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Rashid, Abdul and Saedan, Mashael

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**Financial Crisis and Exchange Rates in Emerging Economics:  
An Empirical Analysis using PPP-UIP-Framework**

**Abdul Rashid**

International Institute of Islamic Economics (IIIE),  
International Islamic Economics (IIU), Islamabad, Pakistan  
Email: [Abdulrashid@iiu.edu.pk](mailto:Abdulrashid@iiu.edu.pk)

**Mashaal Bin Saedan**

Dar al Uloom University, Riyadh, Saudi Arabia  
Email: [Mesho1040@me.com](mailto:Mesho1040@me.com)

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**Abstract**

This paper empirical investigates the effects of 2008 financial crisis on exchange rate determination in PPP-UIP framework for four emerging countries, using monthly date over the period 1981-2012. The results suggest that the impact of recent financial crisis led to change the role of determines of exchange rates in exchange determination. The findings also reveal that the effects of financial crisis on the exchange rate are different in all the four emerging economies. The findings of the study are of significant for policy makers in designing effectives policies in order to reduce the effects of financial crisis on exchange rates.

## **1. Introduction**

Globalization makes the world more correlated through many channels such as exports, imports, and net capital flows. More economic and financial integration makes the impact of 2008 financial crisis spread faster globally. This financial crisis was one of the worst disasters in the history since the crisis of 1929, which causes a huge fall in the household wealth and the whole financial market (Brunnermeier, 2008; Crotty, 2009; Galbraith, 2009; Heikki, 2009). Moreover, it caused many serious effects in the global exchange rate regime (Fratzscher, 2009). Therefore, it is significant to investigate the impact of 2008 financial crisis on exchange rate determination.

The foreign exchange market is considered as one of the highest trading value in all financial markets. Thus, the fluctuation in the exchange rate might lead to a significant impact in the underlying economy, in particular when the risk and uncertainty is growing in the financial markets. The recent financial crisis causes several doubts and uncertainty regarding the sustainability of existing financial system across the world. Along with numerous other socioeconomic effects, the financial crisis also affects determination of exchange rates in both short and long run (Kebrowski and Welfe, 2011).

The aim of this paper is to examine how 2008 financial crisis affects exchange rate determination in purchasing power parity (PPP) and uncovered interest rate parity (UIP) framework. Since several previous empirical studies, such as (Refshal, 2010) and (Rashid, 2009), have provided significant evidence that the exchange rate is determined by jointly through PPP and UIP. We therefore also study the impact of financial crisis on exchange rates in PPP-UIP framework. We also examine whether the impact of financial crisis on the exchange rate differs across countries with different economic and social backgrounds. Thus, the empirical analysis is carried for four emerging economies, namely Egypt, India, Turkey, and Thailand, using monthly data covering the period from 1981 to 2012.

The rest of the paper is organized as follows. Section 2 reviews the literature related to PPP, UIP, and financial crisis. Section 3 explains the PPP, UIP, and the combined form of PPP and UIP. Section 4 describes data and presents the empirical findings. Section 5 concludes the paper.

## 2. Literature Review

Several researchers, such as Blanchard *et al.* (2010), Keglowski and Welfe (2011), Refshal (2010), Wong and Wai Li (2010), Tsangarides (2012), and Fratzscher (2009) examine the impact of the subprime financial crisis upon the global exchange rate using different methods. Most of these studies either test the PPP or UIP while testing financial crisis effects. However, other studies, such as Rashid (2009), Jaramillo and Servanb (2012), and Keglowski and Welfe (2011) test the joint form of the PPP and the UIP. These studies provide strong evidence that both PPP and UIP conditions play a significant role in the determination of exchange rate.

Refshal (2010) examines the factors that affect the fluctuation of Australian dollar in the time of the financial crisis. Specifically, he aims to answer the question as to “why Australia has handled the most recent financial crisis so much better than most other developed nations?”. Specifically, the author tests the PPP, UIP, and the real interest parity (RPI) by using cointegration approach and provides evidence that there is a strong relationship between the Australian dollar and world commodity prices which assistances to stabilize domestic economic activities.

Jaramillo and Servan (2012) using trade-weighted exchange rates test whether the PPP and UIP hold for the Peruvian economy. Their study covers the period 1997-2011. They document that the mixture of PPP and UIP significantly explains the dynamics of the nominal effective exchange rate in Peru. They also argue that although the central bank's intervention is significant for smoothing the exchange rate short term volatility, it does not have a long term influence on the exchange rate.

