Journal of Business and Economics, ISSN 2155-7950, USA
January 2016, Volume 7, No. 1, pp. 44-57
DOI: 10.15341/jbe(2155-7950)/01.07.2016/004

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Country Risk Analysis in Emerging Markets: The Indian Example

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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 are Forex Reserves, Exchange Rate, Current Account Balance, Unemployment rate and GDP Deflator. The effect of political risk on overall country risk is also studied.
Key words: country risk; country beta model; risk modeling
JEL codes: F59, F69 and G18

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

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[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 accessed at http://www.eulerhermes.com/en/press/press_20090112_00100060.html.

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 be 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 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:

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

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 *World bank site*[3].

The variables used are the following, forming the initial macroeconomic indicator vector, X, used in equation (2):

(1) GDP

(2) GDP deflator

(3) Public debt

(4) Current Account Balance

(5) Interest rates

(6) Forex reserves

(7) Exchange Rate (against the USD)

(8) FDI Inflows

(9) Unemployment

(10) Political Risk Index (PRI)

Interest rates and exchange rates give an indication of the monetary policy, while public debt and current account balance reflect the fiscal policy of the economy — the case is the same in India as well.

FDI inflows indicate how foreign economies perceive the local economy and the story holds for the Indian economy too.

Data on the macroeconomic indicators i through ix listed above were collected from 1991 to 2013. The data for PRI (10) was available for years from 1996 to 2013 (Table 1), provided by the *Economist Intelligence Unit*. Its index of "Political Stability and Absence of Violence" 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
2009	0.55
2010	0.55
2011	0.55
2012	0.55
2013	0.55

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,

[3] http://info.worldbank.org/governance/wgi/pdf/c104.pdf.

as described by Box and Jenkins (1970), wherever applicable.

All regressions were run using the R 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 differencing the time series until it became non-trended, using R. 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 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	(0,1,1)
GDP Deflator	(1,1,0)
Public Debt	(0,1,0)
Forex Reserves	(0,1,0)
Exchange Rate	(0,1,0)
Unemployment	(0,1,1)
FDI Inflows	(2,1,0)
Current Account Balance	(0,1,0)
Short Term Interest Rate	(0,1,1)

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	t-value	Model R-square	D-W test	p-value (F test)
Forex Reserves	0.02704	0.520	0.06341	2.2974	0.871
Exchange Rate	0.03329	0.774			
Current Acc. Balance	-0.06968	-1.021			
Constant	-0.73773	-0.786			

Table 5 Model 2

Variables	Coefficient	t-value	Model R-square	D-W test	p-value (F test)
GDP Deflator	0.3982	0.741	0.04756	2.3414	0.8135
Unemployment	1.1329	0.318			
Constant	-0.4157	-0.437			

