INVESTIGATING THE LINK BETWEEN FINANCIAL DOLLARIZATION AND INFLATION: EVIDENCE FROM JAMAICA

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ABSTRACT

This paper utilizes VAR analysis to investigate the role of financial dollarization in the dynamics of inflation in Jamaica. Descriptive analysis suggests that macroeconomic instability as well as institutional factors have shaped the process of financial dollarization. The empirical findings confirm the relevance of financial dollarization in influencing the inflation outcome. The results indicate that positive shocks to financial dollarization contribute to a depreciation of the exchange rate, confirming the high elasticity of substitution between domestic and foreign currency. This leads to an initial reduction in the monetary base as the monetary authority tightens domestic liquidity to stem the substitution from domestic currency to foreign currency holdings. Additionally, the fiscal authorities try to compensate for the reduction in domestic currency holdings by increasing expenditure thereby stimulating a continued increase in the CPI. Further, results from the VAR analysis show that while economic agents limit their conversion to foreign currency holdings in instances of excess volatility of the real exchange vis-à-vis inflation volatility (based on the portfolio approach by Ize and Yeyati (1998)), this is not an influential factor in reducing financial dollarization in the domestic economy. Rather, the empirical evidence suggests that a substantial reduction in financial dollarization in the Jamaican economy is associated with a relatively stable exchange rate.

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1.0 Introduction

Dollarization, which can be either official or unofficial, involves the replacement of a country's domestic currency with the currency of another country, typically the US dollar. Official dollarization or currency substitution is an advanced stage of dollarization which involves a complete conversion from the domestic currency to a foreign currency, under the directive of the government. According to Gulde *et. al.,* (2003), unofficial or partial (de facto) dollarization occurs when the local currency remains the exclusive legal tender but transactions are allowed to be denominated in US dollars, effectively facilitating a bi-currency system.[2]

Financial dollarization is one form of unofficial dollarization and reflects economic agents' efforts to protect the value of their wealth and income, in the context of deteriorating financial conditions that have an adverse effect on the expected return on domestic money holdings relative to foreign money holdings.[3] Financial dollarization (asset or liability substitution) induces foreign currency mismatches, which can result in gaping exposures in the event of sharp exchange rate depreciations. As such, the increasing share of US dollar intermediation in the banking system of many developing and emerging market economies has sparked growing concerns among policymakers.[4] These concerns are grounded in the pervasive influence of financial dollarization in the financial and exchange rate crises of the late 1990s. Seminal work by Levy-Yeyati (2004) provides evidence that financial dollarization jeopardizes financial stability.

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2 Throughout the rest of the paper, the term financial dollarization and dollarization are used synonymously. The term official dollarization is used when referring to a country's complete conversion to a foreign currency.

3 See Domac *et. al.,* (2002).

4 See, for example, Gulde *et. al.,* (2004).

Financial dollarization also raises concerns regarding the effectiveness of monetary policy. Bahmani-Oskooee and Domac (2002) investigated the importance of dollarization in the inflation dynamics of Turkey. They found that dollarization reduces the domestic money component of money supply and generates increases in inflation for a given budget deficit, adding complexity to the implementation of monetary policy. As such, the presence of financial dollarization impairs the central bank's ability to moderate credit and output cycles. Despite the channels discussed, dollarization has not been presented as the cause of inflation. Rather, dollarization is a response of economic agents to economic instability, in particular high and volatile inflation rates. As such, the presence of dollarization could stimulate further inflationary pressures, influencing additional portfolio shifts by these agents. This paper augments existing studies on the dollarization process in Jamaica by investigating the influence of dollarization on inflation. US dollar intermediation in the Jamaican banking system has its origins in the liberalization process of the late 1980s and early 1990s. Since that period, there has been a trend increase in financial dollarization in the domestic economy. At the end of December 2004, foreign currency deposits as a proportion of total deposits in Jamaica were approximately 39.0 per cent.[5]

Given the high incidence of dollarization in the domestic economy, the purpose of the empirical investigation is two-fold. First, the paper utilizes VAR analysis to investigate the impact of financial dollarization on inflation dynamics in Jamaica. Second, this study uses the portfolio approach of Ize and Levy-Yeyati (1998) to assess the response of economic agents when there are periods of increases in real exchange rate volatility relative to inflation volatility. Based on findings by Ize and Levy-Yeyati (1998), this would discourage financial dollarization as economic agents make portfolio shifts to safeguard their income.

The remainder of the paper is organized as follows: Section 2 presents an overview of the literature. Section 3 provides a descriptive analysis of the factors influencing the development of financial dollarization in Jamaica. The empirical methodology and the results

5 The ratio was computed using Jamaican banking system data at end December 2004.

of the monetary policy analysis are discussed in Sections 4 and 5. The policy implications of the results and the conclusion are presented in Section 6.

2.0 Literature Review

The phenomenon of dollarization has been studied since the 1970s. These early studies could not distinguish between the motives of currency and asset substitution because of the assumption of a choice from only two assets: domestic and foreign currency. This assumption was considered reasonable within a framework of restricted capital mobility. Early models, including Calvo and Rodriguez (1977), primarily considered the implications of currency substitution for money demand, exchange rate determination and the conduct of monetary policy. Calvo and Rodriguez (1977) developed a two-sector model of exchange rate determination for a small open economy where residents held both the domestic and foreign currency, had rational expectations, and prices were fully flexible. Residents maximized real financial wealth *W,* in the foreign currency:

$$W=M/E + M^*,$$

where M is the domestic money, M^* is foreign money and E is the nominal exchange rate.[6]

Later research re-examined the currency substitution issue by specifying asset portfolio balance models. These models improved on the earlier work by explicitly assuming the existence of bonds denominated in each currency. Cuddington (1983) outlined that domestic residents' demand for foreign money was distinct from their demand for foreign non-monetary assets. The demand for the non-monetary asset was specified as a function of real income and the real return of the asset. As a result, Cuddington's model facilitated the empirical estimation of domestic money demand with the inclusion of both currency and asset substitution. A shortcoming of the model, however, was the inability to explain the relevance of currency substitution, particularly in the context where interest-bearing bonds were available.