Keglowski and Welfe (2011) propose a new modelling of exchange rate that enhances the capital enhanced equilibrium exchange rate (CHEER) model, which is the combination of the PPP and UIP. Specifically, they include an independent credit default risk into their specification to take into account the decisions of financial investors. They use cointegrated VAR system and monthly data from Poland and Euro area. Their results suggest that the sovereign credit risk is an important factor that determines the exchange rate along with the price and the interest rate differentials.

As a result of the financial crisis, there was uncertainty in the financial market, which may affect the determinations of exchange rates (Keglowski and Welfe 2011). The recent financial crisis caused abrupt fluctuations in the global exchange rate regime (Fratzcher, 2009) that had an inverse impact in the emerging countries mainly

through external shocks; mostly by two channels: net capital flows and export (Blanchard *et al.*, 2010). Consequently, the experience of recent financial crisis left several lesson for emerging economies, particularly, regarding the choice of the exchange rate regime (Tsangarides, 2012).

Most of the emerging countries have constructed considerable positive holding of US dollar treasury bills from the time of the crises of the late 1990, whereas they face a boom in the FDI capital inflows at the same period (Devereux and Sultherland, 2009). Nonetheless, Fratzscher (2009) highlights that the subprime financial crisis breakdown the idea that the US dollar plays a vital role in the international adjustment process because of the sharp decline in the assets price and the huge deleveraging procedure amid financial organizations. Thus, the economies went to recession, which led to huger hazard to human security that becomes from global financial insecurity and had series effects upon the emerging countries especially the poorest (Fukuda-Parr, 2008).

Fratzscher (2009) analyzed the data from 50 advance and emerging countries to investigate the change in the global exchange rate during the recent financial crisis period. He states that a sharp fluctuation in the global exchange rate configurations has caused by the recent financial crisis. He strongly recommends the importance of the macroeconomic fundamental, in specific sufficient foreign exchange reserves and sound current account positions to pawn capital flow reversal.

Blanchard *et al.* (2010) inspected the impact of the crisis in the emerging countries doing a case study of three emerging countries (Latvia, Russia, and Chile). They toke a simple of cross-country specification, connecting unexpected trade and financial variables over two quarters. Their results do not support the hypothesis that holding more foreign reserves helps limit the drop in output in the disaster. Fukuda-Parr (2008) also observed that even though some developing countries increased the reserves and surpluses, they badly affected from the recent financial crisis.

Reviewing previous empirical studies, we find that there are not enough empirical evidence how the recent financial crisis affects exchange rate determination in the PPP-UIP framework. Therefore, in this paper, we study the impacts of financial crisis on the exchange rate in four emerging economies after taking into account factors related to both PPP and UIP.

### 3. Economic Theory

#### 3.1 Purchasing Power Parity (PPP)

Under the PPP, the change in the price levels between any two countries determines the exchange rates for these countries when expressed in same currency, which is the assumption of ‘low of one price’ (Mishkin, 2010; Pilbeam, 2006). The relative form of PPP is as:

$$e_{it} = \alpha_i + \beta_i (p_{it}^d - p_t^f) + \varepsilon_i \quad t=1, \dots, T \quad (1)$$

$e_{it}$  = log nominal exchange rate for domestic country is defined as the number of domestic currency units needed to purchase one foreign currency unit.

$p_{it}^d$  = log domestic price level

$p_t^f$  = log of foreign country price level at time

$\varepsilon_i$  = trade shock with zero mean and finite variance

$\alpha_i$  = constant

$T$  = the number of observations over time.

#### 3.2 Uncovered interest rate parity (UIP)

This theory allows the capital movements and its state that the change of the interest rate between any two countries determines exchange rates for these countries (Pilbeam, 2006). The UIP can be expressed as:

$$\Delta e_{it+1} = \lambda_i + \delta_i (i_{it}^d - i_t^f) + \mu \quad (2)$$

$i_{it}^d$  = log domestic interest level

$i_t^f$  = log foreign interest level

#### 3.3 Combining PPP and UIP

MacDonald and Taylor (1992) and Rashid (2009) state that there is not enough empirical evidence supporting the PPP and UIP separately as many researchers failed to found it. They also argue that there are several factors that caused the failure of PPP; for instance, trade barriers, relative price level, imperfect market, and transport cost. While the limited capital mobility and the risk premium are examples of the factors that cause the failure of UIP. Therefore, the two models might not be evaluated individually when exploring the determinants of exchange.

