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Country Risk Analysis in Emerging Markets: The Indian Example

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COUNTRY RISK ANALYIS IN EMERGING MARKETS: THE INDIAN EXAMPLE

Abstract:
The **Beta Country Risk Model**, as described by Erb, Harvey and Viskanta (1996) and used by Andrade and Teles (2004) for Brazil, is used to estimate the country risk of India based on several macroeconomic indicators. Ordinary least squares regression is run on the white noise (unexpected component) of these variables to explain the variation in country risk to identify the most relevant of these variables. The study shows that the variation in country risk of India is highly correlated with changes in FDI flows, interest rates (monetary policy), exchange rates and the unemployment rate. The effect of political risk on overall country risk is also studied.

Key words: country risk, country beta model, risk modeling

1. Introduction

Globalization and increasing financial unification has led to a rapid growth of international lending, foreign direct and institutional investment. With this, economies across the globe are increasingly becoming interdependent and developments in one part of the world affect returns in another. Given this, country risk analysis provides insights into that part of the risk of an investment specific to a certain country. "**Country Risk"**, in general refers to the risk associated with those factors that determine or affect the ability and willingness of a sovereign state or borrower from a particular country to fulfill their obligations towards one or more foreign lenders and / or investors; this is the approach and the definition used by Bates and Saini (1984) as well as by Abassi and Taffler (1982). This shall also be the definition used in this paper. The analysis of country risk consists of the assessment of the political, economic and financial factors of a borrowing country or FDI[1] host. These factors give an indication of the stability and profitability in an economy. As Harvey and Viskanta (1996) point out, "non – diversifiable systemic risk" arises out of the factors over which borrowers have little control, and country risk may also represent such "non-diversifiable systematic risk".

Emerging Markets country risk analysis provides a challenge for researchers, according to Euler Hermes[2], since calculation of statistical properties of the various parameters based on historical returns could be misleading. In addition, reliable data is not available for several periods, especially far back into the past. Such data might not even be relevant as, by their very nature, the past in emerging economies rarely reflects the present and to a lesser extent, the future.

The **Country Beta Approach** is a quantitative method of country risk analysis in which the difference between the returns of a country's equity market and the world equity market is attributed to the country risk. This difference indicates the returns in a country specific to it and different from the rest of the world. This model has first been described in the seminal paper by Erb, Harvey and Viskanta (1996b). This model has been applied to Australia by Gangemi, Brooks and Faff (2000) to examine the effects of foreign debt on country risk, to Latin America by Verma and Sydermir (2006) to study the economic determinants of a time-varying country beta and to Brazil by Andrade and Teles (2004) to study the effect of interest rates. But such an analysis has not been previously done for India. India provided an interesting case for country risk and studying those factors affecting country risk in an emerging economy, through the liberalization phase in the early 1990s.

This study examines the relationship between country risk and macroeconomic variables and identifies those variables that affect country risk the most, using Ordinary Least Squares (OLS) regression on the white noise of the variables. In addition, the impact of political risk is also studied. It can been seen that FDI inflows, interest rates (monetary policy), exchange rates and the unemployment rate impact country risk the most. Section 2 gives a brief history of the

[1] Foreign direct investment is that investment, which is made to serve the business interests of the investor in a company, which is in a different nation distinct from the investor's country of origin.

[2] Euler Hermes is a French credit insurance company. The article can be accesses at http://www.eulerhermes.com/en/press/press_20090112_00100060.html

studies done in this field. Section 3 describes the country beta model, the methodology used to white the time series of the variables and the final regression. Section 4 gives an analysis of the results obtained using this model. Certain limitations and future scope for this study are presented in section 5.

2. Literature Review

Country risk analysis has been defined and studied in several different ways since the latter part of the previous century. Ribeiro (2006) categorized some standard economic variables that often could be found in most of the diverse approaches adopted by financial institutions and rating agencies (such as Goldman Sachs, Merrill Lynch, S&P and Fitch Ratings) into **External sector** (exports, imports, debt services, direct investments, loans, repayment of loans, external debt and flow of foreign reserves), **Internal sector** (interest rate, public debt and its service, level of investments, budget equilibrium, internal savings, consumption, GDP/GNP, inflation rate, money supply, etc) and **Other variables** (population, life expectancy, rate of unemployment, level of literacy, etc). Teixeira, Klotzle and Ness (2008), identified the determinant factors of the country risk for selected emerging markets. Three models were used to estimate country risk – in the first model the relation between country risk and fundamental economic variables was tested; in the second model the external component was be added to the group of explanatory variables; and the third model tested the relation between specific country risk and the economic fundamentals. The results found for emerging markets indicated that four domestic factors are consistent determinants of country risk and specific country risk – growth rate, external debt, public debt and international reserves.

