Financial Dollarisation and Exchange Rate Dynamics: The Case of Jamaica

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Abstract

We introduce a novel theory to explain the enigmatic trend stationary depreciation characterising the Jamaican-USD exchange rate instead of the expected random walk. Our model of financial dollarisation underscores households' accumulation of dollar-deposits for hedging against business cycle and exchange rate risks, while firms favour dollar-loans due to their exchange rate-adjusted cost efficiency. Dollar deposits serve as a propagating factor, expanding during depreciation shocks and extending the period of exchange rate deviation from its equilibrium trend. Conversely, dollar loans induce mean-reversion by contracting during depreciation shocks and accelerating the exchange rate's return to its trend depreciation. Although our model accommodates intermittent central bank foreign exchange intervention, this only explains 0.18 percent of the observed mean reversion. Finally, we empirically document that dollar-deposits and dollar-loans engender a trend stationary depreciation, and foreign and (domestic) demand shocks depreciate and (appreciate) the exchange rate when financial dollarisation effects dominate absorption effects.

Keywords: Jamaica, exchange rate, trend stationary depreciation, dollar-loans, dollar-deposits
JEL Classification: E10, F31, F41, O54

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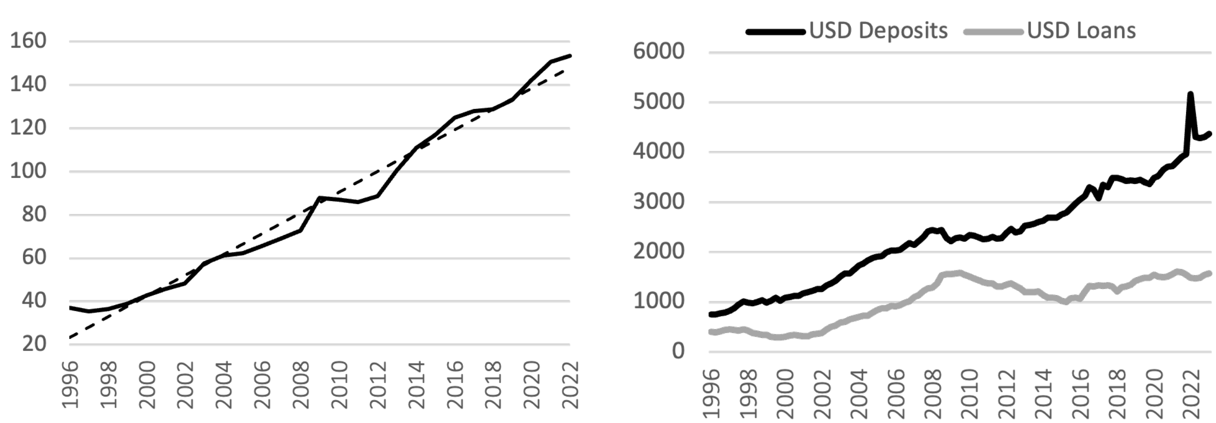
1 Introduction

This article presents evidence that the Jamaica-U.S. nominal exchange rate is consistent with a trend stationary depreciation rather than the expected random walk (Itskhoki 2021; Rogoff 1996); see Figure 1(a). This is the first documentation of a trend stationary depreciation, which adds a new puzzle to the basket of exchange rate puzzles.[1] In our view, this requires an explanation because the Jamaican central bank has recently adopted an inflation-targeting framework, and its credibility and effectiveness rest on a comprehensive understanding of its exchange rate and its role in the monetary policy transmission mechanism. Moreover, we estimate that Jamaica's nominal exchange rate has a half-life of approximately 1.58 years unlike the 3-5 years documented by other studies (Rogoff 1996). Three questions emerge from these facts: (i) What accounts for the stable equilibrium dynamics of Jamaica's nominal exchange rate? (ii) Why is the nominal exchange rate consistently depreciating relative to the U.S. dollar (USD)? (iii) How might one explain the faster speed of convergence to the equilibrium exchange rate compared to other floating regimes?

Figure 1: Exchange Rate and U.S. Dollar-Deposits and Loans

(a) JMD/USD **(b)** Financial Dollarisation



Notes: Data source is the Bank of Jamaica, and JMD and USD refer to Jamaican and US dollars, respectively.

This article proposes a new theory of exchange rate behaviour and empirically evaluates its predictions. The main novelty of our model is that it merges the rich literatures on financial dollarisation and exchange rate dynamics to provide a coherent explanation of the trend stationary

[1] Existing exchange rate puzzles include the Meese and Rogoff (1983) puzzle; a random walk exchange rate behaviour, the forward premium puzzle (Fama 1984); uncovered interest rate parity violation, and the purchasing power parity puzzle; the real exchange rate closely tracks the nominal exchange rate at most frequencies, among others.

depreciation. In our set-up, commercial banks provide loans denominated in USD and accept dollar-deposits, which are consistent with the facts in Jamaica (Bennet 1994); see Figure 1(b). We build on Christiano et al. (2022)'s insurance view and outline that households accumulate wealth in dollar-deposits to insure against business cycle and exchange rate risks. In turn, tradable firms prefer dollar-loans for their convenience, while non-tradable firms borrow dollar-loans because they are cheaper subject to exchange rate risk. Figure 1(b) shows the stock of dollar-deposits exceed the stock of dollar-loans, and this gap expanded after 2008. It is also evident that loan-dollarisation has plateaued in recent years, while deposit-dollarisation grows consistently in Jamaica.

Our theory demonstrates that exchange rate shocks *persist* because of dollar-deposits and are *mean-reverting* on account of dollar-loans and central bank foreign exchange intervention. A depreciation shock is propagated because it reduces local currency wealth in dollar terms and raises the demand for dollar-deposits, which ignites another round of exchange rate depreciation. Conversely, depreciation shocks are mean-reverting as the central bank "leans against the wind", and because higher exchange rate risk contracts the demand for dollar-loans and appreciates the nominal exchange rate. Based on our theory, the exchange rate stability parameter is decomposed as follows, where the scaling factor is the exchange rate propensity of import demand (ϕ).

$$S_t = \left(\frac{\overbrace{\mu_1}^{\text{Dollar-Deposits}} - \overbrace{\kappa_1}^{\text{Dollar-Loans}} - \overbrace{\rho_1}^{\text{FX Intervention}}}{\phi} \right) S_{t-1} \tag{A}$$

Our model also provides an accounting of the trend depreciation and this is realised when the following factors generate an excess demand for foreign exchange: (i) The relative interest rate on dollar-deposits is higher and the relative interest rate on dollar-loans is lower, (ii) The central bank accumulates foreign assets as the magnitude of loan- and deposit-dollarisation increases on consideration of firm- and bank-level balance sheet risks, and (iii) The income propensity of export demand exceeds the income propensity of import demand. The latter channel is counter-intuitive from the perspective of the standard model. Typically, foreign demand shocks appreciate the nominal exchange rate through the export channel, while domestic demand shocks depreciate the exchange rate through the import channel. However, foreign demand shocks also raise the stock of dollar-loans so firms can expand capacity and domestic demand shocks reduce the stock of dollar-deposits as households require less dollar insurance. It follows that foreign and (domestic) demand shocks depreciate and (appreciate) the exchange rate when financial dollarisation effects dominate absorption effects.