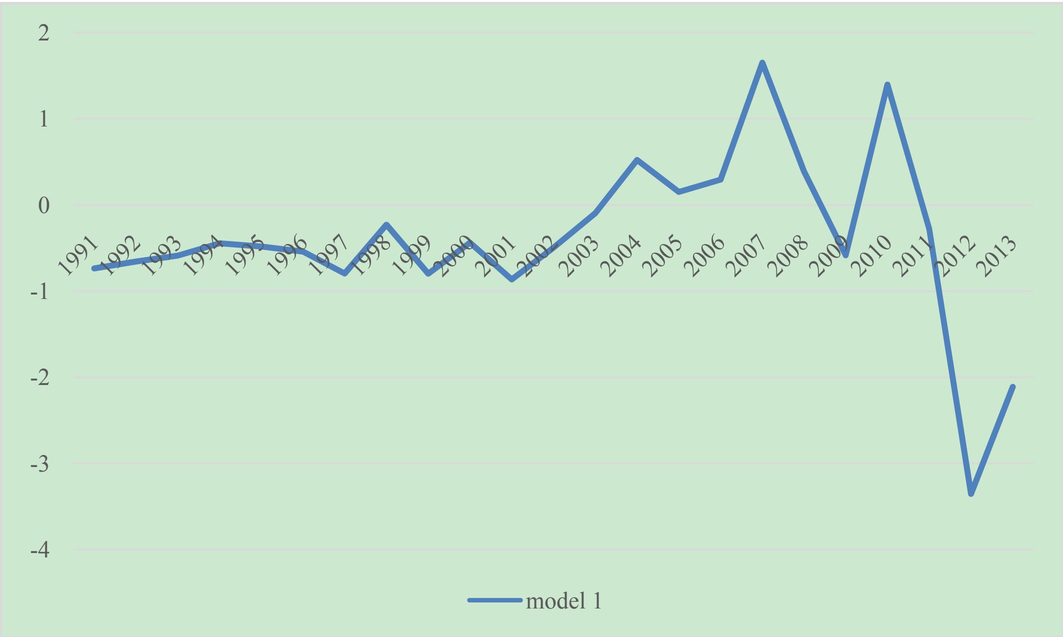

Figure 1 Beta-Model 1

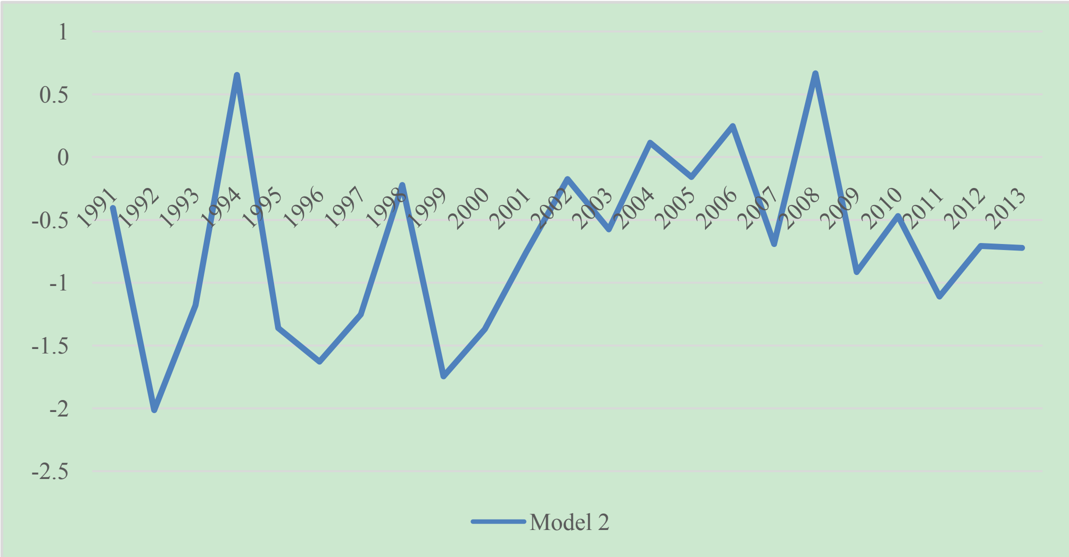

Figure 2 Beta-Model 2

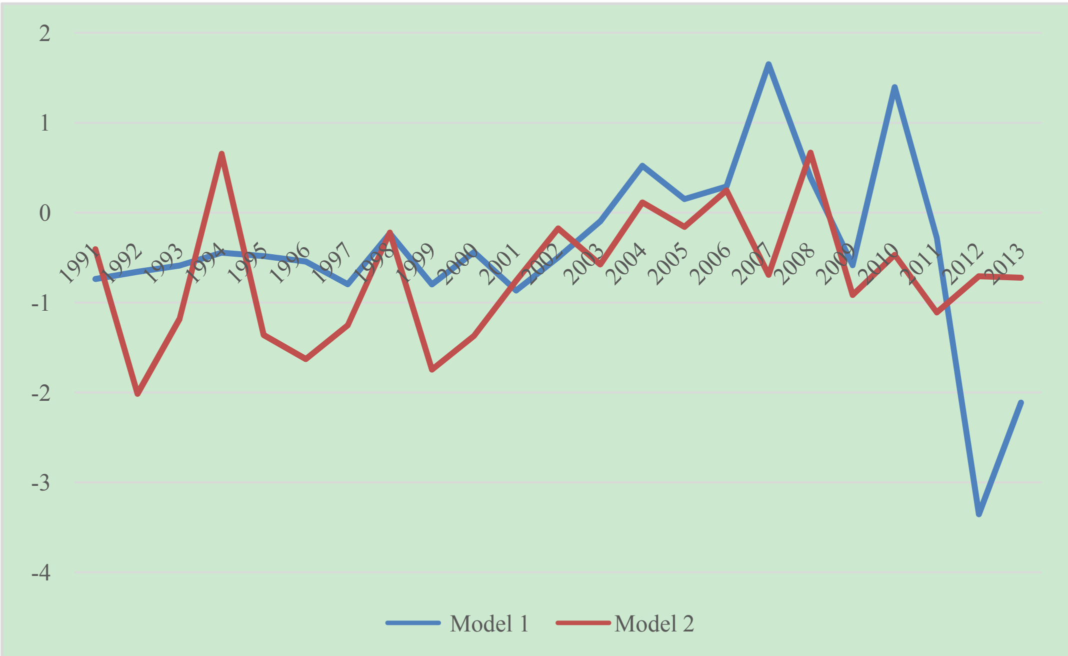

Figure 3 Country Beta-Model 1 vs. Model 2

The two models give similar results, especially after 2002; thus, it appears that the models reasonably estimate country risk in the period from 1991 to 2013, to the extent possible in a mathematical model.

3.4.1 Adding Political Risk

Since the political risk data was available for only 17 years between 1996 and 2013, it was not included in the main regressions. Another regression was run on the sample for the 17 years when the political risk data was available to see how much this index affects country risk. The results are summarized below.

Inclusion of 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 appears that the explanatory variables

(Exchange rate, Forex reserves and Current account balance) 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 GDP Deflator becomes high, indicating 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 are most likely due to the small sample size; increasing the sample size might give better results.