Various methods used for country risk appraisal may be categorized into one of four types – Fully Qualitative Method, Structured Qualitative Method, Checklist Method and Other Quantitative Methods. The popular quantitative methods used for country risk analysis are listed by Nath (2008). Artificial Neural Networks are extensively used for country risk analysis. Yim and Mitchell (2004) investigated the possibility of outperformance of traditional statistical models by two artificial neural networks, multilayer perceptron and hybrid networks, for predicting country risk rating. The results in sample indicate that the hybrid ANN – ANN-Logit-Plogit – produced the best results. This supports the conclusion that for researchers, policymakers and others interested in early warning systems, hybrid networks would be useful. Another novel model used for country risk analysis is the country beta model described by Erb, Harvey and Viskanta (1996). This model was applied to estimate the country risk of Brazil from 1991 to 2002, by Andrade and Teles (2004). The four variables used for the model are foreign reserves, world oil prices, nominal interest rate and public debt. Three different specifications of the model were analyzed – one including all the 4 variables, one without public debt and one without interest rate. The following observations were made – one, the effects of forex reserves is very small since the adoption of the floating exchange rate regime, and two, unanticipated increase in interest rates reduces country risk.

This paper uses the same model, as has been used by Erb, Harvey and Viskanta (1996) and Andrade and Teles (2004) for estimating Brazilian country risk, for analyzing India’s country risk.

3. The Model

Country Beta Model of Erb, Harvey and Viskanta (1996) is described below. As stated earlier, this is the model used in the study of Brazilian country risk and is also used to estimate India's country risk. The data period for the study in the Indian context is between 1984 and 2008.

3.1. The Country Beta Model

Erb, Harvey and Viskanta (1996) have shown that the difference between the returns of a country's equity market and the world equity market may be attributed to the country risk. This relation may be expressed as follows:

$$R_{Equity\_Country} = \alpha + \beta R_{Equity\_World} + e_t \qquad (1)$$

β is the basic measure of country risk, since it indicates the returns in a country specific to it and different from the rest of the world. As β increases, country risk decreases, that is, the returns in the country are affected only by factors common to the rest of the world, which is essentially a non-diversifiable risk for a particular country.

Country risk would be a variable affected by certain macroeconomic variables specific to the country. Thus, beta is modeled as a linear combination of those variables:

$$\beta = b_0 + \mathbf{b.X} \qquad (2)$$

where **X** represents a vector of macroeconomic indicators.

This was applied to the Indian context and the following model was used to estimate country risk:

$$R_{India} = \alpha + \beta R_{World} + e_t \qquad (3)$$

where R_{India} is the return on the Indian equity market and R_{World} is the return on the world equity market. β is an indicator of India's country risk. As β increases, country risk decreases. The variables that go into the vector of macroeconomic indicators, **X**, are described in Section 3.2. Equation (2) is substituted in (3) and subject to OLS regression analysis to determine those variables that affect β, and thus, the country risk.

Based on the *Efficient Market Hypothesis* (Fama (1965)), only unexplained shocks in the explanatory variables affect country risk, since market expectations get incorporated into R_{India} and R_{World}. Thus, an Auto-Regressive Integrated Moving Average (ARIMA) model is run on each of the variables to filter out the expected components.

3.2. Data

The regression was run on two different models based on significance of explanatory variables. Annual macroeconomic data for the variables was collected from the *Euromonitor International* database[3]. The variables used are the following, forming the initial macroeconomic indicator vector, **X**, used in equation (2):

- GDP
- GDP deflator
- Public debt
- Current Account Balance
- Interest rates
- Forex reserves
- Exchange Rate (against the USD)
- FDI Inflows
- Unemployment
- Political Risk Index (PRI)

Interest rates and exchange rates give an indication of the monetary policy in India, while public debt and current account balance reflect the fiscal policy of the economy. FDI inflows indicate how foreign economies perceive the Indian economy. Data on the macroeconomic indicators 1 through 9 were collected from 1980 to 2009. The data for PRI (10) was available for a few years from 1996 to 2008 (**Table 1**), provided by the *Economist Intelligence Unit*. Its index of "Political Stability and Absence of Violence"[4] was used as a proxy for country risk. This indicates how non-business political events such as wars, regime changes and terrorist attacks affect profitability of businesses.

Table 1: Political Risk Index

Year	**Political Risk Index**
1996	0.80
1998	0.75
2000	0.65
2002	0.35
2003	0.30
2004	0.35
2005	0.50
2006	0.50
2007	0.55
2008	0.60

The annual return on the **BSE SENSEX index** was used for R_{India} and the return on the **NYSE index** was used as a proxy for R_{World}.

Each of the economic variables was subject to the ARIMA smoothing using the **Box-Jenkins** Methodology, as described by Box and Jenkins (1970), wherever applicable.

[3] http://www.euromonitor.com/
[4] http://info.worldbank.org/governance/wgi/pdf/c104.pdf

All regressions were run using the SPSS 16.0 statistical software.

3.3. Whiting the Time Series (ARIMA)

A thorough observation and graphing of data showed that a lot of these variables were non-stationary, i.e., they are *integrated*. As shown by Andrade and Teles (2004), under the assumption of the *Efficient Market* hypothesis, only unanticipated shocks of the variables are expected to affect returns. Simply put, this means that there would be a need to make the data stochastic or stationary in this case. The deterministic trend in these variables needs to be eliminated. That being the case, the econometric model should consider only the non anticipated components of the related series. Therefore, to white the series Box-Jenkins (B-J) procedure was applied and a univariate ARIMA process for each macroeconomic series was obtained.

