Investigating the Drivers of Portfolio Inflows and Outflows for Jamaica

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Abstract

The study aims to identify the underlying determinants of portfolio flows in the Jamaican economy and expands on previous work through the disaggregation of the flows into inflows and outflows. A structural vector autoregression (SVAR) model on quarterly data over the period 2003:Q1 to 2016:Q4 was utilized in explaining the behaviour of portfolio flows through the 'push (external factors) and pull (internal factors)' framework. Further, impulse response functions and variance decompositions are used to investigate the underlying shocks that influence portfolio flows. The results revealed that while both pull and push factors are important in explaining the behaviour of portfolio flows for Jamaica, domestic factors play a dominant role. The findings show that economic growth, foreign and domestic interest rates as well as the exchange rate are more influential in driving portfolio inflows. In addition, domestic interest rates, the fiscal balance, domestic inflation and foreign interest rates are seen as having a stronger impact on portfolio outflows for Jamaica. Additionally, the findings show that net cash flow and the domestic stock market index are important pull factors driving portfolio inflows and portfolio outflows for Jamaica.

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1. Introduction

While international capital flows have been rising over the last two decades, they have been notably volatile. In particular, during the 2007-2008 global financial crisis, strong portfolio flows were invested into fixed income assets (bonds) of advanced economies (AEs). Conversely, during 2009-2011 there was a reversal in these flows to emerging market economies (EMs) after those economies showed signs of steady recovery after the financial crisis. Sharp reversals or sudden stops in private capital flows could have significant negative consequences for emerging markets and a small open economy like Jamaica. In developed financial markets, capital flows are dispersed across various assets and sectors. However, many EMs have not achieved this level of development and so large capital flow movements are reflected more through the exchange rate, assets prices and bank credit. Significant movements in capital flows can result in financial imbalances such as high credit growth, over-valued asset prices and exchange rate misalignments (Culha, 2006; Raghavan, Huey, & Hwa, 2017). Therefore, it is important that the policy makers of Jamaica take a preemptive approach and be aware of the determinants driving the movements of portfolio flows, in particular, in order to reduce the degree of vulnerability and risks to the financial system.

This paper builds on previous work conducted by Langrin and Stennett (2011) and Rochester (2012) which have investigated private capital flows for Jamaica. Langrin and Stennett (2011) examined the relationship between net private capital flows and financial instability in Jamaica. This was investigated by identifying the drivers that influence capital flows during periods of economic instability such as the financial crises of 1997 and 2008. Rochester (2012) studied the impact of each component of net private capital flows on foreign exchange market pressure in Jamaica. Evidence from this paper showed that private capital flows have serious implications for the foreign exchange market in Jamaica, in particular, portfolio flows.

While the literature on the determinants of private capital flows is extensive, this paper seeks to expand on previous studies by disaggregating net portfolio flows into portfolio inflows and portfolio outflows and seeks to identify the factors which are more influential in driving each component. Disaggregating net portfolio flows into inflows and outflows could provide improved insights with regard to the behaviour of portfolio flows for Jamaica and thereby

assist policymakers' management of the foreign exchange market. This is especially important in the Jamaican context since movement in the exchange rate is an important channel to inflation. Relatedly, policymakers may therefore be keen to focus on the drivers of portfolio outflows, given the high level of susceptibility of capital outflows to herd behaviour and consequent foreign exchange market instability.

Some factors could be more significant in driving portfolio inflows versus outflows to Jamaica's foreign exchange market. The findings will then be used to forecast cash flows within the country's foreign exchange market thereby identifying periods of possible foreign exchange market pressures in Jamaica. This paper also differs from previous work on portfolio flows in that portfolio flows are measured based on the cash accounting framework rather than the Balance of Payments accrued accounting method traditionally used. Portfolio flows are the most volatile sub-component of total capital flows and so exploring the determinants influencing these flows could help policy makers better predict and manage potential foreign exchange rate pressures on the financial system.

This study employed a Structural Vector Autoregression Model to identify the main macroeconomic variables that best explain the behaviour of portfolio inflows and portfolio outflows for Jamaica during 2003:Q1 to 2016:Q4 under the 'push (external factors) and pull (internal factors)' framework. Impulse Response Functions and Variance Decomposition were also used to support the analysis. The estimated model was also used to forecast the future movements of portfolio flows for Jamaica. Determining the relative roles of push and pull factors in influencing portfolio flows is a crucial issue regarding the actions of the policy makers in Jamaica. If portfolio flows are impacted more by push factors, policy makers would have less control over these flows. However, if portfolio flows are determined more by pull factors, policy makers in Jamaica would have more influence on these flows by implementing sound macroeconomic policies. The structure of the paper is as follows: Section 2 presents a literature review of both the theoretical background and empirical studies, Section 3 highlights stylized facts on private capital flows in Jamaica, Section 4 describes the data and methodology, Section 5 provides the empirical results and discussion of findings, while Section 6 presents the conclusion and policy recommendations.

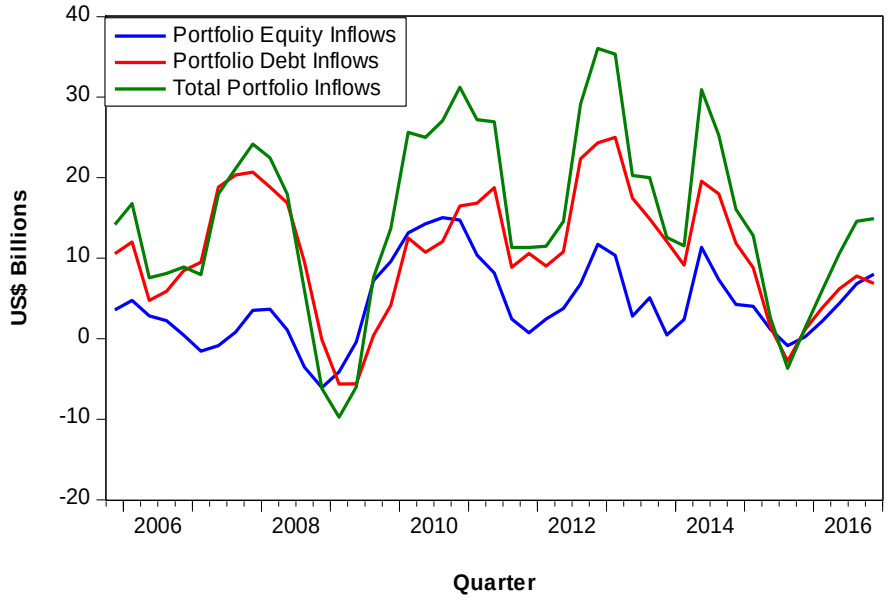
2. Literature Review

The debate on the drivers of capital flows date as far back as the 1990s. Capital flows allow the recipient country to increase domestic savings by tapping into foreign savings, lowering the cost of capital for borrowers, enabling smooth consumption, helping the development of financial markets, institutions and facilitating the transfer of technology and management expertise while simultaneously allowing the source country of these flows to improve the rates of return available to savers and enhance the diversification of portfolios (Liyanage, 2016). Capital flows can be divided into three main sub components: foreign direct investment (FDI), portfolio flows/investment (PF) and other investment/flows, that is, government and private sector long-term loans. However, this paper will focus only on the behaviour of portfolio flows which tend to be more volatile and short term in nature. Historically, capital inflows represent a principal source of funding for most EMs and so they have relied on the flow of international capital in order to finance infrastructure and other development projects (Liyanage, 2016).

Net capital flows to EMs slowed since 2010 after a modest recovery after the 2007-2008 global financial crisis. Pre-global financial crisis, there were two notable surges in net capital flows to EMs. In the late 1970s to the early 1980s there was the Latin American debt build up and during the mid-1990s there was the emerging Asia-led boom (Culha, 2006). Subsequent to these periods of high international capital flows into EMs, there were periods of decline. During the 2007-2008 global financial crisis, EMs saw a reduction in foreign investment but later saw increased flows around 2009-2011, which mainly reflected aggressive accommodative stances embarked on by the US Federal Reserve and other monetary authorities in advanced economies (Ananchotikul & Zhang, 2014). This recovery began to slow in 2011-2012 as global risk aversion increased during the peak of the Euro Area crisis before rebounding in 2013 (Ananchotikul & Zhang, 2014). Subsequently, portfolio flows has continued to deteriorate since 2016. This increase in outflows from EMs emanated from: (i) weaker economic growth in EMs, (ii) weaker commodity prices, (iii) investor concerns regarding creditworthiness and more recently, (iv) the market's response to the US Federal Reserve's move to tighter monetary policy.

