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Financial crisis and exchange rates in emerging economies: An empirical analysis using PPP-UIP-Framework

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This paper empirically 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 recent financial crisis led to change the role of exchange rate determinants in exchange rate 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 effective policies in order to reduce the effects of financial crisis on exchange rates.

JEL Classifications: C39; F29; F31

Keywords: Exchange rates; financial crisis; PPP; UIP; emerging economies

Introduction

Globalization makes the world more correlated through many channels such as exports, imports, and foreign capital flows. More economic and financial integration spread the impact of 2008 financial crisis 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). Moreover, it caused several serious effects in the global exchange rate regime (Fratzscher, 2009). Therefore, it would be 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 financail markets. Thus, the fluctuation in the exchange rate might lead to a significant impact on the underlying economy, in particular when risk and uncertainty are 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 the determination of exchange rates in both short and long run (Keblowski and Welfe, 2011).

The main 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. We 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 curried 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. In subsequent section we provide review of 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.

Literature review

Several researchers, such as Fratzscher (2009), Blanchard *et al.* (2010), Wong and Wai Li (2010), Keblowski and Welfe (2011), and Tsangarides (2012),examine the impact of the subprime financail crisis upon the global exchange rate system using different methods. Most of these studies have used either the PPP or UIP while exploring finacial crisis effects on exchnage rates.However, other studies, such as Rashid (2009),Keblowski and Welfe (2011), andJaramillo and Servanb (2012),testthe joint form of the PPP and the UIP. These studies provide strong evidence that both PPP and UIP conditions together play a significant role in the determination of exchnage rate. Thus, considering only one of these paraties while examining the behavior of exchnage rate may yield bias results.

Jaramillo and Servan (2012) using trade-weighted exchange rates test whether the PPP and UIP hold for the Peruvian economy.Their study covers the period1997-2011. 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 dose not have a long term influence on the exchange rate.

Keblowski and Welfe (2011) propose a new modelling of exchange rate that extends the capital enhanced equilibrium exchange rate (CHEER) model, which is the combination of the PPP and UIP. Specifically, they include a independent credit default risk into their specification to take into account the decisions of financial investors. They usecointegrated vector autoregressive (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 (Keblowski and Welfe, 2011). The recent financial crisis caused abrupt fluctuations in the global exchange rate regime (Fratzscher, 2009) that had an unfavorable impact in the emerging countries mainly through external shocks; mostly by two channels: net foreign capital flows and exports (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 holdings of US dollar treasury bills from the time of the crises of the late 1990s, 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 became global financial insecurity and had several serious effects upon the emerging countries, especially the poorest (Fukuda-Parr, 2008).

Fratzscher (2009) analyzes 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 the capital flow reversal.

Blanchard *et al.* (2010) study the impact of 2008 financial crisis in the emerging countries doing a case study of three emerging countries (Latvia, Russia, and Chile). They used 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 is not enough empirical evidence on how the recent financial crisis affects exchange rate determination in the PPP-UIP framework. Therefore, in this paper, we study the impacts of 2008 financial crisis on the exchange rate in four emerging economies after taking into account the factors that related to both PPP and UIP.

Economic theory

Purchasing Power Parity (PPP)

Under the PPP, the change in the price levels between any two countries determines the exchange rate 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:

$$e_{it} = \alpha_i + \beta_i\left(p_{it}^d - p_t^f\right) + \varepsilon_t \qquad t = 1,\ldots,T \text{ and } i = 1,\ldots,N \qquad (1)$$

e_{it} = log nominal exchange rate for *ith* 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 at time *t*

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

ε_t = trade shock with zero mean and finite variance

α_i = constant

T = total observations

N = total number of countries included in the analysis.

Uncovered interest rate parity (UIP)

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

$$\Delta e_{it+1} = \lambda_i + \delta_i\left(i_{it}^d - i_t^f\right) + \mu_t \; t = 1,\ldots,T \text{ and } i = 1,\ldots,N \qquad (2)$$

i_{it}^d = log domestic interest rate at time *t*

i_t^f = log foreign interest rate at time *t*

Δ = difference operator

η_t= error term with zero mean and finite variance

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 find it. They also argue that there are several factors that caused the failure of PPP; for instance, trade barriers, relative price levels, imperfect market, and transport costs. While the limited capital mobility and 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 rate. The main advantage in the combined form of PPP and UIP is that both parity conditions complete each other.