The chief tools in identification are the autocorrelation function (ACF), the partial autocorrelation function (PACF), and the resulting correlograms, which are the plots of ACFs and PACFs against the lag length – the approach used is the one described in Gujrati (2007). The 'I' part of ARIMA can be set by directly choosing from the SPSS tool for autocorrelation. Identification of ARMA is done based on the following table which talks of pattern recognition.

Table 2: Theoretical patterns of ACF and PACF

Type of model	Typical pattern of ACF	Typical pattern of PACF
AR(p)	Decays exponentially or with damped sine wave pattern or both	Significant spikes through lags q
MA(q)	Significant spikes through lags q	Declines exponentially
ARMA(p, q)	Exponential decay	Exponential decay

The ACF and PACF functions for each of the time series data were calculated and analyzed to match with one of the typical patterns from **Table 2**. After a tentative Box-Jenkins model has been fitted, it is subjected to various diagnostic checks (based on ACF and PACF) as formulated by Box and Pierce (1970) & Box and Jenkins (1970) to test its adequacy as a stochastic representation of the process under study. If the model is found to be inadequate, analysis of the model residuals suggests ways to modify the model structure to obtain a new tentative model which will likely do an improved job of representing the process. Multiple combinations of (p, q) were tried to identify the ARIMA process underlying the series. The following table (**Table 3**) gives the final ARIMA model used for each of the macroeconomic variables.

Table 3: ARIMA Models for the Macroeconomic Series

Macroeconomic Variable	ARIMA (p,d,q)
GDP	(1,1,0)
GDP Deflator	(1,1,0)
Public Debt	(1,0,0) on square of first difference
Forex Reserves	(3,1,0)
Exchange Rate	(1,1,0)
Unemployment	(1,1,0)
FDI Inflows	(2,1,0)
Current Account Balance	First Difference – No correlation
Short Term Interest Rate	No correlation

The series obtained after filtering the deterministic components correspond to 'white noise' i.e., the stochastic components or unanticipated shocks in the markets. This way, our analysis would involve only stationary data and hence avoid 'spurious regression'. The difference between the actual time series and the series whited using ARIMA is given in **Exhibit 1**.

The Beta for the country risk estimation involves the following macroeconomic explanatory variables. The table below gives the ARIMA results of these estimators. The final values used in the Beta estimation are obtained by adjusting the data points according to the ARIMA results.

3.4. Regression Results

Using the ARIMA-smoothed time series from above, different regressions were run to find the model that fits the data best. The following two models were found to give the highest R^2 (adjusted) as well as reasonable significance of the variables. The results from the two regressions are summarized below.

Table 4: Model 1

Variables	Coefficient	p-value (t test)	Model R-square	D-W test	p-value (F test)
Exchange Rate	-0.400	23.1%	0.164	1.807	18.7%
Unemployment	-0.774	18.9%			
FDI Inflows	-4.54E-6	8.8%			
Constant	0.274	12.1%			

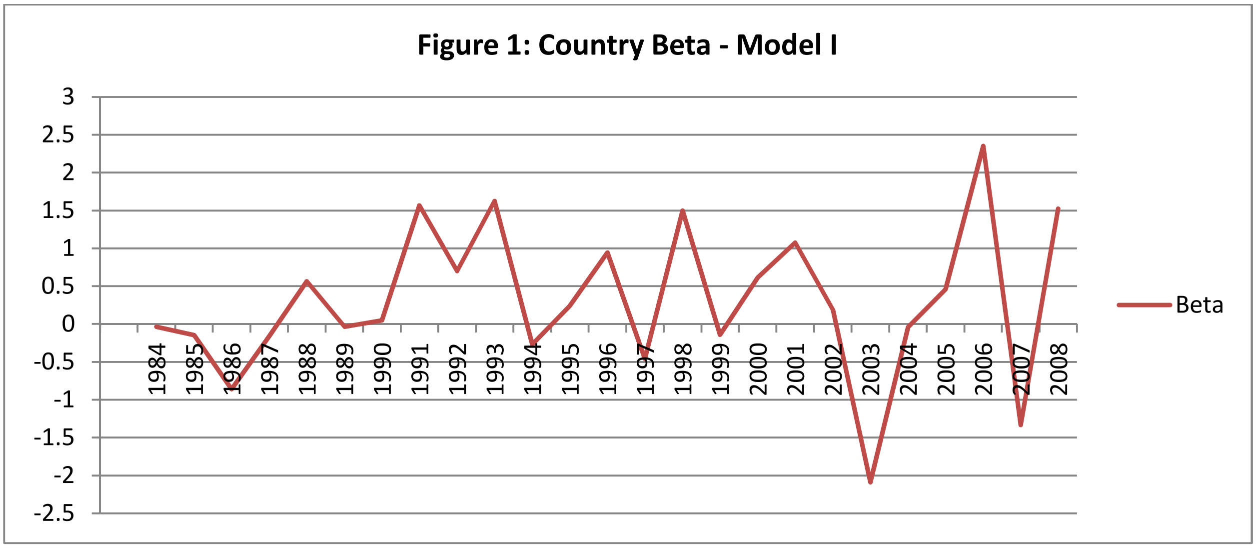


Table 5: Model 2

Variables	Coefficient	p-value (t test)	Model R-square	D-W test	p-value (F test)
ST Interest Rate	0.07	18.3%	0.054	2.093	20.9%
FDI Inflows	-5.79E-6	15.6%			

