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COUNTRY RISK MODEL FOR ZIMBABWE

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Abstract

The main objective of the study is to determine a country beta model for Zimbabwe based on six economic fundamentals; namely political risk, GDP deflator, FDI inflows, current account, external debt and GDP per capita. The country beta model is useful for predicting country risk. Logistic multiple regression analysis was employed in order to develop the beta model.

1. Introduction

Country risk is of critical concern worldwide today with political, social, financial and economic events in one country spilling over to another, which in turn impact on returns in the country. The 19th Century witnessed unmatched interest and research

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in identifying and scrutinizing country risk and its determinants because many individual and institutional investors with portfolios across borders were exposed to country risk. Gurus and researchers of emerging markets country risk analysis face a hard task in coming up with the selection criterion and evaluation systems to represent and interpret the various economic, social and political factors [1]. Moreover, computation and interpretation of statistical properties of various parameters based on historical returns could be misleading, thus adversely impacting on the reliability and relevancy of the data.

According to [2], country beta approach is a quantitative method of analysing country risk in which the difference between the returns of a country's equity market and the world equity market is attributed to the country risk. They further cite that this difference indicates the returns specific to the country and different from the rest of the world. This model was first introduced by [3] and also employed by [4] in Australia, [5] in Brazil, [6] in India, and [7] in Latin America in carrying out their research studies on emerging economies.

With special reference to Zimbabwe, this study examines the relationship between country risk and its determinants and identifies those variables that affect country risk most, using logistic multiple regression analysis. In the next section, we give a brief literature review of country risk analysis.

2. Literature Review

There are many definitions of country risk in the literature, ranging from narrow to broad, general interpretations. Some focus on the effect of country risk on the profitability levels of company operations from an investment perspective. For instance, country risk can refer to "the volatility of returns on international business transactions caused by events associated with a particular country, as opposed to events associated with a particular economic or financial agent" [8]. Another related definition is "the risk that non-market events (economic, social and political) in a foreign country would adversely affect an institution's financial interest" [6]. Other analysts have a quite different interpretation of the concept of country risk, such as for instance [2], who refer to country risk at a higher macroeconomic level and define country risk as "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 definition used by [9] as well as by [10]. In general, the analysis of country risk consists of the assessment of the socio-political, economic and financial factors of a borrowing country which host foreign direct investment. Many researchers strongly agree that country risk is a function of political, social and economic variables [11]. However, [12] argue that country risk is of a systematic nature and is hardly diversified in the country's financial portfolio, while [4] suggest that country risk is a function of the country's exposure to the world markets. Country risk is divided into six significant types namely sovereign risk, convertibility risk, contagion risk, currency risk, macroeconomic risk and indirect country risk[1]. [13] define country risk analysis (CRA) as an attempt to identify imbalances that increase the risk of a shortfall in expected returns of a cross-border investment while [14] provides a simple theoretical underpinning to country risk analysis as he cites that the growing imbalances in economic, social, or political factors increase the risk of shortfall in expected return on an investment.

In this research, we use the same approach used by [15], [2] to estimate Indian country risk, [4] in estimating Australian country risk, [5] for estimating Brazilian country risk and [16] in estimating New Zealand's county risk.

3. The Model Specifications

To estimate the regressand, logistic multiple regression analysis was employed because it incorporates multiple explanatory variables. The model is expressed as follows:

$$Y_i = \alpha_0 + \alpha_1 X_{1i} + \alpha_2 X_{2i} + \alpha_3 X_{3i} + \cdots + \alpha_n X_{ni} + \varepsilon_i \qquad (3.1)$$

Y_i is country risk. The notation X_{ni} indicates the values of the nth independent variable for the case i. The alpha terms are unknown partial regression coefficients and the ε_i terms are independent random variables that are normally distributed with

[1]The Bank of Thailand policy statement on country risk management (2008), Central Bank of Barbados country risk management guidelines (2008:03) and Hong Kong monetary authority supervisory policy manual on country risk management (2001).

mean zero and constant variance σ^2.

