Working Paper

The Effects of U.S. Unconventional Monetary Policy on Asset Prices Selected in Latin America and Caribbean Economies

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Abstract

Using a series of SVAR models, this study evaluates the relative effects of U.S. unconventional monetary policy shocks on asset prices in selected Latin America and Caribbean (LAC) developing countries. The study was conducted using weekly data from November 2008 to May 2015.US shocks are identified by changes to the ten (10) year term premium and are treated as exogenous to shocks from Latin America and Caribbean economies. Evidence from the study showed that compression of the term premium reduced yields in these economies, as investors searched for higher returns in emerging market assets. This induced a significant flow of capital into Latin America throughout the Federal Reserve's quantitative easing program. However, due to the response of the domestic monetary policies, with the exception of Brazil, the transmission to the foreign exchange market was negligible, thus the risk of further instability to these economies was mitigated.

Keywords: Unconventional Monetary Policy; Monetary Policy Transmission; Capital Flows

JEL Classification: E43; E44; E52

[1] The views and results expressed in this paper represent those of the author and not necessarily those of the Bank of Jamaica.

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I. Introduction

The heterogeneous spillover effects of the Federal Reserve's unconventional monetary policy measures have been identified across the global economy by large number of researchers. The empirical insights have been gathered using varied econometric techniques that addressed a number of topical issues. While the empirical results generally hold for some of countries, more work is required to control for country specific issues such as the impact of credit worthiness and substitutability of assets in different countries for those in the US. Similar to the effects on other areas studied by (Fawley & Neely, 2014; Gaurin, Moreno, & Vargas, 2014), the study finds that US UMP had a relatively substantial but short-lived impact on bond yields and exchange rates in Latin America and Caribbean Economies.

The literature points to a number of channels through which the US UMPs flow to emerging markets and developing economies. These include the signalling, the macroeconomic, the interest rate, the portfolio-balance and financial channels (Bowman, Londono, & Sapriza, 2014). Through these channels, US policy is able to affect the monetary policy rates, imports through commodity prices, the cost of capital and the returns on financial assets in the domestic economies. The multiplicity of effects creates the possibility of a large number of modelling issues including heteroskedasticity and model specification biases Fawley & Neely,(2014).

The objective of this study is to investigate the nature of the impact of UMPs on a selected group of economies. The study adds to the existing body of literature by focusing on a selected group with market driven exchange rates and inflation targeting monetary policy regimes. It also identify and explain the active transmission channels of UMPs to the financial markets in these economies and assesses how the degree of substitutability of the domestic financial assets relative to US Treasuries along with country's creditworthiness impact the theorised portfolio-rebalancing channel in these economies.

This paper examines the spillover effects of the US UMPs on five (5) Latin America and Caribbean economies using a Structural VAR (SVAR) model as explained by Kilian,(2011). The SVAR enables the researcher to model the average response of the domestic variables to a given one time structural shock in the exogenous US term premium. The model allows for the

construction of forecast error variance decomposition that quantifies the average contribution of a given structural shock to the variability of the data, and can be used to provide historical decomposition that measures the cumulative contribution of each structural shock to the variables over time.

The remainder of the paper is organized as follows: Section 2 gives a review of the existing literature on UMPs transmission to developing economies; Section 3 gives a brief description of the data used in the study and presents the econometric methodology; the results and policy implications are discussed in Sections 4; and the Section 5 concludes the study, highlights the limitations and provides recommendations for further studies.

II. Literature Review

Unconventional Monetary Policy measures (UMPs) became increasingly significant following the global financial crisis of 2008-2009. The objective of these policies was to accommodate a macroeconomic and financial landscape that would foster growth in advanced economies. UMPs in the US include non-traditional measures implemented at the onset of the financial crises by the US Federal Reserve (FED) with the aim to restore proper functioning to the financial markets and intermediation to provide policy accommodation to stimulate economic activity at the zero bound level of interest rates. These UMPs included Large Scale Asset Purchases (LSAPs), Maturity Extension Programs (MEPs) and liquidity provision to the housing markets through the purchase of Mortgage Backed Securities (MBS). Table 1 details the list of UMP measures undertaken by the FED.

Table 1: US Unconventional Monetary Policy Measures[2]

LSAP1	25-Nov. 2008	The Fed announced that it will initiate a program to purchase US$100 billion in GSE obligations and US$500 million in mortgage backed securities.[3]
LSAP1b	18-Mar. 2009	The Fed announced the additional purchase of US$750 billion of agency MBS and US$100 billion GSE loan obligations. The committee also decided to purchase up to US$300 billion of longer term treasuries (2-10 year tenor) to

[2] Federal Reserve Board
[3] The Government Sponsored entities are Fannie Mae, Freddie Mac and the Federal home loan Banks

Table 1: US Unconventional Monetary Policy Measures[2]		
		help improve conditions in the credit market.
	04-Nov. 2009	The quantity of GSE loan obligations was reduced from US$200 billion to US$175 million, reflecting the limited availability of debt.
LSAP2	03-Nov. 2010	The Fed announced its intention to purchase an additional US$600 billion in longer term securities by the end of Q2 2011, at a pace of US$75 billion per month.
MEP	21-Sep. 2011	***Maturity Extension Program:*** The Fed announced its intention to purchase US$400 billion in Treasury securities with remaining maturities of 6 to 30 years and to sell an equal amount of 3 year or less.
LSAP3	13-Sep. 2012	The FED announced its intention to increase policy accommodating by purchasing additional MBS of US$40 billion per month. The FED will also continue its maturity extension program at a pace of US$45 billion per month.

While these UMPs fulfilled these objectives for the US, they created macro-financial shocks which reverberated into the global economy thereby impacting emerging and developing economies through a number of channels (Fic, 2013). Bowman, Londono, & Sapriza, (2014) identifies these channels to be signalling which impact policy rates; macroeconomic which impacts foreign currency policy; changes in US interest rates which may cause foreign currency depreciation in and finally and the portfolio-balance channel which impact international asset flows among other asset classes.

As the level of financial integration increase, unconventional monetary policies in developed economies affect capital flows and asset price movements in less advanced economies (Elod & Vela, 2014). However, some studies have shown that the size of the impact differs for countries, depending on the strength of the market fundamentals within the economies as well as the design and expectation of the policy announcement and response. This view is supported by Chen, Mancini-Griffoli, & Sahay (2014) who posited that strong macroeconomic fundamentals, current account and external debt balances increase the resilience of a country to unconventional international policy shocks. Gambarcorta, Hofmann, & Peersman (2012) also found that the impact on EME's for both conventional and unconventional policy were relatively heterogeneous. Similarly, Ehrmann & Fratzscher (2004) found that stock prices across countries react to UMP's with high levels of heterogeneity.

Chowdrow-Reich (2014) explains that by design, the UMP should affect the financial sector by reducing the risk free rate which then lowers the hurdle rate for risky investment projects. He noted that a direct consequence is the search for higher returns due to institutional dissatisfaction with low returns. He also found evidence of expectations and the portfolio balance channels of unconventional monetary policies.

Identifying the impact and channel of the UMP on EME is akin to understanding the supply and demand conditions facing financial assets in both the US and international economies, respectively. On the supply side, Chowdrow-Reich (2014) posits that the portfolio balance channel operates only with the quantitative easing policy tool where investors value certain type of securities beyond their risk adjusted pay-off structure which allows the FED to affect interest rates other than short-term policy rates by changing the portfolio of assets private investors must hold in equilibrium. Additionally, he asserts that UMP impacts real spending by lowering long-term real interest rates which then stimulates riskless spending through households' intertemporal substitution, and where firms discount future profits at lower rate and a positive wealth effect from a commitment to future expansionary policy.

