Working Paper

The Impact of Net Private Capital Flows on Foreign Exchange Market Pressures in Jamaica

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Abstract

The study utilized a VAR framework to assess the impact of the components of net private capital (NPC) flows on foreign exchange market pressure in Jamaica. Exchange market pressure (EMP) is assessed using the Eichengreen (1995) EMP index which consists of a weighted average of normalized changes in the exchange rate, the ratio of international reserves to the money stock and the nominal interest rate differential. NPC flows, both from a BOP accrued accounting and a cash accounting framework, were examined. The results indicate that there is a significant negative causal relationship between NPC flows and volatility. FDI-related flows, however, were insignificant in determining EMP.

JEL Classification: F31, F32

[1] The views expressed in this paper do not necessarily reflect those of the Bank of Jamaica.

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1.0 Introduction

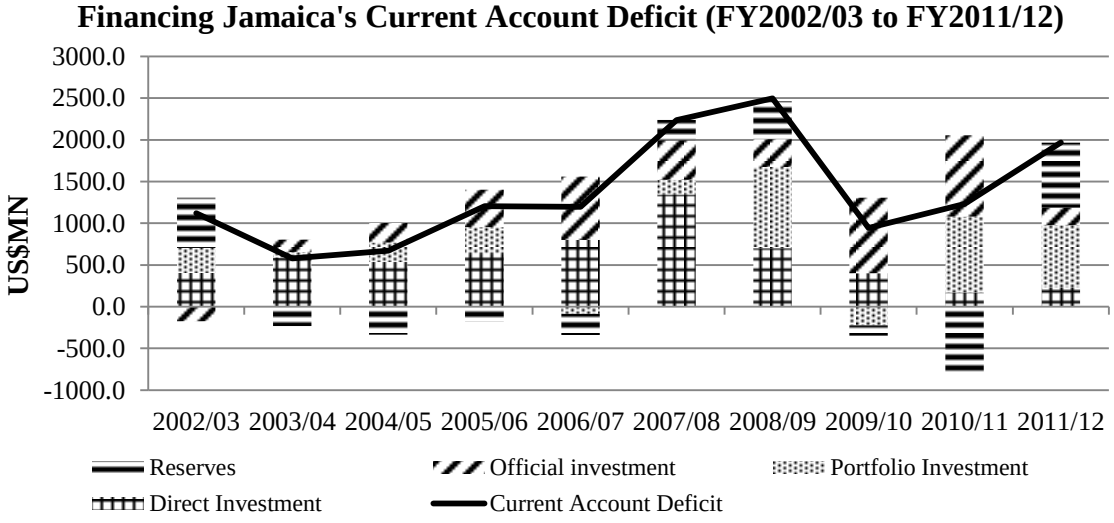
Since the late 1990s, net private capital (NPC) flows have become a significant source of investment for many developing countries. Although these flows are still largely targeted to a few high-income and emerging economies, NPC flows are moving into low income countries (LICs) at an unprecedented rate (UNDP, 2011). NPC flows have, however, tended to be highly volatile in a context where financial shocks can result in the sudden reversal of NPC flows (UNDP, 2011).

Based on the IMF BOP manual 5th edition, NPC flows are defined as the sum of net foreign direct investment (FDI), net portfolio investment (PI), net derivative and net other investment flows, excluding other investment flows to the general government and monetary authorities.[2] It is generally assumed that foreign direct investment (FDI), as compared to portfolio investment (PI) is more stable, less prone to volatility and brings significant development benefits to the country. However, recent evidence highlights a substantial degree of volatility of FDI (UNDP, 2011).

NPC flows have been a significant source of financing for Jamaica's current account deficit (CAD) over the 10 year period ending FY2011/12 contributing, on average, 71.7 per cent to overall financing (see **Figure 1**). Between FY2002/03 and FY2007/08, FDI was the dominant source of private financing, accounting for 65.8 per cent of overall financing for the country's CAD. This ratio declined noticeably to 24.0 per cent between FY2008/09 and FY2011/12 following the onset of the global recession. FDI in Jamaica is concentrated in a number of key sectors with substantial, though not fully exploited linkages. The main sectors largely relate to construction, mainly infrastructure, as well as tourism and mining. While FDI is important to the economy for several reasons, there is often the simultaneous outflow of foreign exchange to import the required raw materials and capital goods. Additionally, profits from the various investments are usually repatriated to the parent company overseas. These two occurrences have an adverse impact on the country's current account deficit in the short-run.

[2] Portfolio investment encompasses purchases of equity which represents less than 10.0 per cent of the value of an enterprise (IMF).