6 See Piontkovsky (2003).

Seminal work by Thomas (1985) involved closer scrutiny of the properties of currency and asset substitution. Thomas developed a liquidity services model where economic agents determined currency substitution based on transaction costs and nominal interest rates, while unofficial dollarization was influenced by real return differentials, risk characteristics of assets' and economic agents' attitude to risks. The model assumes perfect financial markets, where economic agents can borrow and lend on both the domestic and international markets without constraints. The model allows for the possibility of portfolio balance motives for currency substitutability. Thomas (1985) argued that expected-utility-maximizing agents respond to changes in inflation or exchange rate expectations by adjusting non-monetary assets or liabilities to mitigate the risks associated with money holdings. The model's assumption of unrestricted access to international capital markets is a limitation in assessing dollarization in emerging and transition economies.

Following work done by Thomas (1985), Ize and Levy-Yeyati (1998) developed a Capital Asset Portfolio Model (CAPM) formulation to explain the dollarization process from both sides of a financial intermediary's balance sheet. The model assumed that investors could minimize the variance of their portfolio returns by holding foreign currency and local currency in proportions determined by the relative volatility of the inflation and real exchange rate. As such, banks and depositors hedge against inflation and foreign exchange risks in order to achieve minimum variance portfolio equilibria in the loanable funds market.

Ize and Levy-Yeyati (1998) found evidence that investors' equilibrium dollarization fluctuates around the level of dollarization at which the whole portfolio has minimum variance, thus influencing the level of dollarization within the economy.[7] The dollar share of the optimal investment portfolio, which reflects the minimum variance portfolio, has the following specification:

7 See Piontkovsky (2003).

$$\lambda^{*} = \frac{Var(\pi) + Cov(\pi, s)}{Var(\pi) + Var(s) + 2Cov(\pi, s)}$$

where π = domestic inflation and s is real depreciation.

Based on the above expression, increases in the variance of inflation for a given variance of real exchange rate depreciation are associated with increases in dollarization. Ize and Levy-Yeyati (1988) found evidence that the equilibrium portfolio largely approximates actual dollarization for a broad sample of countries. The model suggests that asymmetries between depositors' and borrowers' portfolios could generate deviations from this equilibrium.

Recent studies have typically investigated the vulnerabilities associated with increased financial dollarization. Levy-Yeyati (2004) augmented previous work by Ize and Honohan (2003) which found evidence that financial dollarization increases solvency and liquidity risks in the banking sector. Domac and Bahmani-Oskooee (2002) summarized pertinent concerns in the literature related to the impact of dollarization on the implementation and effectiveness of monetary policy. They outlined that dollarization jeopardizes the effectiveness of the transmission mechanism by: (i) reducing the yield of the inflation tax, resulting in higher and more volatile inflation, for a given budget deficit, (ii) reducing the monetary authorities' control over domestic liquidity both by inducing shifts away from local money holdings and increasing the volatility of domestic money demand, (iii) affecting the choice of exchange rate regime and (iv) increasing the exposure of the banking system to additional risks on account of uncovered foreign liabilities, thus complicating the intermediation channel for effecting monetary policy.

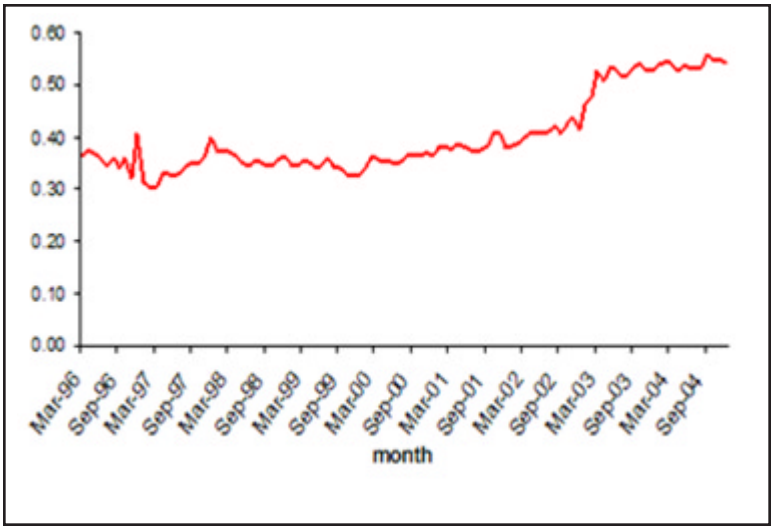
3.0 Factors influencing the Development of Financial Dollarization in Jamaica

Financial dollarization in the Jamaican economy was spawned by the economic liberalization process of the late 1980s and early 1990s. The liberalization process involved financial system and foreign exchange market reforms, including the elimination of exchange controls, allowing residents to hold foreign currency. Since then, there has generally been a steady rise in dollarization in the Jamaican economy. During the

post-liberalization period, the dollarization ratio, measured as foreign currency deposits as a share of M2Y, increased from 37.0 per cent at the end of March 1996 to 54.0 per cent at the end of 2004, due to strong growth in foreign currency deposits (see Figures 1 & 2).[8] This trend increase in financial dollarization has raised concerns for policymakers regarding the implications for the effectiveness of monetary policy. There have been three phases in the development of dollarization in the domestic economy. This has involved the post-liberalization era during 1992 to 1995, the financial crisis period of 1996 to 1999 and the post-crisis period from 2000 to the close of the sample period in 2004.