Historical movements suggests that the reversal in these flows could have an adverse impact on EMs investment and growth prospects and likely spillover effects on the global economy. According to the International Monetary Fund's (IMF) World Economic Outlook (2016), EMs have been immensely integrated in the global financial market over the years. Additionally, EMs accounted for approximately 36 percent of world GDP and 44 percent of world trade in 2014. The movement of these flows from industrial to developing economies has increased tremendously since the 1990s but declined subsequent to 2012 (see **Figure 1**). Receiving countries of net capital inflows experienced a decline in capital inflows. The overall change in the direction of these flows from a surge in net capital inflows to a reversal emanated from heightened global risk aversion and a narrowing of growth differentials between AEs and EMs (Ananchotikul & Zhang, 2014; IMF, 2016). Capital flows have become significantly more volatile during crisis periods and still remain a challenge to policy makers given the changing global environment and low capital inflows (Kim, Mody, & Taylor, 2001).

Figure 1: Emerging Markets Portfolio Flows 2005:Q4 – 2016:Q4



Source: Institute of International Finance and Bloomberg

The growing trend in capital flows to developing economies has fueled extensive research in the area in an attempt to examine the drivers that influence the direction of the movements of these flows. Literature on the determinants of capital flows traditionally have investigated

the issue through the "*Push and Pull Framework*". Capital flows into a country are influenced by various factors, broadly characterized as push and pull factors. Push (external) factors are exogenous determinants of capital flows from the developed countries to emerging economies, while pull (internal) factors refer to the domestic determinants of capital flows in a specific emerging market economy (Culha, 2006; Raghavan, Huey, & Hwa, 2017).[1] Several papers have highlighted the US interest rate and economic growth as some common push factors (Culha, 2006; De Vita & Kyaw, 2008; Korap, 2010; Raghavan, Huey, & Hwa, 2017).[2] Lower interest rates and slower economic growth in the US and other industrial countries often influence the flow of capital investment into developing economies (Brana & Lahet, 2008; Culha, 2006; De Vita & Kyaw, 2008; Langrin & Stennett, 2011). According to Raghavan, Huey and Hwa (2017), stronger global growth increases portfolio flows. Pull factors cited are productivity and economic growth of the receiving country, domestic interest rates, sovereign ratings, stock market prices, macroeconomic stability, exchange rate regime, inflation, domestic credit level and capital market liberalization (Kim & Ying, 2001; Korap, 2010; Liyanage, 2016). It is critical for policy makers in the recipient country to understand the dynamics of push and pull factors in order to develop policies that maximize the benefits of receiving foreign investment while limiting the adverse impacts. If international flows are driven by external determinants, policy makers of the recipient country would have limited control over these flows in comparison to the level of control they would have if capital flows are influenced mainly by country-specific factors.

There has been a growing debate in the literature on which factors are the most critical. Liyanage (2016), cited internal determinants as the main causes of international flows into Sri Lanka. Similarly, Culha (2006) found pull factors to be more dominant over push factors in determining capital flows into Turkey. Contrary to these findings, Korap (2010) highlighted that push factors were more critical in determining portfolio flows into the Turkish economy. On the other hand, push factors are seen driving majority of the capital

[1] Portfolio flows are generally 'pulled' by attractive domestic conditions or 'pushed' by unfavourable external conditions (Raghavan, Huey, & Hwa, 2017).

[2] The US interest rate and economic growth in the US are generally used as proxies for foreign interest rate and global growth, respectively.

movements into Asian countries and Mexico (Brana & Lahet, 2008; Kim & Ying, 2001).[3] Other authors have noted the equal importance of both push and pull factors in attracting international investment in low income countries (Taylor & Sarno, 1997).

Some studies have revealed that it is important to disaggregate capital flows since different types of flows are attracted by different factors. This was investigated further by Liyanage (2016) which used two estimation techniques: (i) Fully Modified Ordinary Least Squares Regression (FMOLS) and (ii) the Vector Error Correction Model (VECM) to identify the determinants of capital inflows for Sri Lanka. The FMOLS developed by Philip and Hansen (1990) was used since the variables estimated in the model were co-integrated, and it can be used to identify and estimate the impact of the variables that influence capital flows. This empirical technique has an advantage over the Ordinary Least Squares estimation technique in that it is able to account for serial correlation and endogeneity issues present in the variables (Liyanage, 2016). Using the FMOLS technique, capital flows were further disaggregated into three sub-components: FDI, portfolio investment and other investment.

Findings from Liyanage (2016), revealed that during periods of instability (civil war), the budget balance has a significant negative relationship with portfolio investment. The study also showed that domestic and international growth have a significant positive relationship on portfolio investment. These results are consistent with the findings from Culha (2006) as well as IMF (2016) which highlighted that growth differentials, global risk aversion and interest rate differentials are key drivers of portfolio flows. According to IMF (2016), net inflows reversed into net outflows following an increase in global risk aversion during the peak of the Euro Area financial crisis in 2011-2012. Additionally, in 2013 and 2014 EMs experienced a reversal of capital inflows as the market speculated about an end to the quantitative easing program by the US Federal Reserve and heightened uncertainty about the growth prospects of EMs (IMF, 2016). Traditionally, the Chicago Board Options Exchange Volatility Index (VIX) is a common proxy for global risk aversion (Koepke, 2015). Findings from Koepke (2015), indicated that an increase in global risk aversion is associated with a

[3] Asian economies: Korea, Thailand, the Philippines, Indonesia and Malaysia.

reduction in portfolio flows. With regard to the current account balance, there was a negative but insignificant impact on portfolio investment but was significant in influencing FDI investment in the case of Sri Lanka (Liyanage, 2016). With regard to FDI, the interest rate differential, growth and private sector credit had a positive and significant influence while the budget balance had a negative and significant impact (Liyanage, 2016).

Taking into consideration the issue of endogeneity in the Liyanage (2016) paper, a VECM was also estimated and the findings confirmed that growth, current account deficit, interest rate differential, private sector credit growth have a positive effect on inflows, while the budget deficit has a negative effect. Both techniques revealed that an increase in domestic GDP growth is found to attract more capital flows to Sri Lanka in the long-run which was consistent with the findings of (Abdullah, Mansor, & Puah, 2010; Pushparajah, 2009; Ralhan, 2006). Higher economic growth can eventually lead to an increase in capital flows due to rising investors' confidence. The growth in resources of a country usually improves the sovereign's creditworthiness which then attracts greater capital flows (Culha, 2006; Fernandez-Arias, 1996). Studies by Abdulla et al. (2010) and Kara (2007) posit that the budget balance is an important factor in explaining capital inflows. Also, in the case of Sri Lanka, the interest rate differential, which can be used as a proxy for real return to capital exporting countries, exhibited a positive relationship with capital inflows thus implying that higher returns encourage higher inflows (Liyanage, 2016). This is consistent with other findings which showed that in the short-run, the interest rate differential appears to be the most influential pull factor in determining capital inflows to Turkey (Celasun, Denizer, & He, 1999; IMF, 2016; Raghavan, Huey, & Hwa, 2017). Contrary to these findings, Korap (2010) results show that portfolio inflows have a negative and positive relationship with higher domestic and foreign interest rates, respectively, which could be associated with the level of sovereign risk perceived by investors. However, a study by De Vita and Kyaw (2008), noted that foreign interest rates did not play a significant role in influencing portfolio flows.

The study by Liyanage (2016), found that pull factors, in particular GDP growth and the fiscal balance, play a dominant role in determining capital flows into Sri Lanka. Similarly, Culha (2006) found that pull factors were more important in explaining the behaviour of capital

flows into Turkey. Additionally, Culha (2006) and Raghavan, Huey and Hwa (2017) highlighted the positive relationship associated with the exchange rate, strong stock market performance and higher capital inflows. A rise in the stock market index reflects improved macroeconomic fundamentals as well as higher returns on investment which is consistent with theory (Korap, 2010; Raghavan, Huey, & Hwa, 2017). Conversely, Korap (2010), found that push factors played a vital role in driving portfolio flows in Turkey but also found that domestic interest rates were negatively related to portfolio flows. One explanation noted was that higher domestic interest rates were not seen by investors as excess return possibilities but as associated with higher risk premia due to negative economic fundamentals. De Vita and Kyaw (2008), highlighted the importance for developing economies to acknowledge the significant role of economic growth, that is, both foreign and domestic output in inducing capital inflows.

In the case of Jamaica, Langrin and Stennett (2011), examined the relationship between capital flows and financial instability in Jamaica. The paper highlighted the role of private capital flows in influencing and responding to financial crises especially those similar to the Jamaican financial crisis in the late 1990s and the global financial crisis in 2008. The study seek to identify those drivers of private capital flows during periods of financial instability which could aid in policy responses. Results showed that both push and pull factors are equally important in explaining private capital inflows for Jamaica during crises periods.[4] Rochester (2012), assessed the impact of each component of net private capital flows on foreign exchange market pressure in Jamaica. The findings indicated that portfolio flows had a significant and negative relationship with foreign exchange market pressure while FDI and other official investments did not significantly impact exchange market pressure.

