## **Currency Risk Exposure in the Stock Markets of Emerging Economies**

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### Abstract

The growing interdependence of capital markets has increased the global investors' interest in the exchange rate fluctuations. The study tries to examine whether the currency risk exposure is significant in the stock markets of emerging economies, considering the exchange rate regime in the country. The study uses the International Capital Asset Pricing Model to explore the association between currency risk exposure and stock market return in emerging countries. The model considers major stock indices of the selected emerging countries for the stock market return, Morgan Stanley Capital International Emerging Market Index for market return and Real Effective Exchange Rate (REER) indices of the individual economies to assess the exchange rate risk exposure. The significance of currency risk exposure in the stock market is estimated using panel data regression. The study concluded that the stock markets of emerging countries are significantly exposed to currency risk, regardless of the country's exchange rate regime. But the exchange rate regime followed in a country significantly influences the nature of the association between the stock index and exchange rate.

**Keywords:** Currency risk exposure, Stock Market, International Asset Pricing Model, Exchange Rate Regime

JEL classification: F31, E44, G12, E42

### Introduction

The emerging stock markets are always anew for foreign investors in expectation to accelerate the gains from the high volatility. The global investors tend to closely watch the movement of exchange rates for stock market investments in emerging countries. The interplay of various macroeconomic variables triggers the exchange rate of an emerging country to fluctuate (Su, 2012 and Adusei & Gyapong, 2017). The emerging stock markets may become agog towards this fluctuation. The foreign investors may have a fear of losing their investment value due to the change in exchange rate. This exchange rate risk may act as a source of systematic risk in stock returns, due to the growing interdependence of the economies. In view of this, the currency risks exposure of a stock

market is gaining importance among global investors. The "International Capital Asset Pricing Model" is thus having wide acceptance, as it assumes countries as a stock portfolio in the global market (Korkmaz, Çevik& Gürkan, 2010) and considers the exchange rate as one of the factors determining the stock return.

The influence of exchange rate fluctuation on the stock market return may vary depending on the country's exchange rate regime. A country's regime explains the institutional framework and regulatory provisions followed in determining and controlling exchange rate of currencies. The stock market response to the fluctuation in the exchange rate may be robust or frail, depending on the country's exchange rate regime.

The current study attempts to investigate the significance of exchange rate risk exposure in emerging stock markets in light of the countries' respective exchange rate regimes<sup>1</sup>. The study considered emerging economies belonging to two different exchange rate regimes<sup>1</sup>; conventional pegged arrangement regime and floating regime. The stock markets in economies with floating regime are more likely to have significant currency risk exposure, as the exchange rates are largely market determined, without a predictable path for the rate. But in the economies with conventional pegged regime, the exposure may not be significant as the exchange rate is only permitted to fluctuate within a limited small margin and also the home currency is pegged at a fixed rate to the currency/currencies of key trading allies.

## **Review of Literature**

The model used for estimating the currency risk exposure of the stock index return is based on the "International Asset Pricing Model" stated by Stulz (1981) and Adler & Dumas (1983). Sharpe and Lintner's "Capital Asset Pricing Model" introduced in 1964-1965, forms the basis for international asset pricing model that incorporates world index return and exchange rate in the basic model. Alder & Dumas (1983) suggested using the beta coefficient of the exchange rate, derived when regressed on stock return, for estimating exchange rate exposure. In the scenario where there is a deviation from Purchasing Power Parity, the "asset pricing model should contain the risk premium based on the covariance of assets with exchange rates, besides the conventional risk premium based on the covariance with the market return" (Dumas & Solnik, 1995, p 445). Various studies such as Jorion (1990), Bodnar & Gentry (1993), Bartov & Bodnar (1994), Choi & Prasad (1995), Allayannis & Ofek (1997), He & Ng (1998), Pritamania, Shome & Singal (2003), Yuzel & Kurt (2003), Dominguez & Tesar (2005), Solakoglu (2005), Pan & Liu (2012), Erol, Algüner & Küçükkocaoğlu (2013) and Dranev & Babushkin (2014) have used the model that regressed market return and exchange rates on companies' stock return to ascertain companies' exchange rate exposure. Most of the studies used the data of developed economies and only limited studies proved significant foreign exchange risk exposure in company stock return.