The main advantage in the combined PPP and UIP is that both parity conditions complete each other.

The approach, which combined PPP and UIP, is the capital enhanced equilibrium exchange rate (CHEER) model. A key idea of the CHEER model is that a stationary connection reliable with the assets and good markets interdependence adjustment in to equilibrium is shaped by non-stationary deviation from PPP and UIP ( Stephens, 2004; Rashid, 2009).

Hence, PPP is a long-term circumstance, which supposed that the PPP forms in the expectations foundation in the UIP circumstance. So, this link is transferred to equation by plugging equation (1) into equation (2), which yield the following equation:

$$\eta_i (p_{it}^d - p_t^f - \alpha_i - e_{it}) = \lambda_i + \delta_i (i_{it}^d - i_t^f) + \mu_{it} \quad (3)$$

Rearranging:

$$e_{it} = p_{it}^d + p_t^f + \frac{\delta_i}{\eta_i} (i_{it}^d - i_{it}^f) + \Psi \quad (4)$$

where  $\Psi = \alpha_i + \frac{\lambda_i}{\eta_i} + \frac{\mu_{it}}{\eta_i}$

Finally, to examine the impact of financial crisis, we augment equation (4) by adding the interactions between explanatory variables and financial dummy. The equation takes the following form.

$$e_{it} = p_{it}^d + p_t^f + \frac{\delta_i}{\eta_i} (i_{it}^d - i_{it}^f) + D^{crisis} \cdot p_{it}^d + D^{crisis} \cdot p_t^f + \frac{\delta_i}{\eta_i} D^{crisis} \cdot (i_{it}^d - i_{it}^f) + \Psi \quad (5)$$

#### 4. Econometrics framework

##### 4.1 Data

The monthly data covering the period from 1981-2012 are taken from the International Financial Statistics (IFS) database for four emerging countries. We select different emerging countries, first a big Asian economy (India), second an economy heavily relies on tourism (Thailand), third a country (Turkey), which is closet to Europe geographically, and finally one Middle East oil produced country that is Egypt. The selection of these countries allows us to make an interesting comparison.

The variables included in the analysis are the exchange rate, the interest rate, consumer price index (CPI), producer price index (PPI), and share price index (SPI). All variables are in log form. Additionally, we create a dummy variable (taking value 1 for post crisis period (11/2007 until 12/2012) and 0 for pre crisis period) in order to identify the impact of the financial crisis. Table 1 presents the summary statistics.

Variables	Egypt		India		Turkey		Thailand		Panel	
	Mean	S.D	Mean	S.D	Mean	S.D	Mean	S.D	Mean	S.D
Exchange rate	0.906	0.8496	3.299	0.5895	-3.204	3.414	3.409	0.2259	1.102	3.221
Interest rate	2.495	0.2161	2.144	0.2663	3.705	0.4259	1.684	0.9062	2.507	0.9172
CPI	3.892	0.9082	4.024	0.6596	0.5672	3.822	4.29	0.3301	3.193	2.511
PPI	3.86	0.8517	4.052	0.5841	4.311	0.3208	4.258	0.3505	4.114	0.601

## 4.2 Empirical Results

This section presents empirical findings that examine the impacts of financial crisis on exchange rate determination under two well-know parities (PPP and UIP) for four emerging economics. To test the effect of financial crisis on exchange rate determination, we run several specifications following previous empirical studies, such as Refshal (2010), Jaramillo and Servan (2012) and Rashid (2009). In this paper, we consider USA as a foreign country.

We begin our empirical analysis by testing the order of integration of each variable. Specifically, we apply the augmented Dickey-Fuller (hereafter ADF) unit root test on both levels and first differences of the variables and test whether they are integrated of order zero or one. We also apply the panel unit root test, namely Fisher-type tests. This test is based on the ADF test. Specifically, Fisher-type tests conduct unit root tests for each individual included in the panel and combine the p-value from these tests to produce an overall test. The hypothesis for these tests is that all panels contain unit roots, while the alternative hypothesis is that at least one panel is stationary.

The results from the ADF tests for levels and first differences of the variables are presented in Tables 2 and 3, respectively.