Figure 1



In general, the magnitude and swings in NPC flows primarily reflect the strength of the world economy as well as the domestic policy framework which directly impacts market sentiment. Langrin and Stennett (2011) estimated the determinants of NPC during periods of financial crisis using a structural vector autoregression (SVAR) model of Jamaica's economy. The authors found that NPC flows are impacted equally by push and pull factors. Push factors refer to external determinants of NPC flows and include foreign interest rates and international business cycles. On the other hand, pull factors refer to the internal macroeconomic fundamentals which influence NPC flows such as domestic interest rates, economic growth, inflation, fiscal and current account balances, the terms of trade, the stock market index, credit rating and the level of domestic credit. This study by Langrin and Stennett (2011) is relevant in the context of the central role that NPC plays in the economy and the desire to better understand the impact of these flows on exchange market pressures (EMP) in Jamaica.

Exchange market pressure indices are often used for identification of speculative attacks and crisis episodes. Conventionally, some thresholds based on a certain number of standard deviations around the mean of the EMP measure are used to isolate periods of crisis. However, as Pontines and Siregar (2008) point out, such a procedure implicitly assumes that EMP indices are normally distributed (Stavarek, 2010).

There are several methods of computing EMP that have been empirically tested in the literature. Girton and Roper (1977) (G-R), for example, used a monetary approach of BOP and exchange rate determination to derive EMP as a simple sum of the rate of change in international reserves and the rate of change in exchange rates. The main theoretical proposition of the G-R model is that the domestic money market equilibrium, if disturbed, is restored through some combination of the currency depreciation/appreciation and international reserves outflow/inflow. The excess domestic money supply will cause a combination of currency depreciation and reserves outflow while excess domestic money demand will cause some combination of currency appreciation and reserves inflow to restore the money market equilibrium (Stavarek, 2010). The methodologies that are generally used build on the original G-R model, which is represented by the equation

$$e - r = d - y - p* + m \qquad (1)$$

where r and d denote respective ratios of changes in reserves and of domestic credit with respect to the monetary base. The remaining variables are growth rates of nominal exchange rate e, domestic income, y, foreign prices, $p*$ and the money multiplier, m. In this regard, the paper uses a variant of the G-R measure developed by Eichengreen (1995) and includes private capital flows as a determinant as suggested by (Stavarek, 2010).

This study seeks to identify the forms of foreign financing which are most relevant to explaining EMP in Jamaica. Importantly, there is both the recognition of the close relationship between exchange rate depreciation and inflation as well as the issue of adequacy of the central bank's reserves especially when these are used in an effort to attenuate pressure during periods of intolerable levels of depreciation. While the various types of foreign financing may have importance to several aspects of the economy, such as job creation and infrastructure development, the central focus of the paper is on the relationship between these forms of financing and the foreign exchange market. If the

relationship can be clearly defined, then it may warrant the development and implementation of policy to encourage particular types of flows over others.

The paper is extremely relevant especially in a context of a sharp decline in NPC inflows, both FDI and portfolio investments in 2012. In addition, this has coincided with continued pressures in the foreign exchange market, which is reflected in an accelerated pace of depreciation in the Jamaica Dollar.

The paper is structured as follows: Section two presents the literature review, section three presents the data and methodology, section four shows the results of the econometric estimation while section five provides the conclusion.

2.0 Literature Review

Feridun (2009) investigated the hypothesis that there is a causal relationship between EMP and real exchange rate overvaluation, banking-sector fragility and the level of international reserves in Turkey. An autoregressive distributed lag (ARDL) bounds-testing procedure and Granger causality within vector error-correction models (VECM) were applied. The results of the ARDL bounds test supported the theory that EMP is in a long-run equilibrium with the three hypothesized variables over the sample period. However, the results of the short-run and long-run Granger causality tests indicated the existence of Granger causality running from the three variables to EMP. The findings further suggested that a feedback relation exists between banking-sector fragility and EMP. When applied to Turkey, Feridun (2009) further observed that an economy is more likely to experience a currency crisis if the real exchange rate is appreciated, the banking system is fragile and the level of international reserves does not sufficiently cover liquid liabilities (Feridun, 2009).

O'Connell (2010) studied the two-way relationship between the EMP variable and domestic interest rates using a VAR framework for Kenya. The results indicated that each affects the other, as expected in a world in which market participants respond to interest

rate differentials where the monetary authority must be cognizant of the capital account in setting domestic interest rates. The direction of these responses is consistent, on the one hand, with a conventional portfolio response to changes in domestic monetary policy: a monetary tightening produces a short-run reduction in EMP. In the other direction, the impact of EMP on the interest rate is consistent with a monetary policy stance that seeks to reduce exchange rate volatility by responding to shocks to the BOP (O'Connell, 2010).Finally, the author used the October 2008 demise of Lehman Brothers to shed light on the determinants of *ex ante* vulnerability of the capital account to external shocks. With regard to the measure of EMP used for Kenya, O'Connell (2010) combined exchange rate movements with changes in international reserves in order to accommodate variations over time in how the central bank responded to Balance of Payments (BOP) pressure. Interestingly, O'Connell (2010) found that the time pattern of EMP suggests that national elections have been an important source of BOP volatility, perhaps reflecting uncertainties in the electoral process and working through remittance flows as well as through capital account transactions (O'Connell, 2010).