The selection of various independent variables that were used to estimate country risk is as follows:

$$B_t = CR_t$$

$$= f(GDP\_PER\_CAPITA_t, GDP\_DEFL_t, EXTERNAL\_DEBT\_GDP_t,$$

$$CURR\_GDP_t, GDP\ GROWTH\ RATE_t, FDI\_GDP_t, PB\_GDP_t, POLRSK_t)$$

$$= \alpha_0 + \alpha_1 GDP\_PER\_CAPITA_t + \alpha_2 GDP\ DEFL_t$$

$$+ \alpha_3 EXTERNAL\_DEBT_t + \alpha_4 CURR\_GDP_t + \alpha_5 GDP\ GROWTH\ RATE_t$$

$$+ \alpha_6 FDI\_GDP_t + \alpha_7 PD\_GDP_t + \alpha_8 POLRSK_t + \varepsilon_t, \quad (3.2)$$

where $B_t = CR_t$ = Country risk or beta in period *t*,

α_0 = Country risk intercept,

$\alpha_1, \alpha_2, \alpha_3, \alpha_4, \alpha_5, \alpha_6, \alpha_7, \alpha_8$ = Regression coefficients,

$GDP\_PER\_CAPITA_t$ = Gross Domestic product per capita in period *t*,

$GDP\ DEFL_t$ = Gross Domestic Product Deflator in period *t*,

$EXTERNAL\_DEBT_t$ = External debt balances as a percentage of *GDP* in period *t*,

$CURR\_GDP_t$ = Current Account balances as a percentage of *GDP* in period *t*,

$GDP\ GROWTH\ RATE_t$ = *GDP* growth rate in period *t*,

FDI_GDP_t = Foreign Direct Investment as a percentage of *GDP* in period *t*,

PD_GDP_t = Public Debt balances as a percentage of *GDP* in period *t*,

$POLRSK_t$ = Political Risk Index in period *t*,

ε_i = Random error term or residual.

The above mentioned political, financial and economic risk indicators generally serve as the drivers of country beta. Public debt, external debt and current account

balance indicate the fiscal policy of the economy. GDP Growth rate and Per Capita GDP measure the standards of living in a country. GDP deflator is the most comprehensive measure of inflation since a wide array of goods and services are included in its construction. Moreover, it reflects the monetary policy in a country. FDI inflows indicate how foreign countries perceive the economy. The index for political stability and absence of violence was used as a proxy for political risk index.

4. Detailed Relevance of Dependent and Independent Variables Chosen for the Model

This section discusses the dependent and independent variables that are in the study.

4.1. The dependent variable

The dependent variable is the country beta or risk which is the correlation of the country's returns with that of the world market as well as its returns volatility relative to the world market. [3] and [15] pointed out that beta (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. It is based upon the International Capital Asset Pricing model (ICAPM) where country risk is quantified as the β-coefficient, which represents a time-varying parameter as a function of independent economic and financial fundamentals. This is fully justified by macroeconomic theory, in which the relationship between country risk and or returns on assets and macroeconomic variables has increased. Country beta (β) is objective because it captures the actual situation in a country. The International Capital Asset Pricing Model which is an extension of the Capital Asset Pricing Model emphasizes that higher country beta signifies higher country risk and higher returns while lower country beta signifies lower risk and lower returns.

The proxy used for the returns on Zimbabwe stock market is industrial index (which is a capital adjusted size weighted index representing largest companies listed on the Zimbabwe Stock Exchange). The world stock market is represented by the Morgan Stanley Capital International (MSCI) global stock index, which is also a capital index. ZSE and MSCI monthly index returns from January 1998 to December 2011 were computed and log-normalized. This is done to improve the normality of

the β_t variable. This is consistent with [17] who pointed out that nonparametric tests (where no explicit assumption of normality is made) can suffer as much as or more than parametric tests when normality assumptions are violated, confirming the importance of normality in all statistical analyses, not just parametric analyses. From those log-normalized returns, annual country betas were computed as follows:

$$\beta_t = \frac{\text{Covariance}(\text{ZSE Index Monthly Returns}_t, \text{World Market Index Monthly returns}_t)}{\text{Variance}(\text{World Market Index Monthly Returns}_t)}.$$

4.2. The explanatory variables

The set of independent variables used in the study is derived from past empirical researches and from the suggestions of theoretical research on international borrowings.

(i) Gross domestic product per capita. The variable measures the level of economic development or the standards of living of a country. It is also used by the International Monetary Fund and the World Bank to measure the borrowing eligibility of a country. This variable is positively related to country beta. Thus, countries with low GDP per Capita are generally less creditworthy and risky [6].

(ii) GDP deflator. It is the most comprehensive measure of inflation since a wide array of goods and services are included in its construction [18]. It also gives an indication of the monetary policy in a country. Since it is a measure of inflation, countries with high GDP Deflators are inflationary and risky. Thus, there is a positive correlation between GDP Deflator and country risk.