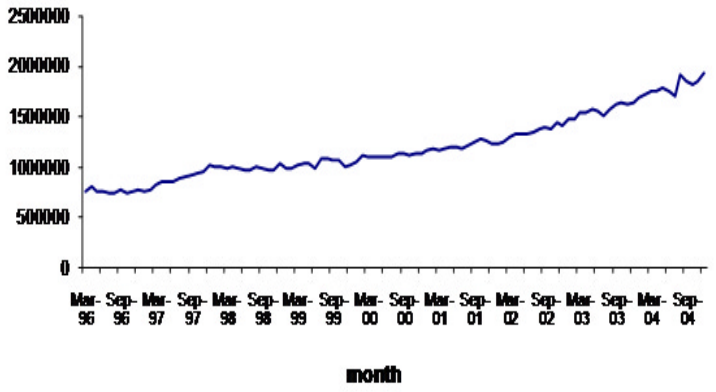
The growth of dollarization in the post-liberalization period was influenced by an increase in macroeconomic volatility as well as an underdeveloped capital market that presented limited outlets for

Figure 1
Dollarization Ratio: Share of FX Deposits in M2Y in Jamaica



8 These figures reflect data availability. *M2Y= M2* + foreign currency deposits, where M2 includes currency in circulation and domestic time, savings and demand deposits.

Figure 2
Foreign Exchange Deposits (US$000) in Jamaica



domestic investments**.** The deterioration in macroeconomic stability emanated from the liberalization of foreign exchange controls in 1990, which precipitated episodes of exchange rate depreciation between late 1991 and early 1992.[9] Given the high import content of domestic production, the depreciation in the exchange rate translated into higher domestic prices and created further challenges for maintaining and achieving monetary stability. The shock to import costs, as well as the expansionary monetary and fiscal policies accompanying liberalization, translated into domestic inflation as high as 107.9 per cent in April 1992.[10] This contributed to shifts in portfolio composition during the economic downturn as residents became increasingly concerned with the capacity of the national currency as a store of value. These macroeconomic uncertainties contributed to a ratio of foreign currency deposits to M2Y as high as 37.0 per cent at the start of the crisis period in 1996.

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9 Inflationary episodes in Jamaica have been primarily influenced by changes in the exchange rate regime and the fiscal policy stance.

10 The sharp episodes of depreciation were due to the initial over-valuation of the exchange rate.

Between March 1996 and December 1999, the dollarization ratio declined from 37.0 per cent to 32.0 per cent. This performance can be explained by a combination of factors. Firstly, efforts by the monetary authorities to restore stability to the financial markets resulted in a moderation in dollarization, with the indicator declining from 37.0 per cent at end March 1996 to 31.0 per cent at end March 1997. The stabilization of domestic prices created liquidity problems for many financial institutions that held rapidly appreciating assets such as real estate and stock prices as collateral for bank loans.[11] This led to fallouts in the financial system and the consequent increase in Government's debt burden weakened investor confidence and fuelled instability in the domestic economy. Secondly, although this led to an increase in foreign currency holdings, the improvement in macroeconomic performance during 1998 contributed to a lowering of foreign currency holdings by economic agents throughout the following year.

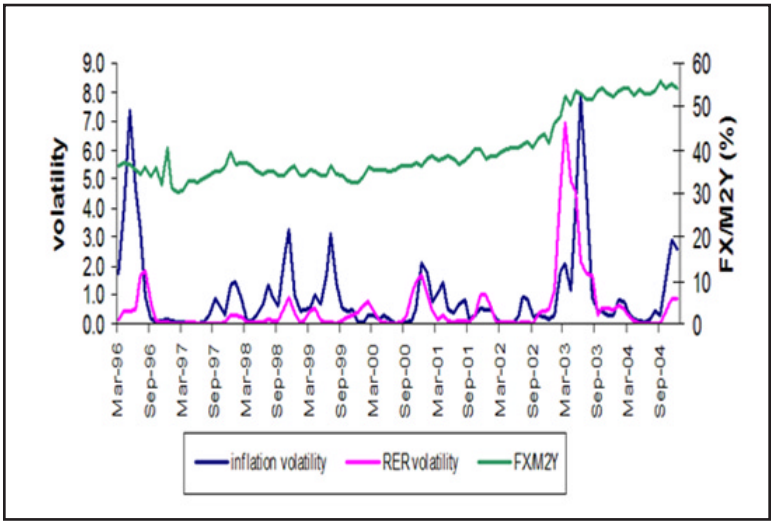
During the post-crisis period, the dollarization ratio increased steadily from a low of 34.0 per cent at the start of 2000 and peaked at 54.0 per cent by the end of 2004. During this period, the movement in the ratio was influenced by a number of external shocks as well as uncertainties regarding public sector financing. In 2001, there was increased dollarization in the domestic economy as the events of September 11 led to a slow-down in foreign exchange inflows, fuelling uncertainty in the foreign exchange market.[12] The increase in dollarization persisted into 2002 due to uncertainties regarding the prospects for tourism as well as anxieties related to the increase in Government's borrowing requirements. The uncertainties in the macroeconomic environment coupled with limited opportunity for Government to source external funding fuelled significant instability in the foreign exchange market during the first half of 2003. This contributed to periods of high inflation and real exchange rate volatility, which influenced higher growth rates in foreign currency savings deposits as economic agents substituted domestic currency savings deposits for a safer store of value

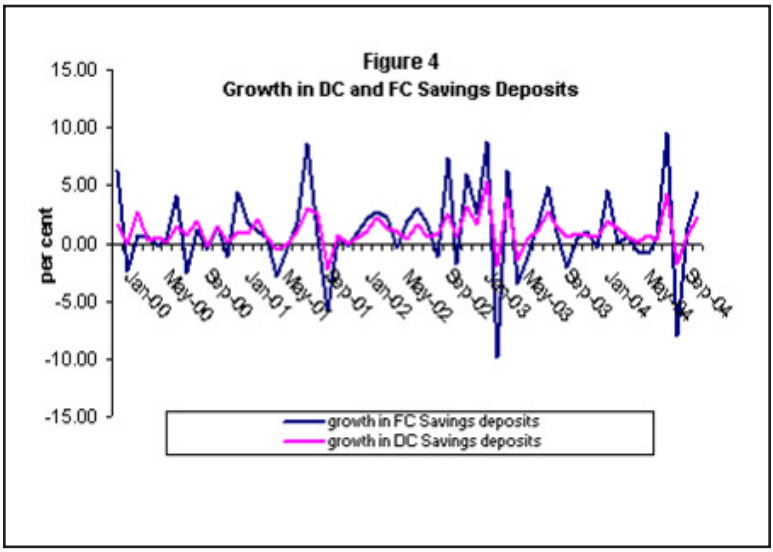
11 Financial sector expansion was channelled into high-yielding financial assets and, as such, was not accompanied by strong real sector growth.