On the supply side, Roache & Rousset (2013) examined the impact on UPM on asset price risk using risk neutral density functions that are estimated from option prices using an event methodology. The results showed that 'tail risk'-the price change expected with a five percent probability declined in the immediate aftermath of an event that served to ease monetary policy through unconventional means. They concluded that this in turn created a more enabling financial environment. Fratzscher, Do Luca, & Straub (2012) in Roache & Rousset (2013) found that UMPs have had a large effect on portfolio decisions and cross border capital flows. Roache & Rousset (2013) argued that it is important to differentiate between the actual announcements of the UMPs and the actual operationalization of these events since these events produce unique challenges.

On the other hand, Takats & Vela (2014) found strong evidence of the existence of different transmission channel of US monetary policy on EMEs. They found that advanced economies

proxied by the US, drives policy rates beyond what domestic factors would require in EMEs. Their findings reveal that long term interest rates affect EMEs long term interest rates significantly. Similarly, Elod & Vela (2014) noted that the policy rates and long term interest rates are most likely to capture shift in transmission implied by a shift from policy rates to unconventional monetary policies after the 2008 crisis. The long term interest rates are more important given the shift from conventional to unconventional monetary policies. Similar to Fratzscher, Do Luca, & Straub (2012), Takats & Vela (2014) finds evidence of the changes of US monetary policy on the international risk appetite since the crisis. Their study also showed that while long term rates in both the US and EME remains correlated, short term rates became less correlated after 2008.

There has been a tremendous discussion on the impact of UMP on portfolio-balance through various asset classes. Bowman, et.al. (2014), used event study to test the impact after the implementation of the UMP in the US, while controlling for country specific vulnerability factors. The study found evidence to support the theory that UMPs had significant and sometimes persistent effect on sovereign yields, foreign exchange rates and stock prices in the seventeen EMEs studied. On the other hand, Gaurin, Moreno, & Vargas (2014) used both a moving window linear regression and a VARX-MGARCH model to examine the effect of US UMPs and found the links between sovereign bond yields changed over time and that the short-run responses of Colombian asset prices were different before, during and after the US UMP was implemented.

A significant part of the UMP discussion analyzes whether the observations seen in EMEs and developing countries are due to the impact of the UMPs or to the conventional monetary policies. Gaurin, Moreno, & Vargas (2014) answered this question by modelling the impact of US policy on Colombian bond yields during the pre-crisis, crisis and post crisis periods. In shedding light on these issues, Gilchrist, Yue, & Zakrajsek (2014) compared the effect of conventional US monetary policy on the bond yields of foreign governments with those of unconventional monetary policies and fund that an expansionary conventional monetary policy increases foreign yield curves while it flattens the yield curve during unconventional period. Significantly, the

authors found that the impact of US UMP as well as conventional monetary policy on average was comparable. This then answers the question of whether the impact of the UMP was structurally stable over time.

III. Empirical Model

In this section we estimate a series of SVAR equations to estimate the spillovers from the US to the LAC economies[4]. The questions of interest what is the effect of a shock to the US term premium on the domestic bond and exchange rate markets' and what are the transmission channels through which the a shock to the term premium affect the domestic financial market.

The baseline VAR model:

$$Y_t = B_0 + B(L)y_{t-1} + Z(L)x_t + U_t \quad (eq.1)$$

Assumptions:

1. *There are as many structural shocks as variables are in the model and the shocks are uncorrelated.* The vector U_t is assumed to be an unobservable zero mean white noise vector process with a time invariant covariance matrix $U_t \sim(0,1)$
2. $B_{12} = 0$. This is consistent with the assumption that the correlation between the USA and LA economies is likely to be unidirectional in the short run, with the USA being the country of influence. This is the general assumption of developing economies. Given its size and level of financial market sophistication, this assumption is expected to hold in both the short and long run for Jamaica.

The VAR equation contains three blocks: $\{Y_{US,t}\}$, the domestic block $\{Y_{LAC,t}\}$ and the block of exogenous variables $\{X_t\}$.

$Y_{LAC,t}$ is a vector of endogenous variables for each LAC country including the spread between the 10-year and 1-year domestic bond yields; the overnight interest rate and the bilateral nominal exchange rate relative to the US dollar and the stock market index.

[4] The countries analysed in this study are Brazil, Mexico, Colombia, Chile and Jamaica.

$$\left[Y_{LAC\ i,t} = i^{10} - i^{1}{}_{i,t}, ON_{i,t}, NER_{i,t}, Stock_{i,t}\right]$$

$Y_{US,t}$ is the $10-$year term premium on the US Treasury.[5] Note that shocks to the term premium would constitute monetary policy surprises and '*other changes'*. The term premium constitutes the main transmission tool of the Fed's UMP. Miyajima, Mohanty, & Yetman, (2014) argues that changes in term premium can cause long term interest rates in the domestic economies to fluctuate through changes in the bond market even if the policy rate is under full control of the central banks.

X_t is a measure of exogenous market volatility proxied by the VIX[6].

The multi country reduced form representation for eq. 1 is given as:

$$Y_{LA\ i,t} = B + B_{2,2}.Y_{LAC\ i,t-1} + Z_{23}^{i}X_t + \in_{2,t} \quad (eq.2)$$

The equations were estimated using weekly data for the period November 2008 to May 2015. The starting period was selected to reflect the start of the UMP implementation. The countries were selected based on the availability of data. All countries in the sample have floating exchange rate regimes and practice either full-fledged inflation targeting or an inflation-targeting lite monetary policy. All variables were differenced to ensure stationarity, which was further tested by using traditional stationarity tests.[7] The lag length used to estimate each model was selected based on the Hannan-Quinn criterion. The results are shown in table 2 below:

Table 2 Results of Lag Length Criteria Tests

Country	Lags	Log(L)	LR	FPE	AIC	SC	HQ
Brazil	7	1945.97	86.99	4.34e-12*	-11.98*	-9.66	-11.05*
Chile	4	2387.15	123.44	9.34E-14	-15.81	-14.41	-15.25*
Colombia	5	2481.94	121.15	5.76e-14*	-16.30	-14.58	-15.61*
Jamaica	2	2680.24	84.98	8.62E-15	-18.20	-17.43	-17.89*
Mexico	2	2387.19	109.21	6.59e-14*	-16.16	-15.40	-15.86*

[5] The 10-Year term premium is the ACM Fitted term premium available at http://www.newyorkfed.org/research/data_indicators/term_premia.html
[6] The VIX is the Chicago Board Options Exchange S&P Volatility Index
[7] See results of unit root tests in appendix 1

In addition to the short-run foreign exogeneity restriction imposed, contemporaneous and lagged restrictions were also imposed on the model. Given the high frequency of the data, we assume no contemporaneous relationship between the variables. That is, all feedback to the variables within the model is expected to occur with a lag of at least one week (Kilian, 2011). The lagged restrictions are summarised in Table 3 below:

Table 3 Restrictions on Lagged Structures (B)

	$Term$	ON	i^{10}	NER	$Stock$
$Term$	na	0	0	0	0
ON	na	na	0	0	0
i^{10}	na	na	na	0	0
NER	na	na	na	na	0
$Stock$	na	na	na	na	na

By imposing these restrictions we have fifteen (15) uniquely identified parameters to satisfy the required number of $K(K+1)/2$.

Using the developing economy-short run assumption, no feedback is allowed between the US term premium and the domestic economy variables. The domestic economies' monetary policy reaction function is reflected in the feedback the response of the domestic monetary policy rate ***(ON)*** to the Federal Reserve's monetary policy-*the signaling channel*. The responses of the domestic long term bond yields to the term premium shocks provide evidence of the portfolio *rebalancing channel*, which if present, is expected to spillover into the foreign exchange and stock markets and provide evidence of the *financial markets channel*.

The effects of the unconventional monetary policy on the domestic economies and the strength of the various transmission channels can be observed in the responses of the domestic variables to the shocks. The impulses response functions and variance decompositions are computed using standard *cholesky decomposition*.