Stavarek (2010) set out to estimate EMP over the period 1995-2009 for eight new EU Member States (NMS). The results suggested that growth of domestic credit and the money multiplier had a significantly positive impact on EMP. Furthermore, EMP in many NMS was determined by foreign disturbances, namely Euro-area's money supply, NPC flows and the interest rate differential. EMP in most of the NMS with flexible exchange rate regime was primarily absorbed by changes in international reserves. This forms, along with fundamentally stable EMP development in recent years, a solid basis for potential fulfilment of the exchange rate stability convergence criterion (Stavarek, 2010).[3]

The Stavarek (2010) model states that, for given growth rates of foreign prices and domestic income, increases in domestic credit and/or money multiplier stimulate a proportionate loss in reserves with no change in the exchange rate (extremely fixed

[3] The exchange-rate stability convergence criterion is one of the criteria for adopting the Euro (Czech National Bank, 2003).

regime), or a proportionate depreciation of the domestic currency with no change in reserves (extremely floating regime), or some combination of these two (intermediate regime). On the contrary, an increase in domestic income and/or foreign prices results in a proportional appreciation of domestic currency and inflow of international reserves (Stavarek, 2010).

The model is specified as:

$$EMP_t = \beta_0 + \beta_1 d_t - \beta_2 y_t - \beta_3 s_t^* + \beta_4 m + \beta_5 n_t + \beta_6 q_t - \beta_7 k_t + u_t \qquad (2)$$

where d_t denotes the ratio of the change in reserves to the monetary base, y_t domestic income, s_t^* the growth of the foreign money supply, m the money multiplier, n_t the difference between changes in the domestic and foreign interest rates, q_t the differential of the domestic interest rate from the purchasing power parity condition, k_t the foreign capital inflow and u_t the error term.

Maret (2009) contributes to the literature through investigation of the relationship between EMP and quality of institutional framework in NMS and EU candidates. He applies a similar methodology to Van Poeck et al. (2007) and confirms the role of domestic credit and the inflation differential in explaining EMP as well as the conclusion that extreme exchange rate regimes lead to lower EMP. The results also suggest that strong rule of law, effective control of corruption, efforts in financial market and enterprise sector reforms significantly reduce EMP in NMS (Stavarek, 2010).

Hegerty (2009) applied a VAR approach to assess the contribution of capital inflows to EMP and growth of domestic credit in four NMS with fixed exchange rate regime. The study provides evidence that capital inflows, particularly inflows of portfolio and other investment, reduce EMP in three countries (Stavarek, 2010)

Bertolli et al. (2010) point out that only part of the central bank's operation is reflected in a variation of the level of international reserves. Central banks can defend the currencies

through off-balance-sheet transactions or activation of credit lines from international authorities, particularly from the International Monetary Fund (IMF). If the central bank draws resources in foreign currencies from these credit lines a speculative pressure on the currency can be solved without having to reduce the gross foreign assets (Stavarek, 2010) (Stavarek, 2010)

Moren (1995) focused on individual components of the EMP index and sequentially considered the crisis thresholds for each of them. Using data for each country, a band was constructed around each component of EMP by taking the mean of the component plus or minus 1.5 standard deviations. To identify episodes of 'excessive pressure', observations where changes in the exchange rate were outside the band were selected first. From the remaining observations, episodes where changes in international reserves breached the band's thresholds were selected next (Stavarek, 2010).

Eichengreen (1995) computed an index consisting of a weighted average of normalized changes in the exchange rate, the ratio of international reserves to M1 and the nominal interest rate differential. The EMP in period t is calculated as

$$EMP_t = \propto \Delta e_t + \beta\Delta(i_t - i_t^*) - \gamma\Delta r_t \qquad (3)$$

where α, β and γ are the weights, calculated as the inverse of the standard deviation of e_t, $(i_t - i_t^*)$ and r_t, respectively. The weights are used to equalize the volatilities of the three components and to prevent the component with the highest volatility from dominating the index. The symbol Δ denotes monthly percentage changes, e_t denotes the percentage change in the nominal exchange rate, i_t denotes the domestic interest rate, i_t^* foreign interest rate and r_t denotes the change of net foreign assets as a percentage of high-powered money. Eichengreen (1995) pointed out that a positive value of the index indicates increased pressure in the exchange rate which can stem from any combination of a devaluation and expansion of the interest rate spread or a loss in international reserves.