12 See BOJ Annual Report (2001).

(see Figures 3 & 4). This resulted in a sharp increase in the dollarization ratio during the first half of 2003, from 42.0 per cent at the end of 2002 to 53.0 per cent at end June 2003.

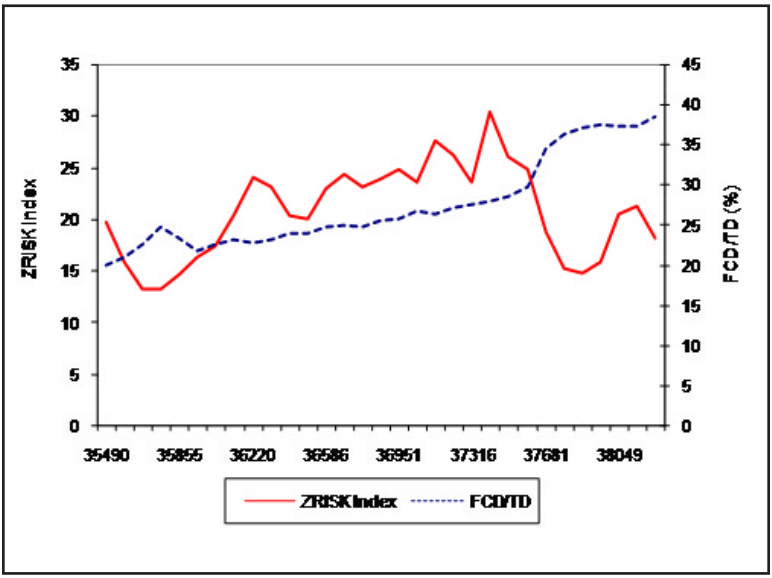
Figure 3
FX/M2Y, Inflation and Real Exchange Rage Volatility





Of importance is that the significant dollarization of banking sector deposits during 2003 was associated with increased banking sector fragility. Figure 5 shows that there is an inverse relationship between dollarization and banking sector soundness, where fragility is measured by a decline in the ZRISK index.[13]

Figure 5
Relationship between Dolarization & Insolvency Risk



Restrictive policy measures by the Central Bank helped to stabilize the growth in dollarization during the second half of 2003. The reduction in dollarization was accomplished through tighter base money management, which helped to limit the demand for foreign currency

13 The ZRISK measures the risk of financial institution insolvency by calculating the number of standard deviations of unexpected losses which would lead to a complete erosion of the institution's capital base (See Hannan and Hanweck 1988).

holdings and contributed to a lowering in inflation.[14] This contributed to the relative stability in the macroeconomic environment during 2004, resulting in the ratio of foreign currency deposits to total deposits in the banking system remaining relatively stable during the year (see Figure 5).

4.0 Empirical Analysis of the Link between Dollarization and Inflation

4.1 Data

The study utilizes key variables influencing dollarization and inflation dynamics in Jamaica, in order to investigate the impact of dollarization on inflation dynamics.[15] The empirical analysis is conducted using a vector autoregression (VAR) model that incorporates monthly data on the exchange rate, CPI, base money, an index of public sector prices (PSP) and the dollarization ratio (FX/M2Y) as its endogenous variables.

The sample period spans March 1996 to December 2004, in order to provide a reasonable sample size for the analysis. The PSP index is computed as government expenditure per capita and is deflated using 1995 values. All series, except the PSP index, were logged to adjust for scaling differences. The PSP and base money variables are indicative of policy stances by the relevant authorities. Although interest rates were not explicitly included in the model, the influence of this variable on domestic liquidity conditions and inflation has been proxied by changes in base money. Exchange rate data are the weighted average nominal exchange rates of the Jamaica currency *vis-à-vis* the U.S. dollar, where

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14 This analysis informs the ordering of the variables employed in the VAR framework, along with the added assumption that Government may resort to expansionary policies, in the event of an increase in dollarization, to increase the yield of the inflation tax.

15 Inflationary episodes in Jamaica have been influenced by changes in the exchange rate regime, uncertainties regarding public sector financing and balance of payments developments.

the U.S. dollar is the currency of the country's major trading partner. A dummy variable is included to capture the financial crisis that occurred during the second half of the 1990s. In examining the portfolio response of economic agents to economic volatilities, the study incorporates the 3-month lagged ratio of real exchange rate volatility to inflation volatility as an endogenous variable. The impact of this variable on the dollarization dynamics in Jamaica is examined in Section 5.2.

4.2 Methodology

The dynamic relationships among the variables in a VAR model are analyzed using impulse response functions and variance decompositions.[16] The VAR framework accounts for this dynamic interaction among variables in the system by expressing each variable as a linear function of its own past value and past values of all the variables being considered. The error terms in these regressions are the 'surprise movements' in the variables, taking past values into account. The study utilizes generalized impulse response analysis, which is a technique originally developed by Koop (1996) and Pesaran and Shin (1998). Unlike traditional impulse response analysis, generalized impulse response analysis is invariant to the ordering of the variables in the VAR, resulting in a unique solution. As a result, it is possible to examine the initial impact of responses of each variable to shocks to any of the other variables. Generalized impulse response analysis takes account of the historical pattern of correlation observed among the different shocks.[17] The approach is useful for the purposes of this study because it accounts for the possibility of a strong correlation of the VAR residuals.

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16 The VAR model treats each variable as endogenous, where each variable is expressed in terms of its own lagged values and the lagged values of all other variables in the system. Impulse response analysis measures the time profile of the effect of a shock on the future values of the variables in the system while variance decompositions determine the movement in a sequence due to its own shock versus shocks to other variables.