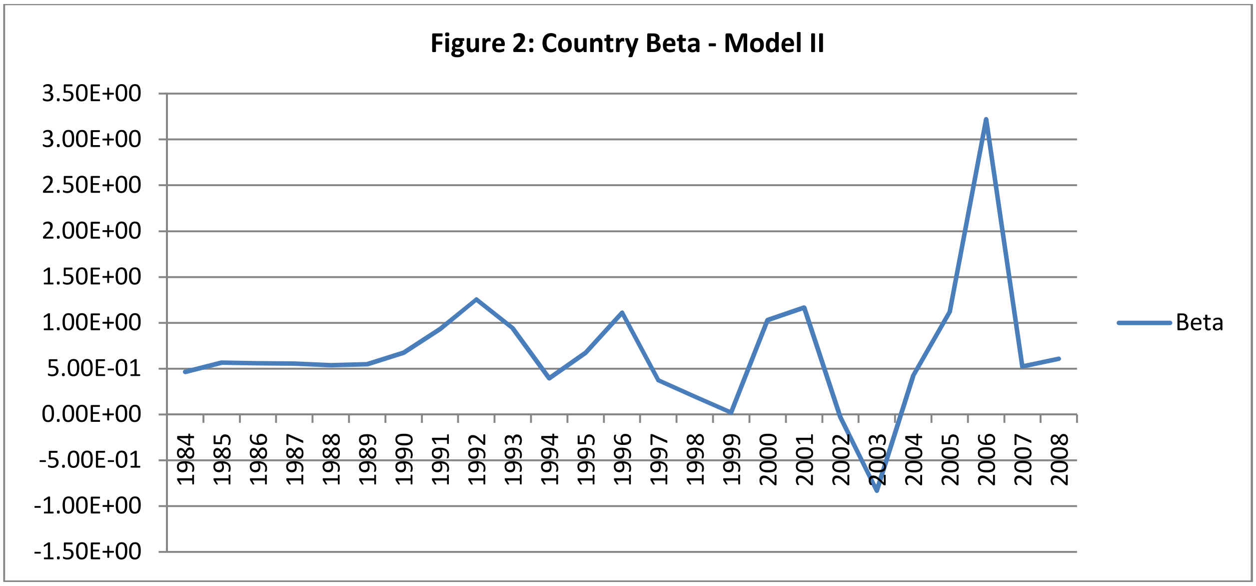
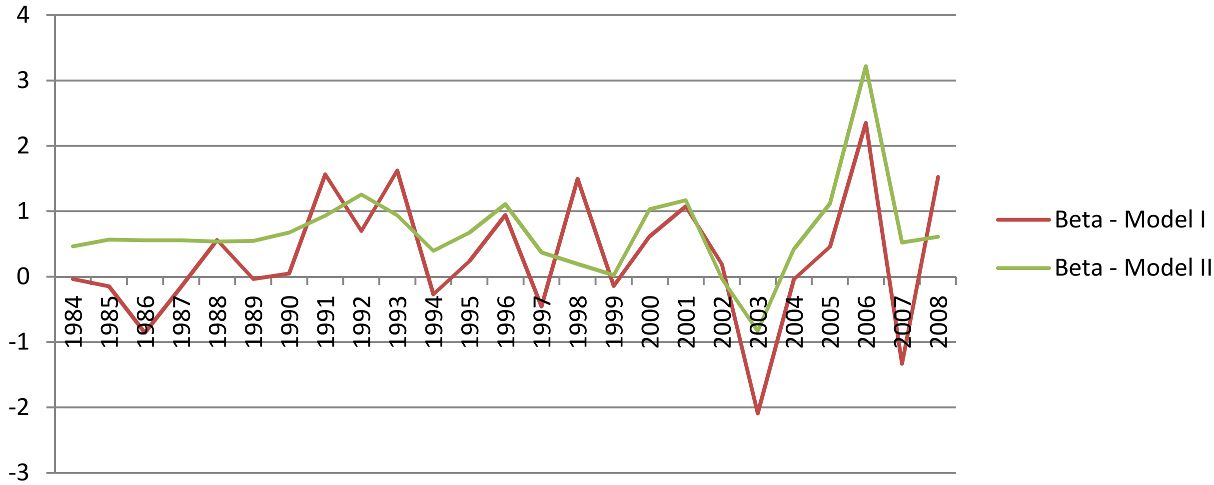


Figure 3: Country Beta - Model I vs. Model II



It can be seen that the two models give similar results, especially after 2002. Thus, it can be said that the models reasonably estimate country risk in the period from 1984 to 2008, to the extent possible in a mathematical model.