Roll (1992) used the "International Capital Asset Pricing Model" (ICAPM) and found that a significant portion of stock index return of developed markets is explained by exchange rate variation. Ferson and Harvey (1994) measured the global economic risk and found only the world market index and fluctuation in exchange rates to be significant. The foreign exchange risk premium exists in equity markets as per the study of Dumas & Solnik (1995). De Santis & Gerard (1998) used the conditional version of ICAPM and found that the model is strong where the significance of exchange rate risk premium was established on international equity returns. Patro, Wald & Wu (2001) resorted to time varying two-factor ICAPM and found substantial foreign exchange risk exposures in sixteen OECD country equity index returns.

Bailey and Chung (1995) found evidence on the exposure of currency risk on time varying equity market premium in Mexico. The foreign exchange risk is priced in the Japanese stock market as per Choi, Hiraki & Tak (1998). Carrieri & Majerbi (2006) found a significant unconditional exchange risk premium in the stock markets of emerging economies. Carrieri, Emerging market currency risk is priced, according to Errunza and Majerb (2006), and it is a key component of stock returns in both emerging and developed economies.

The exchange rate regime followed in a particular country was not considered by any of the previous studies that examined currency exposure. But Bailliu & Murray (2003) found that the exchange rate regime has an impact on the movement of the exchange rate and further macroeconomic performances. Further Ghosh, Ostry, Gulde & Wolf (1996) confirmed that the exchange rate regime does have an impact on country's macroeconomic performance.

## **Objectives of the Study:**

- To know whether stock markets in emerging countries with conventional pegged arrangement regime have significant currency risk exposure.
- To know whether stock markets in emerging countries with floating regime have significant currency risk exposure.
- To know the influence of the exchange rate regime on the association between the stock index and exchange rate.

## **Data and Methodology**

### The Empirical Model:

The "International Asset Pricing Model" is considered for estimating the currency risk exposure of the stock index. In this model "an asset's expected return is associated with the covariance of the asset's return with the returns on the world market portfolio and with the covariance of the asset's return with the returns on foreign exchange rates" (Patro et al., 2002, p 1952).

The present study considered major stock indices in the emerging economies for the stock index return, "Morgan Stanley Capital International (MSCI) Emerging Market index" for world market index return and Real Effective Exchange rate (REER) indices of the respective countries for currency index return. The variation in REER measures the stock markets' currency risk exposure. That is, the MSCI Emerging Market Index return and REER are regressed on the stock index return and the significance of beta values of REER explains the significance of currency risk exposure in the emerging economies' stock market. With the purpose of enhancing the efficacy of estimation, panel data that allows pooling of data across countries was used. The panel data regression was run with the model to arrive at the currency risk exposure in the stock market return. In the later stage, a dummy variable capturing the exchange rate regime impact was introduced to the panel data model.

### Data:

The current study is confined to ten emerging countries<sup>2</sup>; five countries that consistently followed conventional pegged arrangement regime and five countries that consistently followed floating regime during the period of the study. The emerging countries and major stock indices considered for the study are shown in table 1. The analysis is done by considering weekly data from first week of January 2010 to last week of December 2018<sup>3</sup>. The weekly prices of indices were taken from Morgan Stanley Capital International website. The monthly REER of ten countries were obtained from the International Financial Statistics of the International Monetary Fund. Since weekly data are not available for REER, the monthly data are interpolated to weekly data.

## **Empirical Analysis and Results**

The MSCI Emerging Market index return and REER are regressed on the stock index return. The significance of beta values of REER explains the significance of currency risk exposure in the emerging economies' stock market. The panel data regression equation is as follows: -

$$R_{it} = \alpha + \beta_1 R m_{it} + \beta_2 R x_{it} + \varepsilon_{it}$$
  
t = 1 to T (1)

 $R_{it}$  is the stock market return of the *i*<sup>th</sup> country in time *t*.  $Rm_{it}$  is the world market index return,  $Rx_{it}$  is the return on REER index and  $\varepsilon_{it}$  is the error term.  $\beta_1$  is the gauge of market risk and  $\beta_2$  is the gauge of the currency risk exposure, which is the gauge of sensitivity of stock index returns to the variation in currency rates incorporating the market risk effect. Log returns  $(\log \frac{P_t}{P_{t-1}})$  were used in the equation.