Table 6 Model 1' (with Political Risk Index)

Variables	Coefficient	t-value	Model R-square	D-W test	p-value (F test)
Forex Reserves	0.06468	2.425	0.4299	2.5884	0.1854
Exchange Rate	0.03304	1.656			
Current Acc. Balance	-0.09615	-2.716			
PRI	-14.81837	-1.918			
Constant	-0.54416	-1.163			

Table 7 Model 2' (with Political Risk Index)

Variables	Coefficient	t-value	Model R-square	D-W test	p-value (F test)
GDP Deflator	0.7132	2.214	0.2876	2.3606	0.3167
Unemployment	-1.2022	-0.464			
PRI	-13.9967	-1.648			
Constant	-0.4073	-0.805			

The Figures 4 and 5 are the plots of comparison between Beta models (1 and 2 without the PRI component) and Beta models (1' and 2' with PRI component).

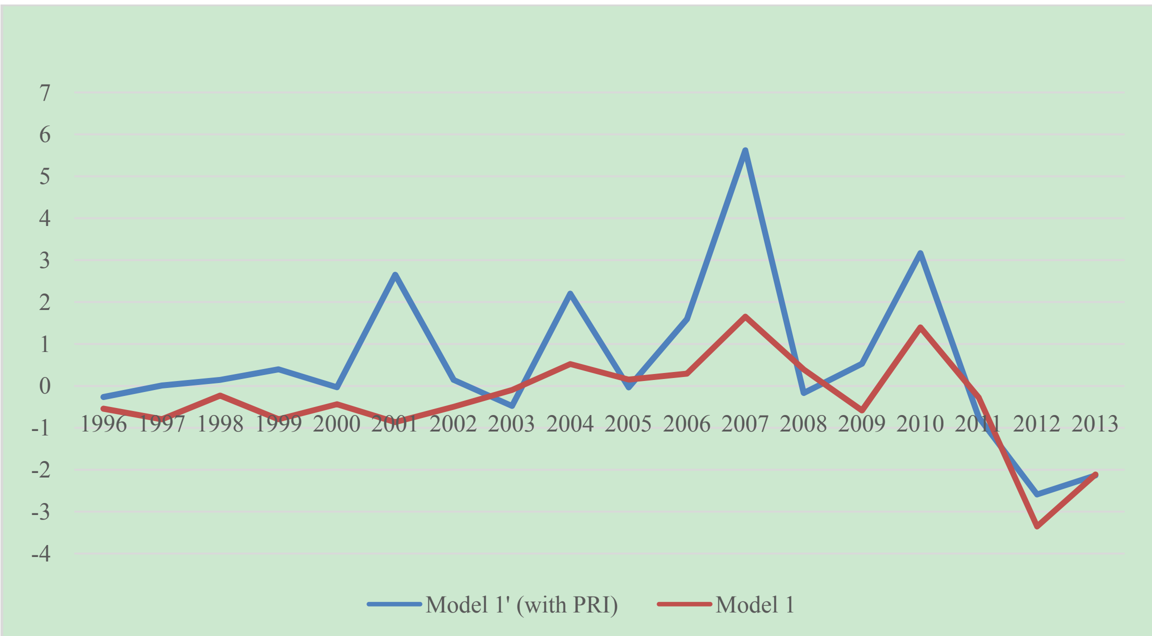

Figure 4 Beta Model Comparison

Figure 5 Beta Model Comparison

4. Interpretation of the Results

This section deals with explanation of significance of certain macroeconomic variables. The most significant variables are Forex Reserves, Exchange Rate, Current Account Balance, Unemployment rate and GDP Deflator.