We utilise a four-prong empirical strategy and monthly data from the Bank of Jamaica online portal (1996M05-2022M12) to evaluate the predictive power of our theory. First, we document that the nominal exchange rate is trend stationary at conventional levels of statistical significance using three unit root tests. Second, we estimate the nominal exchange rate by Ordinary Least Squares (OLS) as a function of a time trend and its lagged exchange rate, and document a stability parameter value of 0.94. This result serves as a robustness check of the unit root tests since a parameter value less than unity indicates dynamic stability. Third, we decompose the stability parameter into its component parts identified in Equation (A) above. We used three different empirical approaches (modified OLS, dynamic OLS and canonical cointegrating regression) to decompose the stability parameter and derive an average parameter value of 0.88, which approximates our OLS estimate of 0.94. We interpret this result as a positive robustness test of our theory. Moreover, irrespective of the empirical model, dollar-loans weighted by ϕ account for 99 percent of the mean-reversion as compared to central bank intervention. This is not a surprising result unless the central bank targets the trend depreciation, which is not official policy to the best of our knowledge. It follows that dynamic stability of the nominal exchange rate and the shorter half-life are largely determined by the mechanics of loan-dollarisation rather than central bank policy.

Finally, we construct four different measures of the trend exchange rate: (i) a linear trend, (ii) a five-month moving average trend, (iii) a seven-month moving average trend, and (iv) the Hodrick-Prescott filter, and estimate our reduced form solution by dynamic OLS and other techniques. We also include three control variables: relative inflation rates between Jamaica and the U.S., Bank of Jamaica's foreign exchange interventions, and M1 money supply. In three of the four empirical models, loan- and deposit-dollarisation and foreign demand account for the trend stationary exchange rate depreciation. It is worth noting that domestic demand has the expected negative sign and is statistically significant, but quantitatively smaller than foreign demand. Only when the exchange rate is measured by a linear trend are relative demand statistically insignificant. Also, we document mixed results for the inflation differential and central bank interventions, while M1 and relative interest rates on dollar-deposits are robustly insignificant across the models. Further, only in one model is the relative interest rate on dollar-loans statistically significant at the 10 percent level. Overall, the evidence indicates that financial dollarisation drives the trend stationary exchange rate depreciation in Jamaica.

The remainder of the article is organised as follows. Section II surveys the related literature, section III describes the stylised facts that characterise the Jamaican economy, section IV outlines the theoretical model, and section V presents the empirical results. Finally, section VI concludes.

2 Related Literature

Our theory is related to portfolio balance models that underline the importance of relative returns on domestic and foreign bonds and private sector wealth for the determination of exchange rate behaviour (Blanchard and Giavazzi 2005; Dooley and Isard 1983; Branson et al. 1977). The canonical model formulates relative bond demand as a function of arbitrage, and more recent versions rely on persistent violations of uncovered interest rate parity or a "financial shock" to explain exchange rate dynamics in developed economies (Itskhoki and Mukhin 2021). In contrast, our theory explains that the demand for foreign bonds is primarily determined by the desire to insure against business cycle and exchange rate risks as opposed to segmented financial markets with noise traders and limits to arbitrage. This insurance view is consistent with empirical evidence documented by Christiano et al. (2022) and explains why households prefer to hold lower-yield but also lower-risk dollar-deposits in equilibrium.

Another strand of the literature that is closely related to our work is the scholarship on financial dollarisation. Agenor and Khan (1996) propose a model with an optimising household who chooses the desired composition of currency holdings depending on the foreign interest rate and the premium on the parallel foreign exchange market. Ize and Levy-Yeyati (2003) extend the literature by modelling the stock of dollar-loans and dollar-deposits as a portfolio choice determined by second moments, where the volatility in the real exchange rate and inflation determine depositors' choice, and the variance in the real borrowing costs alone explains the demand for dollar-loans. Ize (2005)'s extension accounts for households' safe haven considerations in deposit-dollarisation, and concludes that inflation targeting and a pure float should produce de-dollarisation effects.[2] We depart from the portfolio choice model and second moments formulation to better match the Jamaican case, where inflation volatility is lower and the trend depreciation and deposit-dollarisation reinforce each other. In contrast to this class of models, Catao and Terrones (2000) develop a model of financial dollarisation from the perspective of an optimising bank with two constraints imposed on the model: (i) endogenous loan default and (ii) dollar-loan collateral. In this model, foreign interest rate and exchange rate shocks have ambiguous effects depending on market structure, loan collateralisation, banking costs, and the initial conditions of financial dollarisation. The key limitation of this work is that it omits the demand side, e.g. interest rate and exchange rate shocks only matter if they maximise bank-level dollar-profits. Broda and Levy-Yeyati (2006) take an interesting approach to the supply side. In a world where there is equal treatment of local currency and dollar-

[2] See Berkmen and Cavallo (2010) for evidence to the contrary from a panel of 145 countries between 1970-2003.

deposits in the case of bank liquidation, they demonstrate that a currency depreciation engenders excessive deposit-dollarisation because it is cheaper for banks to finance their projects. We arrive at a similar result through a different channel: dollar-deposits rise to protect household wealth in dollar terms. In more recent work, Christiano et al. (2022) present a simple model where households hold dollar-deposits as insurance against business cycle risks, which yield a lower return but possess lower risk. They close the model with the constraint that dollar-loans must match dollar-deposits in equilibrium and the key insight is that deposit-dollarisation is independent of arbitrage considerations. We extend this work by modelling the demand for dollar-loans and identifying the exchange rate implications of financial dollarisation.

Our article also contributes to the much smaller theoretical literature that models Jamaica's exchange rate behaviour under a floating regime. Franklin and Longmore (2008) propose a three-agent model, where agents are not financially dollarised and the economy is characterised by flexible prices and full employment. In this model, uncovered interest rate parity and purchasing power parity are assumed to hold, and the agents' perfect foresight ensures the system is saddle point stable. These scholars show that the rate of exchange rate depreciation depends on the domestic-foreign monetary growth differential, and the stocks of domestic capital and net foreign assets relative to their steady-state values. Unlike this work, our stable equilibrium dynamics are driven by loan-dollarisation and central bank intervention rather than the assumption of perfect foresight, and we do not impose the parity conditions on our model. In fact, the inflation differential between Jamaica and the U.S. has been trending downwards since the 1990s, which suggests that the relative purchasing power parity model is a poor fit of the trend depreciation (see Figure 3). In more recent work, Aysun (2022) constructs a three-region dynamic stochastic general equilibrium model with nominal and real rigidities to identify the drivers of exchange rate volatility in Jamaica. Crucially, the financial side of the economy is closed by the uncovered interest rate parity condition and neither households nor firms are financially dollarised. Another difference between this study and ours is the variable of interest. Aysun is motivated by exchange rate volatility and appropriately identifies external financial shocks as the key causal factor, while we model Jamaica's trend depreciation.

There are only a handful of recent empirical studies that model Jamaica's equilibrium exchange rate. Franklin and Longmore (2008) utilise monthly data between 2000-2008 and a structural VAR to estimate their model and find that the domestic-foreign monetary growth differential accelerates Jamaica's exchange rate depreciation, while a positive shock to net foreign assets sharply appreciates the nominal exchange rate. Aysun (2022) employ a two variable VAR with exogenous variables for Jamaica between 1997Q1-2021Q1, which includes the nominal exchange rate, interest rates and a global data series as the exogenous variable (e.g., Gold ETF Volatility Index). This model finds that both domestic and external financial shocks determine exchange rate volatility in Jamaica.