In this regard, a positive value indicates that there is pressure either to depreciate the domestic currency or to sell more international reserves to maintain equilibrium in the domestic money market. On the contrary, a negative EMP shows that the domestic currency is pressured to appreciate. Additionally, the value of EMP represents the magnitude of the foreign exchange market disequilibrium which should be removed by a respective change of the exchange rate and/or international reserves depending on the exchange rate regime (Stavarek, 2010).

In order to determine whether EMP is sensitive to its composition and how much of EMP is absorbed by a change in the exchange rate and how much by a change in reserves, a variable represented by $a = \frac{(e-1)}{(r-1)}$ is included in the model (Pollard, 1999). A significant positive coefficient implies that more pressure is absorbed by reserve losses while a significant negative coefficient implies that the monetary authority absorbs more pressure by currency depreciation. An insignificant coefficient implies that the monetary authority is not sensitive to components of EMP. According to Connolly and Da Silveira (1979), the EMP absorption variable is a good measure of the way in which the monetary authorities absorb EMP because the more pressure is alleviated by depreciation relative to reserve losses, the larger the indicator. The original G-R model used the simple ratio e/r but this series is discontinuous for values of r equal to zero (Connolly and Da Silveira, 1979).

The VAR model used in this study is specified as follows:

$$Y_t = \Pi_i Y_{t-i} + \varepsilon_t \qquad (4)$$

where Y_t= (EMP, FDI, PI, official investment, EMP absorption, percentage change in bank deposits, exchange rate overvaluation). [4]

[4] PI was used in the model instead of NPC since there was a disaggregation of NPC into PI and FDI.

In the empirical results, γ_t represents FDI, k_t represents PI, θ_t represents official investment, a represents EMP absorption, ρ_t represents the percentage change in bank deposits, τ_t represents the per cent overvaluation of the exchange rate and u_t represents the error term.

Based on the G-R model and in accordance with *a priori* assumptions, the per cent overvaluation of the exchange is expected to be positively correlated with EMP. The per cent overvaluation of the exchange rate is represented by $\Delta e_t{*}(i_t^* - i_t)$ where Δe_t is the percentage change in the nominal exchange rate, i_t^* denotes the foreign interest rate and i_t denotes the domestic interest rate. An increase in the rate of growth of bank deposits signals the risk of greater capital flight in the event of a crisis and is, therefore expected to be positively correlated with EMP (Feridun, 2009). NPC flows, FDI and official investment were expected to be negatively correlated with EMP. EMP absorption was not expected to be significant in accordance with Pollard (1997).

3.0 Data and Methodology

The data ranged from February 2001 to March 2012 at a monthly frequency. Data for the nominal exchange rate, stock of reserves, M3 and the 90-day Jamaica Dollar Treasury bill yields were taken from the Bank of Jamaica's (BOJ's) database while the US Treasury bill data were taken from Bloomberg Data Services. Estimates of the current account deficit were taken from the BOJ. These current account estimates were used to inform the cash demand for BOP current account transactions and consequently, NPC on a cash accounting basis. Data for direct, portfolio, other private and official investment were taken from the BOJ's database. Exchange rate and inflation rate data used to calculate the overvaluation of the exchange rate based on the assumption of PPP were also taken from the BOJ's database.

Informed by the work of Franklyn and Longmore (2008), the study utilized estimates of PI based on a cash accounting framework in addition to BOP flows based on accrued accounting. The cash flow current account balance is estimated from BOP statistics and

reflects the net foreign exchange flows into and out of the economy over a specified period. Non-cash transactions reflect situations where an entry is made in the BOP but the corresponding flow of foreign currency through the domestic banking system does not take place simultaneously. The reason for focusing on this distinction comes from the view that changes in the exchange rate, which react to disjuncture between the demand for and the supply of foreign exchange, should more reflect cash flows rather than accrued flows (Franklyn and Longmore, 2008).

The model used a one-period lead of the percentage change in PI. The lead was chosen since the expectation of future PI will affect current demand for foreign currency. In other words, the expectation of low PI in the future can be self-fulfilling and negatively affect current EMP as agents make portfolio decisions which restrict the supply of foreign currency and/or increase demand for foreign currency as a means by which to hedge risk.

A dummy variable was also added to the model to account for the decline in market sentiment for periods during 2003 and 2008. With the exception of the variable seeking to capture the overvaluation of the exchange rate relative to the PPP measure, all other variables were I(0) (see **Table 2, appendix**).

This study applies the Eichengreen (1995) methodology to determine EMP and includes private capital flows as a determinant as suggested by (Stavarek, 2010). For Jamaica, M3* is used instead of M1 since M3* is the measure which recognises that there is a risk of capital flight from both local and foreign currency liabilities of the banking sector.
The crisis threshold is defined as the average of the EMP index plus 3.0 standard deviations above that average.