17 See Dua (2004) and Domac *et. al.,* (2002).

The variance decomposition analysis is performed by orthogonalizing the underlying shocks in the VAR model using the Cholesky decomposition of the variance-covariance matrix of errors, which is a pre-specified ordering of the variables in the VAR.[18] The ordering shown below is based on a priori expectations and indicates that exchange rate changes influence dollarization through portfolio adjustments by economic agents. Changes in the level of dollarization in turn influence domestic liquidity through base money management by the monetary authorities. Domestic liquidity conditions in turn impact the CPI, which has implications for public sector prices.

Exchange Rate $\longrightarrow$ FX/m2y $\longrightarrow$ Base Money $\longrightarrow$ CPI $\longrightarrow$ PSP

VAR Model Setup

The estimated VAR model takes the following form:

$$X_t = a_1 X_{t-1} + a_2 X_{t-2} + \varepsilon_t \qquad (1)$$

where X_t is a vector of 5 x 1 endogenous variables: are parameter matrices and ε_t is a vector of innovations or surprise movement in the variables. The vector X_t includes the endogenous variables: base money, exchange rate, public sector prices, CPI and FX/M2Y. The vector X_t is a VAR (2) process, where the general VAR (p) process can be written as:

$$x_t = \sum_{i=1}^{p} \Phi_i x_{t-i} + \varepsilon_t, \qquad t = 1, 2, ..., T \qquad (2)$$

where *xt = (x1t, x2t, ..., xmt)'* is an *m x 1* vector of jointly determined dependent variables $\{\Phi\, i = 1,2,...,p\}$ and are *m x m* coefficient matrices and $E(\varepsilon t) = 0$ and $E(\varepsilon t\, \varepsilon' t) = \sum = (\sigma ij)$. In order to obtain the Generalized

18 The Cholesky decomposition or orthogonal factorizations was utilized since non-orthogonal factorizations yield decompositions that do not satisfy an adding up property.

Impulse Response Function, X_t, which is assumed to be covariance stationary, can be re-written as:

$$X_t = \sum_{i=0}^{\infty} A_i \varepsilon_{t-i}, \qquad t = 1, 2, ...,T \qquad (3)$$

where the *m x m* coefficient matrices A_i can be obtained from the recursive relations:

$$A_i = \Phi 1\, A_{i-1} + \Phi_2 A_{i-2} + ... + \Phi\, p A_{i-p}, \quad i = 2,...,$$
with $A_o = I_m$ and $A_i = 0$ for $i<1$

The generalized impulse response for *x,* based on an arbitrary shock to the *j*th element of ε_t, is denoted by:

$$GI_x (n, \delta_j, w_{t-1}) = E[X_{t+n} / \varepsilon_{jt} = \delta_j, \qquad (4)$$
$$w_{t-1}] - E [X_{t+n} / w_{t-1}]$$

for $n = 0,1,....$

Given that e_t has a multivariate normal distribution, i.e., $\varepsilon t \sim N(0, \sum)$ then:

$$E (e_t / e_{jt} = \delta_j) = (\sigma_{1j}, \sigma_{2j}, ... \sigma_{mj}), \sigma_{jj}^{-1} \delta_j = \qquad (5)$$
$$\sum e_j \sigma_{jj}^{-1} \delta_j$$

Equation 5 represents the predicted shock in each error given a shock to ε_{jt}, based on the typically observed correlation between the errors, where the economy's history up to period $t - 1$ is denoted by the non-decreasing information set, . This differs from the case where the disturbances are orthogonal and the shock only changes the *j*th error as follows:

$$E(\varepsilon_t / \varepsilon_{jt} = \delta_j) = \delta_j e_j$$

As such, the *m x 1* vector of the generalized impulse response of a shock in the *j*th equation at time *t* on X_{t+n} is given by:

$$\left(\frac{A_n \sum e_j}{\sqrt{\sigma_{jj}}}\right)\left(\frac{\delta_j}{\sqrt{\sigma_{jj}}}\right), \qquad \text{for n = 0,1,2,……}$$

By setting $\delta_j = \sqrt{\sigma_{jj}}$ in equation 5, i.e. measuring the shock by one standard deviation, the generalized impulse response function can be re-stated as:

$$\psi_j^g(n) = \sigma_{jj}^{\frac{1}{2}} A_n \sum e_j, n = 0,1,2,....$$

5.0 Estimation Results

5.1 Inflation Response to Dollarization

The lag order of the VAR was selected based on several information criteria. As such, an optimal lag length of 2 was determined based on the LR test statistic, Final prediction error and Akaike information criterion (see Table 1).[19]

19 The issue of whether the variables in a VAR need to be stationary is widely discussed in the literature. Sims (1980) proposed that the variables in a VAR model should not be differenced even if they contain unit roots, since differencing would distort the interrelationships among the variables and the natural co-movements in the data. See Sims *et. al.,* (1990) for more on this. Following this argument, the variables included in the model were not differenced. Additionally, unit root tests showed that the variables were integrated of different orders, with no cointegrating relations being imposed on the system.

Table 1. VAR Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	NO
0	-22.86	NA	7.18E-08	0.58	0.73	0.64
1	602.67	1163.49	5.44E-13	-11.21	-10.12*	-10.77*
2	646.19	75.73*	4.72E-13*	-11.36*	-9.33	-10.54
3	666.48	32.87	6.58E-13	-11.05	-8.08	-9.85
4	690.55	36.11	8.67E-18	-10.81	-6.90	-9.23
5	704.62	19.42	1.43E-12	-10.37	-5.53	-8.41
6	735.63	39.07	1.74E-12	-10.27	-4.49	-7.93