In earlier work, Robinson (2010) systematically evaluates competing exchange rate theories using monthly data between 1995-2009. A vector error correction (VEC) model was used to estimate the Jamaica-US bilateral nominal exchange rate, which controlled for relative prices and interest rates, but this model found no evidence of purchasing power parity or uncovered interest rate parity in Jamaica over the review period. This is in contrast to much earlier work by Ghartey (1997), who documents evidence in support of purchasing power parity between 1960Q-1993Q2. Robinson (2010) also utilised a VEC model to estimate the real exchange rate as a function of medium- and long-run factors, and transitory factors. He finds that productivity growth appreciates the real exchange rate, while the domestic-foreign debt differential and higher domestic rates depreciate the Jamaica-US bilateral real exchange rate. Craigwell et al. (2009) take the classical approach and estimate four standard models of the nominal exchange rate in Jamaica. Unlike previous studies surveyed, they employed a dynamic OLS, a much shorter monthly dataset (2000-2008), and controlled for relative inflation rate, relative interest rates, relative M1, central bank intervention, bid-ask spread, and purchase and sales of foreign currencies. The key conclusion is that the micro-based variable improves the overall fit and the explanatory power of the standard models.

It is transparent that the empirical literature does not model the trend depreciation or evaluate the exchange rate implications of financial dollarisation in Jamaica; our work fills this gap.

3 Basic Facts

Jamaica became an independent nation in 1962 and during the post-war period (1950s and 1960s) GDP growth was approximately 7 percent per year. Further, according to World Bank Data, the economy grew in real terms (constant 2015 USD) from about USD 7 billion in 1966 to USD 11 billion in 1972. As of 1970, Jamaica was the world's largest Bauxite producing nation, producing about 12 million tonnes of bauxite per year, which accounted for about one fifth of global output. However, due to a combination of external shocks (e.g. oil price shocks) and domestic dislocations (migration and capital flight), the economy declined after 1972 and did not return to the 1972 level of real GDP until 1990. Figure 2 captures much of this historical evolution. Growth rates are much lower after 1990 as compared to the early post-war years, and the declining importance of bauxite is reflected in a widening trade deficit since the 1990s.

Figure 2: Real GDP Growth Rate & Balance of Trade in Goods and Services (USD)

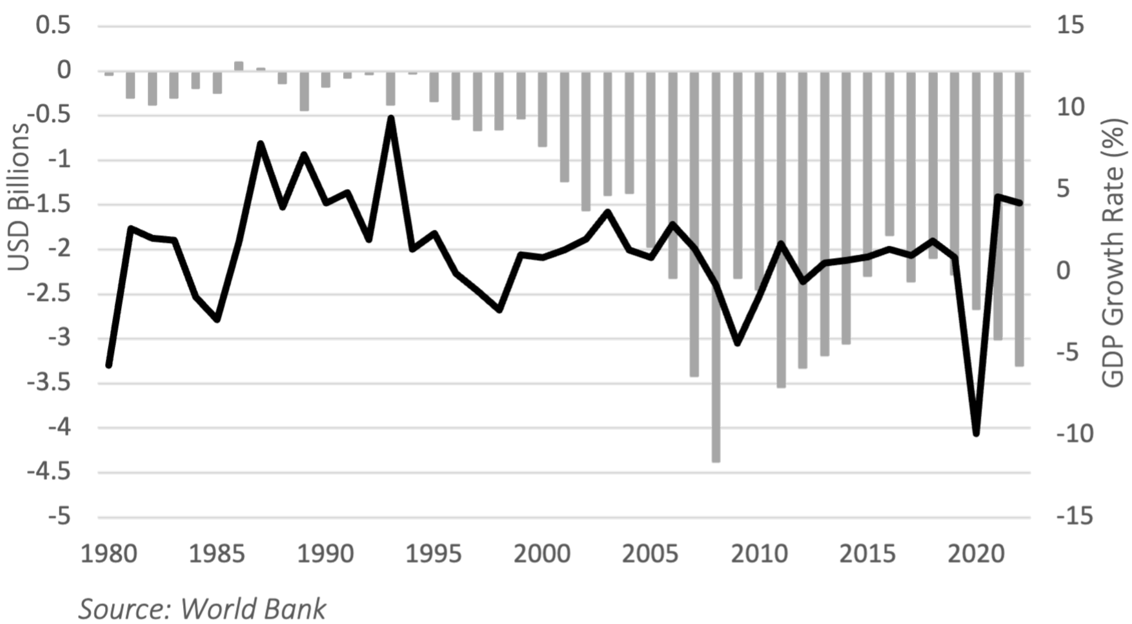
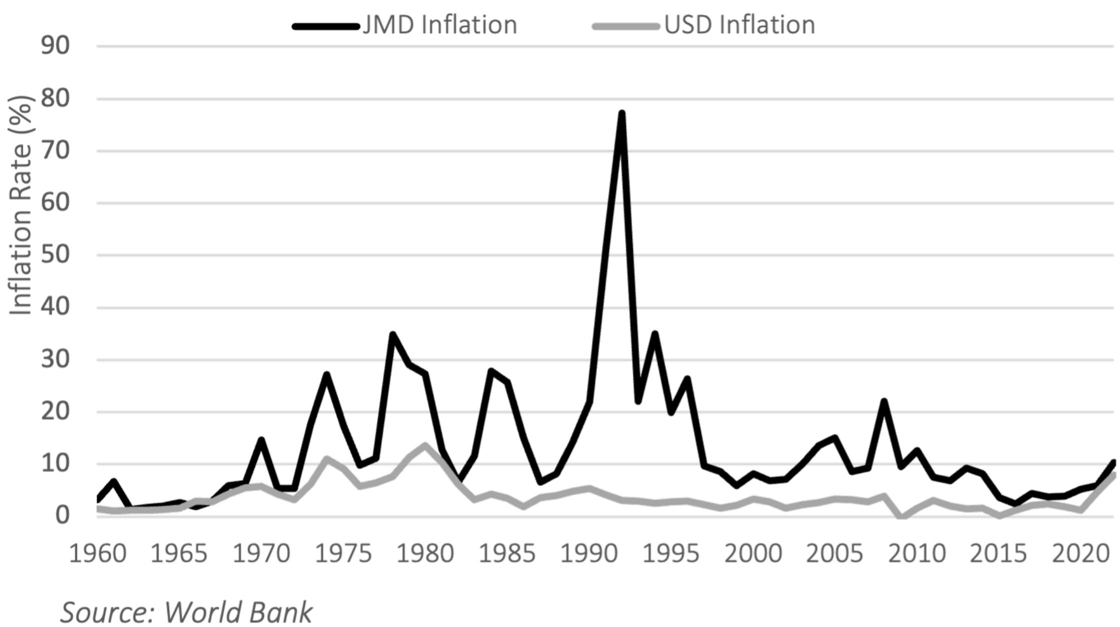


Figure 3 demonstrates why inflationary concerns are central to the Jamaican story as exceptionally high rates are observed in the 1990s, which coincides with the introduction of financial dollarisation (Bennet 1994). Notwithstanding a significant reduction in the rate of inflation during the late 1990s and relative stabilisation in the 2000s, the stock of dollar-deposits and dollar-loans continue to expand (see Figure 1). Following this inflationary history and the introduction of a flexible exchange rate in 1991, the Bank of Jamaica officially announced an inflation-targeting regime in 2017 and occasionally intervenes in the local foreign exchange market to reduce unwarranted exchange rate volatilities. Figure 3 also shows the inflation differential between Jamaica and the U.S. has been trending downwards since the 1990s and more strongly since 2008. This fact is useful to rule out the relative purchasing power parity hypothesis as an explanation for the trend stationary exchange rate depreciation.