<b>Table 2: Unit Root Results: At levels</b>		
<b>Variables</b>	<b>Constant</b>	<b>Constant + trend</b>
<b>Egypt</b>		
Exchange rate	-1.089 (0.7196)	-1.006 (0.9433)
Interest rate	-1.475 (0.5457)	-2.454 (0.3515)
CPI	-3.085 (0.0277)	-1.595 (0.7945)
PPI	-1.705 (0.4284)	-1.573 (0.8030)
<b>India</b>		
Exchange rate	-2.091 (0.2483)	-1.126(0.9247)
Interest rate	-0.044 (0.9547)	-1.934 (0.366)
CPI	-1.024 (0.7443)	-1.892 (0.6589)
PPI	-1.205 (0.6714)	-1.174 (0.9158)
SPI	-1.286 (0.6358)	-2.120 (0.5348)
<b>Turkey</b>		
Exchange rate	-2.587 (0.0958)	0.726 (1.0000)
Interest rate	-0.572 (0.8772)	-1.576 (0.8017)
CPI	-2.849 (0.0516)	2.274 (1.0000)
PPI	-1.103 (0.7139)	-6.066 (0.0000)
SPI	-2.226 (0.1970)	-1.535 (0.8167)
<b>Thailand</b>		
Exchange rate	-1.885 (0.3390)	-1.781(0.7138)
Interest rate	-1.492 (0.5377)	-2.723 (0.2265)
CPI	-0.971 (0.7637)	-1.211 (0.9083)
PPI	0.581 (0.9871)	-3.058 (0.1165)
SPI	-1.521 (0.5229)	-3.549 (0.0344)
<b>USA</b>		
Interest rate	0.242 (0.9745)	-1.087 (0.9312)
CPI	0.734 (0.9905)	-1.903 (0.6530)
PPI	-3.524 (0.0074)	-2.962 (0.1430)
SPI	-1.438 (0.5639)	-1.275 (0.8940)
<p>Note: The figures given in parentheses are p-value. The null hypothesis for ADF unit root test is that the series is non-stationary, while the alternative hypothesis is that the series stationary.</p>		

For Egypt, both exchange rate and interest rate are non-stationary at their levels. These results hold regardless we estimate the ADF equation without and with a linear time trend. However, consumer price index is stationary when the ADF equation is estimated without trend. It appears non-stationary when the trend is included in the equation.

Looking at results for India, the result suggest that only the nominal exchange rate is stationary at its level when only constant is included in the ADF equation. However, when the trend is added into the equation, it becomes non-stationary. All others variable are non-stationary regardless of whether a linear time trend is included or not except the interest rate, which is non-stationary without the trend, and become stationary with the trend.

Turning to Turkey we observe that shares price index is stationary when the ADF equation runs without the trend but all the other variables are non-stationary. However, the consumer price index, price production index, and exchange rate are stationary when the trend is accounted but the SPI turns non-stationary. The interest rate in both cases appears non-stationary.

For Thailand, all the underlying variables appear non-stationary at their levels, as we do not reject the null of unit root. These finding hold for all variables except share price index even when we include a linear time trend in the ADF equation. Share price index appears stationary when we consider a linear time trend. Finally, in case of the USA, the unit root test results provide evidence that all the underlying variables also are non-stationary at their levels. The results from the ADF unit root tests for first differences of the variables are given in Table 3. It is clear from the table, for all variables, we reject the null of non-stationary in favor of the alternative hypothesis of stationary for all countries. This implies that all the variables are integrated of order one.