Despite the economic benefits, there are some negative implications of receiving international investment. Even though capital inflows are known to increase overall consumption and investment expenditure in the recipient country, it could also result in an appreciation of the real exchange rate, a widening of the current account deficit and the

[4] see Appendix, **Table 1** for summary of empirical studies.

inducement of inflationary pressures (Raghavan, Huey, & Hwa, 2017). Research has revealed that there exists a positive relationship between capital inflows and real exchange rate appreciation and a widening in the current account deficit (Calvo, Leiderman, & Reinhart, 1993; Raghavan, Huey, & Hwa, 2017). An appreciation of the exchange rate decreases the competitiveness of the trade sector of the receiving country and increases the vulnerability of the domestic banking system. Also, a sudden reversal of these flows outside of emerging market economies could result in severe consequences as evidenced by the Mexican foreign exchange crisis in late 1994 as well as the Asian financial crisis in the late 1990s. However, Kim and Ying (2001) and Liyanage (2016) cited that the risks associated with receiving capital inflows may vary depending on the type of investment. Long-term direct investment that is more growth oriented tends to be less adverse for the domestic economy. However, short-term investment in the form of portfolio investment that originates from external shocks such as changes in foreign interest rates, is linked to higher risks to economic stabilization.

Based on the foregoing, it is important that small developing states like Jamaica with large budgetary constraints and that rely partly on these investments, carefully assess both the internal and external dynamics of capital flows. A better understanding of what attracts the various forms of international investment could help policy makers develop more effective policies aimed at minimizing the risks to domestic exchange rates and inflation (Culha, 2006). As a result, this paper investigates the dynamic behaviour of portfolio inflows and outflows for Jamaica in order to help policy makers manage possible foreign exchange pressures in the financial system and formulate more robust macroeconomic policies.

3. Stylized Facts

With regard to Jamaica, there were two notable financial crises that were associated with private capital flows. The first occurred between 1996-1997 after Jamaica liberalized the financial system and relaxed credit standards earlier in the decade. This led to higher private sector credit and an acceleration in the domestic inflation rate. As a result, interest rates were increased to reduce money supply and control inflation. This sharp tightening led to a

surge in net private capital flows and higher public debt accumulation (Langrin & Stennett, 2011). Notwithstanding record levels of real interest rates, heightened financial instability eventually led to a decline in net private capital inflows and a significant depreciation of the domestic currency.

The second episode took place after the Jamaican economy was exposed to external shocks subsequent to the sub-prime mortgage crisis in the US during 2007-2008. Relative to 1997, Jamaica's macroeconomic fundamentals had improved. As such, the average quarterly private capital flows over the period 2000-2007 were significantly higher than those which prevailed for the preceding five-year period (Langrin & Stennett, 2011). During 2007-2008, the global environment had worsened. Notwithstanding the limited exposure to sub-prime collaterized debt obligations (CDOs) of Jamaica's financial institutions, there was a noticeable reduction in net private capital inflows into the Jamaican economy after 2008 (Langrin & Stennett, 2011). This reduction in net private capital inflows was reflected in the foreign exchange market as the rate of depreciation accelerated significantly in the last quarter of 2008 and the first quarter of 2009 (Bank of Jamaica (BOJ), 2008).[5] Also, the Government of Jamaica's (GOJ) weighted average Treasury bill yields on the 3-month instrument increased during the December 2008 quarter in response to the deterioration in the macroeconomic environment (BOJ, 2008).

Foreign currency inflows from abroad decreased significantly in 2009, which reflected declining inflows from private investment (BOJ, 2009). Similarly, demand for foreign currency was weaker due to subdued domestic economic performance and rising unemployment (BOJ, 2009). In 2010, there was a subsequent rebound in portfolio inflows and a decrease in outflows which emanated from improved investor confidence partly from the Government of Jamaica's announcement of the Jamaica Debt Exchange (JDX) programme in January 2010 and the signing of a Stand-By Arrangement with the IMF in February 2010 (BOJ, 2010). These programmes were a part of the fiscal consolidation plans set by the

[5] see Appendix, **Figure 2.**

Government of Jamaica in order to improve its large fiscal deficit and unsustainable debt dynamics.

However, the improvements in portfolio inflows during 2011, preceded a significant reversal over the next two years. During 2012-2013, the Jamaican economy operated in a challenging environment both internationally and domestically which was characterized by increased market uncertainties. In 2012, domestic investors were concerned by the nature and timing of the funding arrangement with the International Monetary Fund (IMF), which resulted in heightened uncertainties in the financial market (BOJ, 2012). In the global economy, the fiscal crisis in Europe continued to have a significant impact on global trade and growth (Ananchotikul & Zhang, 2014; BOJ, 2012). Within the domestic context, there was a reduction in net private capital inflows and heightened demand for foreign currency in Jamaica, which contributed to increased instability in the foreign exchange market as well as an acceleration in the rate of depreciation of the domestic currency relative to the US dollar (BOJ, 2012).

In 2013, there was (i) an increase in domestic inflation due to continued depreciation of the domestic exchange rate and rising crude oil prices, which boosted transportation and utility costs as well as (ii) heightened market uncertainty surrounding Jamaica's large fiscal deficit, (iii) unsustainable current account deficit and relatively low Net International Reserves (NIR) and (iv) uncertainty about whether there would be an approval of a medium-term economic programme, in the form of a four-year Extended Fund Facility (EFF) with the IMF (BOJ, 2013). On 12 February 2013, the Government of Jamaica announced the National Debt Exchange (NDX) which was an exchange of debt instruments between the government and creditors on the local market. This represented the Government of Jamaica's second debt exchange programme geared towards fiscal consolidation and was one of the pre-requisites to the approval of the EFF. Notwithstanding the approval of the EFF in May 2013, there was still looming market uncertainty about the ability of the authorities to meet the targets of the programme. As a result, it manifested in a reduction of net private capital inflows which then contributed to a faster pace of depreciation in the exchange rate.

For the period 2014-2017, there were noticeable improvements in portfolio inflows and outflows in Jamaica. During this time, there were significant improvements in Jamaica's macroeconomic outlook resulting in a slower pace of depreciation of the Jamaican dollar against the US dollar over the period 2014-2015. This was due to a deceleration in domestic inflation emanating from a significant reduction in global crude oil prices. This further resulted in a narrowing in the difference in Jamaica's inflation rate relative to that of its major trading partners (BOJ, 2014). In addition, there were (i) diminished risks due to the continued achievements of the monetary targets under the EFF, (ii) a contraction in the current account deficit, (iii) improvements in the NIR and (iv) positive reviews by international rating agencies (BOJ, 2014, 2015). Notwithstanding the improvements in Jamaica's macroeconomic conditions, the foreign exchange market was characterized by periods of excess demand in 2015 (BOJ, 2015). In 2016, there were continuous improvements in Jamaica's macroeconomic fundamentals amid a favourable outlook for domestic inflation, an acceleration in growth relative to 2015 along with the approval of a new three-year Precautionary Stand-by Arrangement (SBA) with the IMF in November 2016. However, there was a faster pace of depreciation of the domestic currency in 2016 relative to 2015, primarily reflecting periods of instability particularly during the June 2016 quarter and increased investor demand for high yielding foreign denominated instruments (BOJ, 2016).

4. Data and Methodology

4.1 Data Description

This research employed quarterly time series data over the period 2003:Q1 to 2016:Q4. Data was collected on a number of indicators to identify the main drivers that influence portfolio flows for Jamaica. The first is the dependent variable portfolio flows which was further decomposed into two sub-components, inflows and outflows. Portfolio inflows (PIF) are measured as total market purchases of foreign currency from authorized dealers (ADs) and cambios less foreign currency cash inflows from earners. Portfolio outflows (POF) represents total market sales of foreign currency from ADs and cambios less total surrenders to the central bank and foreign currency cash outflows by earners. With regard to an

independent 'push' variable, the model utilized the US 3-month Treasury Bill (T-Bill) rate (USTBILL) as a proxy for foreign interest rates.[6] With regard to 'pull' macroeconomic variables, the following were used in the model: (i) the Jamaica Stock Exchange (JSE) Main Index as an asset return indicator for Jamaica, (ii) growth differential (GD), measured by the difference between Jamaica's real GDP growth and US real GDP growth, (iii) the fiscal balance (FB) which was calculated as the difference between total domestic revenues and expenses, (iv) net cash flow (NCF) which measures the difference between total foreign currency cash inflows and outflows from earners, (vi) the domestic inflation rate (DI), measured by the quarter-over-quarter percentage change and (vii) domestic interest rate proxied by the Government of Jamaica (GOJ) 90-day T-Bill rate (DTBILL). An exogenous dummy variable was also included in the model to account for any structural breaks that occurred during the global financial crisis. All variables excluding GD, DI, USTBILL and DTBILL were measured by their growth rates. The data was obtained from the Bank of Jamaica, Bloomberg and the Jamaica Stock Exchange. **Table 2** in the Appendix, presents the correlations among all the variables.