Figure 3: Jamaica versus U.S. Inflation Rate



4 Model

This section outlines our theoretical model. Consider a small open economy with a flexible exchange rate that is financially dollarised, i.e., the banking sector issues loans and deposits denominated in U.S. dollars to households and firms. Households insure their wealth holdings against business cycle risks and exchange rate depreciations by accumulating dollar-deposits; though local currency-deposits yield a higher nominal return. Moreover, tradable firms prefer dollar-loans for their convenience, while non-tradable firms borrow dollar-loans because they are cheaper but subject to exchange rate risk. Further, exporting firms utilise the Dominant Currency Pricing strategy, where goods and services are priced in US Dollars. Also, households have a foreign bias in consumption, and domestic and foreign goods are imperfect substitutes, which implies limited expenditure switching effects.

The foreign exchange market clearing condition is outlined below:

$$X_t - M_t = \Delta F_{CBt} + \Delta L_{Ft} + \Delta D_{Ft}, \tag{1}$$

where X_t and M_t are export and import demand, and ΔF_{CBt}, ΔL_{Ft}, and ΔD_{Ft} refer to the change in the stock of foreign assets held by the central bank, change in dollar-loans, and dollar-deposits in the banking system, respectively. It is transparent that exports (X_t) represent the source of foreign exchange and $\Delta F_{CBt} + \Delta L_{Ft} + \Delta D_{Ft} + M_t$ reflect the various uses of foreign exchange. It is worth underlining that this formulation is stylised as it omits remittance and foreign direct investment flows for simplicity without any loss of generality.

In turn, export and import demand are specified as follows:

$$X_t = \alpha + \beta Y_{Ft} \tag{2}$$

$$M_t = \gamma + \varepsilon Y_t - \phi S_t, \tag{3}$$

where Y_{Ft} indicates external demand, domestic income is given by Y_t, S_t is the nominal exchange rate, and α and γ are constants. An increase in S_t indicates a nominal depreciation of the local currency relative to the USD, and Equation (2) omits the nominal exchange rate because exports are priced in USD.

Substitution of Equations (2-3) into (1) yields:

$$S_t = \frac{\Delta F_{CBt} + \Delta L_{Ft} + \Delta D_{Ft} + \gamma - \alpha + \varepsilon Y_t - \beta Y_{Ft}}{\phi}. \tag{4}$$

This result indicates that the *accumulation* of dollar-assets by households, firms, and/or the central bank depreciates the nominal exchange rate, while relative incomes have the familiar effect.

4.1 Financial Dollarisation

This sub-section presents simple models that capture the dynamics of financial dollarisation. Equation (5a) models the change in dollar-denominated loans as the difference between firms' *target* stock of dollar-loans and the size of dollar-loans in period $t-1$, where $0 < \lambda < 1$.

$$\Delta L_{Ft} = L^T_{Ft} - \lambda L_{Ft-1} \tag{5a}$$

Firms that operate in the non-tradable sector lower their target stock of dollar-loans when they expect the nominal exchange rate to depreciate as exchange rate risks are higher. In turn, the expected exchange rate is determined by the spot exchange rate in the previous period (S_{t-1}) as shown in Equation (5b). Also, firms lower their target if the interest rate on dollar-loans rises (r^F_{Ft-1}) relative to local currency loans (r_{Lt-1}), which captures the relative cost channel. Finally, the target stock of dollar-loans rises to expand production capacity as foreign demand increases.[3]

$$L_{Ft}^{T} = \kappa_0 - \kappa_1 S_{t-1} - \kappa_2 (r_{L\,t-1}^{F} - r_{Lt-1}) + \kappa_3 Y_{Ft} \tag{5b}$$

Substitution of (5b) into (5a) yields the dynamics of dollar-loans:

$$\Delta L_{Ft} = \kappa_0 - \kappa_1 S_{t-1} - \kappa_2 (r_{L\,t-1}^{F} - r_{Lt-1}) + \kappa_3 Y_{Ft} - \lambda L_{Ft-1}. \tag{5c}$$

Lemma 4.1 summarises the effect of an exchange rate shock on the dynamics of dollar-loans.

Lemma 4.1 (Exchange rate risk and dollar-denominated loans)**.** *A depreciation (appreciation) shock in period $t-1$ decreases (increases) the accumulation of dollar-loans.*

Proof.

$$\frac{\partial \Delta L_{Ft}}{\partial S_{t-1}} = -\kappa_1$$

□

A key implication of this result is that dollar-denominated loans serve as a mean-reverting factor, which is outlined below.

Proposition 4.1 (Mean reversion and dollar-denominated loans)**.** *Given an exchange rate shock in period $t-1$, say, a depreciation shock, the higher exchange rate risk reduces the accumulation of dollar-loans and appreciates the nominal exchange rate in period t.*

Proof. This follows directly from Lemma 4.1 and Equation (4). □

The basic intuition is that a depreciation shock raises exchange rate risk and loan repayment in local currency terms for firms that operate in the non-tradable sectors. Consequently, firms lower their target stock of dollar-loans and by extension, their demand for foreign exchange. Thus, the depreciation shock is mean reverting as the reduced demand for dollar-loans appreciates the nominal exchange rate.

Analogously, Equation (6a) illustrates the dynamics of dollar-deposits, where D_{Ft}^{T} indicates households' target stock of dollar-deposits, D_{Ft-1} represents the stock of dollar-deposits in period $t-1$, and $0 < \psi < 1$.

[3] See Corrales and Imam (2021), Fidrmuc et al. (2013), and Brown et al. (2011) for empirical evidence in support of our model of loan-dollarisation.

$$\Delta D_{Ft} = D^T_{Ft} - \psi D_{Ft-1} \tag{6a}$$

Consistent with the literature, households raise their target stock of dollar-deposits if they expect a nominal depreciation of the exchange rate (Equation 6b). The intuition is that a depreciation shock reduces real wealth holdings in dollar terms and thereby, foreign-biased consumption and welfare. Equation (6b) also admits the possible effects on dollar-deposits given some change in relative interest rates. For example, households may increase their target if the interest rate on dollar-deposits (r^F_{Dt-1}) rise relative to local currency deposits (r_{Dt-1}). Finally, since dollar-deposits serve an insurance policy against exchange rate and business cycle risks, a positive shock to domestic income lowers households' target stock of dollar-deposits.[4]

$$D^T_{Ft} = \mu_0 + \mu_1 S_{t-1} + \mu_2 (r^F_{Dt-1} - r_{Dt-1}) - \mu_3 Y_t \tag{6b}$$

Substitution of (6b) into (6a) yields the dynamics of dollar-deposits:

$$\Delta D_{Ft} = \mu_0 + \mu_1 S_{t-1} + \mu_2 (r^F_{Dt-1} - r_{Dt-1}) - \mu_3 Y_t - \psi D_{Ft-1}. \tag{6c}$$

Lemma 4.2 summarises the insurance hypothesis.

Lemma 4.2 (Dollar-deposits as an insurance policy)**.** *A depreciation (appreciation) shock in period* $t-1$ *increases (decreases) the acquisition of dollar-deposits.*

Proof.

$$\frac{\partial \Delta D_{Ft}}{\partial S_{t-1}} = \mu_1$$

□

This result implies that dollar-deposits serve as a propagating factor of exchange rate shocks, which is summarised below.