Our a priori expectation is that US monetary policy will affect the economies through two main

channels: the *exchange rate and portfolio balance* channels. It is anticipated that the LSAP program will reduce the availability of longer term fixed income securities to private investors thus reducing the reducing the yields in the US. This in turn will drive investors to seek riskier assets with high-returns, resulting in an increase in the price of domestic market assets. Additionally, portfolio flows from the portfolio rebalancing channel previously described may result in a depreciation of the US dollar relative to the currencies of the recipient countries, assuming exchange rate flexibility. If the currency effect is not anticipated and curtailed by the central banks in the recipient countries, it may lead to further negative spillover effects to these economies.

IV. Results

Given the sample period, a decline in the term premium is attributed to an accommodative monetary policy stance where the Federal Reserve purchases long term treasuries from the market. The responses of the domestic yields are shown in Panel A below. The US term premium has a relatively small impact on the yields in the Latin America economies. Long term domestic bond yields increase by a maximum of 5 basis points within one to two weeks after an increase in the term premium. These effects are however, short-lived and tend to disperse within approximately three months after the initial shock. By the assumption of asymmetric effects, this result would support the observed increases volatility in portfolio flows to these economies due in part to the compression of the term premium throughout the Fed's quantitative easing Program, supporting the portfolio rebalancing channel. Continuous low interest rates in the USA have served as a significant push factor for portfolio flows to Latin America since the global financial crisis.

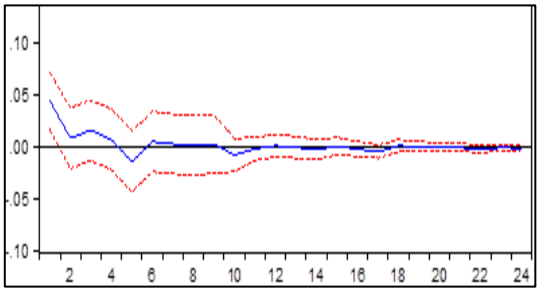
In contrast to response of the Latin America sovereign bonds to a term premium shock, the data suggests that Jamaica's sovereign yields decline by a minor 0.3 basis points following a compression of the term premium, which subsequently increases within one week of the initial decline. This result may be explained by country specific factors that were occurring during this time period. Throughout the financial crisis, Jamaica's macroeconomic environment could be characterised as a fragile environment in which investor confidence plummeted. As a result of

these conditions, the degree of substitutability between US Treasuries and Jamaica's sovereign bonds would have been low to non-existent. Moreover, Jamaica's foreign currency bonds are rated speculative by the international rating agencies while the Latin America bonds are investment grade bonds. Consequently, any spillovers from the compression of the US term premium would have been negated by existing domestic.

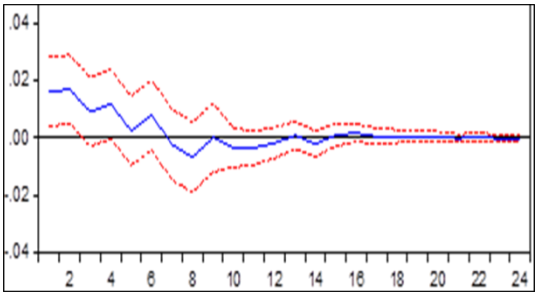
Figure 1: Responses to a Shock to the US10 Year Term Premium

Panel A: Response of Long Term Domestic Sovereign Bond Yields

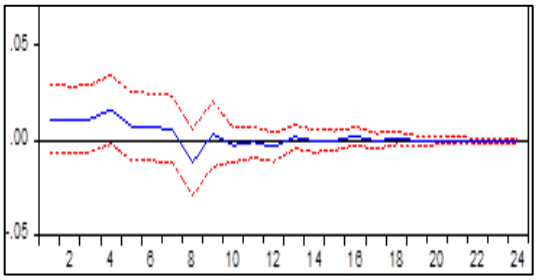
Brazil



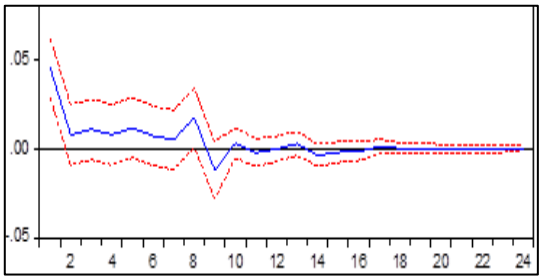
Chile



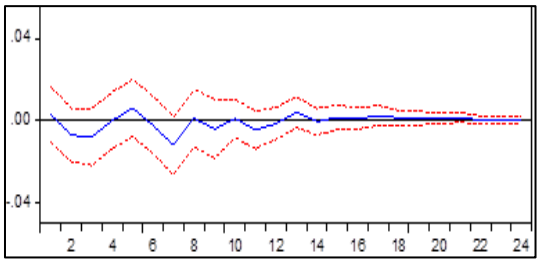
Colombia



Mexico



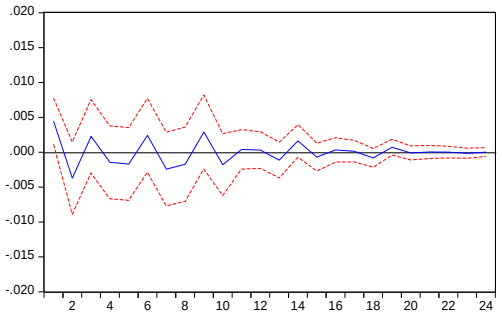
Jamaica



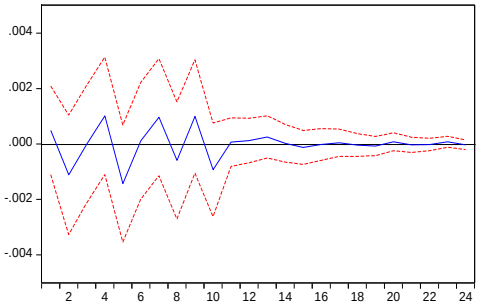
Inflows of foreign capital can provide a source of financing for a country's external obligations. However, significant portfolio capital flows or *"hot money"* increases currency among other negative spillovers to the domestic economies.

Panel B: Response of Nomimal Exchange Rate vs US Dollar

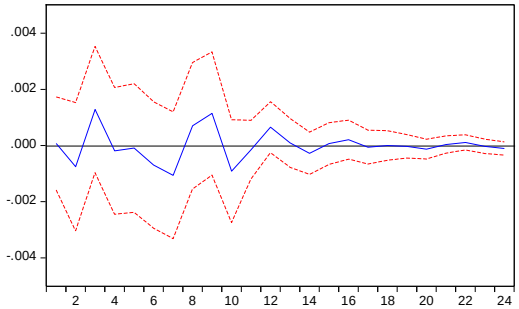
Brazil



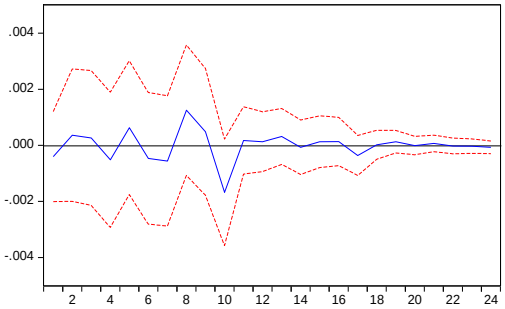
Chile



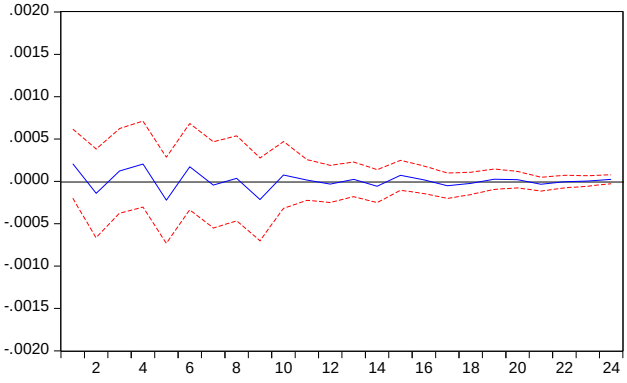
Colombia



Mexico



Jamaica



In free-floating exchange rate regimes, large influxes of foreign capital can lead to currency

appreciation in the host economies. This is evidenced by the response of the exchange rate to the term premium shown in **Panel B**. For all countries except Mexico, the results suggest that a reduction in the term spread would induce statistically negligible nominal exchange rate depreciation. The magnitude of the response is expected for two reasons: 1) the Central Banks of Brazil, Chile and Jamaica all increased their monetary policy rates substantially in response to inflationary pressures and subsequently started reduction in 2009.[8] This could have mitigated the impact of the foreign exchange market and 2) the negligible response of the exchange rate may be due to the other factors driving the exchange rate such as market interventions[9].