<b>Table 3: Unit Root Results: At first differences</b>		
<b>Variables</b>	<b>Constant</b>	<b>Constant + trend</b>
<b>Egypt</b>		
Exchange rate	-9.350 (0.0000)	-9.376 (0.0000)
Interest rate	-6.950 (0.0000)	-6.949 (0.0000)
CPI	-9.698 (0.0000)	-10.266 (0.0000)
PPI	-10.023 (0.0000)	-10.214 (0.0000)
<b>India</b>		
Exchange rate	-7.778 (0.0000)	-7.944 (0.0000)
Interest rate	-11.417 (0.0000)	-11.535 (0.0000)
CPI	-9.933 (0.0000)	-9.978 (0.0000)
PPI	-9.262 (0.0000)	-9.337 (0.0000)
SPI	-9.005 (0.0000)	-9.030 (0.0000)
<b>Turkey</b>		
Exchange rate	-7.373 (0.0000)	-7.959 (0.0000)
Interest rate	-8.939 (0.0000)	-9.128 (0.0000)
CPI	-5.568 (0.0000)	-6.412 (0.0000)
PPI	-12.558 (0.0000)	-12.535 (0.0000)
SPI	-7.828 (0.0000)	-8.112 (0.0000)
<b>Thailand</b>		
Exchange rate	-9.830 (0.0000)	-9.880 (0.0000)
Interest rate	-6.807 (0.0000)	-6.798 (0.0000)
CPI	-9.403 (0.0000)	-9.438 (0.0000)
PPI	-9.365 (0.0000)	-9.460 (0.0000)
SPI	-6.823 (0.0000)	-6.893 (0.0000)
<b>USA</b>		
Interest rate	-8.198 (0.0000)	-8.288 (0.0000)
CPI	-8.756 (0.0000)	-8.831 (0.0000)
PPI	-9.146 (0.0000)	-9.584 (0.0000)
SPI	-8.609 (0.0000)	-8.691 (0.0000)
<p>Note: The figures given in parentheses are p-value. The null hypothesis for ADF unit root test is that the series is non-stationary, while the alternative hypothesis is that the series stationary.</p>		

Table 4 presents the results for panel unit root tests for the underlying variables at levels as well as the first differences. Most of the variables appear non-stationary when a linear trend term is included in the equation. However, the results from estimating the Fisher-type tests for first differences of the variables show that all variables are stationary. These results hold when we even include a linear time trend in the equation. Overall, the results from panel unit root tests suggest that all variables are integrated of order one.

<b>Table 4: Panel unit root: at level</b>		
<b>Variables</b>	<b>Constant</b>	<b>Constant + trend</b>
Exchange rate	-3.814 (0.0001)	2.064 (0.9807)
Interest rate	-1.780 (0.0369)	0.033(0.5131)
CPI	-3.942(0.0000)	1.479(0.9305)
PPI	-1.710(0.0434)	-1.811(0.0351)
SPI	-2.894(0.0019)	-0.479(0.3160)
<b>Panel unit root first difference</b>		
<b>Variables</b>	<b>Constant</b>	<b>Constant + trend</b>
Exchange rate	-15.419(0.0000)	-13.972(0.0000)
Interest rate	-14.789(0.0000)	-13.131(0.0000)
CPI	-14.914(0.0000)	-14.148(0.0000)
PPI	-16.252(0.0000)	-15.496(0.0000)
SPI	-12.699(0.0000)	-11.058(0.0000)
Note: The figures given in parentheses are p-value. The null hypothesis for ADF unit root test is that the series is non-stationary, while the alternative hypothesis is that the series stationary.		

After confirming the order of the integration of the variables, we apply the Johansen (1995) cointegration test to identify whether the variables included in the exchange rate model are cointegrated in the long run. Specifically, we apply the trace statistic to examine the number of cointegrated vectors. The results are presented in Table 5. The asterisk indicates the maximum significant number of cointegrated vectors.

<b>Rank</b>	<b>Egypt</b>	<b>India</b>	<b>Turkey</b>	<b>Thailand</b>
0	76.771	80.457	105.589	71.777
1	36.653*	46.997*	52.74	38.284*
2	17.352	21.624	24.838*	15.689
3	7.265	9.969	7.897	3.697
4	2.527	1.488	0.914	0.015

As it can be seen from the table, there is only one cointegrated vector for all countries except Turkey. In Turkey, there are two cointegrated vectors. However, I select the first one when I estimate the vector error correction model to examine the impact of financial crisis on the determination of the exchange rate. The existence of the cointegration between the exchange rate and domestic interest rate, foreign interest rate, domestic price levels, and foreign prices suggest that these variables have a co-movement in the long run. In other words, there is a unique long-run equilibrium.

After confirming the existence of the long-run relationship between the exchange rate and its determinants, I estimate the vector error correction model for each country to examine the impact of financial crisis on the exchange rate. The results are presented in Table 6.