The approach, which combined PPP and UIP in a single equation, 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 into the 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 the UIP equation by plugging equation (1) into equation (2), which yield the following model:

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

After rearranging, we obtain the following equation:

$$e_{it} = p_{it}^d + p_t^f + \frac{\delta_i}{\eta_i}\left(i_{it}^d - i_{it}^f\right) + \psi_i \qquad (4)$$

Where, $\psi_i = \alpha_i + \frac{\lambda_i}{\eta_i} + \frac{\mu_{it}}{\eta_i}$

Finally, to examine the impact of financial crisis, we augment equation (4) by adding the interactions between explanatory variables and a financial dummy which takes value one after the crisis period and zero otherwise. Specifically, the equation takes the following form.

$$e_{it} = p_{it}^d + p_t^f + \frac{\delta_i}{\eta_i}\left(i_{it}^d - i_{it}^f\right) + p_{it}^d \times D^{crisis} + p_t^f \times D^{crisis} + \frac{\delta_i}{\eta_i}\left(i_{it}^d - i_{it}^f\right) \times D^{crisis} + \psi_i \qquad (5)$$

Econometrics Framework

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 four different emerging countries: first a big Asian economy (India), second an economy heavily relies on tourism (Thailand), third a country (Turkey), which is closest 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 which is defined as the price of one unit of foreign currency (US dollar) in domestic currency of the underlying country, the interest rate which is money market rates and is defined as average of rates on deposits with maturity of one to 90 days in national currency, consumer price index (CPI), producer price index (PPI), and share price index (SPI) which refers to the index of security prices and is computed based on prices of ordinary shares in all industries traded on the major stock exchange of respective country. 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.

TABLE 1. SUMMARY STATISTICS

	Egypt		India		Turkey		Thailand		Panel	
Variables	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	3.4140	3.409	0.2259	1.102	3.2210
Interest rate	2.495	0.2161	20144	0.2663	3.705	0.4259	1.684	0.9062	2.507	0.9172
CPI	3.892	0.9082	4.024	0.6596	0.567	3.8220	4.290	0.3301	3.193	2.5110
PPI	3.860	0.8517	4.052	0.5841	4.311	0.3208	4.258	0.3505	4.114	0.6010

In January 2003, the Central Bank of Egypt (CBE) announced floating exchange rate for the Egyptian pound (LE). Since the 1960s until fiscal year 2003, Egypt's exchange rate has been pegged with US$ and exhibited a large extent of rigidity. With the announcement of the float, Egypt's currency has been depreciated until October 2004. However, for next four years, the exchange rate has continuously and reached LE/US$ 5.32. This appreciation is mainly attributed to foreign exchange earnings from oil exports, tourism, Suez Canal, and FDI. After getting independence 1947, India has shifted from a par value system to a basket-peg exchange rate regime. In December 1971, with the breakdown of the Bretton Woods System, Indian rupee was pegged with pound sterling. In the early 1990s, India recognized that Indian macroeconomic policies and structural factors had significantly created balance of payment problems. To overcome balance of payment difficulties, India shifted to a flexible exchange rate system in 1992-93.

Before 1963, there was a float of Thai Baht. However, the floating exchange rate regime was ended on October 20, 1963, and the Thai Baht was pegged with US$. In March 1978, instead of only US dollar, Thailand pegged Baht to a weighted basked currency of major trading partners of Thailand. Afterwards, Thailand adopted controlled floating rate and allowed Baht to float within a narrow range. For the period of 1984-1997, Thailand has used monetary and financial measures to shield the Baht value against US currency. In December, 2006, the bank of Thailand imposed several controls on the exchange rate which resulted in a considerable spread between offshore and onshore exchange rates. However, on March 3, 2008, the controlled were mainly lifted and thus, there is now significant divergence between offshore and onshore exchange rates. Before the period of 1980, there was a fixed exchange rate regime in Turkey. The fixed exchange rate system was replaced with crawling peg exchange rate system in 1980. However, Turkey adopted a floating exchange rate regime for the period 1989-1993. During the period of 1994-1996, the Turkish Lira exchange rate has been determined within crawling band. In 2000, Turkey started the stabilization program and under this program, Turkey adopted currency-peg regime. Finally, since 2001, there is a floating exchange rate regime in Turkey.