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. This is to be expected as the Indian economy became more and more integrated with the world economy and hence the increase in the risk.

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 Forex Reserves

Official international reserves assets allow a central bank to purchase the domestic currency, which is considered a liability for the central bank. The quantity of foreign exchange reserves can change as a central bank implements monetary policy, but this dynamic should be analyzed generally in the context of the level of capital mobility, the exchange rate regime and other factors. A large percentage of commodities, such as gold and oil, are usually priced in the reserve currency, causing other countries to hold this currency to pay for these goods. Holding currency reserves, therefore, minimizes exchange rate risk, as the purchasing nation will not have to exchange their currency for the current reserve currency in order to make the purchase.

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 Current Account Balance

The current account is an important indicator about an economy's health. A positive current account balance indicates that the nation is a net lender to the rest of the world, while a negative current account balance indicates that it is a net borrower from the rest of the world. A current account surplus increases a nation's net foreign assets by the amount of the surplus, and a current account deficit decreases it by that amount.

4.2.4 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 GDP Deflator

The GDP deflator shows how much a change in the base year's GDP relies upon changes in the price level. Unlike some price indices, the GDP deflator is not based on a fixed basket of goods and services. The basket is allowed to change with people's consumption and investment patterns. Specifically, for the GDP deflator, the "basket" in each year is the set of all goods that were produced domestically, weighted by the market value of the total consumption of each good.

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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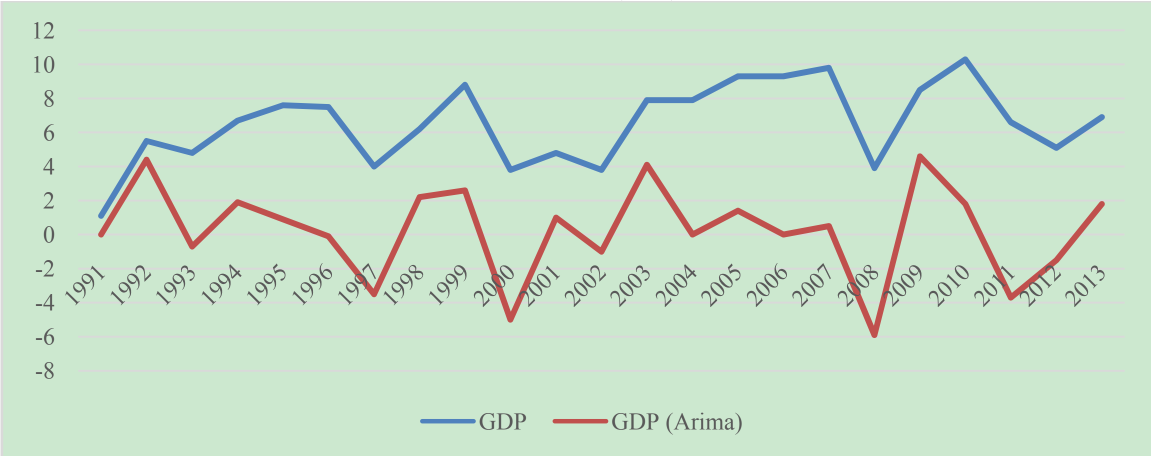
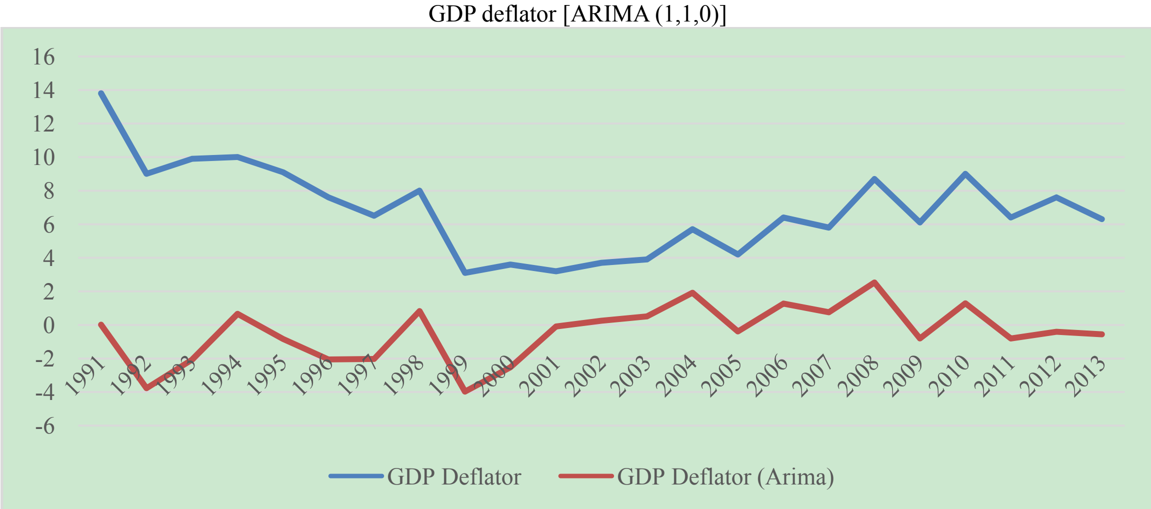
Exhibit 1