3.4.1. Adding Political Risk

Since the political risk data was available for only 10 years between 1996 and 2009, it was not included in the main regressions. Another regression was run on the sample for the ten years when the political risk data was available to see how much this index affects country risk. The results are summarized below.

Adding the political risk index to Model 1 leads to high multicollinearity, indicated by high R^2, low significance of the variables and high variance-inflation factors. Thus, it can be inferred that the explanatory variables (Exchange rate, unemployment rate and FDI inflows) determine political risk to a large extent. It is thus not necessary to include political risk in this model.

Upon adding political risk index to Model 2, the variance inflation coefficient of ST interest rate becomes high, indication strong correlation with political risk. The significance of the model remains the same and thus, including political risk does not add incremental value to the estimation. This is probably because the political risk is already reflected in other factors like interest rates and FDI inflows.

These results could be due to the small sample size; increasing the sample size might give better results.

Table 6: Model 2 with Political risk index

Variables	Coefficient	p-value (t test)	Model R^2	D-W test	p-value (F test)	VIF
ST Int Rate	-0.072	36.4%	0.259	1.700	20.8%	8.742
FDI Inflows	-6.435E-6	7.4%				1.067
PRI	1.694	50.0%				8.603

4. Interpretation of the Results

This section deals with explanation of significance of certain macroeconomic variables. The most significant variables are FDI Inflows, Exchange rate, Unemployment rate and Short-term interest rates.

4.1. Explaining Variation in Beta

In the model, higher β implies lower country risk. The level of β does not have as much significance as the change in the level, since we are trying to estimate how macroeconomic indicators lead to a *change* in β.

From **Figure 3,** it can be seen that the variation in country risk increases significantly, especially in Model 2, after 1991 – the result of liberalization in India.

The years 1998 to 2001 saw increasing β, or a reduction in country risk during the dot-com bubble. Following this period until 2003, there was an increase in country risk when the bubble burst. This is expected in a country like India with the IT industry accounting for a 5.9% of its GDP as of 2009, employing over 2.3 million people.

Post the IT bubble, India was back on track and country risk decreased until around 2007, and again increased during the sub-prime crisis.

4.2. Relevance of the Variables Chosen by the Model

4.2.1. FDI Inflows

Inflows are a clear indication of the confidence foreign countries place in the performance of our economy. It can be seen that as our economy has progressed, the FDI and FII percentages in our stock markets have consistently risen. They help track the internal policies and regulations. A low risk economy is bound to attract higher capital inflows. We see a very strong negative correlation between risk and inflows.

4.2.2. Exchange Rate

In India, exchange rates are significantly governed by trade activities. The right price of currency in demand-supply terms is essential in judging the stability and growth of any country. The exchange rate is influenced strongly by the behavior and decisions of economic agents and interacts with most of the macroeconomic parameter changes. It is a representation of a country's income distribution, output, price levels and trade terms. Even the slight change in the rate can be interpreted as difference in returns between alternative choices of investments.

It is also a representation of optimal resource allocation in the economy to maximize profits in the economy.

India has adopted a flexible exchange rate regime in order to underplay external imbalances arising out of high volatility of capital flows and its requests for immediate macroeconomic adjustments. This is why Governments promote artificial rates to make necessary adjustments. This would also impact many other macroeconomic variables.

4.2.3. Unemployment

Higher the unemployment, lower is the wage rate; which implies that there is a large pool of unemployed workers available in the country. Labor risk, i.e., difficulty in finding qualified workforce at reasonable wage rates, plays a critical role in a country's growth. The labor risk is lower when unemployment is higher. However, this is more effectual than causal. The GDP growth which results in lowering unemployment rate could have been accounted in other factors like FDI inflows and exchange rate.

4.2.4. Short Term Interest Rate

Interest rate is generally determined by the market but the Government often controls it to restore economic balance in the country by means of monetary policy. Government interventions arise out of need to restore stability in the economy. Therefore, they can provide a proxy for unexpected shocks experienced by the economy.

5. Future Scope

One of the biggest challenges in the analysis was the lack of sufficient data for an OLS regression. The model can be predicted with greater accuracy if monthly data can be obtained for macroeconomic parameters. Our analysis was restricted to 30 data points (1978-2008). The numbers of explanatory variables being more than 10 drastically reduces the degrees of freedom. In addition, the NYSE composite return was used as a proxy for world return R_{World}. Better results may be obtained using an index that is an aggregate of several stock exchanges from different parts of the world. Due to the dynamic nature of the variables and the determinants of country risk themselves; it might make more sense to use coefficients that vary through time (time-varying beta using Kalman Filter). Qualitative parameters like the political risk index may be calculated for the entire time series and included in the regression to account for non-quantifiable elements causing change in country risk. A regression may be run on a panel of similar economies, rather than on a single country to cancel out common quantitatively unexplained factors in the regression.