## Measuring Currency Risk of Conventional Pegged Arrangement Regime countries

The Hausman test was performed on the panel data to decide whether the "fixed-effect model" (FEM) or the "random-effect model" (REM) is appropriate to get a reliable result. But the estimates of the Hausman test (refer to table 2) shows that "estimated cross-section random effects variance is zero", that is the cross-section intercepts are all constant. The REM estimation shows that the model is not a random-effect model but pooled ordinary least squares (pooled OLS).

Further Redundant Fixed Effects Test was done to examine the significance of fixed effects. The Redundant FE test result (refer to table 3) shows that the fixed effects are insignificant. Since there are no fixed effects and random effects, it is decided to go with the pooled OLS model. The pooled OLS model was run to ascertain the currency risk exposure of emerging countries with conventional pegged arrangement regime. The result is shown in table 4.

The Durbin-Watson stat of this model is close to two, signifying that there is no (first-order) autocorrelation in the residuals. The beta value of REER (Rx) is -0.37 which is the currency risk exposure of stock markets of countries that follow the Conventional Pegged Arrangement Regime. The REER beta is found to be significant in explaining stock returns. This shows that the stock markets of emerging countries where official intervention exists in exchange rates have significant currency risk exposure. But the relationship between stock index returns and REER is negative which indicates that an appreciation in the currency value would lead to a higher stock index return. The significance (the p-value being less than 0.05) of the joint influence of the market return and REER on the stock index return is also confirmed using the Wald test.

# Measuring Currency risk of Floating Regime countries

Here also the tests show that there exists no fixed effect and random effect and therefore pooled OLS is performed to ascertain the currency risk exposure of emerging countries with floating regime. The result is shown in table 5.

The Durbin-Watson stat of this model is approximately equal to 2, signifying that the residuals have no (first-order) autocorrelation. The beta value of REER (Rx), 0.07 which is the currency risk exposure of stock markets of countries that follow the floating regime is significant at 1%. This shows that the stock markets of emerging countries where exchange rates are largely market-determined also have significant currency risk exposure. The relationship between stock index returns and REER is positive which indicates that depreciation in the currency value would lead to a higher stock index return.

# Introducing dummy variable for Exchange rate regime

The panel data regression is run with all countries together after introducing a dummy variable to the model to capture and understand the influence of the exchange rate arrangement of the country. The dummy variable is regressed along with market index return and REER on stock index return.

$$R_{it} = \alpha + \beta_1 R m_{it} + \beta_2 R x_{it} + \beta_3 D U M_R e g_{it} + \varepsilon_{it} \quad , t = 1 \text{ to } T$$
(2)

 $DUM\_Reg_{it}$  is the dummy variable having the value 1 for floating regime and 0 for conventional pegged arrangement regime.

The tests favoured pooled OLS model and the result of pooled OLS is shown in table 6. The Durbin-Watson stat of this model is 2.05, signifying that there is no (first-order) autocorrelation in the residuals. The dummy variable introduced to capture the effect of the regime is significant at 1% and the coefficient is negative. The p-value of REER beta is significant at 1%, showing the significance of currency risk exposure in emerging countries. Further, the coefficients of interaction variables, market return-regime and REER-regime are positively significant. The results confirm that the exchange rate (REER) positively influences the stock market return in countries with floating regime and negatively influences the stock market return in countries with conventional pegged arrangement regime. The significance of the joint influence of the market return, REER and exchange rate regime on the stock index return is also confirmed at 1% (p-value < 0.01), using the Wald test.

### Conclusion

The study examined the currency risk exposure of the stock markets of emerging countries by considering the exchange rate regime. The study found that the stock markets of emerging countries have significant currency risk exposure regardless of the type of regime followed in the country. However, countries' exchange rate regime significantly influences the nature of the association between the stock index and exchange rate. Exchange rate and stock return are found to be positively related in emerging countries with floating regime and are found to be negatively related in emerging countries with conventional pegged arrangement regime. This difference in the nature of the relationship may be due to the mediation of various other macroeconomic variables such as money supply, inflation, capital convertibility, imports and exports of the country, the foreign investments in the stock markets, etc.

The findings of the study have significant practical implications on foreign investment decisions in the emerging stock markets. The findings suggest that global investors should consider the exchange rate regime to infer the movement of stock prices in relation to the exchange rate movement. The study may be extended by considering other macroeconomic variables that would be helpful in making better international portfolio selection decisions as well as various macroeconomic policy decisions.