**Table 6: Results from Vector Error Correction Model; Dependent Variable:  $\Delta\text{Log}$  (Exchange Rate)**

Variables	Egypt		Turkey		Thailand		India	
	Coef	P >  z	Coef	P >  z	Coef	P >  z	Coef	P >  z
Error term	-0.002	0.442	0.001	0.084	-0.0006	0.32	-0.005	0
$\Delta\text{Log}(\text{exchange rate})_{t-1}$	0.06	0.25	0.185	0.001	0.158	0.002	0.051	0.345
$\Delta\text{Log}(\text{interest rate})_{t-1}$	0.309	0.018	-0.027	0.566	0.013	0.573	-0.069	0.166
$\Delta\text{Log}(\text{CPI})_{t-1}$	-0.017	0.894	0.12	0.301	0.025	0.933	0.355	0.021
$\Delta\text{Log}(\text{foreign interest rate})_{t-1}$	-0.069	0.117	-0.006	0.891	-0.022	0.439	0.025	0.318
$\Delta\text{Log}(\text{foreign CPI})_{t-1}$	-0.624	0.057	0.078	0.819	0.342	0.141	0.11	0.541
Dummy <sup>crisis</sup> $\Delta\text{Log}(\text{interest rate})_{t-1}$	-0.287	0.208	0.057	0.683	-0.057	0.188	-0.046	0.969
Dummy <sup>crisis</sup> $\Delta\text{Log}(\text{CPI})_{t-1}$	-0.422	0.392	0.266	0.59	0.351	0.503	0.541	0.122
Dummy <sup>crisis</sup> $\Delta\text{Log}(\text{foreign interest rate})_{t-1}$	0.087	0.096	-0.008	0.892	0.018	0.602	0.017	0.575
Dummy <sup>crisis</sup> $\Delta\text{Log}(\text{foreign CPI})_{t-1}$	0.532	0.3	-0.317	0.526	-0.347	0.506	-0.533	0.129
$\Delta\text{Log}(\text{exchange rate})_{t-2}$							0.022	0.693
$\Delta\text{Log}(\text{interest rate})_{t-2}$							0.003	0.944
$\Delta\text{Log}(\text{CPI})_{t-2}$							-0.184	0.278
$\Delta\text{Log}(\text{foreign interest rate})_{t-2}$							-0.006	0.834
$\Delta\text{Log}(\text{foreign CPI})_{t-2}$							-0.078	0.664
Dummy <sup>crisis</sup> $\Delta\text{Log}(\text{interest rate})_{t-2}$							-0.794	0.521
Dummy <sup>crisis</sup> $\Delta\text{Log}(\text{CPI})_{t-2}$							0.348	0.381
Dummy <sup>crisis</sup> $\Delta\text{Log}(\text{foreign interest rate})_{t-2}$							0.003	0.915
Dummy <sup>crisis</sup> $\Delta\text{Log}(\text{foreign CPI})_{t-2}$							-0.047	0.89
$\Delta\text{Log}(\text{exchange rate})_{t-3}$							0.052	0.346
$\Delta\text{Log}(\text{interest rate})_{t-3}$							0.028	0.572
$\Delta\text{Log}(\text{CPI})_{t-3}$							-0.077	0.617
$\Delta\text{Log}(\text{foreign interest rate})_{t-3}$							-0.025	0.318
$\Delta\text{Log}(\text{foreign CPI})_{t-3}$							-0.038	0.832
Dummy <sup>crisis</sup> $\Delta\text{Log}(\text{interest rate})_{t-3}$							1.541	0.26
Dummy <sup>crisis</sup> $\Delta\text{Log}(\text{CPI})_{t-3}$							-0.066	0.851
Dummy <sup>crisis</sup> $\Delta\text{Log}(\text{foreign interest rate})_{t-3}$							0.039	0.196
Dummy <sup>crisis</sup> $\Delta\text{Log}(\text{foreign CPI})_{t-3}$							-0.527	0.23
-Trend			-0.0001	0.002	0	0.312	-0.0001	0
-constant	0.0066	0.017	0.1054	0	0.0188	0.315	0.068	0

Looking at the coefficient of error term, we observe that the sign of the estimated coefficient is negative for three countries, namely Egypt, India, and Thailand. The negative sign is consistent with the theory. This implies that there is a significant convergence to the long-run equilibrium. The p-values indicate that this convergence is statistically meaningful only for the case of India. Interestingly, the estimated coefficient of the error term for Turkey is positive and statistically significant at 10% level of significance, indicating that there is divergence from the long-run equilibrium. The results also indicate that the one-period lagged value of exchange rate has positive and statistically significant impact on the current level of exchange rate for Turkey and Thailand. Nonetheless, for remaining two countries, while the estimated impact is positive, it is not significant statistically.