The results obtained for Colombia are similar to those of Gaurin, Moreno, & Vargas, (2014), that found evidence of the portfolio rebalancing channel for Colombia during the crisis period. The author also found a relative small depreciation response of the exchange rate to a term preium shock. Using an event study approach, Fic (2013) also showed that Brazil's bonds yields declined substantiantally following a quantitative easing event.

While the results show no direct implications for financial market vulnerabilities from the exchange rate channel, the response of the bond yields show potential vulnerabilities from portfolio flows volatility. Of note, the varying magnitude of the responses in the yield would be reflective of the diverging fundamentals between the countries. In particular, most of the negative portfolio volatility spillovers would be evident during periods of tapering when US withdraws these monetary policy easing strategies. As a test of robustness, I re-estimated eq.2 over two time periods the November 2008 to November 2013-UMP Period and December 2013 to May 2015-tapering period. The results suggest that the response of the domestic economy to the FED's policy is similar to the results presented above, where a compression of the yields spread would lead to a decline in Latin America bonds bond yields as investors revert to safe-haven assets. Therefore, even if these policies are well managed the normalization of the UMPs following the crisis would have created some capital flow reversal in these economies. Similar to the effects of the UMPs, the effects on the domestic economies would be largely based on each country's vulnerabilities. Therefore to ensure macro prudential stability, each central bank

[8] See appendix 5
[9] See appendix 4 for the response of the Central Banks' Policy rate to the US term shocks

should be prompt in policy implementation to counter effects of exchange rate absorption of both volatile capital flows.

V. Conclusion

The Fed's unconventional monetary policy has had a relative significant impact on the Latin America bond and exchange rates market throughout the Fed's response to the global financial crisis. However, the study found no direct spillover into the Jamaican asset markets, which we attribute to countervailing country specific impulses during that period of time. We note that the magnitude of the spillover effects varies across countries and is reflective of the heterogeneous responses highlighted in the literature. Of note, the impact of each shock on the domestic economy is short lived as opposed to the persistent effects found by some researchers. The results show that low US term premium spills over to Latin America mainly through low domestic bond yields. These results are consistent with the findings of others that US UMP has been increasingly transmitted to developing economies through asset markets. However, we find little evidence of financial market vulnerability as policy makers in these economies allow the exchange rate to absorb the bond market effects and subsequently respond with foreign exchange intervention.

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Appendices

Appendix 1 Unit Root Test

Table 4: Results-Unit Root Test						
Test	**Variable**	**P. Value**	**Conclusion**	**Variable**	**P. Value**	**Conclusion**
ADF Trend	i_{us}^{10}	0.2870	No Stationarity	ON_{Jam}	0.7929	No Stationarity
	VIX_{us}	0.0475	Stationarity	ON_{chil}	0.0088	Stationarity
	$Term_{us}$	0.5885	No Stationarity	NER_{col}	0.9652	No Stationarity
	i_{col}^{10}	0.1158	No Stationarity	NER_{mex}	0.5756	No Stationarity
	i_{mex}^{10}	0.0706	Stationarity	NER_{braz}	0.1147	No Stationarity
	i_{braz}^{10}	03994	No Stationarity	NER_{Jam}	0.9608	No Stationarity
	i_{Jam}^{10}	0.2965	No Stationarity	NER_{chil}	0.3734	No Stationarity
	i_{chil}^{10}	0.5546	No Stationarity	$Stock_{col}$	0.9648	No Stationarity
	ON_{col}	0.8706	No Stationarity	$Stock_{mex}$	0.3421	No Stationarity
	ON_{mex}	0.3361	No Stationarity	$Stock_{braz}$	0.2483	No Stationarity
	ON_{braz}	0.2768	No Stationarity	$Stock_{Jam}$	0.9291	No Stationarity
				$Stock_{chil}$	0.4642	No Stationarity

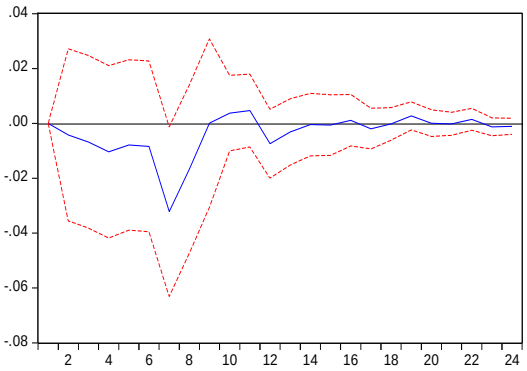
Appendix 2 US Unconventional Monetary Policy Measures

Table 5 Modifications to US Unconventional Monetary Policy Measures	
18 December 2013	The FED announced its decision to reduce the pace of asset purchases to US$35 billion per month for MBS and US$40 billion per month for Treasury securities down from US$40 billion per month for MBS and US$45 billion for Treasury securities.
29 January 2014	The FED announced its decision to further reduce the pace of asset purchase to US$30 billion per month for MBS and US$35 billion per month for Treasury securities down from US$35 billion per month for MBS and US$40 billion for Treasury securities.
19 March 2014	The FED announced its decision to further reduce the pace of asset purchase to US$25 billion per month for MBS and US$30 billion per month for Treasury securities down from US$30 billion per month for MBS and US$35 billion for Treasury securities.
30 April 2014	The FED announced its decision to further reduce the pace of asset purchase to US$20 billion per month for MBS and US$25 billion per month for Treasury securities down from US$25 billion per month for MBS and US$30 billion for Treasury securities.
18 June 2014	The FED announced its decision to further reduce the pace of asset purchase to US$15 billion per month for MBS and US$20 billion per month for Treasury securities down from US$20 billion per month for MBS and US$25 billion for Treasury securities.
30 July 2014	The FED announced its decision to further reduce the pace of asset purchase to US$10 billion per month for MBS and US$15 billion per month for Treasury securities down from US$15 billion per month for MBS and US$20 billion for Treasury securities.
17 September 2014	The FED announced its decision to further reduce the pace of asset purchase to US$5 billion per month for MBS and US$10 billion per month for Treasury securities down from US$10 billion per month for MBS and US$15 billion for Treasury securities.
29 October 2014	Asset purchases concluded

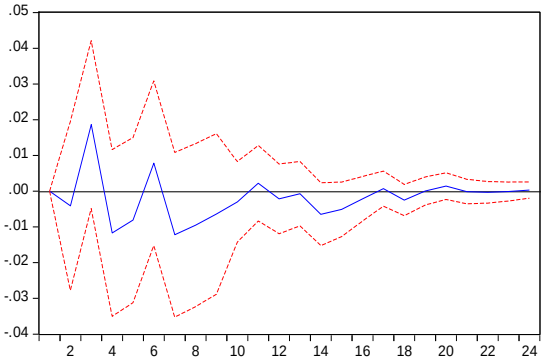
Appendix 3: Responses of the Equity Market