4.2 Empirical Framework

To examine the determinants of portfolio inflows and outflows for Jamaica, a Structural Vector Autoregressive (SVAR) model was employed following the empirical studies of Culha (2004) and Korap (2010), among others:

Portfolio inflows = f {**push factor**, **pull factors, portfolio inflows**} (1)

Portfolio outflows = f {**push factor**, **pull factors, portfolio outflows**} (2)

Equations (1) and (2) define portfolio inflows and portfolio outflows, respectively, as a function of a shock to a push factor as represented by the US 3-month T-Bill rate and shocks to pull factors such as the domestic stock market index, growth differential, domestic interest

[6] Literature on capital flows commonly cites global growth, foreign interest rates and global risk aversion as popular external (push) factors which could influence portfolio flows for EMs. US GDP growth which is used as a proxy for foreign/global economic growth is embedded in the growth differential variable which is calculated as the difference between Jamaica's GDP growth and US GDP growth. Of note, the VIX was used as a proxy for global risk aversion, however the fit of model was better without this variable, and so it was excluded from the estimation.

rate, fiscal balance, domestic inflation and net cash flow as well as itself (portfolio inflows/portfolio outflows depending on which model above is being estimated). Before the models were estimated, all the variables were pre-tested for a unit root using the Augmented Dickey-Fuller (ADF) and Phillips Perron tests (see Appendix, **Table 3**) for results. Based on the results, all variables were found to be stationary with the exception of the domestic interest rate variable which was I(1) stationary. The first difference of this variable was found and is represented by (D_DTBILL). As a result, a SVAR model was chosen as the best model to assess the determinants of portfolio inflows and outflows for Jamaica.

The first step in constructing the unrestricted VAR model is to determine the correct number of lags which was determined by lag specification tests such as the Likelihood Ratio (LR), Schwarz Bayesian Criterion (SBC) and the Akaike Information Criterion (AIC) which specified an optimal lag length of one for both models. After re-estimating the VAR models with the optimal number of lags, diagnostic tests were conducted to test the validity of the estimates which included tests for serial correlation, heteroscedasticity and stability of the VAR model. All tests were passed and revealed that the estimates from the models were robust (see Appendix, **Figures 3** and **4**).

The second step involved identifying and imposing additional restrictions to provide some economic structure to the models and to unfold the underlying structural shocks in the data. The SVAR model was deemed more suitable due to its ability to examine the dynamic relationships and behaviour of portfolio flows as result of individual structural shocks to the other variables through impulse response functions. The model also as the ability to have restrictions imposed based on underlying macroeconomic theory and generate forecasts of portfolio flows (Culha, 2006). A nine variable VAR model was considered in order to extract several structural shocks. The identification of structural shocks, u_t, in the system of nine variables from the reduced form shocks requires at least $\frac{k(k-1)}{2} = \frac{9(9-1)}{2} = 36$ restrictions. The restrictions specified in this model were drawn from economic theory and existing literature for emerging market economies. According to the LR test statistic estimated for the system identification restrictions, the SVAR model for portfolio inflows was over-identified with $\mathcal{X}^2(13) = 18.4277$ and a probability value of 0.1419 while the model for

portfolio outflows was over-identified with $\mathcal{X}^2(13) = 17.9484$ and a probability value of 0.1595. The restrictions imposed on the models for portfolio inflows and outflows are summarized in matrix A below:

$$\begin{pmatrix} ustbill_t \\ gd_t \\ ncf_t \\ di_t \\ d\_dtbill_t \\ fb_t \\ er_t \\ jse_t \\ pif_t \text{ or } pof_t \end{pmatrix} = \begin{pmatrix} * & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & * & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & * & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & * & 0 & * & 0 & 0 & 0 & 0 & 0 \\ * & * & 0 & * & * & 0 & 0 & 0 & 0 \\ 0 & * & 0 & * & * & * & 0 & 0 & 0 \\ 0 & * & * & * & * & * & * & 0 & 0 \\ 0 & * & 0 & * & * & 0 & 0 & * & 0 \\ * & * & * & * & * & * & * & * & * \end{pmatrix} \begin{pmatrix} u_t^{ustbill} \\ u_t^{gd} \\ u_t^{ncf} \\ u_t^{di} \\ u_t^{d\_dtbill} \\ u_t^{fb} \\ u_t^{er} \\ u_t^{jse} \\ u_t^{pif \text{ or } pof} \end{pmatrix} \quad (3)$$

The third step involves conducting impulse response functions from the estimated SVAR models by generating a one standard deviation shock to all variables and examining how both portfolio inflows and outflows react to these impulses. Variance decomposition analysis was also used to identify which shocks account for the most variance in portfolio flows at various forecast horizons. **Table 4** below presents the expected relationship between each variable and portfolio inflows and outflows. The final step involved using the estimated SVAR models to produce a four period ahead dynamic forecast for portfolio inflows and outflows for Jamaica over the horizon 2016:Q1 to 2016:Q4 to assess how well the model performed in-sample.

Table 4: Classification of the Main Drivers of Portfolio Flows and their Expected Relationship

Type	Drivers	Portfolio Inflows	Portfolio Outflows
Push	US 3-month T-Bill rate as a proxy for foreign interest rates	**+ /-**	**+ /-**
Pull	JSE Main Index (asset return indicator)	**+**	**+/ -**
	Growth Differential	**+**	**+/ -**
	GOJ 90-day T-Bill rate as proxy for domestic interest rates	**+/ -**	**+/ -**
	Domestic Inflation	**-**	**+**
	Domestic Exchange rate	**+**	**-**
	Fiscal Balance	**+/ -**	**+/ -**
	Net Cash Flow	**+ /-**	**+/-**

+ represents strong evidence for a positive relationship

- represents strong evidence for a negative relationship

5. Results and Discussion of Findings

5.1 Structural Impulse Responses

Impulse response functions were conducted over a three year horizon and measured relative to one standard deviation shocks (see Appendix, **Figures 5** and **6**). This analysis was conducted to assess the impact of various macroeconomic shocks on portfolio inflows and outflows in Jamaica. Results show that a positive shock to US 3-month T-bill rate (USTBILL), a proxy for foreign interest rates, leads to a decrease in portfolio inflows and outflows for Jamaica. Higher foreign interest rates are likely to attract more investment towards foreign denominated assets relative to domestic denominated financial instruments due to the higher rate of return. This finding is consistent with literature. Also, if higher interest rates on short term USTBILL are perceived by investors as increased sovereign risk in the US, this could lower domestic investor confidence and result in a decrease in portfolio outflows for Jamaica.

With regard to the growth differential (GD), which represents the difference between real domestic GDP growth and US real GDP growth, a shock to this indicator leads to an initial increase in portfolio inflows and a decline in portfolio outflows. This result is consistent with prior expectations and findings from Clark, Converse, Coulibaly and Kamin (2016). A potential explanation is that as domestic economic growth expands faster relative to growth in the US, the market's expectation of Jamaica's growth prospects also improve contemporaneously. This manifests into higher portfolio flows to Jamaica but starts to decline by the second quarter until it normalizes during the eighth quarter. The initial decrease in portfolio outflows during the first quarter preceded an increase during the second quarter, which could imply that enhanced realized GDP growth in Jamaica over time could lead to increased investment overseas, which may translate into higher portfolio outflows.

A positive shock to net cash flow (NCF) implies that there is an increase in foreign currency supply to Jamaica from domestic earners. Results indicated that a shock to this variable leads to a negative response in portfolio inflows and a positive response in portfolio outflows. This could suggest that domestic traders are earning less in foreign currency relative to the

amount of money they need to cover their foreign obligations or need to purchase raw materials for their businesses. This could explain why portfolio outflows are increasing and portfolio inflows are declining as the traders hold onto their foreign currency earnings and demand additional foreign currency to cover their expenses aboard.