Proposition 4.2 (Dollar-deposits as the propagating factor)**.** *Given an exchange rate shock in period* $t-1$*, say, a depreciation shock, households expect their real wealth holdings and welfare to fall in dollar terms. Consequently, they accumulate dollar-deposits, which depreciate the nominal exchange rate in period* t*.*

[4] See Arteta (2005), Levy-Yeyati and Rey (2006) and Honohan (2008) for empirical evidence in support of our model of deposit-dollarisation.

Proof. This follows directly from Lemma 4.2 and Equation (4). □

Few small open economies operate a pure float and it has become standard practice by inflation-targeting central banks to smooth out exchange rate fluctuations by periodic interventions in the local foreign exchange market; and Jamaica is no exception. To model this practice, we specify an Equation of motion of the foreign assets held by the central bank in (7a). This formulation explains that the central bank accumulates foreign assets when it buys (F_t^B) more foreign assets than it sells (F_t^S) in the local market.

$$\Delta F_{CBt} = F_t^B - F_t^S \tag{7a}$$

In turn, the central bank purchases foreign assets when the magnitude of financial dollarisation increases to lean against balance sheet risks—firm-level and bank-level balance sheet risks increase with the stock of dollar-loans and dollar-deposits, respectively. Macro-prudential policy requires that the central bank accumulate foreign assets to insure against the risk of firm- and/or bank-level external debt distress or default, which may require bailouts and exchange rate stabilisation.

$$F_t^B = \eta_0 + \eta_1 L_{Ft-1} + \eta_2 D_{Ft-1} \tag{7b}$$

Conversely, the central bank sells foreign assets to the local market to smooth out exchange rate fluctuations.

$$F_t^S = \rho_0 + \rho_1 S_{t-1} \tag{7c}$$

Substitution of Equations (7b) and (7c) into (7a) yields:

$$\Delta F_{CBt} = \eta_0 + \eta_1 L_{Ft-1} + \eta_2 D_{Ft-1} - \rho_0 - \rho_1 S_{t-1}. \tag{7d}$$

The following result underlines that the central bank leans against the proverbial wind.

Lemma 4.3 (Foreign exchange intervention)**.** *Given a depreciation (appreciation) shock in period* $t-1$*, the central bank decumulates (accumulates) foreign assets to stabilise the exchange rate.*

Proof.

$$\frac{\partial \Delta F_{CBt}}{\partial S_{t-1}} = -\rho_1$$

□

It follows that both dollar-loans and central bank interventions in the foreign exchange market ensure that exchange rate shocks are mean reverting.

Proposition 4.3 (Mean reversion and foreign exchange intervention)**.** *Given an exchange rate shock in period $t-1$, say, a depreciation shock, the central bank sells foreign currencies in the local foreign exchange market and appreciates the exchange rate in period t.*

Proof. This follows directly from Lemma 4.3 and Equation (4). □

4.2 Steady-State Equilibrium

This sub-section derives the long-run nominal exchange rate and evaluates its stability properties. Substitution of Equations (5c), (6c), and (7d) into (4) yields the following dynamic Equation, where $\chi = \gamma - \alpha + \eta_0 - \rho_0 + \kappa_0 + \mu_0$ and $\varphi = \mu_2(r^F_{Dt-1} - r_{Dt-1}) - \kappa_2(r^F_{Lt-1} - r_{Lt-1})$.

$$S_t = \frac{\chi \overbrace{+\varphi}^{\text{Relative Interest Rates}} + \overbrace{(\mu_1 - \kappa_1 - \rho_1)}^{\text{Stability Parameter}} S_{t-1} \overbrace{+(\eta_1 - \lambda)L_{Ft-1} + (\eta_2 - \psi)D_{Ft-1}}^{\text{Financial Dollarisation}}}{\phi} + \frac{\overbrace{(\varepsilon - \mu_3)Y_t + (\kappa_3 - \beta)Y_{Ft}}^{\text{Trade Propensities}}}{\phi} \tag{8}$$

The general solution of the model is given by:

$$S_t = \frac{S_0 - S^*(\mu_1 - \kappa_1 - \rho_1)^t}{\phi} + \frac{\overbrace{\chi + \varphi + (\eta_1 - \lambda)L_{Ft-1} + (\eta_2 - \psi)D_{Ft-1} + (\varepsilon - \mu_3)Y_t + (\kappa_3 - \beta)Y_{Ft}}^{\text{Trend or Steady-State Nominal Exchange Rate}}}{\phi[1 - (\mu_1 - \kappa_1 - \rho_1)]}, \tag{9}$$

where $\phi[1-(\mu_1-\kappa_1-\rho_1)] > 0$ and S^* is the long-run nominal exchange rate. Given $\frac{S_0 - S^*(\mu_1-\kappa_1-\rho_1)^t}{\phi}$, when $S_0 = S^*$, Equation (9) collapses to the long-run nominal exchange rate ($\lim_{t\to\infty} S_t \equiv S^*$):

$$S_t = \frac{\chi + \varphi + (\eta_1 - \lambda)L_{Ft-1} + (\eta_2 - \psi)D_{Ft-1} + (\varepsilon - \mu_3)Y_t + (\kappa_3 - \beta)Y_{Ft}}{\phi[1 - (\mu_1 - \kappa_1 - \rho_1)]}. \tag{10}$$

Equation (10) indicates that the long-run exchange rate is determined by the relative interest rates, the degree of financial dollarisation, and the weighted foreign trade propensities. The following result outlines the condition for a long-run trend depreciation of the nominal exchange rate.

Proposition 4.4 (Trend depreciation of the nominal exchange rate)**.** *A trend depreciation of the nominal exchange rate is realised when:*

(i) The relative interest rate on dollar-deposits is higher ($r^F_{Dt-1} > r_{Dt-1}$) and the relative interest rate on dollar-loans is lower ($r^F_{L\,t-1} < r_{Lt-1}$) $\rightarrow$($\varphi > 0$),

(ii) The central bank is more responsive than firms and households to the magnitude of loan- and deposit-dollarisation on consideration of balance sheet risks, such that, $\eta_1 - \lambda > 0$ and $\eta_2 - \psi > 0$, and

(iii) The income propensity of import demand is less than the income propensity of export demand $(\kappa_3 - \beta)Y_{Ft} > (\varepsilon - \mu_3)Y_t$.

Proof. This follows directly from Equation (10). □

Items (i) and (ii) are transparent but it is worth clarifying point (iii). Note carefully that relative income shocks have ambiguous effects depending on the difference between $(\kappa_3 - \beta)Y_{Ft}$ and $(\varepsilon - \mu_3)Y_t$. Typically, foreign demand shocks appreciate the nominal exchange rate through the export channel, but they also raise the stock of dollar-loans in a world of financial dollarisation, which may depreciate the exchange rate. Ergo, when financial dollarisation effects dominate the export channel, foreign demand shocks depreciate the nominal exchange rate. Similarly, while domestic demand shocks depreciate the nominal exchange rate through the import channel, they also lower the stock of dollar-deposits and appreciate the nominal exchange rate. It follows that domestic demand shocks may appreciate the exchange rate if the financial dollarisation effects dominate.

The exchange rate dynamics are non-oscillatory and converges to the long-run trend *if and only if*:

$$0 < \frac{\overbrace{\mu_1}^{\text{Propagating Factor: Dollar-Deposits}}}{\phi} - \frac{\overbrace{\kappa_1}^{\text{Mean-Reverting Factor: Dollar-Loans}}}{\phi} - \frac{\overbrace{\rho_1}^{\text{Mean-Reverting Factor: FX Intervention}}}{\phi} < 1. \tag{11}$$

The following result identifies the factors that determine exchange rate stability.