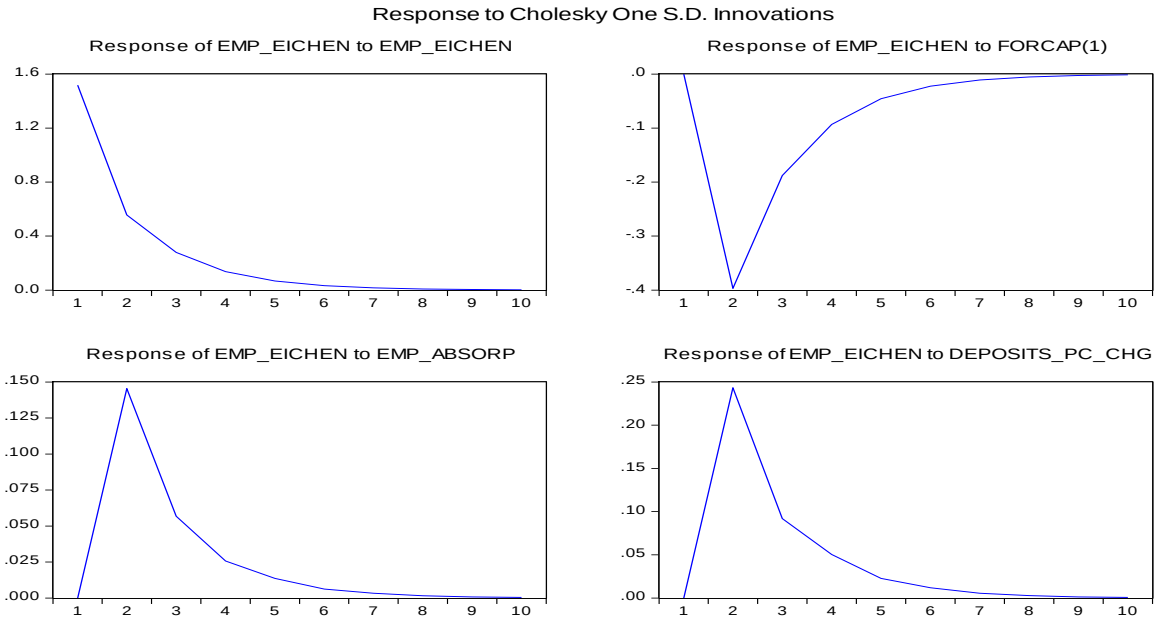
4.0 Results

The chosen VAR model included one-period lags of the EMP Eichengreen index and the EMP absorption vector.[5] The model sought to capture the periods of 2003 and 2008 when the market was affected by loss of confidence due to the downgrade of the Government's credit rating and the global financial crisis, respectively. The graph of the EMP Eichengreen Index highlighted these two periods to have breached the crisis threshold (see **Figure 1, appendix**).

Based on the VAR results, only PI and the lag of the EMP index had significant explanatory power in the model. The overvaluation of the exchange rate based on PPP, official investment, FDI as well as the EMP absorption variable were insignificant. As expected, an increase in PI leads to a decline in EMP while an increase in EMP positively influences EMP in the future (see **Figure 2 and Table 3, appendix**). In accordance with Pollard (1997), the EMP absorption variable was not statistically different from zero and indicates that there is a one-to-one trade-off between reserve losses and exchange rate depreciation. The dummy variable capturing crisis episodes characterized by a loss of confidence was found to be highly significant. Robustness checks were carried out on the VAR model which was shown to be stable (see **Figures 3 and 4, appendix**). A re-estimation of the model, omitting the insignificant variables produced results which were in line with the extended model. Impulse response functions and the variance decomposition were produced (see **Figure 2 and Table 1**).

[5] The Hannan-Quinn Information Criteria indicated a lag length of one as appropriate (see table 1, appendix).

Figure 2: VAR Impulse Response Functions (Reduced model)



Variance decomposition of EMP shows that the effect of past EMP is highly significant in determining future EMP since, up to 10 months ahead, approximately 90.0 per cent of the variation of EMP is explained by itself while approximately 7.0 per cent and 1.8 per cent are explained by PI and the change in banking sector deposits, respectively (see **Table 1**).