A shock was imposed on domestic inflation (DI) and the results show that portfolio inflows and portfolio outflows decreased initially. The decline in portfolio inflows during the first quarter is consistent with literature, which suggests that higher domestic prices could create some uncertainty among investors abroad about the economic stability of Jamaica which results in lower inflows. However, this negative impact does not continue into the second quarter, but is seen falling again during the third and fourth quarters before normalizing. With regards to the reduction in portfolio outflows, this may be due to the initial fall in demand for foreign currency by domestic investors as their immediate domestic costs increase due to rising inflation. The results also suggest that as inflation rises, over time there is a smaller decline in portfolio outflows. If higher domestic inflation relative to major trading partners is perceived by foreign and domestic investors as an indicator of unfavourable domestic economic conditions, this could make the country less attractive and, therefore, increase outflows.

There is an immediate decrease in portfolio inflows and outflows in response to higher domestic interest rates (D_DTBILL). The initial negative impact of domestic interest rate shock on portfolio inflows diminishes over time and starts to rise during the third quarter. This unexpected decline in portfolio inflows could be associated with the risk premium innate in the T-bill rates in Jamaica which may result in a slow-down in foreign investment from abroad. However, over time as more data and information becomes available and investors are able to fully assess the macroeconomic environment of Jamaica, there could be an increase in portfolio flows to Jamaica. Consistent with the findings for portfolio inflows, a shock to the domestic interest rate leads to a fall in portfolio outflows. Investors are encouraged to keep existing savings and other investments held in domestic currency in Jamaica due to the higher rate of return received on domestic denominated assets relative to foreign financial instruments.

A structural shock to the fiscal balance (FB) results in an immediate negative response in portfolio inflows and portfolio outflows. A positive shock to the fiscal balance implies that there is an improvement in the fiscal balance for Jamaica. The improvement in the fiscal balance may be due to an increase in government revenues, which could reflect an increase in domestic taxes and eventually deter new investment from abroad thus causing lower portfolio inflows. With regards to portfolio outflows, the initial decline is in line with economic theory however this negative response quickly reverses by the second quarter. This further supports the view that an improvement in the fiscal balance due to higher imposed taxes, may result in large outflows over time.

Portfolio inflows and outflows immediately responded positively to a shock in the exchange rate (ER). A positive shock to this variable implies that there is an appreciation in the Jamaican dollar relative to the US dollar. A stronger Jamaican dollar could signal stability in the Jamaican economy, which could improve foreign investor confidence and boost portfolio inflows. In addition, findings indicate that a stronger Jamaican dollar relative to the US dollar immediately results in a marginal increase in portfolio outflows but quickly dissipate and starts to decline over the remaining horizon, which is consistent with prior expectations.

A shock to the domestic stock market index (JSE) measured by the Jamaica Stock Exchange Index, results in a positive response in portfolio inflows and outflows. This behaviour is consistent with macroeconomic theory which suggests that strong performance in the domestic equity market is synonymous with economic growth in that country and by extension could attract larger portfolio inflows. When a similar shock was imposed on portfolio outflows, there was also a positive response implying that earnings received from a booming domestic stock market could also stimulate external investments. This finding is also consistent with prior expectations.

5.2 Variance Decomposition Analysis

Tables 5 and **6** in the Appendix, presents the variance decompositions of portfolio inflows and portfolio outflows, respectively. This analysis provides evidence on the relative importance of each shock. More specifically, the tables identify the percentage of the forecast

error variance due to each shock in the structural VAR model over a 12 quarter horizon.[7] Results show that both push and pull factors play a significant role in influencing portfolio flow trends for Jamaica. Findings indicated that during the first quarter, the main drivers of portfolio inflows are movements in the exchange rate, foreign and domestic interest rates (see Appendix, **Table 5**). Generally, over the 12 quarter horizon, shocks to foreign interest rate, domestic interest rate and the exchange rate explain on average approximately 7 per cent, 6 per cent and 4 per cent, respectively, of the variation in portfolio inflows. After the first quarter, economic growth gains significance in its role over the remaining period, as its share rises to approximately 8 per cent on average. With regards to the other variables, the fiscal balance accounts for approximately 3 per cent of the variation in portfolio inflows while domestic inflation and net cash flow equally explains about 1 per cent. The stock market index has a small influence on portfolio inflows in Jamaica. Lastly, portfolio inflows are largely driven by movements in itself.

Evidence suggests that during the first quarter, portfolio outflows are mainly affected by pull factors. **Table 6** shows that domestic interest rates and inflation play a pivotal role in explaining the forecast error variance in portfolio outflows. However, during the remaining 12 quarter horizon the domestic interest rate continues to dominate, explaining approximately 7 per cent of the forecast variance. Shocks to the fiscal balance accounts for about 5 per cent, which represents the second largest forecast variation in portfolio outflows, while the third largest was domestic inflation which explains approximately 3 per cent. Furthermore, shocks to foreign interest rates and the stock market index represents approximately 2 per cent each in the forecast variation. The exchange rate accounted for only 1 per cent over the period while economic growth and net cash flow explain only a small portion of the variation in portfolio outflows. Similar to portfolio inflows, the forecast variation in portfolio outflows are largely explained by shocks to itself. With regards to portfolio inflows, the important drivers are domestic and foreign interest rates, the exchange rate, economic growth and the fiscal balance while the most influential factors of portfolio outflows are the domestic interest rate, fiscal balance, domestic inflation, foreign interest

[7] Variance decomposition refers to the break-down of the forecast error variance for a specific time horizon. This test can be used to indicate the percentage of the fluctuation in a time series (variable of interest) attributable to shocks to other variables at selected time horizons.

rate and stock market index. These findings imply that the most dominant factor in explaining the behaviour in both portfolio inflows and outflows for Jamaica is the domestic interest rate.

5.3 Forecasting Portfolio Inflows and Portfolio Outflows

The VAR model was also used to perform an in-sample forecast for portfolio inflows and outflows over the period 2016:Q1 to 2016:Q4 (see Appendix, **Figures 7** and **8**). Results show that the model performs reasonably well in predicting the movements of portfolio flows for Jamaica over the forecast period. In particular, the model accurately predicted a decline in portfolio inflows for the first quarter in 2016 and projected a reversal in the second quarter of 2016, albeit a smaller forecast increase relative to the actual outturn. During the third quarter of 2016, the model predicts that portfolio inflows should fall-off but the actual outturn shows a larger decline which continued into the December 2016 quarter. However, the model did not correctly predict the movement of portfolio inflows during the last quarter of 2016. With regard to the forecasting capability of the model for portfolio outflows, it also accurately predicted the movements of portfolio outflows during the first half of 2016. For the March 2016 quarter, the model had predicted that portfolio outflows would have increased and then decreased during the June 2016 quarter which was relatively in line with the outturn. However, the model was not able to accurately capture the behaviour of portfolio outflows during the second half of 2016. Furthermore, the model forecast that portfolio outflows would increase during the September 2016 quarter but actual data shows that outflows began to increase towards the end of the quarter. In addition, the model was not able to accurately predict the behaviour of portfolio outflows during the last quarter of 2016.

The forecasts were evaluated to assess how accurate and robust they are by using the Root Mean Squared Error (RMSE) and the Theil inequality coefficient (see Appendix, **Table 7**). Results indicated that the models performed relatively well in predicting the turning points for both portfolio inflows and outflows over the first half of the forecast period. Contrary, to these findings the models do not perform well in accurately forecasting the behaviour of

portfolio flows for Jamaica during the second half of the forecast horizon. The table shows that the RMSE for portfolio inflows and outflows are 12.8248 and 6.1720, respectively, which implies that the forecast errors between the actual and the forecast values are relatively small.[8] However, the results also show that the forecasts for portfolio inflows and outflows had a Theil Inequality coefficient of 0.9576 and 0.8915, respectively.[9] This suggests that the models used to generate the predicted values for portfolio inflows and outflows could be improved.

6. Conclusion and Policy Recommendations

In summary, this paper investigated the determinants of portfolio inflows and outflows using a Structural VAR model. The model employed quarterly data on selected macroeconomic indicators over the period of 2003:Q1 to 2016:Q4. Results revealed that while both pull and push factors are important in explaining the behaviour of portfolio flows for Jamaica, pull factors played a more dominant role. In particular, data shows that the main four drivers in explaining the behaviour of portfolio inflows for Jamaica are economic growth, foreign and domestic interest rates and the exchange rate. However, domestic interest rates, the fiscal balance, domestic inflation and foreign interest rates are more influential in driving portfolio outflows for Jamaica. Findings also highlighted that economic growth, foreign interest rates and the exchange rate have a stronger impact on portfolio inflows compared to portfolio outflows, while domestic inflation, the fiscal balance and the domestic stock market index have a larger influence on the movements of portfolio outflows. Further analysis indicates that the domestic interest rate is the most dominant and consistent factor in driving both portfolio inflows and outflows for Jamaica. Based on forecast evaluation statistics, the estimated model performs fairly well in predicting future movements in portfolio flows, in particular, for two periods ahead.