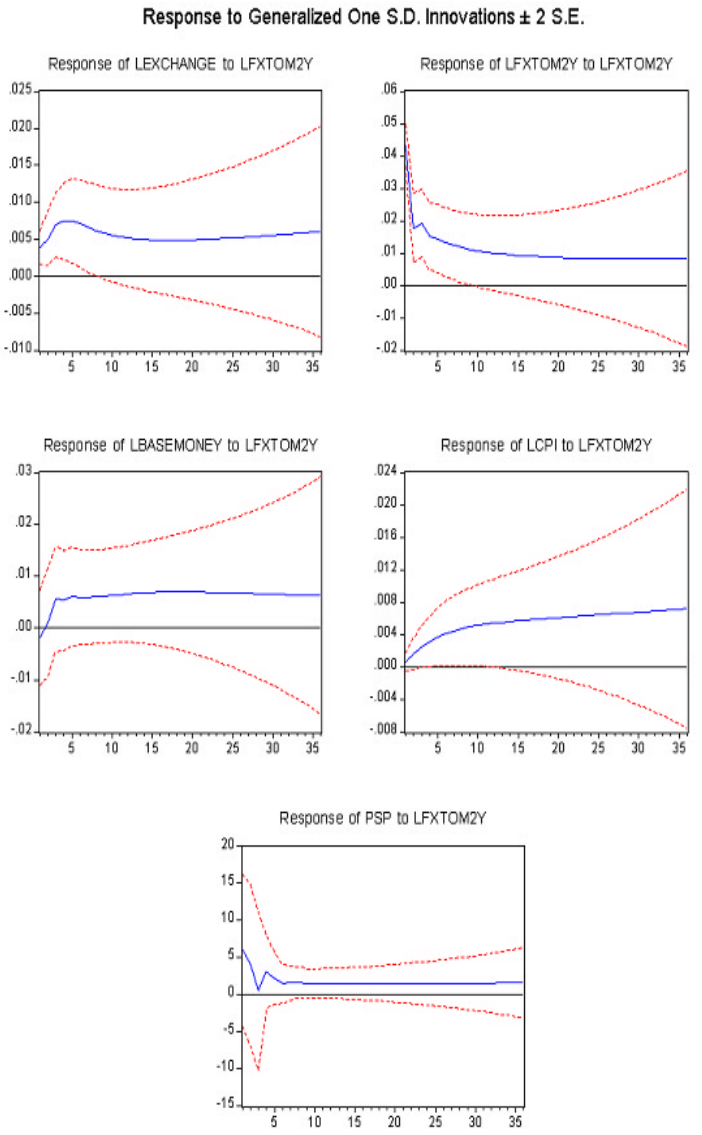
* = Indicates lag order selected by the criterion.
LR = Sequential Modified LR test statistic (each test at 5% level).
FPE= Final prediction error.
AIC = Akaike information criterion.
SC = Schwarz information criterion.
HQ = Hannan-Quinn information criterion.

(i) Generalized Impulse Response Analysis

Figure 6 plots the impulse responses of CPI, base money, exchange rate, public sector prices, and the dollarization ratio (FX/M2Y) with respect to a one standard deviation increase in FX/M2Y over a horizon of thirty-six months.[20] The VAR coefficients and standard errors from the model are calculated by the Monte Carlo method with 1000 repetitions (of ±2 standard deviations).

20 The impulse to the dollarization ratio was employed in order to assess the policy responses of the relevant authorities to a sudden increase in dollarization and the consequent implications for inflation performance.

Figure 6


Response to Generalized One S.D. Innovations ± 2 S.E.
Response of LEXCHANGE to LFXTOM2Y
Response of LFXTOM2Y to LFXTOM2Y
Response of LBASEMONEY to LFXTOM2Y
Response of LCPI to LFXTOM2Y
Response of PSP to LFXTOM2Y

The strong positive response in the exchange rate within the first 3 months is consistent with the increased foreign currency holdings by domestic residents and typifies the high elasticity of substitution between the domestic and foreign currency based on the Jamaican experience. This fuels inflationary pressures, particularly given the relatively high exchange rate pass-through for the Jamaican economy. The exchange rate reflected a consistent increase from month 20, with the impulse persisting beyond the forecast horizon. The impulse response suggests that shocks in FX/M2Y result in an initial decline in base money. This initial impact reflects efforts by the monetary authority to limit the conversion from domestic to foreign money holdings by tightening domestic liquidity. Additionally, the impact of the decline in base money on prices is tempered by an increase in government expenditure per capita, which represents the proxy for administered prices. This contributes to an overall increase in the CPI over the forecast horizon. Increases in administered prices mirror the initiatives of the fiscal authorities to cushion the decline in the inflation tax associated with a decline in the domestic money component of the money supply.

Overall, the results are consistent with previously discussed channels through which dollarization complicates monetary policy implementation. The evidence corroborates the view that dollarization complicates the efficacy of the transmission mechanism. The results suggest that sudden increases in dollarization in the Jamaican economy are associated with inflationary pressures due to the decline in the yield of the inflation tax.

(ii) Variance Error Decomposition

The results from the variance decomposition suggest that FX/M2Y accounts for the largest proportion of the error in forecasting its own variation (see Tables 2-6). Over a thirty-six month horizon, the variable contributes to 37.5 per cent of its own variation, lending support to the hypothesis of hysteresis in the dollarization process observed in other countries. The results show that dollarization accounts for a significant, but declining, proportion of its own variation over time. This result is consistent with the findings from the descriptive analysis, which indicate that dollarization has remained high even in a context of a moderation in economic instabilities. The findings also indicate that the exchange rate

is critical in explaining the variation in the dollarization indicator. The variable accounts for 39.9 per cent of the variation in dollarization over a 36-month horizon. This suggests that deviations in the level of the exchange rate is a critical factor in influencing the level of dollarization in the domestic economy.