Table 1: Variance Decomposition of EMP (Reduced model)

Period	S.E.	EMP	k	a	ρ
1	1.523364	100.0000	0.000000	0.000000	0.000000
2	1.694293	92.21388	5.602353	0.306469	1.877302
3	1.728423	91.15998	6.478651	0.331211	2.030157
4	1.736216	90.91445	6.675615	0.333843	2.076089
5	1.737968	90.86086	6.720112	0.334937	2.084087
6	1.738369	90.84840	6.730185	0.335081	2.086338
7	1.738460	90.84562	6.732484	0.335134	2.086766
8	1.738481	90.84497	6.733005	0.335142	2.086879
9	1.738486	90.84483	6.733124	0.335144	2.086902
10	1.738487	90.84480	6.733151	0.335145	2.086908

The finding highlights the sensitivity and extreme caution of investors to developments in the Jamaican foreign exchange market with respect to depreciation in the exchange rate, loss of reserves and the differential in interest rates. In this regard, the findings suggest that these components are more important in determining market behaviour compared to the changes in NPC. In fact, it has been observed that capital flows fall whenever the components of the EMP move in a direction deemed unfavourable to the market, regardless of the outlook for the economy. This finding also points to a substantial degree of herd behaviour as players in the market choose to follow the actions of others. It also suggests that the issue of confidence plays a significant role in determining market behaviour and market players will always seek to hedge risks. This finding is supported by Ghosh (2012), who showed that for a large sample of emerging economies, risk aversion is more important than growth differentials in determining whether a surge in capital inflows will occur (Balakrishnan, 2012). This result was based on a study of the rebounding NPC flows to emerging Asian economies following the global financial crisis.

Given the foregoing, the VAR model which utilized the cashflow version of PI did not produce results which were preferable to the BOP accrued accounting version.

5.0 Conclusion

The study set out to assess the relationship between NPC flows and EMP for Jamaica using a VAR framework which sought to isolate the effect of the various components of NPC flows on EMP. The finding was that PI was significant and negatively correlated with EMP while FDI and official investment did not significantly impact EMP. Notwithstanding the significance of PI, this accounted for a relatively small proportion of the variance from each shock.

An interesting finding was the effect of past episodes of EMP on future EMP. Past episodes of EMP had both a statistically significant and large impact in explaining the variation in market pressure. This result is interesting given the components of the index, namely, the changes in the exchange rate, the ratio of international reserves to the money stock and the nominal interest rate differential. This result points to the importance of these variables to market participants in determining the level of pressure which exists within the foreign exchange market. The findings also suggest that market players exert extreme caution when there is either deterioration in domestic conditions or the expectation of low foreign currency supply. In addition, the significance of the confidence dummy points to the importance of factors that could lead to risk aversion in the market, thus triggering market pressures and a high degree of herd behaviour by financial market participants.

Stabilizing the volatility associated with PI is critical given the finding that these flows impact EMP negatively. Most countries have focused on strengthening domestic resource mobilization in order to reduce dependence on external sources of investment, (UNDP, 2011). Specific measures to stabilize NPC could include focusing on the composition of inflows by encouraging inflows that have higher proportions of fresh equity investments, relative to debt and tracking the sustainability of NPC flows in net terms. This will require assessing the policy measures which are most likely to reduce risk and profit repatriation and adverse environmental impact. Policy makers could also develop rapid

response and early warning systems to help predict and deal with NPC flow-related shocks (UNDP, 2011).

Notwithstanding the need to stabilize PI, the findings of the paper suggest that the objective of the policy makers should be to engender orderly movements in the exchange rate as pressure in the foreign exchange market feeds on itself. It is not clear, however, which of the components in the index has the most dominant impact. Further work is required to measure the impact of each component to guide policy makers on which variable should be the primary focus. For example, in reducing pressures in the foreign exchange market, the policy maker would be interested in the appropriateness of interest rate adjustments versus intervention. In the absence of this measurement and given the significance of the confidence dummy, the paper concludes that the preferred option would have to be the one which has the greater positive influence on confidence. This decision would, therefore, have to be taken after giving consideration to the impact of the policy option on the pull factors which influence NPC flows, cited by Langrin and Stennett (2011), such as economic growth, inflation, the fiscal and current account balances and credit rating of the country.

In a context where the absorption variable was not statistically different from zero, the paper, in keeping with the literature, concludes that there is a one-to-one trade-off between reserve losses and exchange rate depreciation.

Further important work needs to be undertaken to establish definitively the lead/lag relationship between PI and the EMP as it is clear that a feedback relationship exists. As long as the EMP index is deteriorating, PI will remain low if the actions of policy makers do not instill confidence in the foreign exchange market. This view is consistent with the developments in the crisis periods, as suggested by the EMP index.