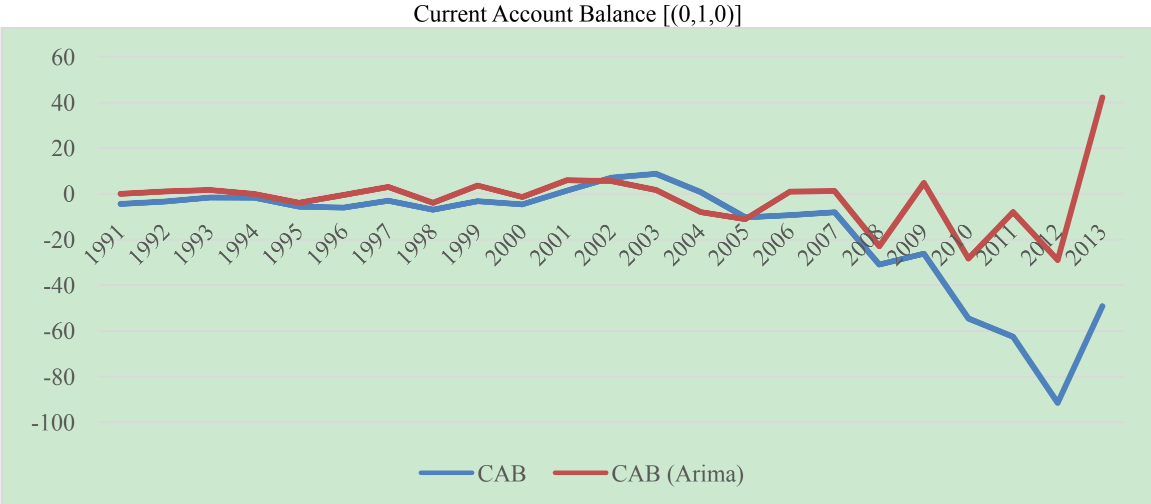
GDP [ARIMA (0,1,1)]



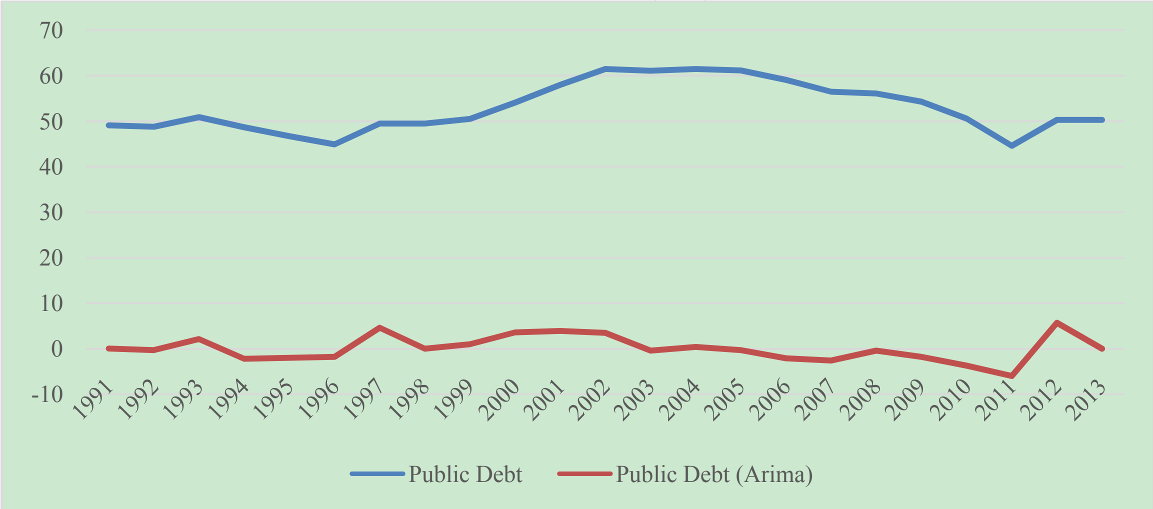
GDP deflator [ARIMA (1,1,0)]