(iii) External debt as a percentage of GDP. This indicates the accumulated fiscal performance of a country. According to [6], it is the debt owed to non-residents repayable in foreign currency goods or services. As this debt rises substantially, various economists warn against the dangers of debt trap, a term used to signify an inability of a government to repay and service its debt. A country with a high external debt is more vulnerable to foreign exchange crisis and more likely to default [19]. Therefore, this variable is positively related to country risk.

(iv) Current account balance as a percentage of GDP. Current account surplus or deficit is the difference between exports and imports of goods, services and income [18]. It also reflects the fiscal policy of the economy of a country. One way of reducing country risk is raising current account surplus as it enhances the

liquidity position of a country and thus reduces the country's default probability. This variable is negatively related to country risk because countries with large current deficits are less creditworthy [19].

(v) GDP growth rate. It measures the economic growth of a country. If the rate is going up, it shows that the country is generating more resources to finance its debts and thus reducing its default probability. This concurs with [20] assertion that poorer countries may have less flexibility to reduce consumption than richer countries. For this variable to properly measure the level of development in a country, it should be used in conjunction with other indicators like GDP per capita, level of infrastructure development, level of technological development, and others. Thus, this variable is negatively related to country risk.

(vi) Foreign direct investment inflows as a percentage of GDP. It encompasses various forms of capital contribution such as stock purchases, re-investment made from profits or earnings derived from loans extended to affiliate companies or branches abroad. The International Monetary Fund put forth a criterion where an investment is considered an FDI if an investor holds at least 10 percent of an issuer's common stocks or a number of such which gives him the right to vote. [2] cites that FDI inflows are an indication of how foreign economies perceive the a country's economy. They track the internal policies and regulations. Normally, an economy with low risk attracts more capital inflows. Thus, there is a strong negative correlation between country risk and FDI inflows.

(vii) Public debt balance as a percent of GDP. This also indicates the accumulated fiscal performance of a country. According to [21] it is defined as the sum of all outstanding financial liabilities of the public sector in respect of which there is primary legal responsibility to repay the original amount borrowed (principal) and to pay interest (debt servicing). A large debt stock usually results in more difficulty of the public sector to honour the debt service, which increases default risk [22]. Because this variable is positively related to country risk, emerging countries with large public debt are riskier than those with low public debt balance.

(viii) Political risk. Political risk is the most debated about and difficult to define. There is no agreement in literature on what the concept includes and excludes but could be defined as the probability that political forces will negatively affect a firm's profit or impede the attainment of other critical business objectives [23]. Using this definition, the effects can either be direct (such as nationalization and

expropriation) or indirect (such as taxes and monetary policies through, for instance, macroeconomic performance and currency fluctuation).

The more narrow and precise definition of political risk is the risk of a strategic, financial, or personnel loss for a firm because of such non-market factors as macroeconomic and social policies (fiscal, monetary, trade, investment, industrial, income, labour and developmental), or events related to political instability, that is, terrorism, riots, coups, civil war and insurrection [24] .

Political risk index indicates how non-business political events such as wars, regime changes and terrorist attacks affect profitability of business. [25] cited that disruptive political events frequently precede debt rescheduling. Thus, countries experiencing high political turmoil are more likely to default. Furthermore, [26] argued that political instability can reduce a country's willingness to service debt.

According to [1], over a period of time, political instability may slow economic growth; contribute to inflation, domestic bottlenecks and production shortage from an imbalance between exports and imports. [27] concurs with the latter argument because he argued that political instability is often accompanied by high inflation regardless of whether or not controls which hamper capital flows are in place. Thus inflationary countries are risk to invest in thereby making this variable positively correlated to country risk.

5. Data Sources

The data necessary to determine the country beta model for the period 1998 to 2011 was derived from secondary sources. The GDP figures, GDP per Capita, Consumer Price indices were obtained from Central Statistical Offices (CSO) Zimbabwe. Current Account Balances, External Debt figures, Foreign Direct Investment figures were obtained from the Reserve Bank of Zimbabwe and the Ministry of Finance. The information for Zimbabwe's proxy for political risk index was obtained from http://info.worldbank.org/governance.

6. Data Analysis and Results Presentation

Detecting multi-collinearity problem

The correlation test results of all the variables before dropping GDP per Capita and public debt as a percentage of GDP are shown in Table 1.

