42904]	[2.19679]	[-1.30980]	[0.27520]	[-1.35734]	[0.35246]
D(RESID(-4))	-0.001305	0.005095	-0.000559	0.004171	-0.002842	9.52E-05	-0.003879	-3.82E-05	-0.00459	0.681012
	-0.00232	-0.00188	-0.00018	-0.00271	-0.00193	-8.40E-05	-0.00467	-0.0002	-0.00262	-2.12813
	[-0.56367]	[2.70301]	[-3.13308]	[1.54039]	[-1.47157]	[1.13080]	[-0.83143]	[-0.18847]	[-1.75184]	[0.32000]
D(RESID(-5))	-0.002061	0.004192	-0.000481	0.00453	-0.001411	7.21E-05	0.000117	1.82E-06	-0.004581	-0.128519
	-0.0018	-0.00146	-0.00014	-0.0021	-0.0015	-6.50E-05	-0.00362	-0.00016	-0.00203	-1.65155
	[-1.14716]	[2.86574]	[-3.47375]	[2.15551]	[-0.94124]	[1.10263]	[0.03227]	[0.01159]	[-2.25278]	[-0.07782]
D(RESID(-6))	-0.002417	0.003611	-0.000306	0.003853	6.46E-05	5.80E-05	-0.000383	-1.80E-05	-0.002945	-0.313427
	-0.00156	-0.00127	-0.00012	-0.00182	-0.0013	-5.70E-05	-0.00314	-0.00014	-0.00176	-1.43179
	[-1.55196]	[2.84762]	[-2.54989]	[2.11475]	[0.04970]	[1.02305]	[-0.12210]	[-0.13212]	[-1.67067]	[-0.21891]

D(RESID(-7))	-0.000453	0.001233	-0.000204	0.002018	-0.001075	3.21E-05	-0.001881	-9.32E-05	-0.003568	-0.424097
	-0.00111	-0.0009	-8.50E-05	-0.0013	-0.00093	-4.00E-05	-0.00224	-9.70E-05	-0.00126	-1.01962
	[-0.40811]	[1.36522]	[-2.38506]	[1.55520]	[-1.16167]	[0.79617]	[-0.84143]	[-0.95925]	[-2.84248]	[-0.41594]
D(RESID(-8))	-0.001832	0.002788	-6.53E-05	0.000537	-0.000444	7.26E-05	-0.000717	-2.38E-05	-0.002159	0.053919
	-0.00107	-0.00087	-8.20E-05	-0.00125	-0.00089	-3.90E-05	-0.00215	-9.30E-05	-0.00121	-0.98023
	[-1.71820]	[3.21135]	[-0.79504]	[0.43083]	[-0.49901]	[1.87175]	[-0.33371]	[-0.25499]	[-1.78926]	[0.05501]