Table 2. Percentage of the Variance of Exchange Rate Explained by:

Months	Exchange Rate	FX/M2Y	Base Money	CPI	Public Prices
6	92.9777	3.5683	1.4369	0.2262	0.0244
12	82.3701	7.6783	1.9309	4.9797	0.0167
24	63.0725	12.6710	1.2813	20.4345	0.0267
36	50.6075	16.0935	1.1791	30.3533	0.0590

Table 3. Percentage of the Variance of FX/M2Y Explained by:

Months	Exchange Rate	FX/M2Y	Base Money	CPI	Public Prices
6	35.1630	55.9085	0.4710	2.4838	0.4545
12	39.1471	46.6029	0.3672	2.1573	0.4609
24	40.5073	40.3961	0.3659	4.6085	0.4500
36	39.8564	37.4865	0.4738	8.8798	0.4274

Table 4. Percentage of the Variance of Base Money Explained by:

Months	Exchange Rate	FX/M2Y	Base Money	CPI	Public Prices
6	0.7548	4.6717	74.0983	7.0785	0.8840
12	0.8375	6.6951	60.0289	8.0506	0.8940
24	3.8996	8.0624	48.1121	7.5981	0.8747
36	6.9518	9.0744	43.1005	7.9097	0.8444

Table 5. Percentage of the Variance of CPI Explained by:

Months	Exchange Rate	FX/M2Y	Base Money	CPI	Public Prices
6	5.3907	7.2523	0.6224	84.1726	0.1054
12	13.3423	14.2411	1.2898	69.7268	0.1153
24	20.2365	19.5296	1.4277	57.6309	0.1499
36	23.4225	21.3030	1.4192	52.3955	0.1713

Table 6. Percentage of the Variance of Public Prices Explained by:

Months	Exchange Rate	FX/M2Y	Base Money	CPI	Public Prices
6	2.3808	1.4201	1.6996	3.0664	90.4871
12	2.6604	1.6146	1.6959	3.2030	89.6509
24	3.2227	1.9707	1.6893	3.6096	88.1204
36	3.7647	2.3656	1.6824	4.1968	86.5141

Overall, the results indicate that, over a thirty-six month horizon, shocks to FX/M2Y explain approximately 21.3 per cent of the variation in the CPI. This finding confirms the importance of dollarization in the inflation process. Consistent with the dynamics of inflation in Jamaica, over a 36-month horizon, the exchange rate accounts for 23.4 per cent of the variation in the CPI.

5.2 Dollarization Response to excess Real Exchange Rate Volatility *vis-à-vis* Inflation Volatility

A lag length of 2 was chosen based on the overall results of the tests reported in Table 7.

Table 7. VAR Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-161.74	NA	8.23E-08	3.55	3.74	3.63
1	471.50	1159.82	3.76E-13	-8.75	-7.24*	-8.14*
2	523.51	87.60*	3.58E-13	-8.81*	-5.99	-7.67
3	562.23	59.51	4.64E-13	-8.19	-4.45	-6.92
4	591.95	41.29	7.54E-13	-8.19	-2.73	-5.98
5	622.23	37.61	1.28E-13	-7.79	-1.02	-5.06
6	665.33	47.19	1.81E-13	-7.67	0.42	-4.40
7	731.28	62.48	1.75E-13	-8.03	1.38	-4.23
8	794.50	50.58	1.10E-13	-8.33	2.40	-3.99

*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: Schwartz information criterion

(i) Generalized Impulse Response Analysis

Figure 7 shows the response of the respective variables to a 1.0 unit shock in 3-month lagged ratio of real exchange volatility to inflation volatility over a 36-month period. The lagged impact of the ratio is considered, given the absence of immediate adjustments by economic agents in response to the ratio. The results suggest that over time economic agents respond by reducing the foreign currency holdings in their portfolio in periods of excess real exchange rate volatility relative to inflation volatility. In addition, shocks to the ratio have a negative initial impact on the exchange rate within the first 3 months. The increase in real exchange rate volatility without a commensurate increase in inflation volatility promotes an appreciation in the exchange rate, since economic agents limit their conversion to foreign currency holdings from domestic money holdings.

The appreciation in the exchange rate is accompanied by a sustained reduction in the CPI. The initial increase in the monetary base reflects a more relaxed monetary policy stance by the central bank due to the lower level of dollarization. The eventual reduction in public sector prices is suggestive of a lowered reliance on inflation tax by the fiscal authorities due to reduced dollarization.

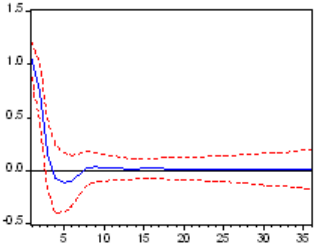
In summary, economic agents respond in periods of excess real exchange rate volatility by limiting the foreign currency holdings in their portfolios, influencing an appreciation in the exchange rate.

(ii) Variance Error Decomposition

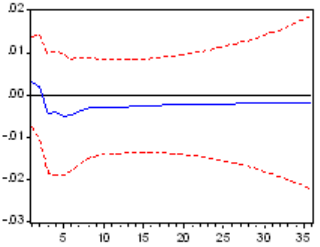
The results from the variance decomposition indicate that the exchange rate explains 36.3 per cent of the variation in dollarization over a 6-month horizon (see Tables 8-13). More importantly, the exchange rate accounts for an increasing proportion of the variation in the dollarization indicator. The results from the variance decomposition also show that the volatility ratio accounts for a small and declining proportion of the variation in the dollarization indicator over time. The dollarization ratio accounts for a large proportion of its own variation over the 36-month period, albeit a declining share over time, supporting the inertial component to the dollarization process. Over the 36-month