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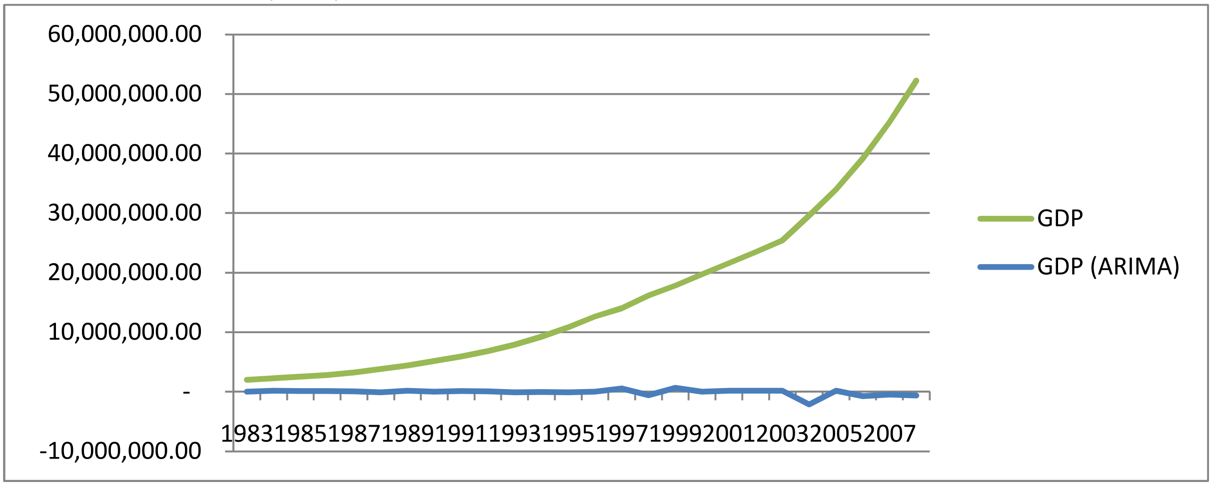
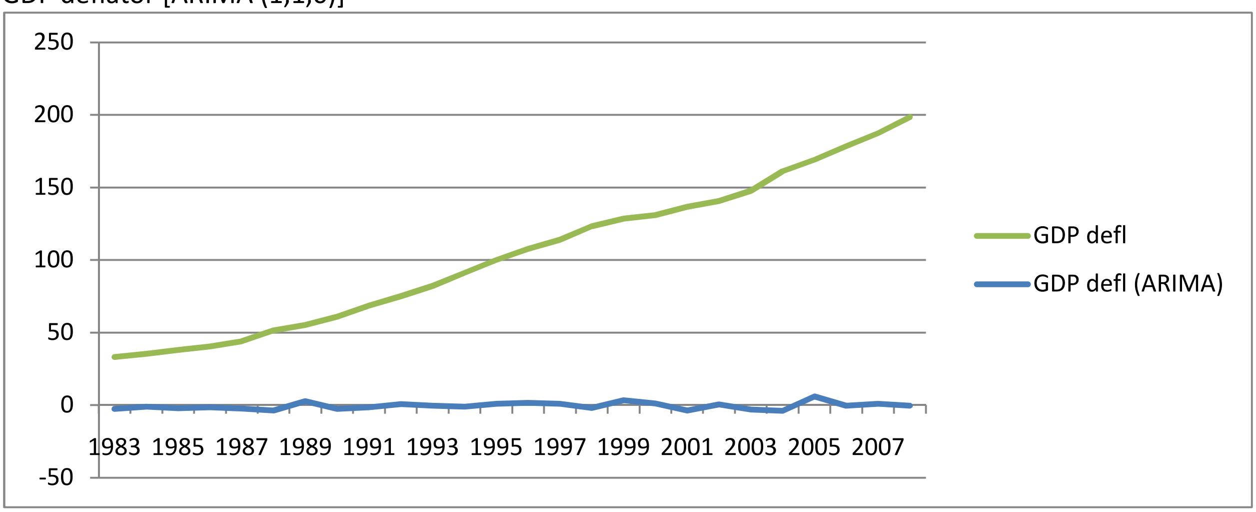
Exhibit 1