6.0 Appendix

Figure 1

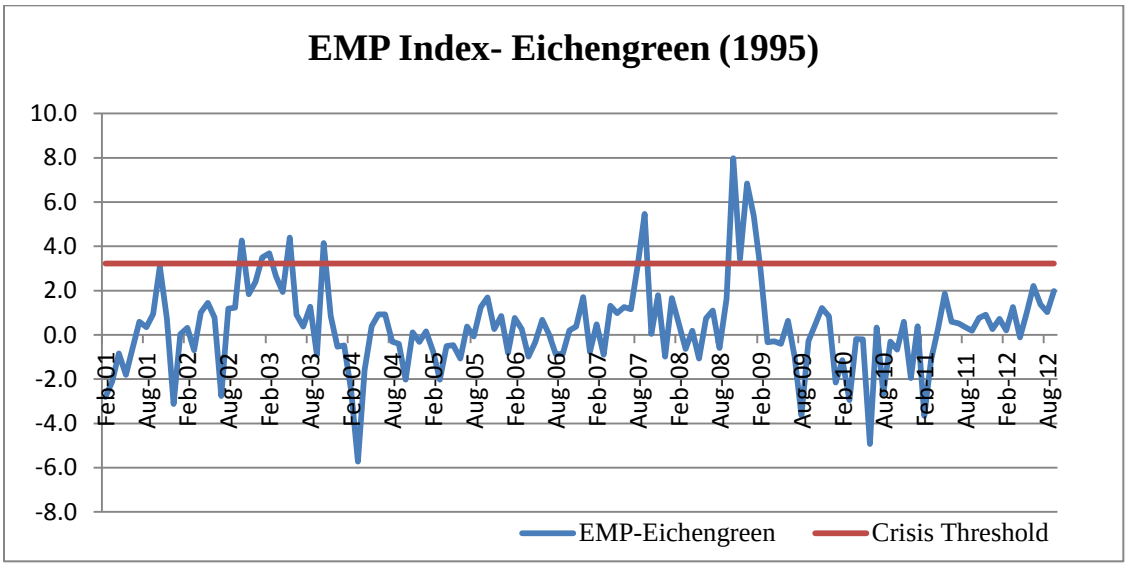


Table 1

VAR Lag Order Selection Criteria
Endogenous variables: EMP_EICHEN FORCAP(1) EMP_ABSORP FDI OFFICIAL_INVEST DEPOSITS_PC_CHG D(PPP_OVERVAL_PC)
Exogenous variables: C DUM_CONFIDENCE
Date: 10/31/12 Time: 09:37
Sample: 2001M02 2012M03
Included observations: 125

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-2132.095	NA	1928790.	34.33752	34.65429*	34.46621
1	-2048.586	154.9930	1112349.	33.78538	35.21085	34.36447*
2	-1997.416	89.23982	1083176.*	33.75066*	36.28483	34.78016
3	-1954.802	69.54710*	1223671.	33.85283	37.49570	35.33273
4	-1919.918	53.02315	1591820.	34.07869	38.83026	36.00900
5	-1881.327	54.33691	1998491.	34.24523	40.10549	36.62594
6	-1846.459	45.18891	2747894.	34.47134	41.44030	37.30246
7	-1806.816	46.93719	3644917.	34.62105	42.69872	37.90258
8	-1759.371	50.86052	4494453.	34.64594	43.83230	38.37787

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Table 2: Results of Unit Root Test

	EMP	k	a	θ	ρ	τ	λ
ADF Statistics (levels)	-4.96*	-10.92*	-11.42*	-11.60*	-12.32*	-2.45	-10.44*
ADF Statistics (first difference)						-8.53*	
PP Statistics (levels)	-7.21*	-10.92*	-11.45*	-11.60*	-17.50*	-1.96	-10.78*
PP Statistics (first difference)						-8.60*	

Table shows results for the Augmented Dicky-Fuller (ADF) and Phillips-Peron (PP) unit root tests where the * denotes rejection of the null hypothesis at the 1 per cent level.

Figure 2: VAR Impulse Response Functions (Full model)