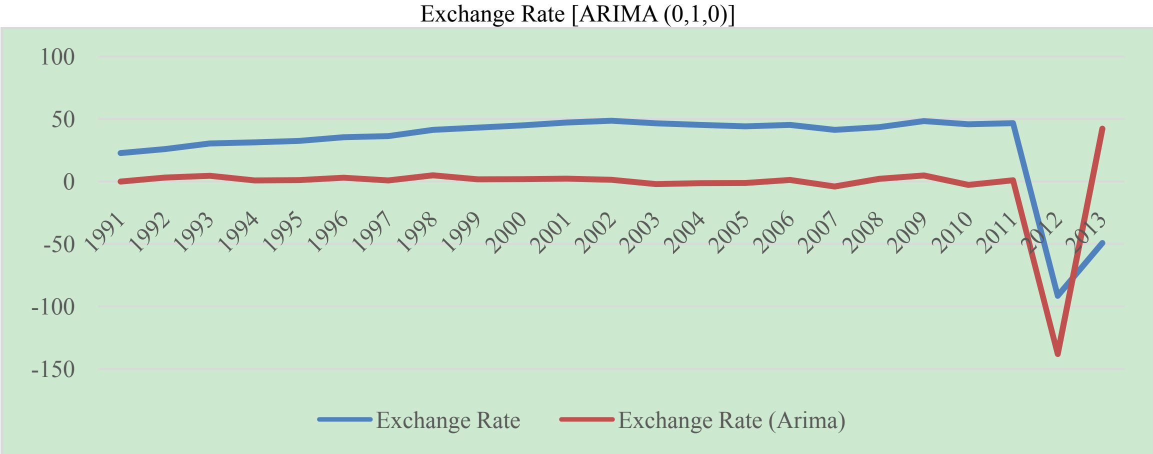
Current Account Balance [(0,1,0)]



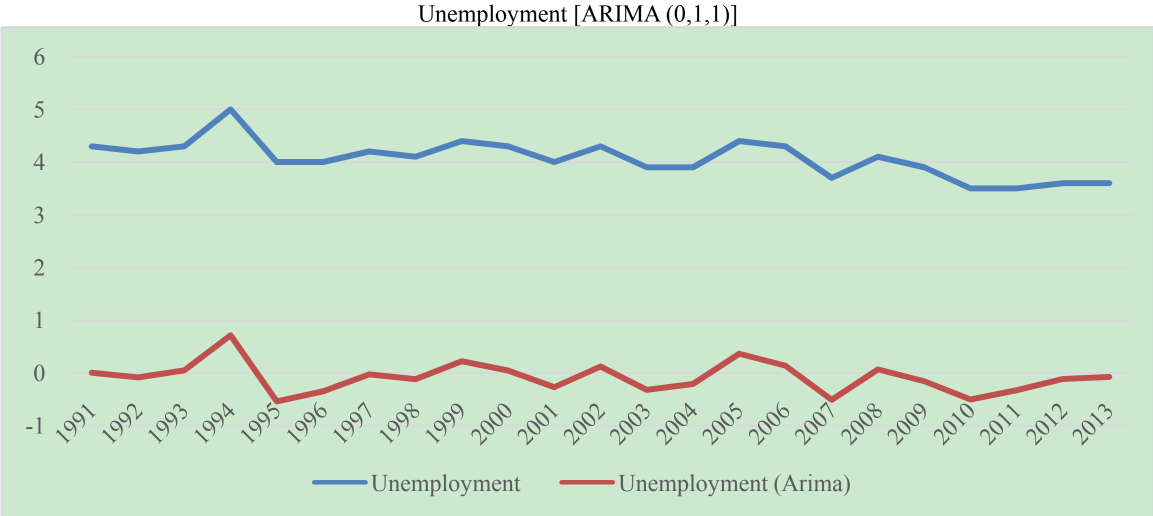
Public Debt [ARIMA (0,1,0)]