FIGURE 7
Response to Generalized One S.D. Innovations ± 2 S.E

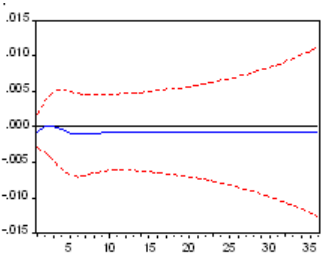
RESPONSE OF EXCHANGE VOLATILITY RATIO TO EXCHANGE VOLATILITY RATIO



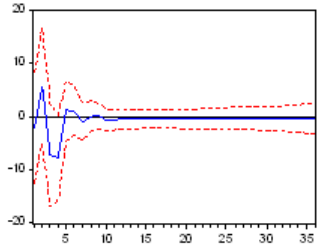
RESPONSE OF LFXTOM2Y TO EXCHANGE VOLATILITY RATIO



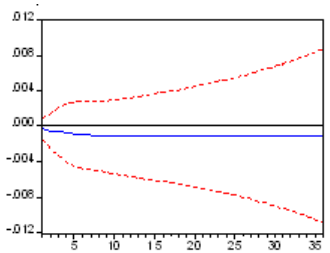
RESPONSE OF L EXCHANGE TO EXCHANGE VOLATILITY RATIO



RESPONSE OF PSP TO EXCHANGE VOLATILITY RATIO



RESPONSE OF LCPI TO EXCHANGE VOLATILITY RATIO



RESPONSE OF L BASE MONEY TO EXCHANGE VOLATILITY RATIO

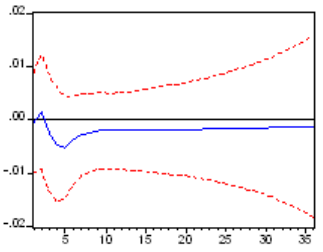


Table 8. Percentage of the Variance of Exchange Rate Volatility Ratio Explained by:

Months	Exchange Rate Volatility Ratio	Exchange Rate	FX/M2Y	Base Money	CPI	Public Prices
6	74.4979	9.7225	3.0977	1.4269	4.1755	4.0960
12	71.3763	9.4170	3.0149	2.1807	4.3002	3.9856
24	69.4983	9.4352	3.0432	2.2820	4.2191	3.9266
36	68.8887	9,7009	3.0384	2.2638	4.2482	3.9060

Table 9. Percentage of the Variance of Exchange Rate Explained by:

Months	Exchange Rate Volatility Ratio	Exchange Rate	FX/M2Y	Base Money	CPI	Public Prices
6	0.1304	93.8453	1.1706	1.7112	0.3217	0.4064
12	0.1715	86.8284	2.8015	3.4334	0.9206	0.3445
24	0.2418	76.8995	4.5738	3.2312	5.9491	0.2946
36	0.3859	70.0661	6.0931	2.5650	10.9269	0.2945

Table 10. Percentage of the Variance of FX/M2Y Explained by:

Months	Exchange Rate Volatility Ratio	Exchange Rate	FX/M2Y	Base Money	CPI	Public Prices
6	2.0209	36.2854	52.3307	0.6729	3.1406	1.3451
12	2.0246	44.4362	41.2484	0.7449	2.6089	1.4128
24	1.8586	53.1302	33.5446	0.9809	2.1430	1.3729
36	1.7303	56.4538	30.3166	1.10500	2.8500	1.2852

Table 11. Percentage of the Variance of Base Money Explained by:

Months	Exchange Rate Volatility Ratio	Exchange Rate	FX/M2Y	Base Money	CPI	Public Prices
6	3.1849	0.8490	3.7231	72.9104	7.0127	1.2527
12	3.7834	1.2025	5.7668	59.9417	7.3230	1.3605
24	3.7953	7.4546	6.3965	48.8568	6.0561	1.5213
36	3.6298	13.4452	6.5549	44.5098	5.5362	1.5295

Table 12. Percentage of the Variance of CPI Explained by:

Months	Exchange Rate Volatility Ratio	Exchange Rate	FX/M2Y	Base Money	CPI	Public Prices
6	0.8766	6.88724	4.5584	0.7121	84.4015	0.3694
12	1.5444	25.6334	8.9332	0.7650	61.3196	0.6164
24	1.6862	44.3468	11.5252	0.3876	39.8883	0.6960
36	1.5367	51.3710	11.6882	0.4032	31.9944	0.6595

Table 13. Percentage of the Variance of Public Prices Explained by:

Months	Exchange Rate Volatility Ratio	Exchange Rate	FX/M2Y	Base Money	CPI	Public Prices
6	5.0979	3.4804	1.2788	1.2729	4.2123	83.7271
12	5.1019	3.8479	1.4206	1.2813	4.2531	82.9685
24	5.0579	4.9623	1.5930	1.2638	4.2942	81.6493
36	5.0025	5.9999	1.7353	1.2574	4.3979	80.4325

horizon, dollarization and the exchange rate account for the largest share of the variation in the ratio.

The results from the variance decomposition also show that the CPI accounts for a large proportion of its own variation over the 36-month period, given the observation of an inertial component to the inflation process in Jamaica. The exchange rate also explains a large proportion of its own variation as well as the forecast error variance in the CPI. The variable accounts for 70.1 per cent of its own forecast error variance and 51.4 per cent of the forecast error variance in the CPI, over a 36-month horizon. In addition, the dollarization indicator accounts for an increasing proportion of the variation in the CPI. Base money accounts for a large proportion of its own variation, which is consistent with the authorities' somewhat autonomous influence on the variable.

In summary, although in periods of excess real exchange rate volatility economic agents respond by limiting their foreign currency holdings, exchange rate stability is critical in achieving a sustained reduction in dollarization.

6.0 Conclusion and Policy Recommendations

The paper explored the relevance of financial dollarization to the inflation process in the Jamaican economy. The findings confirm that financial dollarization influences the inflation outcome in a number of ways. Firstly, exchange rate depreciation pressures arising from increased foreign currency holdings stimulate inflationary impulses, due to the relatively high exchange rate pass-through to inflation. The monetary authorities respond by tightening liquidity to limit the conversion to foreign currency. Given the reduction in domestic currency holdings, the fiscal authorities also raise expenditure per capita to increase the yield from the inflation tax. Overall, the results show a sustained increase in the CPI due to the dollarization stimulus.

The results also show that in periods of increases in real exchange rate volatility *vis-à-vis* inflation volatility, economic agents limit their conversion from domestic currency to foreign currency holdings. However, the findings indicate that this is not a critical factor in achieving meaningful reductions in dollarization. The key result of the empirical analysis is that a relatively stable exchange rate is an influential factor

in achieving substantial reductions in dollarization in the domestic economy. In this context, policy decisions to limit dollarization should focus primarily on achieving exchange rate stability.

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