Lemma 4.4 (Dynamic stability or stationarity). *Dynamic stability is determined by how responsive the following factors are to exchange rate shocks in period $t-1$ weighted by ϕ:*

(i) Households' accumulation of dollar-deposits (μ_1),

(ii) Firms' accumulation of dollar-loans (κ_1), and

(iii) The Central Bank's accumulation of foreign assets (ρ_1).

Proof. This follows directly from Relation (11). □

This result implies the following about the speed of convergence to the steady-state nominal exchange rate.

Proposition 4.5 (Speed of convergence to the steady-state). *The more responsive are dollar-deposits to exchange rate shocks (μ_1), the slower the speed of convergence; and the more responsive are imports (ϕ), dollar-loans, and central bank interventions to exchange rate shocks (κ_1, ρ_1), the faster the speed of convergence.*

$$\textit{Speed of convergence} = \frac{\phi}{\mu_1 - \kappa_1 - \rho_1}$$

Proof. This follows directly from Lemma 4.4. □

The intuition is that depreciation shocks to the nominal exchange rate reduce wealth and welfare in dollar terms, and force households to accumulate dollar-deposits, which further depreciate the exchange rate and thereby, propagate the initial shock, leading to a lower speed of convergence. The reverse is true of the mean-reverting factors.

Theorem 4.1 summarises the main result and the long-run implication of a financially-dollarised economy with a flexible exchange rate regime.

Theorem 4.1 (Trend stationary exchange rate depreciation). *A financially-dollarised economy with a flexible exchange rate and occasional central bank intervention generates a trend stationary exchange rate depreciation.*

Proof. This follows directly from Lemma 4.4 and Proposition 4.4. □

5 Empirical Strategy

This sub-section outlines the empirical strategy to evaluate the implications of our model. The main hypotheses are: (i) Dollar-loans and dollar-deposits are important drivers of the trend depreciation, (ii) Foreign and (domestic) demand shocks depreciate and (appreciate) the nominal exchange rate when financial dollarisation effects dominate the trade channel, and (iii) Exchange rate stationarity is causally related to dollar-loans and central bank foreign exchange interventions.

Our empirical strategy is four-fold: (i) we utilise three unit root tests to determine if Jamaica's nominal exchange rate is trend stationary; (ii) next, we estimate the nominal exchange rate by OLS as a function of a time trend and its lagged exchange rate to estimate the stability parameter; (iii) then, we decompose the stability parameter it into its component parts $(\mu_1 - \kappa_1 - \rho_1)/\phi$ as a robustness check of our theory by estimating Equations (5c), (6c) and (7d) by fully modified OLS, dynamic OLS and canonical cointegrating regression;[5] and (iv) finally, we estimate Equation (10) by dynamic OLS to empirically identify the determinants of the trend stationary depreciation. The dataset is sourced from the Bank of Jamaica online portal.

5.1 Unit Root and Dynamic Stability Results

Table 1 summaries the results of three unit-root tests: the Augmented Dickey Fuller (ADF) test, Phillips Perron (PP) test, and the Kwiatkowski-Phillips-Schmidt-Shin (KPSS) test. We undertake the ADF and PP tests to evaluate the null hypothesis that the nominal exchange has a unit root and include a constant and a linear trend. Both tests reject the null hypothesis at the 99% confidence level and the linear trend is statistically significant. We perform a KPSS test and include a constant and a liner trend to evaluate the null hypothesis that the nominal exchange rate is stationary. We fail to reject the null hypothesis at conventional levels of statistical significance; see Table 1. Moreover, the linear trend is statistically significant across the three unit root tests, which is consistent with a nominal exchange rate that is trend stationary (Lemma 4.4).

Next, we estimate a simple dynamic model of the exchange rate to calculate the speed of convergence to the steady state and robustly evaluate Lemma 4.4. The result below shows the stability coefficient $0 < 0.947641 < 1$ satisfies the stability criterion in relation (11), which reinforces the results in Table 1. A stability parameter of about 0.95 implies a half-life of approximately 1.58 years or 3.18 years to the steady-state equilibrium.

[5]The fully modified OLS and canonical cointegrating regressions produce almost identical results, so we only report the dynamic OLS results.

Table 1: Unit Root Tests

	Augmented Dickey-Fuller Test	Phillips-Perron Test	Kwiatkowski-Phillips-Schmidt-Shin Test
Null Hypothesis	FXR has a unit root	FXR has a unit root	FXR is stationary
Constant	YES*	YES*	YES*
Linear Trend	YES*	YES*	YES*
Test Statistic	-3.5021**	-3.449**	0.383*
Sample	1996M05-2023M03	1996M05-2023M03	1996M05-2023M03
Observations	323	326	327

Notes: * and ** indicate 99% and 95% statistical significance, respectively, and Schwartz Information Criterion determined the optimal lag selection.

$$FXR_t = \underbrace{0.947641 FXR_{t-1}}_{(0.014297)} + \underbrace{0.021973 TREND}_{(0.005742)} + \underbrace{1.261618}_{(0.338883)}$$

$Adj.\ R^2 = 0.998;\quad F\ Statistic = 94081.87;\ Obs = 326;\ Sample = 1996M01 - 2020M03.$

Based on our theory, the component parts of the stability parameter must approximate the following: $(\mu_1 - \kappa_1 - \rho_1)/\phi \approx 0.947641$. To that end, we estimate Equations (5c), (6c), and (7d) to derive μ_1, κ_1, ρ_1 and calculate ϕ from Prati et al. (2011). The import elasticity for a given year is $\omega_M = \frac{\phi S_t}{M_t}$, and after rearranging the annual import coefficient is $\phi = \frac{\omega_M M_t}{S_t}$. We utilised annual data from Prati et al. (2011) to construct ϕ over the period 1996–2022, and obtain an average coefficient estimate of 13, 165.

Table 2 presents a decomposition of the stability parameter by three different empirical approaches, which produce consistent results. Based on the fully modified OLS, dynamic OLS, and canonical cointegrating regression, the stability parameter is 0.877, 0.891, and 0.879, respectively. These results reasonably approximate the estimated coefficient of 0.947. Moreover, irrespective of the empirical model, dollar-loans weighted by ϕ account for the super-majority of the mean-reversion as compared to central bank intervention. It is transparent that κ_1 is significantly larger than ρ_1 in each of the estimated models. It follows that dynamic stability of the nominal exchange rate is largely determined by the mechanics of loan-dollarisation rather than central bank policy. There is no reason to expect a different result; typically, inflation-targeting central banks occasionally intervene in the foreign exchange to arrest excess volatility rather than anchor the exchange rate along a deterministic trend.

Table 2: Decomposition of the Stability Parameter (Robustness Check)

Parameters	Fully Modified OLS	Dynamic OLS	Canonical Cointegrating Regression
Dollar-Deposits (μ_1)	21,730 (t-stat = 17.73*)	21,740 (t-stat = 18.6*)	21,720 (t-stat = 19.6*)
Dollar-Loans (κ_1)	10, 192 (t-stat = 6.68*)	10,022 (t-stat = 6.37*)	10,152 (t-stat = 6.74*)
Central Bank FXI (ρ_1)	6.2 (t-stat = 7.37*)	8.9 (t-stat = 6.86*)	7.4 (t-stat = 7.37*)
FXR Propensity of M (ϕ)	13165	13165	13165
$\frac{\mu_1-\kappa_1-\rho_1}{\phi}$	0.877	0.891	0.879

Notes: *, **, and *** indicate 99%, 95%, and 90% statistical significance, respectively. Also, ϕ is based on the import elasticity estimate of Prati et al. (2011).