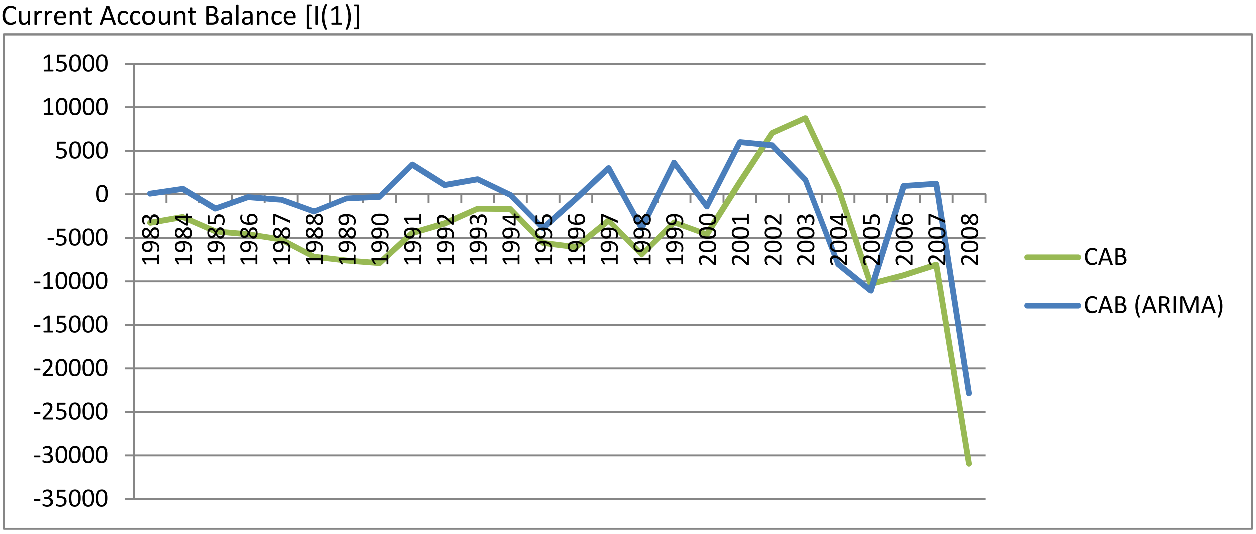
Nominal GDP [ARIMA (1,1,0)]



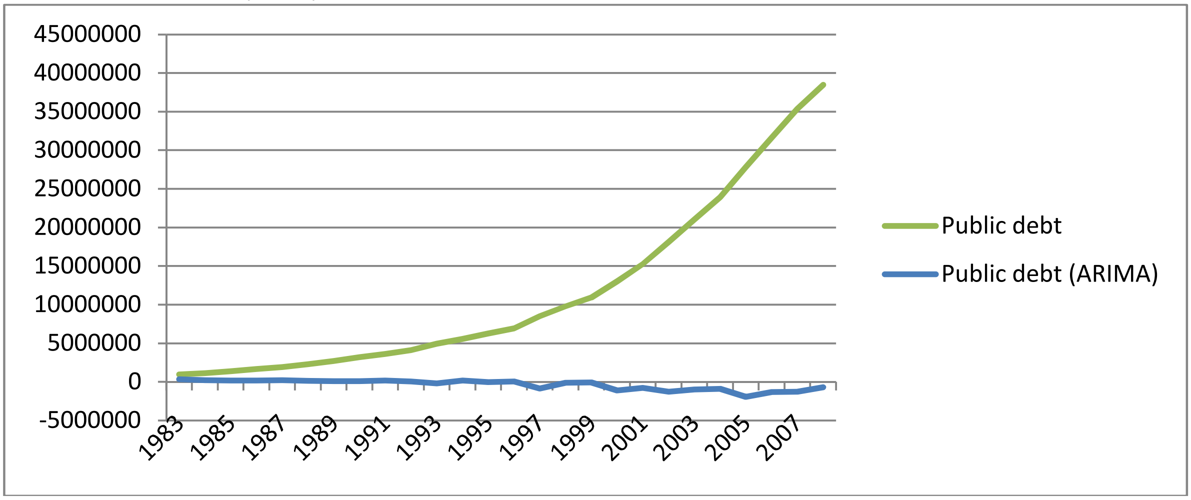
GDP deflator [ARIMA (1,1,0)]



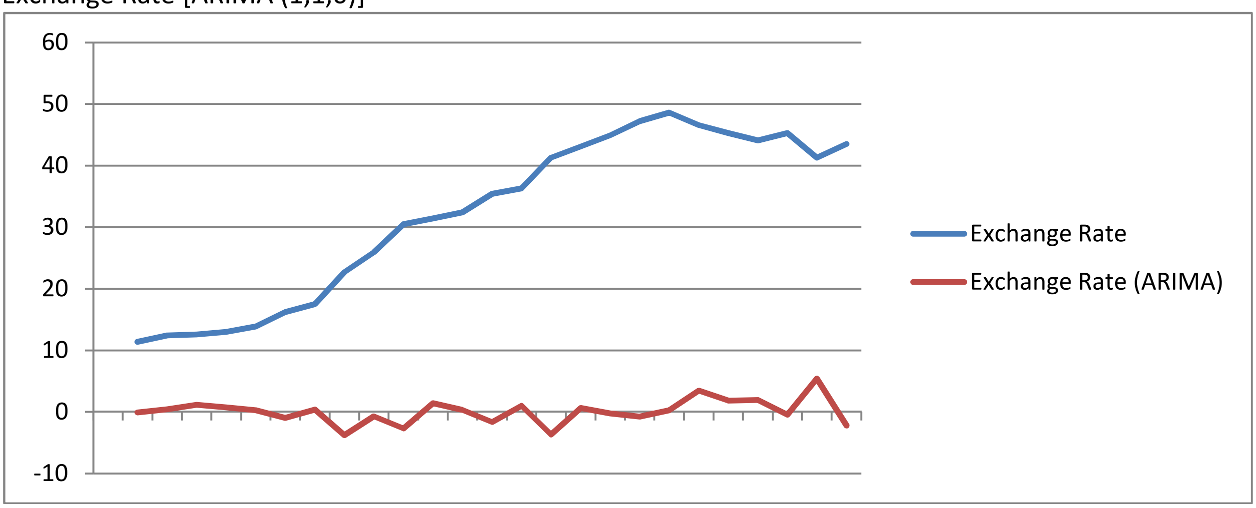
Current Account Balance [I(1)]