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 Rashid (2009), Jaramillo and Servan (2012). In this paper, we consider the USA as a foreign country.

We begin our empirical analysis by testing the order of integration of each variable included in the study. 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 estimate unit root tests for each individual included in the panel and combine the p-value from these tests to construct 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.

TABLE 2. THE ADF UNIT TEST RESULTS FOR LEVELS

Variables	Constant		Constant + trend	
Egypt				
Exchange rate	1.089	(0.719)	-1.006	(0.943)
Interest rate	-1.475	(0.545)	-2.454	(0.351)
CPI	-3.085	(0.027)	-1.595	(0.794)
PPI	-1.705	(0.428)	-1.573	(0.803)
India				
Exchange rate	-2.091	(0.248)	-1.126	(0.924)
Interest rate	-0.044	(0.954)	-1.934	(0.366)
CPI	-1.024	(0.744)	-1.892	(0.658)
PPI	-1.205	(0.671)	-1.174	(0.915)
SPI	-1.286	(0.635)	-2.12	(0.534)
Turkey				
Exchange rate	-2.587	(0.095)	0.726	(1.000)
Interest rate	-0.572	(0.877)	-1.576	(0.801)
CPI	-2.849	(0.051)	2.274	(1.000)
PPI	-1.103	(0.713)	-6.066	(0.000)
SPI	-2.226	(0.197)	-1.535	(0.816)
Thailand				
Exchange rate	-1.885	(0.339)	-1.781	(0.713)
Interest rate	-1.492	(0.537)	-2.723	(0.226)
CPI	-0.971	(0.763)	-1.211	(0.908)
PPI	0.581	(0.987)	-3.058	(0.116)
SPI	-1.521	(0.522)	-3.549	(0.034)
USA				
Interest rate	0.242	(0.974)	-1.087	(0.931)
CPI	0.734	(0.990)	-1.903	(0.653)
PPI	-3.524	(0.007)	-2.962	(0.143)
SPI	-1.438	(0.563)	-1.275	(0.894)

Note: The figures given in parentheses are p-value. The null hypothesis for the ADF unit root test is that the series in non-stationary, while the alternative hypothesis is that the series is stationary.

For Egypt, both exchange rate and interest rate are non-stationary at their levels. These results hold regardless we estimate the ADF equation without or with a linear time trend.

However, consumer price index is stationary when the ADF equation is estimated without a linear time trend. It appears non-stationary when the trend is included in the equation.

Looking at results for India we find 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 the exchange rate are stationary when the trend is controlled 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 at any acceptable level of significant. These findings 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 are also 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.

TABLE 3. THE ADF UNIT TEST RESULTS FOR FIRST DIFFERENCES

Variables	Constant		Constant + trend	
Egypt				
Exchange rate	-9.350	(0.000)	-9.376	(0.000)
Interest rate	-6.950	(0.000)	-6.946	(0.000)
CPI	-9.698	(0.000)	-10.266	(0.000)
PPI	-10.023	(0.000)	-10.214	(0.000)
India				
Exchange rate	-7.778	(0.000)	-7.944	(0.000)
Interest rate	-11.417	(0.000)	-11.535	(0.000)
CPI	-9.933	(0.000)	-9.978	(0.000)
PPI	-9.262	(0.000)	-9.337	(0.000)
SPI	-9.005	(0.000)	-9.030	(0.000)
Turkey				
Exchange rate	-7.373	(0.000)	-7.959	(0.000)
Interest rate	-8.939	(0.000)	-9.128	(0.000)
CPI	-5.568	(0.000)	-6.412	(0.000)
PPI	-12.558	(0.000)	-12.535	(0.000)
SPI	-7.828	(0.000)	-8.112	(0.000)
Thailand				
Exchange rate	-9.830	(0.000)	-9.880	(0.000)
Interest rate	-6.807	(0.000)	-6.798	(0.000)
CPI	-9.403	(0.000)	-9.438	(0.000)
PPI	-9.365	(0.000)	-9.460	(0.000)
SPI	-6.823	(0.000)	-6.893	(0.000)
USA				
Interest rate	-8.198	(0.000)	-8.288	(0.000)
CPI	-8.756	(0.000)	-8.831	(0.000)
PPI	-9.146	(0.000)	-9.584	(0.000)
SPI	-8.609	(0.000)	-8.691	(0.000)