Table 1. Correlation Matrix before dropping some two variables

	GDP per CAPITA (Annual)	*CURR/GDP*	*FDI/GDP*	*POLRSK*	*EXTERNAl DEBT/GDP*	*GDP DEFL*	*PB_GDP*	*GDP growth rate*
GDP per CAPITA(Annual)	1.000							
CURR/GDP	-0.315	1.000						
FDI/GDP	0.399	-0.054	1.000					
POLRSK	0.098	0.157	0.374	1.000				
EXTERNAl DEBT/GDP	0.627	-0.161	0.218	0.460	1.000			
GDP DEFL	-0.044	0.144	-0.013	0.044	0.083	1.000		
PB_GDP	0.766	-0.287	0.162	0.175	0.812	-0.098	1.000	
GDP growth rate	0.845	-0.317	0.374	0.201	0.801	-0.144	0.947	1.000

The above results show that GDP growth rate and GDP per Capita are severely correlated. Moreover, public debt as a percentage of GDP and external debt as a percentage of GDP are also highly or severely correlated. There is also a severe multi-collinearity problem between public debt as a percentage of GDP and GDP growth rate. Thus, GDP growth rate and public debt as a percentage of GDP were eliminated from the equation in order to get rid of the multi-collinearity problem.

Multi-collinearity problem/test

The results of correlation matrix after detecting multi-collinearity problem are presented in Table 2.

Table 2. Correlation matrix after dropping two variables

	GDP per CAPITA(Annual)	CURR/GDP	FDI/GDP	POLRSK	External DEBT/GDP	GDP DEFL
GDP per CAPITA(Annual)	1.00					
CURR/GDP	-0.31	1.00				
FDI/GDP	0.40	–0.05	1.00			
POLRSK	0.10	0.16	0.37	1.00		
EXTERNAL DEBT/GDP	0.63	–0.16	0.22	0.46	1.00	
GDP DEFL	-0.04	0.14	–0.01	0.04	0.08	1.00

From the results shown in Table 2 above, there is no multi-collinearity problem among the independent variables because all the correlation coefficients are not greater than the a priori condition of 0.8. Thus all the above explanatory variables should be included in the estimation of country risk.

Regression results

The detailed results of the model estimated by employing multiple regression analysis are shown in Table 3 below:

Table 3. Regression analysis results

Dependent Variable: BETA

Method: Least Squares

Date: 01/24/13 Time: 23:32

Sample: 1 13

Included observations: 13

Variable	Coefficient	Std. Error	*t*-Statistic	Prob.
CURR_GDP	–1.316997	4.027431	–0.327007	0.007548
EXTERNAL_DEBT_GDP	0.356682	1.628900	0.218971	0.008339
FDI_GDP	–5.711162	30.99967	–0.184233	0.038599
GDP_DEFL	2.88E-05	1.37E-05	2.106706	0.007970
GDP_PER_CAPITA_ANNUAL_	–9.059407	10.27705	–0.881518	0.041200
POLRSK	14.31430	8.758179	1.634392	0.015330
C	–7.642042	4.285565	–1.783205	0.012480
R-squared	0.648069	Mean dependent var		1.541969
Adjusted *R*-squared	0.296137	S.D. dependent var		1.922615
S. E. of regression	1.613007	Akaike info criterion		4.097811
Sum squared resid	15.61075	Schwarz criterion		4.402014
Log likelihood	–19.63577	Hannan-Quinn criter.		4.035283
F-statistic	1.841464	Durbin-Watson stat		2.482801
Prob(*F*-statistic)	0.002382			

Therefore,

$$\begin{aligned} &COUNTRY\_BETA \\ &= -7.64204188368 - 1.31699744809(CURR\_GDP) \\ &\quad + 0.356682406624(\text{EXTERNAL DEBT\_GDP}) - 5.71116154556(FDI\_GDP) \\ &\quad + 2.88137208714e-05(\text{GDP\_DEFL}) - 9.05940665867(\text{GDP\_PER\_CAPITA}) \\ &\quad + 14.3142960057(\text{POLRSK}). \end{aligned} \tag{3}$$

All the variables in Table 3 above have the expected signs and are individually statistically significant. The R^2 value of about 0.6481 might seem low, but this value is statistically significant, since the computed *F*-value of about 1.84 is highly significant as its *p*-value is near zero. Since the *F*-statistic tests the hypothesis that all the slope coefficients are simultaneously zero, i.e., all the explanatory values jointly have no impact on the regressand, there is enough evidence to conclude that at least one of the predictors is useful for predicting country risk for Zimbabwe as it can be noted that all the explanatory variables are individually statistically significant at 5% or better level (i.e., the *p*-value is less than 5 percent).