5.2 Determinants of the Trend Depreciation

We construct four trend measures: (i) a linear trend, (ii) a five-month moving average trend, (iii) a seven-month moving average trend, and (iv) the Hodrick-Prescott filter to robustly identify the determinants of the trend depreciation. The dynamic OLS results are presented in Tables 3 and 4. Similar results are also obtained by the fully modified OLS and canonical cointegration methods, so we do not report these here. The variables of interest are foreign demand, domestic demand, deposit spread, loan spread, FX loans and FX deposits. Domestic demand is approximated by the level of Jamaica's real GDP, while foreign demand is proxied by the level of employment in the United States.[6] The deposit and loan spreads indicate the difference between Jamaican-dollar interest rate and dollar-deposit interest rate in the Jamaican banking system, while the loan spread is the difference between the rate charged by banks for Jamaican-dollar loans relative to dollar-loans. We also include three control variables: the relative inflation rates between Jamaica and the U.S.A, Bank of Jamaica's foreign exchange interventions, and the M1 money supply.

Tables 3 and 4 show the results for the linear and the 5-month moving average trends. Across the two estimation results, dollar-loans and dollar-deposits have the expected sign and strong mag-

[6]The monthly employment statistics were obtained from the Federal Reserve Economic Data by the Federal Reserve Bank of St. Louis (https://fred.stlouisfed.org).

nitude. However, a change in dollar-deposits has a stronger effect on trend depreciation. Each model is first estimated with both stationary and non-stationary variables (general model), after which a parsimonious model with only non-stationary variables is estimated for the purpose of robustness and testing for cointegration. The stationary variables are relative inflation, loan spread and deposit spread, while all other variables are non-stationary.

Consider first the linear trend and general model, a \$100,000 increase in dollar-deposits depreciates the trend exchange rate by J\$2.66, all other things remaining constant; while a similar magnitude increase in dollar-loans depreciates the trend by J\$1.39. Similar results are obtained by the parsimonious model with only non-stationary variables: a \$100,000 increase in dollar-deposits depreciates the exchange rate trend by J\$2.13 and an identical magnitude increase in dollar-loans produces a trend depreciation of J\$2.34. The respective magnitudes of a \$100,000 increase in dollar-deposits and dollar-loans are J\$2.57 and J\$1.96 when the 5-month moving average is used as the trend; while the trend increase in the exchange rate is J\$2.85 and J\$1.51 for the accompanying parsimonious model.

Foreign and domestic demand also produce statistically significant effects as well as strong magnitude effects on the linear and 5-month moving average trend. In the case of the expanded linear-trend model, a 10,000 increase in U.S. employment depreciates the exchange rate by J\$4.91, ceteris paribus, which indicates that financial dollarisation effects dominate the export channel. Conversely, a 10,000 increase of Jamaica's real GDP appreciates the exchange rate by J\$2.61, assuming everything else is constant, which also demonstrates that the financial dollarisation effects dominate the import channel. In the case of the parsimonious linear-trend model, the magnitudes are quite strong but the signs stay the same. The 5-month moving average also yields statistically significant effects of foreign and domestic demand as well as economically significant magnitude effects. One might argue that the magnitude effects are very large, but these results hold when all things are constant. In practice, all the variables are changing at the same time, thereby producing a net effect on the trend.

The signs of the foreign and domestic demand might appear counterintuitive from the perspective of the standard framework. However, once we consider the impact of loan and deposit dollarisation as we have in our model, the signs are consistent with dominant financial dollarisation effects. In a classic absorption model, a rise in foreign demand for the country's exports appreciates the currency, all things remaining constant. However, strong foreign demand requires that firms borrow in dollars at home to expand production capacity, which depreciates the exchange rate. Moreover, the conventional absorption approach underlines that higher domestic demand increases imports and depreciates the exchange rate. However, a higher domestic income also lowers the insurance premium of dollar-assets, so households dishoard dollar-deposits, which appreciates the nominal exchange rate.

The interest rate spread variables do not produce strong statistical significance when using the linear and 5-month moving average trends. Similarly, the money supply and relative inflation yield statistically insignificant results.

Tables 5 and 6 presents the results for the 7-mth moving average and HP filter trends. Dollar-deposits and dollar-loans are economically significant, engendering strong magnitude effects across the two trends. For example, a \$100,000 increase in dollar-deposits depreciates the trend by J\$2.59 for the 7-month moving average and by J\$2.34 for the HP filter. As it relates to the parsimonious model, the increase of \$100,000 in dollar-deposits depreciates the trend by J\$2.9 for the 7-month moving average and by J\$3.24 for the HP trend. These results are statistically significant at the 99% confidence level.

A \$100,000 increase in dollar-loans depreciates the trend by J\$1.51 for the 7-month moving average and by J\$1.51 for the HP filter; while for the parsimonious model the effects are J\$1.45 and J\$0.928, respectively. In general, the statistical significance occurs at the 99% confidence level except for the parsimonious model using the HP trend, where the significance is at the 90% level.

Similar to the results in Table 4, the signs on the domestic and foreign demand in both models show that financial dollarisation effects dominate the trade channel. These are also strongly statistically significant at the 99% confidence level across models. The interest rate spread variables are again statistically insignificant regardless of which trend method is used. However, the results for the BOJ intervention is mixed; being statistically significant at the 95% level for the general model and 90% significance for the parsimonious one when the 7-month moving average trend is used. These results do not hold for the estimates using the HP trend. Nevertheless, the negative sign on the coefficient across models indicates that the best the BOJ can accomplish is to lean against foreign exchange market pressure, where the central bank sells hard currency when the rate depreciates and accumulates foreign reserves when the market pressure is diminished. The latter result with respect to FX intervention is similar to that observed in Papua New Guinea and elsewhere (Direye and Khemraj 2021). Also, the estimates with respect to the relative inflation rate is not strong regardless of which model is estimated.

Finally, Tables 3-6 also report the single-equation cointegration test results. In the linear case, the cointegration result is mixed. The Philips-Quliaris test rejects the null of no-cointegration, but the Engel-Granger test fails to reject this hypothesis. However, the 5-month moving average gives statistically significant results at the 99% confidence level for both the Philips-Quliaris and the Engel-Granger tests. The 7-month moving average produces strong cointegration results for both tests, while the HP trend provides test results that reject the null of no-cointegration at the 99% confidence level for the Philips-Quliaris test and at the 90% level for the Engel-Granger test. Therefore, we can conclude that there is strong evidence supporting the long-term trend relationship and its determinants.

6 Conclusion

This article proposes and tests a novel theory of exchange rate determination in the case of a financially dollarised economy. The key motivation for this work is the empirical observation that the Jamaican-USD exchange rate follows a trend stationary exchange rate depreciation since 1996 instead of the expected random walk. Our theory has three merits: (i) It nests the uncovered interest rate parity; portfolio balance and absorption theories of exchange rate determination; (ii) Admits stock-flow consistency, and (iii) Accounts for occasional FX intervention by the central bank. A key result is that the nominal exchange rate becomes trend stationary when an economy is financial dollarised as dollar-deposits and dollar-loans serve as propagating and mean-reverting factors, respectively. We find strong evidence that Jamaica's nominal exchange rate is trend stationary, and dollar-loans and dollar-deposits are statistically significant drivers of its trend depreciation. Moreover, we document that financial dollarisation effects dominate the trade channel, whereby, foreign and domestic demand depreciates and appreciates the nominal exchange rate, respectively.