Based on the vector error correction model, we derive the long-run estimates that are presented in Table 7.

Variables	Egypt		India		Turkey		Thailand	
	Coef	P >  z	Coef	P >  z	Coef	P >  z	Coef	P >  z
Log (exchange rate)	1	-	1	-	1	-	1	-
Log (interest rate)	-1.653	0.002	0.537	0.459	9.166	0	0.063	0.902
Log (CPI)	0.467	0.138	-5.633	0.008	-1.285	0.217	1.898	0.749
Log of foreign interest rate	0.142	0.418	0.113	0.546	0.444	0.629	-0.199	0.721
Log or foreign CPI	-7.743	0	-5.276	0.153	52.144	0.004	4.164	0.562
Dummy <sup>crisis</sup> × Log(interest rate)	0.057	0.982	105.39	0	-36.94	0	17.375	0
Dummy <sup>crisis</sup> × Log (CPI)	-23.024	0.001	73.496	0	77.77	0.09	472.97	0
Dummy <sup>crisis</sup> × Log (foreign interest rate)	-3.534	0	3.9146	0	9.633	0	-4.039	0
Dummy <sup>crisis</sup> × Log (foreign CPI)	23.57	0.004	-114.98	0	-56.75	0	-473.54	0
-trend			0.019	-	-0.037	-	-0.017	-
-constant	34.893	-	29.243	-	-219.3	-	-7.496	-

Consistent with the theory, domestic interest rate is negatively and statistically significantly related with the exchange rate for only Egypt. For Turkey, it is significantly positively related to the exchange rate. Nevertheless, for remaining two countries, there is no statistically significant relationship between domestic interest rate and the exchange rate.

Looking at the interaction between domestic interest rate and financial crisis dummy, we observe that the coefficient is positive and statistically significant for Indian and Thailand. On the other hand, it is negative and statistically significant for Turkey, while for Egypt the estimate is positive but it appears statistically insignificant. It should be noted that in Egypt, the interest rate impact on exchange rates becomes insignificant after financial crisis. In contrast to the case of Egypt, the role of domestic interest rate has become significant in the determination of the exchange rate after financial crisis in India and Thailand. Surprisingly, for case of Turkey, the impact of interest rate on the exchange rate was positive before financial crisis, while it turns negative after financial crisis. The impact of domestic prices on exchange rate is statistically insignificant for all countries except India. For India, it is negative and statistically significant at acceptable level of significance. However, after the financial crisis, the impact of domestic prices is significant for all the four countries. Specifically, it is negative for Egypt, whereas it is positive for remaining three countries.

Turning to the impact of foreign interest rate and price levels, we find that the impact of foreign interest is statistically significant after financial crisis, while it was statistically insignificant before financial crisis for all the four countries. Specially, after financial crisis, the exchange rate is positively affected by the foreign interest rate in the case of Egypt and Thailand. Nonetheless, the exchange rate is negatively affected by the foreign interest rate for the remaining two cases. The foreign price level is negatively related to exchange rate for Egypt and India, while it is positively related to exchange rate for Turkey and Thailand. However, the relationship is statistically significant only for the Egypt and Turkey. The estimated coefficient of the interactions between foreign prices and financial crisis dummy is positive and significant for Egypt, while it is negative and significant for remaining three countries.

Overall, the results presented in Table 7 suggest that the role of exchange rate determinants has been significantly changed in terms of both their sign (impact) and statistical significance after 2008 financial crisis. These findings are consistent with the previous empirical evidence that indicate the significant impact of financial crisis on exchange rate determinations. These results also confirm the idea that the impact of financial crisis on exchange rate significantly differs across countries with different economic and social backgrounds.



## **5. Conclusions**

This study examines the impact of 2008 financial crisis on the exchange rate in PPP-UIP framework for four emerging countries, namely Egypt, India, Turkey, and Thailand. The study uses monthly data covering the period from 1981-2012. The results reveal that the impact of recent financial crisis led to change the role of determinants of exchange rates in exchange determination. Moreover, we show that the effects of financial crisis on the exchange rate are different in different emerging economies. The findings of the study are of significant for policy makers in designing effective policies in order to reduce the effects of financial crisis on exchange rates. The findings are also significant in decisions for the exchange rate regime; especially in the risky time in order to mitigate the adverse effects of financial crisis.

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