Current account balance, FDI and GDP per capita are negatively related to country risk whilst external debt, GDP deflator and political risk are positively related. A priori, all these variables seem logical. Political risk seems to be the most influencing variable to country risk as clearly manifested by the highest partial regression coefficient of about 14.31.

Autocorrelation results

To detect serial autocorrelation between residuals, the correlogram of standardised residuals was employed and the results are shown in Table 4 below:

Table 4. Correlogram of standardised residuals

Date: 01/25/13 Time: 07:25

Sample: 1 13

Included observations: 13

Autocorrelation	Partial Correlation		AC	PAC	*Q*-Stat	Prob.
. **| . |	. **| . |	1	–0.248	–0.248	0.9963	0.618
. *| . |	. *| . |	2	–0.118	–0.191	1.2432	0.537
. **| . |	.***| . |	3	–0.242	–0.359	2.3874	0.596
. **| . |	****| . |	4	–0.211	–0.536	3.3496	0.501
. |***. |	. | . |	5	0.406	–0.035	7.3658	0.695
. | . |	. *| . |	6	0.002	–0.138	7.3659	0.588
. | . |	. *| . |	7	0.012	–0.177	7.3707	0.691
. *| . |	. *| . |	8	–0.078	–0.077	7.6094	0.573
. *| . |	. | . |	9	–0.089	0.041	7.9965	0.535
. | . |	. *| . |	10	0.029	–0.115	8.0525	0.624
. | . |	. *| . |	11	0.031	–0.069	8.1491	0.700
. | . |	. *| . |	12	0.005	–0.076	8.1543	0.773

The a priori condition states that if the probability values are greater than 0.05 there is no serial autocorrelation and vice versa [28]. The results in Table 4 above show that there is no serial autocorrelation hence implying that the residuals are independent of each other. Moreover, the Durbin-Watson d-test statistic from Table 3 also shows that there is no serial correlation because it is greater than the a priori condition of 2.

Heteroscedasticity results

Correlogram of standard residuals squared was drawn in order to detect the presence of heteroscedasticity. The results are shown in Table 5 below:

Table 5. Correlogram of standard residuals squared

Date: 01/25/13 Time: 07:30

Sample: 1 13

Included observations: 13

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob.
. | . |	. | . |	1	–0.054	–0.054	0.0476	0.827
. | . |	. | . |	2	–0.055	–0.058	0.1010	0.951
. | . |	. | . |	3	–0.026	–0.033	0.1144	0.990
. *| . |	. *| . |	4	–0.155	–0.162	0.6321	0.959
. *| . |	. *| . |	5	–0.084	–0.111	0.8051	0.977
. **| . |	.***| . |	6	–0.303	–0.354	3.3601	0.762
. | . |	. | . |	7	0.039	–0.061	3.4104	0.845
. | . |	. *| . |	8	0.025	–0.092	3.4355	0.904
. | . |	. | . |	9	0.025	–0.065	3.4662	0.943
. | . |	. *| . |	10	0.040	–0.123	3.5678	0.965
. | . |	. *| . |	11	0.023	–0.092	3.6185	0.980
. | . |	. *| . |	12	0.025	–0.149	3.7380	0.988

The results in Table 5 above show that there is no heteroscedasticity because all of the probability values in the correlogram of standard residuals squared are greater than 5 percent. Thus unbiased inference and results are produced by the model.

Normal test results

The results of normal test are shown Figure 1 below:

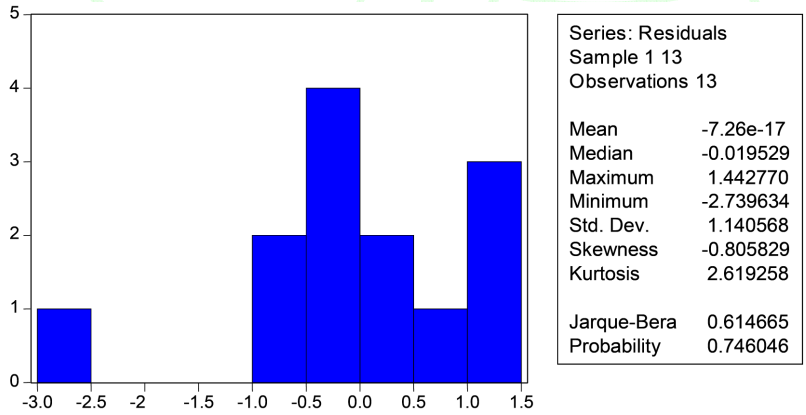

Figure 1. Residuals histogram.