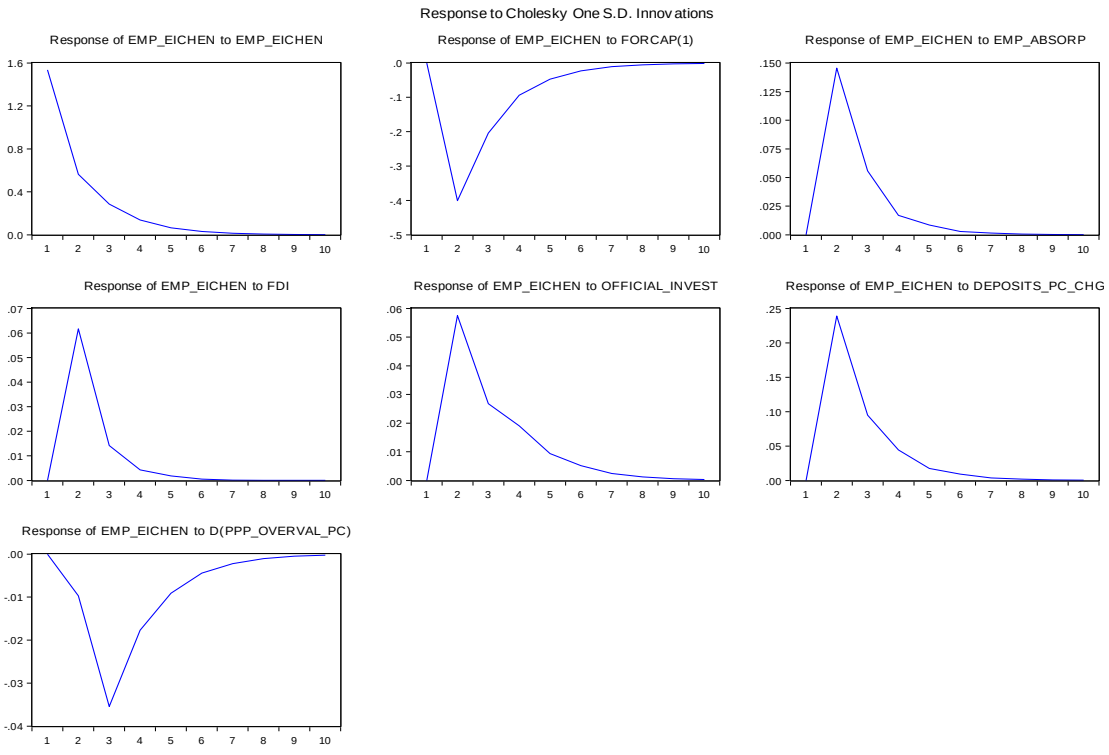


Table 3: Variance Decomposition of EMP (Full model)

Period	S.E.	EMP	k	a	FDI	θ	ρ	τ
1	1.540520	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2	1.711392	92.15557	5.553858	0.302595	0.150846	0.210522	1.618479	0.008129
3	1.749653	90.75972	6.707911	0.330863	0.156335	0.244810	1.763715	0.036646
4	1.757883	90.47314	6.944915	0.328538	0.156039	0.261850	1.790169	0.045351
5	1.759711	90.40526	7.005481	0.328112	0.155811	0.265963	1.791559	0.047813
6	1.760130	90.38859	7.019993	0.327958	0.155737	0.267218	1.792109	0.048393
7	1.760223	90.38493	7.023286	0.327924	0.155721	0.267492	1.792110	0.048539
8	1.760244	90.38408	7.024036	0.327916	0.155718	0.267563	1.792122	0.048570
9	1.760249	90.38389	7.024205	0.327915	0.155717	0.267578	1.792121	0.048577
10	1.760250	90.38384	7.024243	0.327914	0.155717	0.267582	1.792122	0.048579

Figure 3

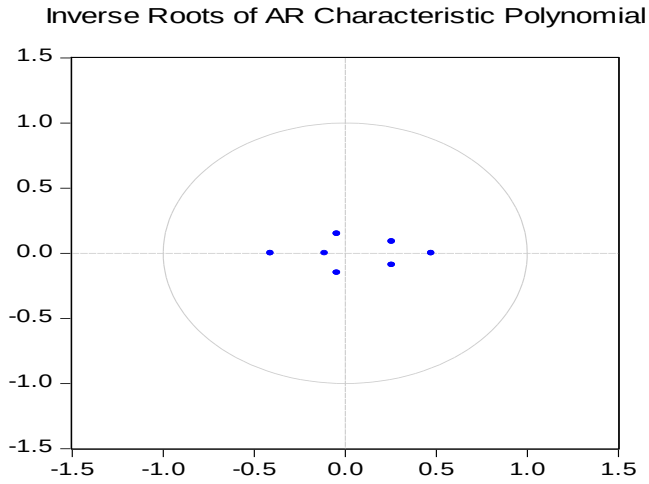


Figure 4

VAR Residual Portmanteau Tests for Autocorrelations
Null Hypothesis: no residual autocorrelations up to lag h
Date: 10/31/12 Time: 09:48
Sample: 2001M02 2012M03
Included observations: 132

Lags	Q-Stat	Prob.	Adj Q-Stat	Prob.	df
1	17.95604	NA*	18.09311	NA*	NA*
2	90.29978	0.5306	91.54983	0.4936	92
3	155.2115	0.1952	157.9712	0.1558	141
4	215.7939	0.0965	220.4467	0.0643	190
5	256.6081	0.2070	262.8678	0.1384	239
6	306.3702	0.2185	314.9995	0.1315	288
7	349.4034	0.3094	360.4425	0.1818	337
8	400.7300	0.2920	415.0806	0.1479	386

*The test is valid only for lags larger than the VAR lag order.
df is degrees of freedom for (approximate) chi-square distribution
*df and Prob. may not be valid for models with exogenous variables

7.0 References

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