Against this background, policy makers should pay specific attention to domestic macroeconomic conditions and design policies aimed at boosting domestic productivity that

[8] The lower the RMSE, the better the forecasting capability of the model.

[9] The Theil inequality coefficient (U) lies between 0 and 1. If $U = 0$, this means that there is a perfect fit which implies that the actual and forecasting is the same.

would promote economic growth as a means of inducing portfolio inflows. Policies should also be geared towards improving the institutional infrastructure in order to mitigate the negative impacts of portfolio flows while maintaining a stable domestic inflation rate and exchange rate.

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Appendix

Table 1: Summary of Empirical Studies

Authors	Scope	Methodology	Key Findings
Abdullah, M.A; Mansor, S.A; Puah, C (2010)	This study utilizes quarterly data for Malaysia from 1985:Q1 to 2006:Q4 for the following variables: • Capital inflow • Real GDP growth • 3-month Treasury bill rate • Budget balance • Current account balance • US industrial Production Index	An Error Correction Model (ECM) was used to examine the factors of international capital inflows into Malaysia in the forms of push and pull factors.	Results show that real GDP, domestic treasury bill rate, budget balance, current account balance and US production granger cause capital inflows into Malaysia in the short run. Evidence also intimates that the budget balance and current account are important push factors influencing capital inflows in Malaysia.
Culha A.A (2006)	Monthly data of Turkey from 1992:01 to 2005:12 for the following variables: • 3 month US Treasury bill • US Industrial production Index • Turkish real Treasury bill rate • Istanbul stock exchange price index • Budget balance • Current account balance	Structural VAR to identify the main determinants of capital inflows. Impulse Response Function and Variance Decomposition were also performed.	Empirical evidence suggests that the relative role of some of the factors have changed considerably in the post crisis period and pull factors are general dominant over push factors in determining capital flows into Turkey.
Kim, Y., & Ying, Y.H. (2001)	Quarterly data for Korea and Mexico from 1960:Q1 to 1996:Q4. Sample was separated into two periods: period I- 1960:Q1 to 1979:Q4 and period II- 1980:Q1-1996:Q4. The variables used are: • Foreign output (US) • Foreign nominal interest rate (US) • Domestic output • Domestic money supply	Structural VAR was employed to investigate the underlying shocks causing the capital inflows.	Results show that the US business cycle and shocks to foreign interest rates account for more than 50% of capital inflows to both countries in the past two decades.
Koepke, R (2015)	Monthly data for 2000:01 to 2013:12. Data set was further divided into two sample periods, period I 2000:01 to 2013:12 and period II (main sample period) 2010:01 to	Multiple versions of a baseline regression model was estimated using the Ordinary Least Squares estimation technique.	Findings provide evidence that changes in market expectations for US monetary policy are an important determinant of portfolio

	2013:12. The variables included are: • BBB rated US Corporate bond spread over Treasuries • The VIX US equity volatility index • Emerging market stock market index • CitiGroup Economic Surprise Index for EM • Emerging market bond yield spread over US Treasuries • Interest rate differential between emerging and advanced economies.		flows to emerging market economies
Korap, L. (2010)	Monthly data for Turkey over the sample period 1992:01 to 2009:06 for the following variables: • Domestic real interest rate • Current account balance • Domestic stock return • Expected domestic inflation • US real interest rate • Growth rate of the industrial production index • Return on share prices	Structural VAR methodology was used to examine the drivers of portfolio capital flows.	Evidence suggests that push factors play a dominant role in explaining the behaviour of the portfolio flows. Results also identified domestic real interest rate as one of the main pull factors which has negatively influenced portfolio flows in Turkey.
Langrin, B & Stennett, R (2011)	Monthly frequency for Jamaica over the sample period 1991:01 to 2011:02 for the variables: • Net private capital inflows • US Industrial production index • 3 month real interest rate on US Treasury bills • Domestic real Treasury bill rate • Private sector credit • Jamaica Stock Exchange Index • Jamaica's Fiscal deficit • Jamaica's Current account deficits	A Structural VAR analysis was used to identify the determinants of private capital inflows and how these factors would affect financial stability in Jamaica. The paper also employed Impulse Response Functions	Results show that there is a relationship between net private capital flows and US interest rate and economic activity. With respect to domestic factors the current account deficit.

Liyange, E (2016)	Quarterly data for Sri Lanka spanning from 2001:Q1 to 2015:Q2 for the respective variables: • Industrial Production Index of advanced economies as a proxy for World GDP • Real domestic GDP • Budget balance • Current account balance • Interest rate differential • Private sector credit • Dummy variable to capture the civil war prevailed in Sri Lanka	The drivers of capital flows into Sri Lanka are investigated using two different approaches: (1) single equation Fully Modified Ordinary Least Squares (FMOLS) Regression and Vector Error Correction Model (VECM)	Empirical results from the FMOLS model shows that real GDP, interest rate differential and world GDP is positively related with capital flows. While the budget deficit negatively influences capital flows. However, the current account balance and private sector credit growth was insignificant. Findings from the VECM shows that real GDP, the current account deficit, interest rate differential, private sector credit growth and world GDP positively affects total capital inflows while the budget deficit negatively impacts it. However, all variables are statistically significant except world GDP.
De Vita, G; Kyaw, K.S (2007)	The model used quarterly data for the period 1976:Q1-2001:Q2 to assess the determinants of capital flows, that is, FDI and portfolio flows to five developing countries (Brazil, Korea, Mexico, Philippines and South Africa) under the push and pull framework. The variables are as follows: • Foreign output proxied by US real GDP growth • Foreign interest rate proxied by US Treasury bill rate • Domestic output • Domestic money supply	The paper utilized a Structural VAR model to identify the determinants of capital flows (FDI and portfolio flows) to developed economies as well as variance decomposition and impulse response functions	Results show that foreign output and domestic productivity are the most important determinants influencing capital flows to developing countries.

Figure 2: Annual Movements in Jamaica's Exchange Rate: 1997:Q1 to 2016:Q4

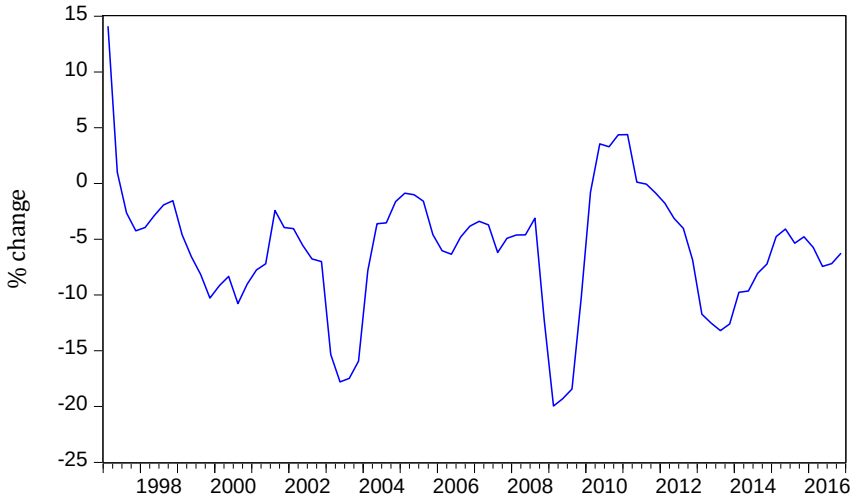
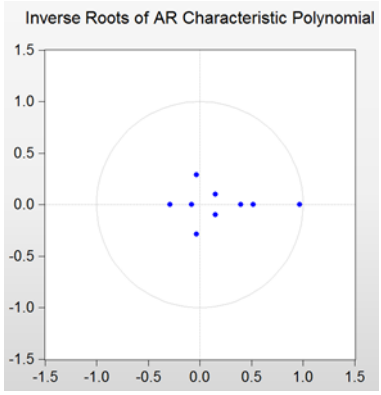


Figure 3: PIF Diagnostic Test Results



VAR Residual Serial Correlation LM T...
Null Hypothesis: no serial correlation ...
Date: 08/02/17 Time: 13:09
Sample: 3/01/2003 12/01/2016
Included observations: 54

Lags	LM-Stat	Prob
1	85.13494	0.3551
2	84.97033	0.3597
3	127.9008	0.0007
4	96.21299	0.1191
5	83.67223	0.3975
6	85.00465	0.3588
7	101.6336	0.0603
8	95.63312	0.1274
9	95.83433	0.1245
10	60.28313	0.9589
11	68.02809	0.8476
12	95.72390	0.1261

Probs from chi-square with 81 df.