Note: The figures given in parentheses are p-value. The null hypothesis for the ADF unit root test is that the series in non-stationary, while the alternative hypothesis is that the series is stationary.

Table 4 presents the results for panel unit root tests for the underlying variables at both levels and 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 the 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.

TABLE 4. PANEL UNIT TEST RESULTS FOR LEVELS

Variables	Constant		Constant + trend	
Exchange rate	-3.814	(0.000)	2.064	(0.980)
Interest rate	-1.780	(0.036)	0.033	(0.513)
CPI	-3.942	(0.000)	1.479	(0.930)
PPI	-1.710	(0.043)	-1.811	(0.035)
SPI	-2.894	(0.001)	-0.479	(0.316)
Panel Unit Root Test results for first differences				
Variables	Constant		Constant + trend	
Exchange rate	-15.419	(0.000)	-13.972	(0.000)
Interest rate	-14.789	(0.000)	-13.131	(0.000)
CPI	-14.914	(0.000)	-14.1448	(0.000)
PPI	-16.255	(0.000)	-15.496	(0.000)
SPI	-12.699	(0.000)	-11.580	(0.000)

Note: The figures given in parentheses are p-value.

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.

TABLE 5. RESULTS FOR COINTEGRATION TESTS

Rank	Egypt	India	Turkey	Thailand
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

Note: * indicates the number of significant cointegrated vectors.

As it can be seen from the table, there is only one cointegrated vector for all countries except Turkey. For Turkey, there are two cointegrated vectors. However, we select the first one, as it is associated with the highest eigenvalue when we 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, we 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: Δlog(Exchange Rate)