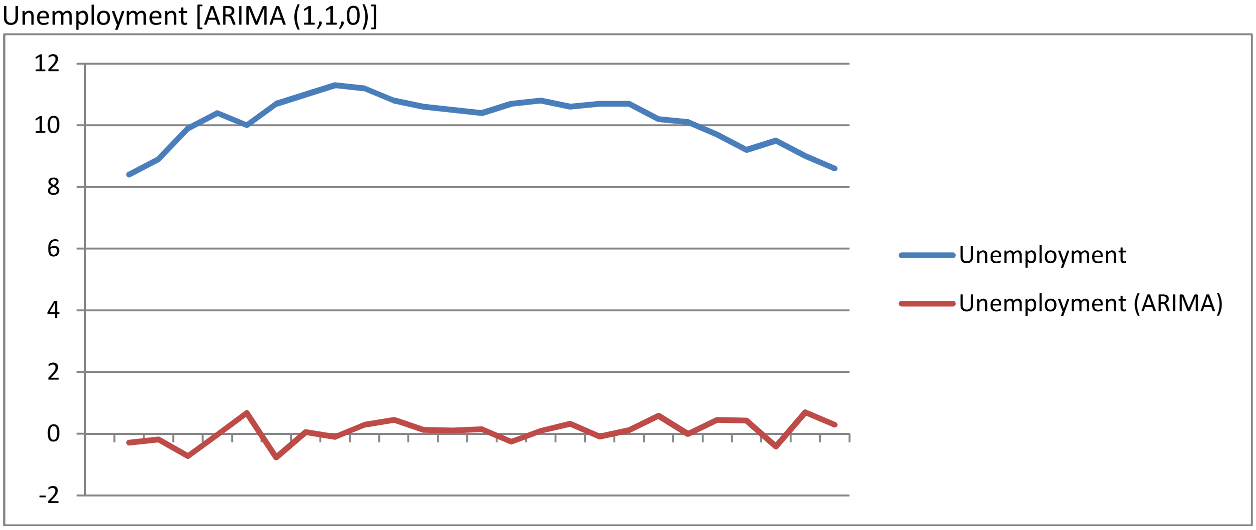
Public Debt [ARIMA (1,1,0)]



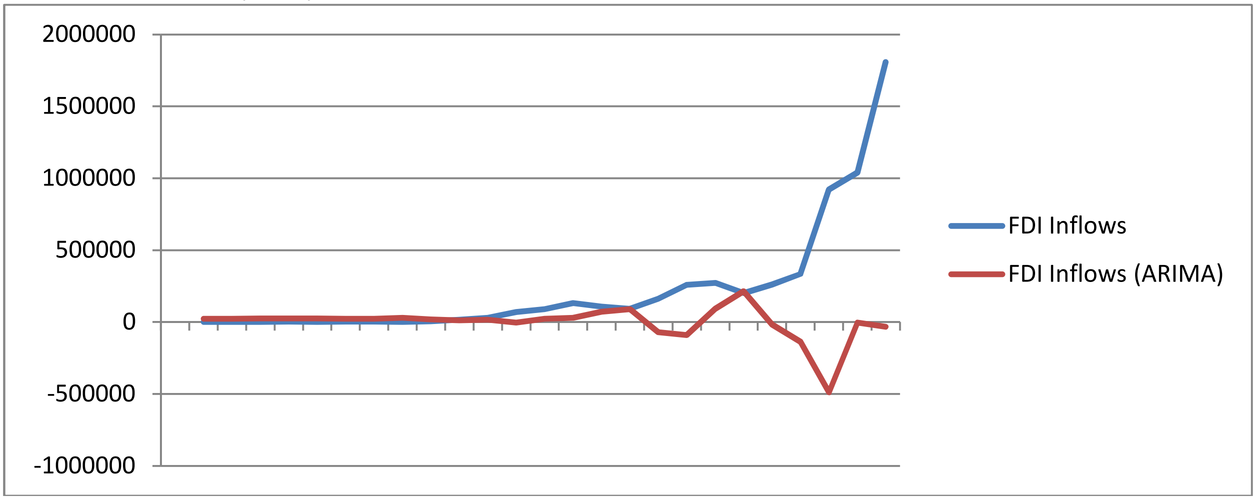
Exchange Rate [ARIMA (1,1,0)]



Unemployment [ARIMA (1,1,0)]



FDI Inflows [ARIMA (2,1,0)]



Forex reserves [ARIMA (3,1,0)]