VAR Lag Order Selection Criteria
Endogenous variables: USTBILL GD NCF DI DTBILL FB ER JSE PIF
Exogenous variables: C
Date: 08/02/17 Time: 11:49
Sample: 3/01/2003 12/01/2016
Included observations: 54

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-1835.484	NA	3.77e+18	68.31423	68.64573	68.44208
1	-1631.981	331.6341*	4.19e+16*	63.77709*	67.09206*	65.05555*
2	-1561.986	90.73547	8.05e+16	64.18465	70.48310	66.61371

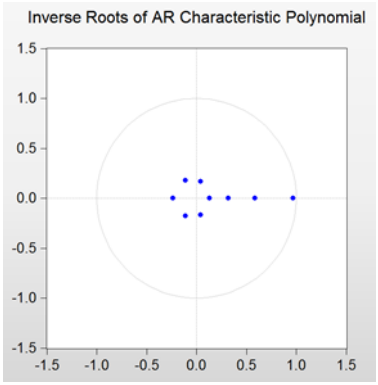
* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

VAR Residual Heteroskedasticity Tests: No Cross Terms (only levels and squares)
Date: 08/02/17 Time: 13:10
Sample: 3/01/2003 12/01/2016
Included observations: 54

Joint test:

Chi-sq	df	Prob.
829.7967	855	0.7256

Figure 4: POF Diagnostic Test Results



VAR Residual Serial Correlation LM T...
Null Hypothesis: no serial correlation ...
Date: 08/02/17 Time: 13:14
Sample: 3/01/2003 12/01/2016
Included observations: 54

Lags	LM-Stat	Prob
1	82.84743	0.4222
2	94.69588	0.1418
3	118.5132	0.0042
4	115.4570	0.0072
5	94.26137	0.1488
6	75.48710	0.6520
7	89.09426	0.2521
8	114.9013	0.0079
9	92.83046	0.1737
10	68.17647	0.8445
11	66.46453	0.8780
12	108.5127	0.0224

Probs from chi-square with 81 df.

VAR Lag Order Selection Criteria
Endogenous variables: USTBILL GD NCF DI DTBILL FB ER JSE POF
Exogenous variables: C
Date: 08/02/17 Time: 11:50
Sample: 3/01/2003 12/01/2016
Included observations: 54

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-1855.135	NA	7.80e+18	69.04203	69.37353	69.16988
1	-1659.403	318.9705*	1.16e+17*	64.79270*	68.10768*	66.07116*
2	-1590.571	89.22686	2.32e+17	65.24336	71.54181	67.67243

* 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

VAR Residual Heteroskedasticity Tests: No Cross Terms (only levels and squares)
Date: 08/02/17 Time: 13:14
Sample: 3/01/2003 12/01/2016
Included observations: 54

Joint test:

Chi-sq	df	Prob.
799.4262	855	0.9128

Table 2: Correlation Matrix

	USTBILL	GD	NCF	DI	DTBILL	FB	ER	JSE	POF	PIF
USTBILL	1.0000	0.2206	0.1417	0.1932	0.3409	-0.0466	0.1005	-0.0868	0.0013	0.1230
GD	0.2206	1.0000	-0.1604	-0.2357	0.2798	-0.0032	-0.4565	-0.0403	-0.1722	-0.2095
NCF	0.1417	-0.1604	1.0000	0.1545	0.2333	-0.0183	0.0394	-0.2615	-0.0449	-0.0030
DI	0.1932	-0.2357	0.1545	1.0000	0.3231	0.0031	0.2526	0.0191	-0.1095	0.0544
DTBILL	0.3409	0.2798	0.2333	0.3231	1.0000	0.0588	-0.3378	-0.0558	-0.1345	-0.0277
FB	-0.0466	-0.0032	-0.0183	0.0031	0.0588	1.0000	-0.1354	-0.1625	-0.0525	-0.0334
ER	0.1005	-0.4565	0.0394	0.2526	-0.3378	-0.1354	1.0000	0.2007	0.1892	0.3719
JSE	-0.0868	-0.0403	-0.2615	0.0191	-0.0558	-0.1625	0.2007	1.0000	0.1020	0.0591
POF	0.0013	-0.1722	-0.0449	-0.1095	-0.1345	-0.0525	0.1892	0.1020	1.0000	0.1470
PIF	0.1230	-0.2095	-0.0030	0.0544	-0.0277	-0.0334	0.3719	0.0591	0.1470	1.0000

Table 3: Results of Unit Root Tests

	ADF Test				Phillips-Perron Test				
	Levels			First Differences	Levels			First Differences	
Variables	**Without Trend & Intercept**	**Intercept**	**Trend & Intercept**	**Without Trend & Intercept**	**Without Trend & Intercept**	**Intercept**	**Trend & Intercept**	**Without Trend & Intercept**	**Order of Integration**
pif	-7.9578***	-7.2497***	-7.9589***	-7.7080***	8.1812***	8.6052***	-8.5914***	-24.3052***	I(0)
pof	-8.7576***	-8.1706***	-8.0634***	-6.0218***	-8.9332***	-15.0780***	-15.2861***	-23.4595***	I(0)
ustbill	-1.8871*	-2.4578	-3.6917**	-4.9701***	-1.2409	-1.4431	-1.9747	-5.3589***	I(0)
gd	-2.6853***	-3.5953***	-3.4639*	-7.5885***	-2.8204***	-3.6710**	-3.5389**	-7.5896***	I(0)
jse	-6.2144***	-6.5499***	-6.4853***	-7.0122***	-6.3444***	-6.6539***	-6.5936***	-30.4446***	I(0)
dtbill	-1.5252	-1.4187	-2.0174	-6.8704***	-1.4799	-1.5691	-2.3564	-6.9094***	I(1)
er	-4.5101***	-5.2926***	-5.2374***	-8.0745***	-4.5376***	-5.3294***	-5.2363***	-8.0745***	I(0)
fb	-7.2611***	-7.4257***	-7.3662***	-5.6161***	-7.2611***	-7.4271***	-7.3665***	-21.0073***	I(0)
ncf	0.2785	-0.0334	0.8246	14.8586***	-6.2258***	6.4019***	-7.1338***	-16.2574***	I(0)
di	-2.8998***	-5.5801***	-6.8726***	-8.4845***	-2.6266***	-5.7335***	-6.8726***	-20.0664***	I(0)

*** significant at 1% level
** significant at 5% level
* significant at 10% level

Figure 5: SVAR Impulse Response Functions for Portfolio Inflows (PIF)

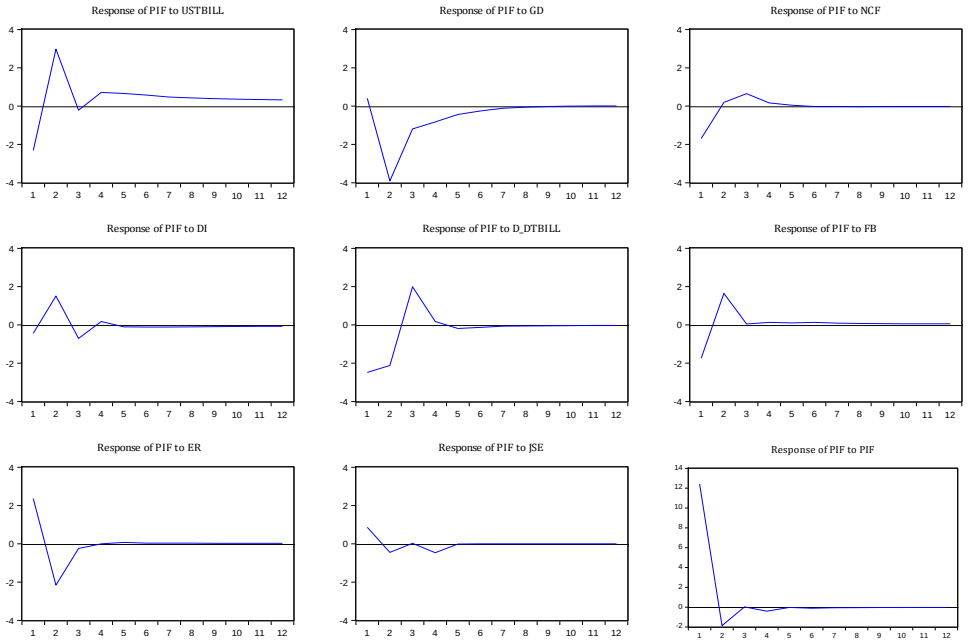


Figure 6: SVAR Impulse Response Functions for Portfolio Outflows (POF)