This work has several implications. First, the widely documented random walk requires the qualification that this holds when households and firms are not financially dollarised. Second, the trend depreciation in Jamaica may anchor inflation expectations, all things equal, which implies that the nominal exchange rate is more volatile than the inflation rate. Typically, floating regimes require an inflation targeting central bank to stabilise prices (Itskhoki 2021; Itskhoki and Mukhin 2021), but the juxtaposition of the Jamaican foreign exchange market and financial dollarisation may perform this function independent of the central bank. Third, financial dollarisation can undermine the monetary transmission mechanism of the benchmark model given the nexus between dollar-loans and the nominal exchange rate. For example, say, the central bank aims to lower inflation by raising the policy rate, which appreciates the nominal exchange rate. Then, the appreciated currency lowers exchange rate risk and may increase firms' demand for dollar-loans, which expands investment and raises the inflation rate—contrary to the central bank's aim. It follows that the benchmark model of the open economy monetary transmission mechanism must be appropriately modified to account for financial dollarisation.

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Table 3: FX Trend (Linear)

Dependent Variable: FX Trend (Linear)	General Model			Simplified Model		
Independent Variable	Coefficient	Std. Error	t-Stat	Coefficient	Std. Error	t-Stat
FX Deposits	0.0000266	0.00000495	5.37*	0.0000213	0.00000317	6.72*
FX Loans	0.0000139	0.00000527	2.63*	0.0000234	0.00000423	5.55*
Foreign Demand	0.000491	0.000557	0.88	0.002046	0.00369	5.55*
Domestic Demand	-0.000262	0.000344	-0.76	-0.000941	0.00022	-4.28*
Spread: Deposit	1.385359	0.951648	1.46			
Spread: Loan	0.949362	0.490845	1.93***			
Money Supply (domestic)	-0.00000413	0.0000286	-0.14			
NIR: Bank of Jamaica	-0.004674	0.002254	-2.07**	-0.004158	0.002036	-2.04**
US-Jam Inflation Diff	-0.373638	0.23211	-1.61			
Constant	-13.14801	41.69308	-0.32	-99.62936	33.50721	-2.97*
Adjusted R-squared	0.977			0.960		
Cointegration Tests						
Phillips-Ouliaris	H0: No cointegration	tau-stat: -6.56*				
Engel-Granger	H0: No cointegration	tau-stat: -3.92				
Method: Dynamic Least Squares						
Sample: 1996M05-2022M12						
Fixed leads and lags (lead=1, lag=1)						

Notes: *, **, and *** indicate 99%, 95%, and 90% statistical significance, respectively.

Table 4: FX Trend (5-Mth. Moving Average)

FX Trend (5-Mth. Moving Average)	General Model			Simplified Model		
Independent Variable	Coefficient	Std. Error	t-Stat	Coefficient	Std. Error	t-Stat
FX Deposits	0.0000257	0.00000393	6.54*	0.0000285	0.0000034	8.39*
FX Loans	0.0000196	0.00000546	3.59*	0.0000151	0.00000453	3.33*
Foreign Demand	0.001665	0.000491	3.39*	0.001862	0.000399	4.67*
Domestic Demand	-0.000333	0.000333	-2.89*	-0.001257	0.000237	-5.31*
Spread: Deposit	0.331225	1.05035	0.32			
Spread: Loan	0.515264	0.532047	0.97			
Money Supply (domestic)	0.0000249	0.0000288	0.86			
NIR: Bank of Jamaica	-0.00495	0.002545	-1.94***	-0.004068	0.002173	-1.87***
US-Jam Inflation Diff	-0.720611	0.258712	-2.79*			
Constant	-51.91459	39.75322	-1.31	-25.56419	35.88404	-0.71
Adjusted R-squared	0.954			0.949		
Cointegration Tests						
Phillips-Ouliaris	H0: No cointegration	tau-stat: -7.38*				
Engel-Granger	H0: No cointegration	tau-stat: -5.13*				
Method: Dynamic Least Squares						
Sample: 1996M05-2022M12						
Fixed leads and lags (lead=1, lag=1)						

Notes: *, **, and *** indicate 99%, 95%, and 90% statistical significance, respectively.

Table 5: FX Trend (7-Mth. Moving Average)

FX Trend (7-Mth. Moving Average)	General Model			Simplified Model		
Independent Variable	Coefficient	Std. Error	t-Stat	Coefficient	Std. Error	t-Stat
FX Deposits	0.0000259	0.00000402	6.44*	0.000029	0.00000347	8.37*
FX Loans	0.0000191	0.00000559	3.41*	0.0000145	0.00000462	3.13*
Foreign Demand	0.001612	0.000504	3.20*	0.001787	0.000409	4.37*
Domestic Demand	-0.000906	0.000344	-2.64*	-0.001228	0.000242	-5.07*
Spread: Deposit	0.499336	1.073328	0.47			
Spread: Loan	0.506133	0.544254	0.93			
Money Supply (domestic)	0.0000306	0.0000299	1.02			
NIR: Bank of Jamaica	-0.005157	0.002606	-1.98**	-0.003952	0.002205	-1.79***
US-Jam Inflation Diff	-0.689261	0.264317	-2.61*			
Constant	-55.39044	40.65791	-1.36	-20.84384	36.52212	-0.57
Adjusted R-squared	0.952			0.946		
Cointegration Tests						
Phillips-Ouliaris	H0: No cointegration	tau-stat: -7.56*				
Engel-Granger	H0: No cointegration	tau-stat: -7.02*				
Method: Dynamic Least Squares						
Sample: 1996M05-2022M12						
Fixed leads and lags (lead=1, lag=1)						

Notes: *, **, and *** indicate 99%, 95%, and 90% statistical significance, respectively.

Table 6: FX Trend (HP Filter)

FX Trend (HP Filter)	General Model			Simplified Model		
Independent Variable	Coefficient	Std. Error	t-Stat	Coefficient	Std. Error	t-Stat
FX Deposits	0.0000234	0.00000397	5.91*	0.0000324	0.00000471	6.88*
FX Loans	0.0000151	0.00000551	2.75*	0.00000928	0.00000547	1.70***
Foreign Demand	0.001583	0.000496	3.19*	0.001361	0.000505	2.69*
Domestic Demand	-0.000813	0.000336	-2.42**	-0.001025	0.000267	-3.83*
Spread: Deposit	-0.385262	1.059621	-0.36			
Spread: Loan	0.456442	0.536744	0.85			
Money Supply (domestic)	0.0000395	0.000029	1.36			
NIR: Bank of Jamaica	-0.004006	0.002568	-1.56	-0.003283	0.00232	-1.41
US-Jam Inflation Diff	-0.518989	0.260995	-1.99**			
Constant	-60.90869	40.10413	-1.52	-23.40903	36.03304	-0.65
Adjusted R-squared	0.956			0.945		
Cointegration Tests						
Phillips-Ouliaris	H0: No cointegration	tau-stat: -7.32*				
Engel-Granger	H0: No cointegration	tau-stat: -4.45***				
Method: Dynamic Least Squares						
Sample: 1996M05-2022M12						
Fixed leads and lags (lead=1, lag=1)						

Notes: *, **, and *** indicate 99%, 95%, and 90% statistical significance, respectively.