The results shown above seem to suggest that the residuals follow a normal distribution because Jarque-Bera is close to zero with a stronger probability value of 74.6 percent.

Goodness of fit test results

The results of goodness of fit test are shown in Figure 2 below:

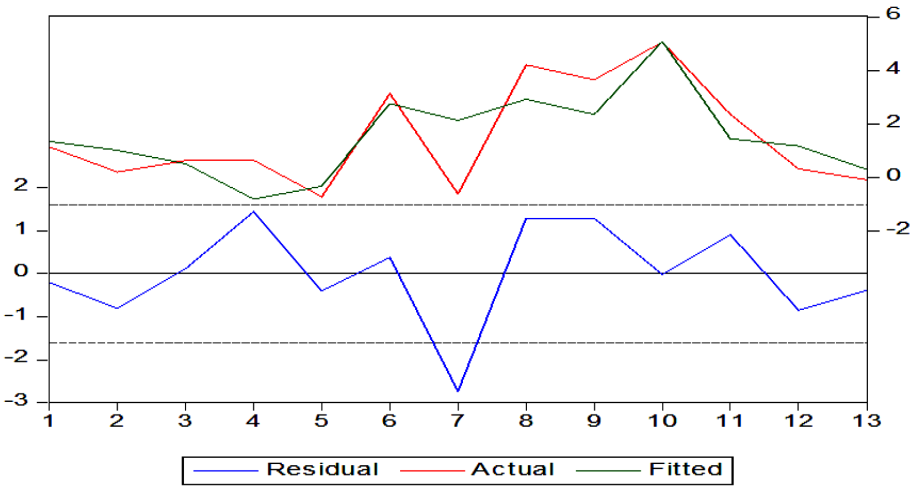

Figure 2. Graph for actual ad fitted values.

The graph drawn above shows that fitted values do not deviate much from the actual values. The model fits better in the earlier and later part of the sample than middle years; the residuals become smaller in absolute value. This implies that the model is adequate to predict Zimbabwe's country risk.

Interpretation of regression results

Political risk is the most significant factor influencing country risk in Zimbabwe because its coefficient is big and positive relative to other coefficients. This has been proven theoretically and empirically.

Zimbabwe's foreign direct investment inflows are negatively related to country risk. The higher the country risk the lower the FDI inflows, keeping other factors constant because they are sensitive to the political, financial and economic situation of the country. This indicates foreign investor's perception about the country. From

1998 to 2008, the FDI inflows of Zimbabwe were nose-diving responding to the deteriorating country risk status. As a result of dollarization in February 2009, the country's economy stabilised and registered an increase in FDIs inflows.

The negative regression coefficient of current account as a percentage of GDP implies that the higher the country risk of Zimbabwe the more negative the current account, ceteris paribus. This concurs with the current economic situation in Zimbabwe where the country is suffering from persistent current account deficit. This is also contributed to the fact that there are little exports relative to more imports because companies are operating below capacity.

Annual GDP per Capita is also negatively related to country risk. As country risk increases, per Capita GDP goes down because major companies will be divesting, reducing FDIs into the country thus lowering the GDP. Due to the deterioration of FDI inflows, the country per Capita GDP followed suit till the introduction of dollarization by the country's authorities.

External Debt as percentage of GDP is positively related to country risk. This has also been proven theoretically and empirically. Zimbabwe has been suffering from persistent unsustainable debt which was pegged at 157.3 percent of GDP as of 2011. This leads to an increase in country default risk which in turn leads to an increase in country risk.

Lastly, GDP deflator is positively related to country risk. Since this variable is a measure of inflation, countries which are inflationary are very risky. Zimbabwe's inflation rose from a 32 percent in 1998 to galloping inflation which reached a peak of 231 million percent in 2008. Thereafter, it falls to an average of 4 percent between 2009 and 2011[2] .

6. Conclusion

We have built a country beta model that can be used to predict Zimbabwe's annual country risk. This was done by examining the effect of various social, economic and political factors on country beta. From the researcher's knowledge, a model has never been built to predict country risk for Zimbabwe.

[2]http://www.rbz.co.zw/about/inflation.asp

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