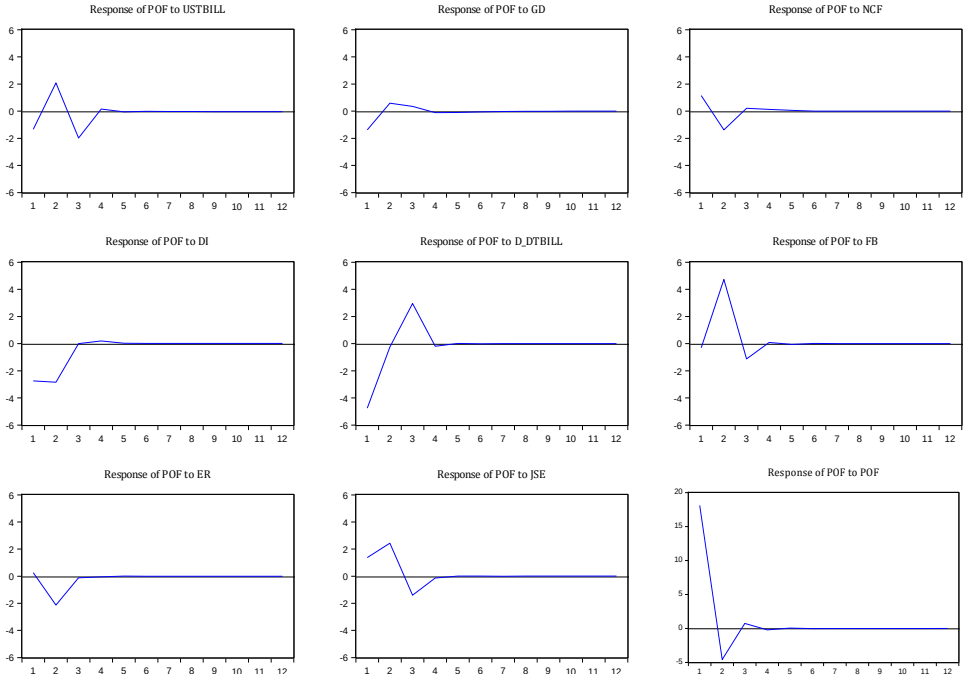


Table 5: Variance Decomposition Portfolio Inflows

		Push Factor	Pull Factors							
Period	S.E.	USTBILL	GD	NCF	DI	D_DTBILL	FB	ER	JSE	PIF
1	0.3904	3.0086	0.0941	1.6077	0.1091	3.4407	1.6975	3.1261	0.4150	86.5013
2	0.5710	6.4540	6.9785	1.3195	1.1129	4.8164	2.6074	4.6500	0.4267	71.6346
3	0.7156	6.2927	7.4022	1.4687	1.3042	6.4203	2.5351	4.5451	0.4149	69.6168
4	0.8334	6.4695	7.6495	1.4702	1.3080	6.3867	2.5238	4.5114	0.5099	69.1710
5	0.9330	6.6380	7.7100	1.4670	1.3089	6.3827	2.5207	4.5001	0.5084	68.9642
6	1.0179	6.7707	7.7230	1.4642	1.3114	6.3770	2.5227	4.4916	0.5074	68.8320
7	1.0915	6.8597	7.7198	1.4627	1.3156	6.3714	2.5235	4.4869	0.5068	68.7536
8	1.1560	6.9322	7.7141	1.4616	1.3186	6.3670	2.5238	4.4833	0.5064	68.6931
9	1.2131	6.9927	7.7086	1.4608	1.3212	6.3632	2.5239	4.4803	0.5060	68.6434
10	1.2642	7.0456	7.7037	1.4600	1.3234	6.3597	2.5239	4.4777	0.5057	68.6004
11	1.3101	7.0931	7.6994	1.4593	1.3253	6.3564	2.5237	4.4754	0.5054	68.5620
12	1.3515	7.1364	7.6955	1.4587	1.3270	6.3535	2.5236	4.4732	0.5052	68.5269

Table 6: Variance Decomposition Portfolio Outflows

		Push Factor	Pull Factors							
Period	S.E.	USTBILL	GD	NCF	DI	D_DTBILL	FB	ER	JSE	POF
1	0.3890	0.4939	0.5231	0.3621	2.0679	6.1974	0.0249	0.0183	0.5158	89.7966
2	0.5652	1.4170	0.5212	0.7465	3.6121	5.2328	5.1658	1.0566	1.7991	80.4488
3	0.7044	2.2321	0.5285	0.7281	3.4789	6.9789	5.2568	1.0205	2.1713	77.6049
4	0.8168	2.2361	0.5314	0.7310	3.4853	6.9847	5.2559	1.0205	2.1743	77.5808
5	0.9110	2.2365	0.5336	0.7316	3.4852	6.9845	5.2562	1.0204	2.1742	77.5777
6	0.9920	2.2365	0.5342	0.7316	3.4852	6.9845	5.2562	1.0204	2.1742	77.5771
7	1.0629	2.2368	0.5344	0.7316	3.4852	6.9844	5.2562	1.0204	2.1742	77.5768
8	1.1255	2.2370	0.5345	0.7316	3.4852	6.9844	5.2562	1.0204	2.1742	77.5765
9	1.1815	2.2373	0.5345	0.7316	3.4852	6.9844	5.2562	1.0204	2.1742	77.5763
10	1.2318	2.2375	0.5345	0.7316	3.4852	6.9844	5.2562	1.0204	2.1742	77.5760
11	1.2773	2.2378	0.5345	0.7316	3.4852	6.9843	5.2562	1.0204	2.1742	77.5758
12	1.3187	2.2381	0.5345	0.7316	3.4853	6.9843	5.2562	1.0204	2.1742	77.5756

Figure 7: Forecasting Results for Portfolio Inflows (PIF)

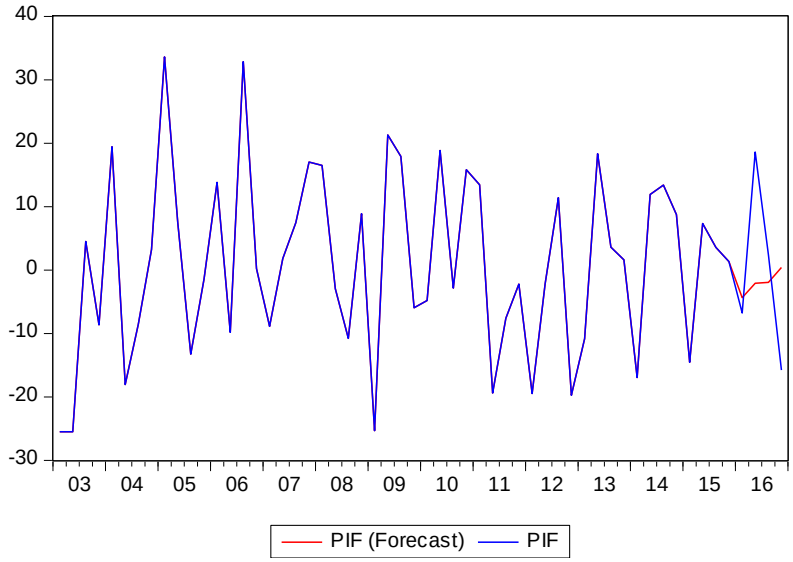


Figure 8: Forecasting Results for Portfolio Outflows (POF)

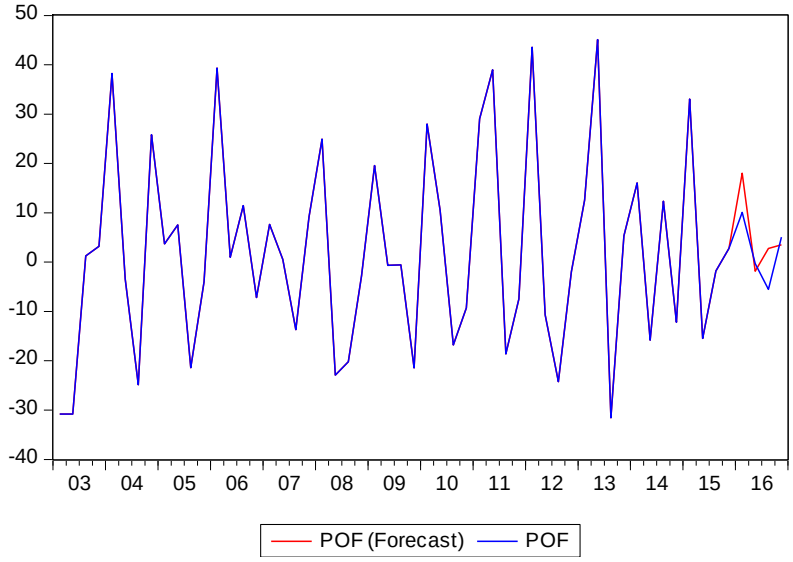


Table 7: Forecast Evaluation

Variable	Inc. obs.	RMSE	Theil
PIF	4	12.8248	0.9576
POF	4	6.1720	0.8915

RMSE: Root Mean Square Error
Theil: Theil inequality coefficient