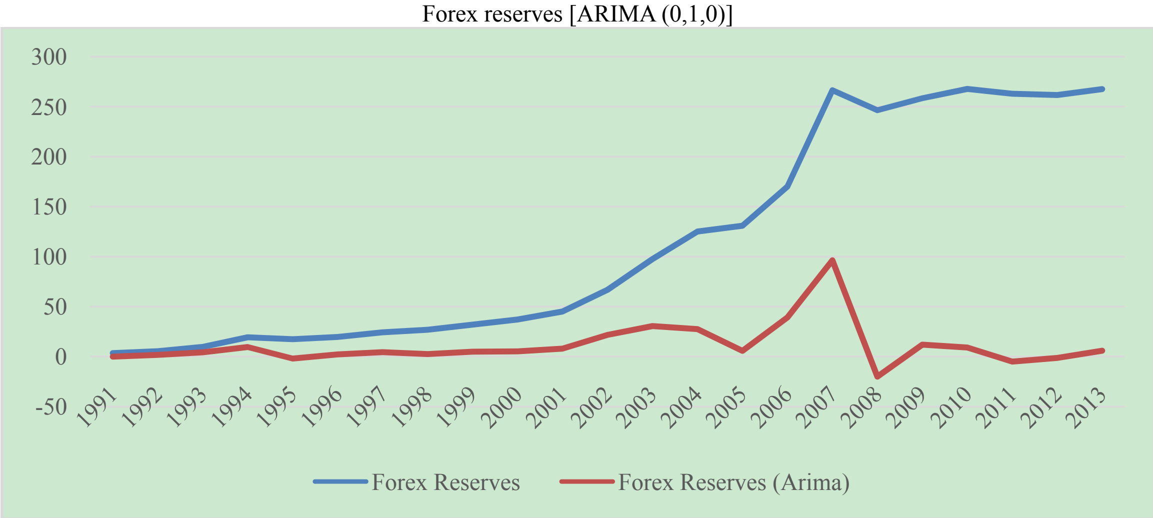
Exchange Rate [ARIMA (0,1,0)]



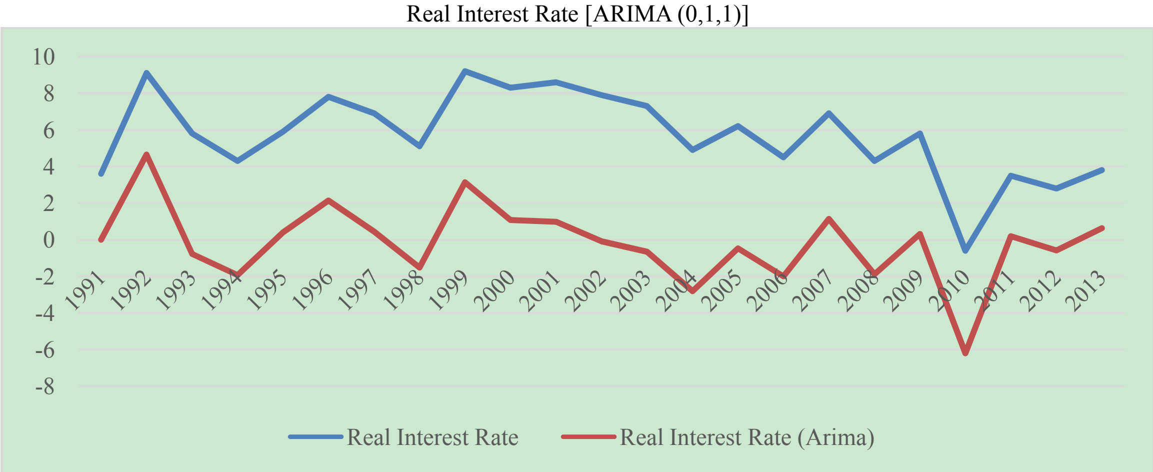
Unemployment [ARIMA (0,1,1)]



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



Real Interest Rate [ARIMA (0,1,1)]



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