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Exchange rate Regime	Emerging Countries	Stock Index
Conventional Pegged Arrangement	United Arab Emirates	ADX General Index
Regime	Kuwait	Premier Market PR Index
	Morocco	Moroccan All-share index
	Saudi Arabia	Tadawul All-Share Index
	Jordan	Amman SE General Index
Floating Regime	Brazil	Bovespa Index
	Colombia	Colombia COLCAP Index
	India	BSE SENSEX
	Philippines	PSE Composite Index
	South Africa	FTSE/JSE Africa All Shares Index

### Table.1. Emerging Countries and Stock Indices considered for the study

Source: Exchange rate regimes of each country identified from "Annual Report on Exchange Rate Arrangements and Exchange rate Restrictions", 2010 to 2018

### Table.2. Hausman Test Estimates

Chi-Square Stat	df	P value
0.403115	2	0.8175

*Note: The estimated cross-section random effects variance is zero. Source: Self Computed* 

### **Table.3. Redundant Fixed Effects Test Estimates**

	Statistic	df	P value
Cross-section F	0.350538	(4,2338)	0.8438
Cross-section Chi-square	1.405929	4	0.8432

Source: Self Computed

### Table.4. Results of Pooled Panel Least Squares model (Countries with Conventional Pegged Arrangement Regime)

Dependent Variable: S tock Return

	Dependent v	difuole. S toek Retuin		
Variable	Coefficient	Standard Error	t-Stat	P value
С	$1.267630^{*}$	0.116551	10.87619	0.0000
Market Return (Rm)	$0.102900^{*}$	0.014924	6.894851	0.0000
REER (Rx)	-0.370497*	0.113283	-3.270527	0.0011
	Goo	odness of fit		
R-squared	0.027762	F-statistic		33.44*
Adjusted R-squared	0.026932	Durbin-Watson stat		1.9
<i>Note</i> . <i>N</i> = 2345.				
* <i>p</i> < .01				

Source: Self Computed

	Dependent V	Variable: Stock Return		
Variable	Coefficient	Standard Error	t-Stat	P value
С	0.587868*	0.036891	15.93510	0.0000
Market Return (Rm)	0.337710*	0.011949	28.26303	0.0000
REER (Rx)	0.074544*	0.036439	2.045755	0.0409
	Go	oodness of fit		
R-squared	0.261810	F-statistic		415.31*
Adjusted R-squared	0.261180	Durbin-Watson stat		2.2
<i>Note.</i> $N = 2345$ . * $p < .01$				

### Table. 5. Results of Pooled Panel Least Squares model (countries with Floating Regime)

Source: Self Computed

### Table. 6. Results of Pooled Panel Least Squares model (equation with dummy variable)

Dependent Variable: Stock Return					
Variable	Coefficient	Standard Error	t-Stat	P value	
С	1.267630*	0.105752	11.98680	0.0000	
Market Return (Rm)	0.102900*	0.013541	7.598910	0.0000	
REER (Rx)	-0.370497*	0.102787	-3.604493	0.0003	
DUM_Reg <sup>a</sup>	-0.679762*	0.113651	-5.981148	0.0000	
RmReg <sup>a</sup>	0.234810*	0.019109	12.28768	0.0000	
RxReg <sup>c</sup>	0.445041	0.110707	4.020006	0.0001	
Goodness of fit					
R-squared	0.135815	F-statistic		147.23*	
Adjusted R-squared	0.134892	Durbin-Watson stat		2.0	
<i>Note. N</i> = 4690.	•	•		·	
<sup>a</sup> Dummy Variable					

<sup>b</sup> Interaction variable, market return-regime

<sup>c</sup> Interaction variable, REER-regime

\**p* < .01

#### Source: Self Computed

#### **Endnotes:**

1. The de facto classification of the countries based on the IMF survey is considered for the study.

- 2. The countries selected for the study are listed as emerging economies in an IMF working paper titled "Inflation Targeting and Exchange Rate Regimes in Emerging Markets" Ebeke & Azangue (2015). These countries are listed as developing countries in the World Economic Situation and Prospects report, 2018 published by the UN.
- 3. IMF has redefined and classified various regimes, which became effective from February 2, 2009. For this reason, the period of the current study starts from 2010.