Variables	Egypt		Turkey		Thailand		India	
	Coef.	P-V	Coef.	P-V	Coef.	P-V	Coef.	P-V
Error term	-0.002	(0.442)	0.001	(0.084)	-0.006	(0.320)	-0.005	(0.000)
$\Delta\log(\text{exchange rate})_{t-1}$	0.060	(0.250)	0.185	(0.001)	0.158	(0.002)	0.051	(0.345)
$\Delta\log(\text{interest rate})_{t-1}$	0.309	(0.018)	-0.027	(0.566)	0.013	(0.573)	-0.069	(0.166)
$\Delta\log(\text{CPI})_{t-1}$	-0.017	(0.894)	0.120	(0.301)	0.025	(0.933)	0.355	(0.021)
$\Delta\log(\text{foreign interest rate})_{t-1}$	-0.069	(0.117)	-0.006	(0.891)	-0.022	(0.439)	0.025	(0.318)
$\Delta\log(\text{foreign CPI})_{t-1}$	-0.624	(0.057)	0.078	(0.819)	0.343	(0.141)	0.11	(0.541)
Dummy $^{crisis}\Delta\log(\text{interest rate})_{t-1}$	-0.287	(0.208)	0.057	(0.683)	-0.057	(0.188)	-0.046	(0.969)
Dummy $^{crisis}\Delta\log(\text{CPI})_{t-1}$	-0.422	(0.392)	0.266	(0.590)	0.351	(0.503)	0.541	(0.122)
Dummy $^{crisis}\Delta\log(\text{foreign interest rate})_{t-1}$	0.087	(0.096)	-0.008	(0.892)	0.018	(0.602)	0.017	(0.575)
Dummy $^{crisis}\Delta\log(\text{foreign CPI})_{t-1}$	0.532	(0.300)	-0.317	(0.526)	-0.347	(0.506)	-0.533	(0.129)
$\Delta\log(\text{exchange rate})_{t-2}$							0.022	(0.693)
$\Delta\log(\text{interest rate})_{t-2}$							0.003	(0.944)
Δlog(CPI)t-2							-0.148	(0.278)
$\Delta\log(\text{foreign interest rate})_{t-2}$							-0.006	(0.834)
$\Delta\log(\text{foreign CPI})_{t-2}$							-0.078	(0.664)
Dummy $^{crisis}\Delta\log(\text{interest rate})_{t-2}$							-0.794	(0.521)
Dummy $^{crisis}\Delta\log(\text{CPI})_{t-2}$							0.348	(0.381)
Dummy $^{crisis}\Delta\log(\text{foreign interest rate})_{t-2}$							0.003	(0.915)
Dummy $^{crisis}\Delta\log(\text{foreign CPI})_{t-2}$							-0.047	(0.890)
$\Delta\log(\text{exchange rate})_{t-3}$							0.052	(0.346)
$\Delta\log(\text{interest rate})_{t-3}$							0.028	(0.572)
Δlog(CPI)t-3							-0.077	(0.617)
$\Delta\log(\text{foreign interest rate})_{t-3}$							-0.025	(0.318)
$\Delta\log(\text{foreign CPI})_{t-3}$							-0.038	(0.832)
Dummy $^{crisis}\Delta\log(\text{interest rate})_{t-3}$							1.541	(0.260)
Dummy $^{crisis}\Delta\log(\text{CPI})_{t-3}$							-0.066	(0.851)
Dummy $^{crisis}\Delta\log(\text{foreign interest rate})_{t-3}$							0.039	(0.196)
Dummy $^{crisis}\Delta\log(\text{foreign CPI})_{t-3}$							-0.527	(0.230)
Trend			-0.001	(0.002)	0.312	(0.000)	-0.001	(0.000)
Constant	0.006	(0.017)	0.105	(0.000)	0.018	(0.315)	0.068	(0.000)

Note: The values given in parentheses are p-value.

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 a 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.

TABLE 7. RESULTS FROM VECTOR ERROR CORRECTION MODEL
Dependent variable: Δlog(Exchange Rate)

Variables	Egypt		Turkey		Thailand		India	
	Coef.	P-V	Coef.	P-V	Coef.	P-V	Coef.	P-V
Log(exchange rate)	1.000		1.000		1.000		1.000	
Log(interest rate)	-1.653	(0.002)	0.537	(0.459)	9.166	(0.000)	0.063	(0.902)
Log(CPI)	0.467	(0.138)	-5.633	(0.008)	-1.285	(0.217)	1.898	(0.749)
Log(foreign interest rate)	0.142	(0.418)	0.113	(0.546)	0.444	(0.629)	-0.199	(0.721)
Log(foreign CPI)	-7.743	(0.000)	-5.276	(0.153)	52.144	(0.004)	4.164	(0.562)
Dummy ^{crisis}×log(interest rate)	0.057	(0.982)	15.390	(0.000)	-36.940	(0.000)	17.375	(0.000)
Dummy ^{crisis}×log(CPI)	-23.024	(0.001)	73.496	(0.000)	77.770	(0.090)	72.970	(0.000)
Dummy ^{crisis}×log(foreign interest rate)	-3.534	(0.000)	3.914	(0.000)	9.633	(0.000)	-4.039	(0.000)
Dummy ^{crisis}×log(foreign CPI)	23.570	(0.004)	-114.980	(0.000)	-56.750	(0.000)	-47.540	(0.000)
Trend			0.019	(0.000)	-0.037	(0.000)	-0.017	(0.000)
Constant	34.893	(0.000)	29.243	(0.000)	-29.300	(0.000)	-7.496	(0.000)

Note: The values given in parentheses are p-value.

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 the 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 the exchange rate for Turkey and Thailand. However, the relationship is statistically significant only for the Egypt and Turkey. The estimated coefficient of the interaction 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 the exchange rate significantly differs across countries with different economic and social backgrounds.

Conclusion

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 observe 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 making 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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