Panel A: Response of the Equity Market

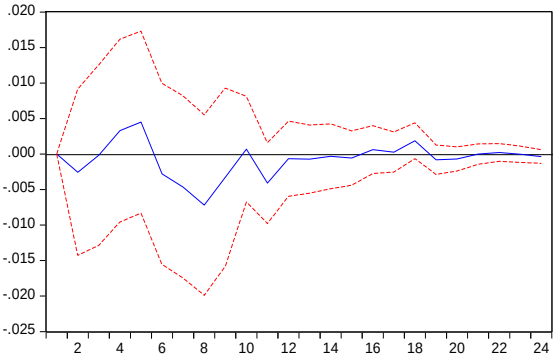
Brazil



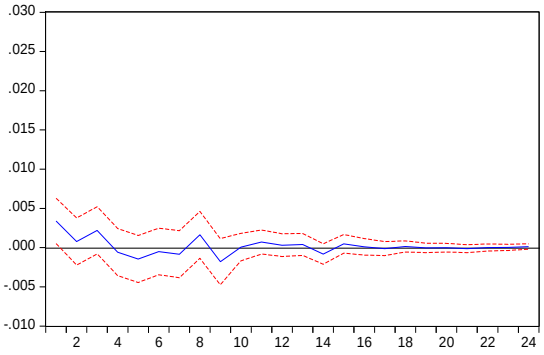
Chile



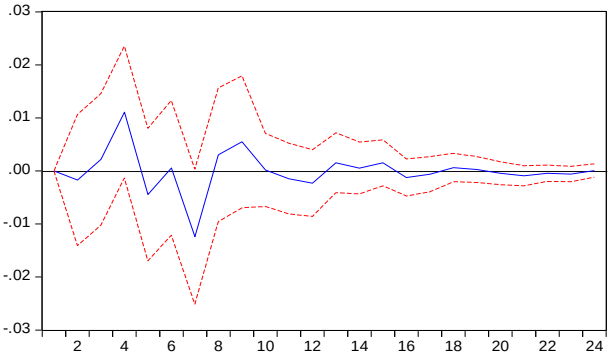
Colombia



Mexico



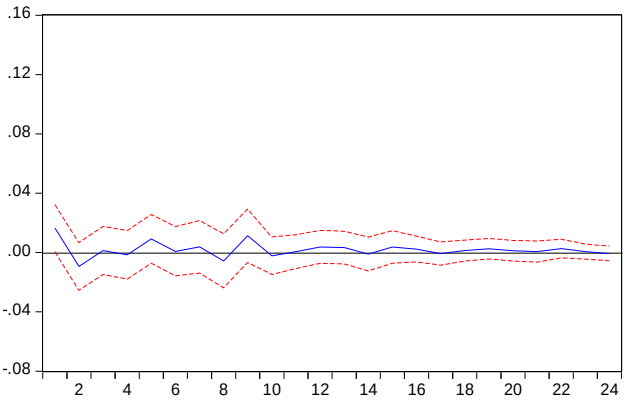
Jamaica



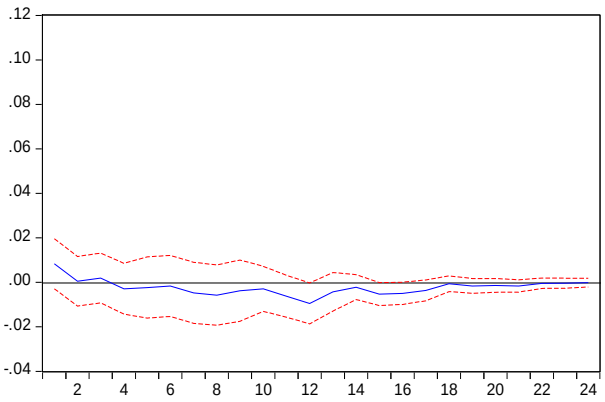
Appendix 4: response of the Monetary Policy Rate

Panel A: Response of Monetary Policy Rates

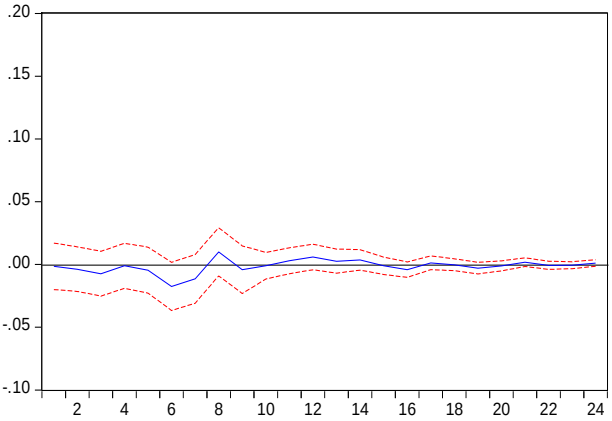
Brazil



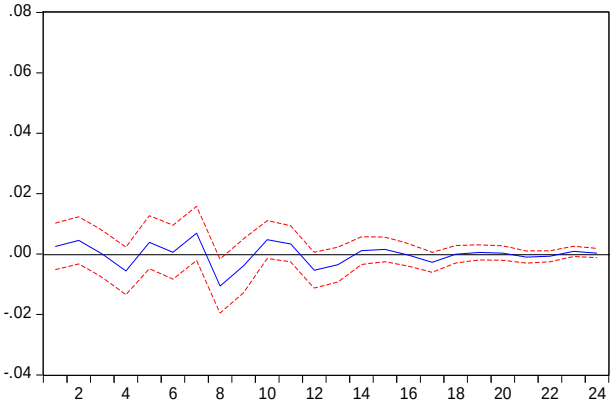
Chile



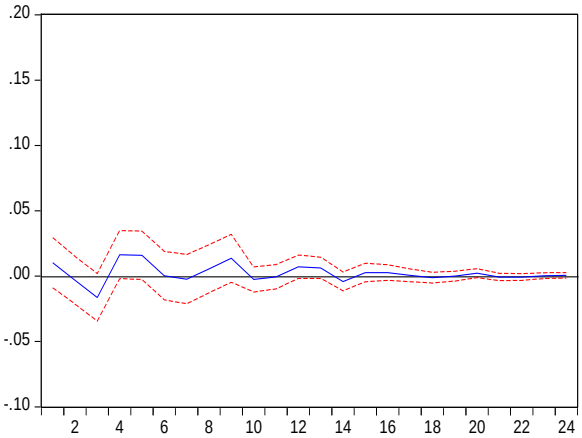
Colombia



Mexico



Jamaica



Appendix 5: Variance Decomposition

Table 6: Variance Decomposition-Brazil

Variance Decomposition of TERM_PREMIUM:

Period	S.E.	TERM_PREMIUM	ON	YIELD	STOCK	DEXRATE
1.00	0.12	100.00	0.00	0.00	0.00	0.00
2.00	0.12	98.77	0.93	0.30	0.00	0.00
3.00	0.12	97.59	0.96	0.30	0.98	0.17
4.00	0.12	96.96	0.96	0.59	1.32	0.17
5.00	0.12	95.94	0.95	0.93	1.41	0.77
6.00	0.12	94.00	0.97	2.87	1.41	0.75
7.00	0.12	93.29	0.99	2.85	2.07	0.80
8.00	0.12	93.09	1.10	2.86	2.15	0.79
9.00	0.12	92.38	1.16	3.09	2.45	0.91
10.00	0.13	92.06	1.20	3.21	2.45	1.08
11.00	0.13	91.83	1.22	3.37	2.45	1.13
12.00	0.13	91.68	1.28	3.42	2.48	1.14

Variance Decomposition of ON:

Period	S.E.	TERM_PREMIUM	ON	YIELD	STOCK	DEXRATE
1.00	0.14	1.31	98.69	0.00	0.00	0.00
2.00	0.15	1.61	96.74	1.49	0.01	0.15
3.00	0.15	1.59	95.32	1.68	0.26	1.14
4.00	0.15	1.56	92.86	2.17	0.26	3.15
5.00	0.16	1.85	89.46	3.61	1.38	3.70
6.00	0.16	1.80	86.98	4.70	2.12	4.40
7.00	0.17	1.61	87.91	4.21	1.84	4.44
8.00	0.18	1.61	86.66	5.23	1.72	4.78
9.00	0.18	1.99	85.91	5.15	1.71	5.23
10.00	0.18	1.99	85.36	5.23	1.78	5.63
11.00	0.18	1.96	84.08	5.52	2.11	6.33
12.00	0.18	2.00	83.90	5.57	2.11	6.43

Variance Decomposition of YIELD:

Period	S.E.	TERM_PREMIUM	ON	YIELD	STOCK	DEXRATE
1.00	0.25	3.20	0.79	96.02	0.00	0.00
2.00	0.27	2.88	0.91	85.57	0.11	10.53
3.00	0.27	3.25	0.90	84.92	0.50	10.43
4.00	0.27	3.32	0.96	84.66	0.65	10.42
5.00	0.28	3.47	0.96	84.39	0.71	10.47
6.00	0.28	3.47	1.59	83.42	0.74	10.79
7.00	0.28	3.47	1.72	83.19	0.81	10.82
8.00	0.28	3.44	2.08	82.81	0.85	10.82
9.00	0.28	3.45	2.15	82.67	0.93	10.80
10.00	0.28	3.46	2.15	81.59	0.93	11.88
11.00	0.28	3.45	2.16	81.47	0.94	11.99
12.00	0.28	3.44	2.23	81.27	0.94	12.12

Variance Decomposition of STOCK:

Period	S.E.	TERM_PREMIUM	ON	YIELD	STOCK	DEXRATE

1.00	0.03	1.10	0.65	8.01	90.24	0.00
2.00	0.03	1.10	1.01	8.02	89.44	0.43
3.00	0.03	1.11	1.44	8.02	88.67	0.76
4.00	0.03	1.31	1.67	8.20	87.81	1.01
5.00	0.03	1.29	1.74	9.17	86.42	1.38
6.00	0.03	1.31	1.74	9.67	85.87	1.40
7.00	0.03	2.34	1.79	9.51	84.98	1.38
8.00	0.03	2.40	1.80	11.58	82.87	1.35
9.00	0.03	2.37	2.20	11.43	81.50	2.50
10.00	0.03	2.36	2.19	11.86	81.01	2.58
11.00	0.03	2.37	2.21	11.85	80.98	2.58
12.00	0.03	2.47	2.22	11.86	80.64	2.82

Variance Decomposition of DEXRATE:

Period	S.E.	TERM_PREMIUM	ON	YIELD	STOCK	DEXRATE
1.00	0.01	0.12	0.23	2.25	27.80	69.60
2.00	0.02	0.38	0.27	2.68	27.62	69.05
3.00	0.02	0.37	0.58	2.66	27.74	68.65
4.00	0.02	0.62	0.59	2.70	28.15	67.94
5.00	0.02	1.11	0.63	2.66	28.48	67.11
6.00	0.02	1.11	0.82	3.03	28.53	66.52
7.00	0.02	1.32	1.20	2.99	28.27	66.22
8.00	0.02	1.38	2.09	3.19	28.09	65.26
9.00	0.02	1.59	2.37	3.31	28.20	64.53
10.00	0.02	1.78	2.40	3.34	28.26	64.22
1.00	0.01	0.12	0.23	2.25	27.80	69.60
2.00	0.02	0.38	0.27	2.68	27.62	69.05

Cholesky Ordering: TERM_PREMIUM ON YIELD STOCK DEXRATE

Table 7 Variance Decomposition-Chile

Variance Decomposition of TERM_PREMIUM:

Period	S.E.	TERM_PREMIUM	ON	YIELD	STOCK	DEXRATE
1.00	0.12	100.00	0.00	0.00	0.00	0.00
2.00	0.12	99.27	0.02	0.19	0.15	0.38
3.00	0.12	97.01	0.14	0.43	0.21	2.21
4.00	0.12	95.59	0.89	0.57	0.60	2.34
5.00	0.12	95.28	0.98	0.73	0.67	2.33
6.00	0.12	95.15	1.11	0.73	0.68	2.32
7.00	0.12	94.31	1.10	1.28	0.74	2.57
8.00	0.12	93.53	1.16	1.73	0.80	2.79
9.00	0.12	92.67	1.14	2.08	0.94	3.17
10.00	0.12	92.36	1.18	2.19	0.97	3.29
11.00	0.12	92.15	1.18	2.24	0.98	3.45
12.00	0.12	91.96	1.33	2.27	0.99	3.45

Variance Decomposition of ON:

Period	S.E.	TERM_PREMIUM	ON	YIELD	STOCK	DEXRATE

1.00	0.10	0.67	99.33	0.00	0.00	0.00
2.00	0.10	0.65	98.17	0.92	0.11	0.14
3.00	0.10	0.67	96.06	1.09	0.42	1.76
4.00	0.11	0.70	91.04	4.90	1.04	2.32
5.00	0.13	0.53	91.33	5.66	0.73	1.75
6.00	0.13	0.54	90.83	6.10	0.75	1.78
7.00	0.13	0.67	90.43	6.08	1.04	1.77
8.00	0.13	0.86	89.77	6.03	1.20	2.15
9.00	0.13	0.90	88.37	6.73	1.26	2.73
10.00	0.13	0.94	88.23	6.81	1.26	2.75
11.00	0.13	1.16	87.93	6.83	1.26	2.82
12.00	0.13	1.65	87.12	6.97	1.32	2.95

Variance Decomposition of YIELD:

Period	S.E.	TERM_PREMIUM	ON	YIELD	STOCK	DEXRATE
1.00	0.11	2.16	0.34	97.50	0.00	0.00
2.00	0.11	4.40	0.33	95.04	0.10	0.13
3.00	0.11	4.99	0.67	93.87	0.10	0.36
4.00	0.11	5.98	0.75	92.07	0.31	0.89
5.00	0.11	5.99	0.82	91.52	0.34	1.33
6.00	0.12	6.16	1.65	90.16	0.70	1.33
7.00	0.12	6.08	2.13	88.69	1.72	1.37
8.00	0.12	6.34	2.27	88.16	1.74	1.48
9.00	0.12	6.26	2.43	87.99	1.73	1.58
10.00	0.12	6.31	2.80	87.55	1.76	1.58
11.00	0.12	6.37	2.85	87.36	1.84	1.58
12.00	0.12	6.38	2.94	87.17	1.92	1.60

Variance Decomposition of STOCK:

Period	S.E.	TERM_PREMIUM	ON	YIELD	STOCK	DEXRATE
1.00	0.02	3.83	0.17	3.24	92.75	0.00
2.00	0.02	3.82	0.23	3.21	92.13	0.61
3.00	0.02	4.82	0.25	4.33	89.98	0.61
4.00	0.02	5.00	0.46	4.35	89.48	0.71
5.00	0.02	5.19	0.46	4.46	89.13	0.76
6.00	0.02	5.24	0.71	5.11	88.03	0.91
7.00	0.02	5.26	0.75	5.43	87.66	0.91
8.00	0.02	5.17	0.82	6.98	86.11	0.92
9.00	0.02	5.18	0.83	7.02	86.04	0.93
10.00	0.02	5.16	0.88	6.97	85.82	1.16
11.00	0.02	5.16	0.89	7.06	85.73	1.16
12.00	0.03	5.17	0.90	7.06	85.71	1.16

Variance Decomposition of DEXRATE:

Period	S.E.	TERM_PREMIUM	ON	YIELD	STOCK	DEXRATE
1.00	0.01	0.12	0.23	2.25	27.80	69.60
2.00	0.02	0.38	0.27	2.68	27.62	69.05
3.00	0.02	0.37	0.58	2.66	27.74	68.65
4.00	0.02	0.62	0.59	2.70	28.15	67.94
5.00	0.02	1.11	0.63	2.66	28.48	67.11
6.00	0.02	1.11	0.82	3.03	28.53	66.52
7.00	0.02	1.32	1.20	2.99	28.27	66.22
8.00	0.02	1.38	2.09	3.19	28.09	65.26

9.00	0.02	1.59	2.37	3.31	28.20	64.53
10.00	0.02	1.78	2.40	3.34	28.26	64.22
11.00	0.02	1.77	2.43	3.46	28.39	63.94
12.00	0.02	1.77	2.75	3.56	28.30	63.62

Cholesky Ordering: TERM_PREMIUM ON YIELD STOCK DEXRATE

Table 8 Variance Decomposition-Colombia

Variance Decomposition of TERM_PREMIUM:

Period	S.E.	TERM_PREMIUM	ON	YIELD	STOCK	DEXRATE
1.00	0.12	100.00	0.00	0.00	0.00	0.00
2.00	0.12	99.35	0.12	0.37	0.00	0.15
3.00	0.12	98.10	0.12	0.41	0.17	1.20
4.00	0.12	97.85	0.25	0.41	0.28	1.22
5.00	0.12	97.01	0.59	0.68	0.52	1.21
6.00	0.12	96.25	0.69	1.25	0.54	1.28
7.00	0.12	95.28	0.82	1.24	1.27	1.41
8.00	0.12	94.04	0.81	1.83	1.47	1.85
9.00	0.12	93.52	1.18	1.95	1.48	1.88
10.00	0.13	93.12	1.26	1.95	1.73	1.94
11.00	0.13	93.02	1.26	2.04	1.74	1.94
12.00	0.13	92.92	1.27	2.07	1.80	1.96

Variance Decomposition of ON:

Period	S.E.	TERM_PREMIUM	ON	YIELD	STOCK	DEXRATE
1.00	0.17	0.01	99.99	0.00	0.00	0.00
2.00	0.17	0.06	98.24	0.22	0.41	1.06
3.00	0.17	0.25	97.65	0.24	0.64	1.22
4.00	0.17	0.25	97.33	0.26	0.79	1.36
5.00	0.18	0.30	92.83	2.75	0.97	3.15
6.00	0.19	1.17	92.09	2.49	1.36	2.89
7.00	0.19	1.50	89.33	2.44	2.70	4.03
8.00	0.19	1.75	87.42	2.56	3.35	4.93
9.00	0.19	1.78	86.81	2.85	3.38	5.18
10.00	0.19	1.78	86.57	3.10	3.39	5.15
11.00	0.19	1.78	86.58	3.15	3.35	5.14
12.00	0.19	1.86	86.23	3.14	3.54	5.23

Variance Decomposition of YIELD:

Period	S.E.	TERM_PREMIUM	ON	YIELD	STOCK	DEXRATE
1.00	0.17	0.47	0.09	99.45	0.00	0.00
2.00	0.17	0.87	0.27	97.80	0.42	0.62
3.00	0.17	1.30	0.37	96.04	0.43	1.87
4.00	0.17	2.11	0.55	93.07	1.67	2.61
5.00	0.17	2.27	0.56	92.58	1.96	2.63
6.00	0.17	2.41	1.15	91.73	2.07	2.65
7.00	0.17	2.50	1.15	91.42	2.19	2.74
8.00	0.18	2.93	1.18	90.61	2.44	2.84
9.00	0.18	2.93	1.18	89.77	3.26	2.87
10.00	0.18	2.95	1.19	89.65	3.26	2.95
11.00	0.18	2.94	1.48	89.35	3.28	2.95

12.00	0.18	2.98	1.50	89.27	3.28	2.97

Variance Decomposition of STOCK:

Period	S.E.	TERM_PREMIUM	ON	YIELD	STOCK	DEXRATE
1.00	0.01	0.01	0.12	4.71	95.17	0.00
2.00	0.01	0.03	0.40	4.30	80.72	14.54
3.00	0.01	0.04	1.45	4.31	78.75	15.45
4.00	0.01	0.15	2.09	5.19	77.40	15.17
5.00	0.01	0.24	2.74	5.50	76.51	15.00
6.00	0.01	0.33	2.70	5.82	76.29	14.86
7.00	0.02	0.54	2.84	6.91	74.79	14.93
8.00	0.02	0.87	2.88	7.08	74.29	14.88
9.00	0.02	0.95	3.00	7.15	74.06	14.84
10.00	0.02	0.95	2.98	7.10	73.59	15.39
11.00	0.02	1.05	2.97	7.11	73.37	15.50
12.00	0.02	1.05	3.07	7.10	73.19	15.59

Variance Decomposition of DEXRATE:

Period	S.E.	TERM_PREMIUM	ON	YIELD	STOCK	DEXRATE
1.00	0.01	0.00	0.30	3.58	72.76	23.36
2.00	0.02	0.13	1.64	4.34	74.71	19.18
3.00	0.02	0.48	4.23	4.54	72.16	18.59
4.00	0.02	0.48	4.26	4.56	72.11	18.59
5.00	0.02	0.46	6.67	5.86	69.04	17.97
6.00	0.02	0.56	6.68	5.84	68.92	18.00
7.00	0.02	0.78	7.21	5.78	68.43	17.80
8.00	0.02	0.87	7.26	5.74	68.18	17.94
9.00	0.02	1.12	7.85	6.16	67.17	17.70
10.00	0.02	1.27	7.86	6.17	67.12	17.59
11.00	0.02	1.26	8.22	6.17	66.83	17.53
12.00	0.02	1.34	8.28	6.13	66.57	17.68

Cholesky Ordering: TERM_PREMIUM ON YIELD STOCK DEXRATE

Table 9 Variance Decomposition-Jamaica

Variance Decomposition of TERM_PREMIUM:

Period	S.E.	TERM_PREMIUM	ON	YIELD	STOCK	DEXRATE
1.00	0.12	100.00	0.00	0.00	0.00	0.00
2.00	0.12	97.00	0.00	0.50	1.39	1.10
3.00	0.12	95.56	0.03	1.32	1.61	1.47
4.00	0.12	95.09	0.05	1.33	1.98	1.55
5.00	0.12	94.47	0.25	1.78	1.96	1.54
6.00	0.12	93.94	0.28	1.76	2.06	1.96
7.00	0.12	93.17	0.27	1.81	2.77	1.97
8.00	0.13	91.87	0.30	1.94	3.84	2.04
9.00	0.13	91.48	0.46	1.98	4.04	2.04
10.00	0.13	91.01	0.56	2.29	4.01	2.13
11.00	0.13	90.86	0.63	2.31	4.07	2.14

12.00	0.13	90.43	0.86	2.32	4.20	2.19

Variance Decomposition of ON:

Period	S.E.	TERM_PREMIUM	ON	YIELD	STOCK	DEXRATE
1.00	0.17	0.35	99.65	0.00	0.00	0.00
2.00	0.18	0.38	99.12	0.06	0.23	0.20
3.00	0.18	1.23	98.26	0.07	0.23	0.20
4.00	0.18	2.06	97.12	0.07	0.55	0.20
5.00	0.18	2.77	95.11	0.16	1.74	0.22
6.00	0.18	2.74	95.00	0.16	1.82	0.27
7.00	0.19	2.63	90.99	4.20	1.91	0.26
8.00	0.19	2.67	90.35	4.63	2.08	0.26
9.00	0.19	3.14	89.54	4.57	2.04	0.71
10.00	0.19	3.14	89.28	4.58	2.08	0.91
11.00	0.19	3.13	89.06	4.76	2.12	0.91
12.00	0.19	3.26	88.96	4.76	2.11	0.91

Variance Decomposition of YIELD:

Period	S.E.	TERM_PREMIUM	ON	YIELD	STOCK	DEXRATE
1.00	0.12	0.06	3.69	96.25	0.00	0.00
2.00	0.13	0.36	3.55	95.83	0.23	0.04
3.00	0.13	0.67	3.23	94.41	0.30	1.40
4.00	0.13	0.66	3.21	94.14	0.47	1.53
5.00	0.14	0.84	3.96	92.34	0.77	2.08
6.00	0.14	0.85	3.89	92.12	1.05	2.08
7.00	0.14	1.58	5.35	89.88	1.12	2.07
8.00	0.14	1.57	5.43	89.10	1.42	2.48
9.00	0.14	1.58	9.59	85.03	1.43	2.37
10.00	0.14	1.57	10.06	84.41	1.42	2.54
11.00	0.14	1.66	10.36	83.79	1.57	2.62
12.00	0.15	1.66	10.54	83.59	1.57	2.63

Variance Decomposition of STOCK:

Period	S.E.	TERM_PREMIUM	ON	YIELD	STOCK	DEXRATE
1.00	0.01	1.75	0.00	0.72	97.52	0.00
2.00	0.01	1.74	0.10	1.23	96.79	0.14
3.00	0.01	1.73	1.25	1.25	95.59	0.18
4.00	0.01	2.80	1.22	1.43	94.22	0.32
5.00	0.01	2.68	4.82	1.53	90.04	0.93
6.00	0.01	2.68	4.89	1.55	89.89	1.00
7.00	0.01	3.41	4.89	2.85	87.88	0.97
8.00	0.01	3.41	4.87	2.86	87.81	1.04
9.00	0.02	3.48	6.36	2.88	85.87	1.41
10.00	0.02	3.47	6.36	2.97	85.68	1.52
11.00	0.02	3.47	6.40	3.27	85.33	1.54
12.00	0.02	3.51	6.47	3.29	85.20	1.54

Variance Decomposition of DEXRATE:

Period	S.E.	TERM_PREMIUM	ON	YIELD	STOCK	DEXRATE
1.00	0.00	0.32	0.05	0.18	0.00	99.45
2.00	0.00	0.27	0.11	0.57	0.14	98.91
3.00	0.00	0.33	0.21	0.57	0.15	98.74
4.00	0.00	0.49	0.23	0.81	0.16	98.32
5.00	0.00	0.69	0.24	0.99	0.35	97.74

6.00	0.01	0.78	0.23	1.52	1.38	96.09
7.00	0.01	0.78	0.26	1.57	1.95	95.43
8.00	0.01	0.78	0.31	1.63	2.17	95.11
9.00	0.01	0.94	0.32	1.69	2.83	94.22
10.00	0.01	0.96	0.33	1.82	3.00	93.90
11.00	0.01	0.94	0.33	2.02	2.96	93.75
12.00	0.01	0.94	0.34	2.06	2.94	93.72

Cholesky Ordering: TERM_PREMIUM ON YIELD STOCK DEXRATE

Table 10 Variance Decomposition-Mexico

Variance Decomposition of TERM_PREMIUM:

Period	S.E.	TERM_PREMIUM	ON	YIELD	STOCK	DEXRATE
1.00	0.11	100.00	0.00	0.00	0.00	0.00
2.00	0.12	95.49	0.81	2.17	0.02	1.51
3.00	0.12	92.85	1.34	2.12	1.07	2.63
4.00	0.12	91.45	1.31	2.11	1.06	4.06
5.00	0.12	90.05	1.37	2.21	2.05	4.31
6.00	0.12	89.51	1.37	2.16	2.38	4.58
7.00	0.12	89.00	1.51	2.22	2.69	4.58
8.00	0.12	88.57	1.52	2.24	3.00	4.66
9.00	0.12	87.38	1.97	2.79	3.22	4.65
10.00	0.12	87.16	2.14	2.78	3.28	4.64
11.00	0.12	86.81	2.41	2.83	3.27	4.68
12.00	0.12	86.78	2.44	2.83	3.28	4.68

Variance Decomposition of ON:

Period	S.E.	TERM_PREMIUM	ON	YIELD	STOCK	DEXRATE
1.00	0.07	0.13	99.87	0.00	0.00	0.00
2.00	0.07	0.52	95.80	1.43	0.20	2.05
3.00	0.07	0.52	95.31	1.42	0.30	2.45
4.00	0.07	1.09	92.32	1.57	0.55	4.47
5.00	0.08	1.09	92.57	1.34	0.75	4.24
6.00	0.08	1.04	88.22	2.03	0.73	7.98
7.00	0.09	1.67	86.21	2.03	1.38	8.71
8.00	0.09	3.14	84.30	2.13	1.72	8.71
9.00	0.09	3.18	83.00	2.09	3.22	8.52
10.00	0.09	3.41	81.98	2.17	3.34	9.10
11.00	0.09	3.53	81.46	2.20	3.47	9.35
12.00	0.09	3.86	81.11	2.23	3.48	9.31

Variance Decomposition of YIELD:

Period	S.E.	TERM_PREMIUM	ON	YIELD	STOCK	DEXRATE
1.00	0.15	8.75	0.01	91.24	0.00	0.00
2.00	0.16	8.74	0.01	89.37	1.49	0.38
3.00	0.16	9.08	0.06	88.13	2.07	0.66
4.00	0.16	9.23	0.27	87.61	2.12	0.77
5.00	0.16	9.59	0.59	85.91	3.11	0.81
6.00	0.16	9.73	0.60	85.51	3.34	0.81

7.00	0.16	9.63	0.69	84.25	3.34	2.08
8.00	0.16	10.54	0.70	83.45	3.28	2.04
9.00	0.16	10.96	0.70	82.68	3.60	2.06
10.00	0.16	10.99	0.72	82.62	3.61	2.06
11.00	0.17	10.99	0.78	82.54	3.62	2.06
12.00	0.17	10.98	0.78	82.52	3.62	2.09

Variance Decomposition of STOCK:

Period	S.E.	TERM_PREMIUM	ON	YIELD	STOCK	DEXRATE
1.00	0.03	1.68	0.06	0.21	98.05	0.00
2.00	0.03	1.59	1.04	4.97	89.00	3.39
3.00	0.03	2.20	1.26	5.02	88.14	3.37
4.00	0.03	2.23	1.83	5.02	87.49	3.44
5.00	0.03	2.46	2.82	5.15	85.99	3.58
6.00	0.03	2.46	2.78	5.23	85.21	4.31
7.00	0.03	2.48	3.24	7.18	82.74	4.37
8.00	0.03	2.71	3.58	7.82	80.66	5.23
9.00	0.03	3.00	3.56	7.69	80.30	5.45
10.00	0.03	2.96	3.53	7.82	79.65	6.04
11.00	0.03	3.01	3.72	7.82	79.36	6.09
12.00	0.03	3.01	3.87	7.85	79.19	6.08

Variance Decomposition of DEXRATE:

Period	S.E.	TERM_PREMIUM	ON	YIELD	STOCK	DEXRATE
1.00	0.01	0.08	0.34	4.28	18.66	76.64
2.00	0.02	0.06	1.06	3.17	14.65	81.06
3.00	0.02	0.07	2.65	3.24	14.82	79.21
4.00	0.02	0.13	3.02	3.31	14.80	78.74
5.00	0.02	0.21	3.02	3.36	14.78	78.63
6.00	0.02	0.25	3.16	3.77	14.91	77.91
7.00	0.02	0.31	3.36	3.73	15.48	77.11
8.00	0.02	0.61	3.44	3.86	15.75	76.35
9.00	0.02	0.64	3.46	4.33	15.63	75.94
10.00	0.02	1.16	3.53	4.45	15.68	75.19
11.00	0.02	1.16	3.68	4.41	15.59	75.16
12.00	0.02	1.16	3.78	4.41	15.61	75.04

Cholesky Ordering: TERM_PREMIUM ON YIELD STOCK DEXRATE

Appendix 5: Monetary Policy Rates in the LAC Economies

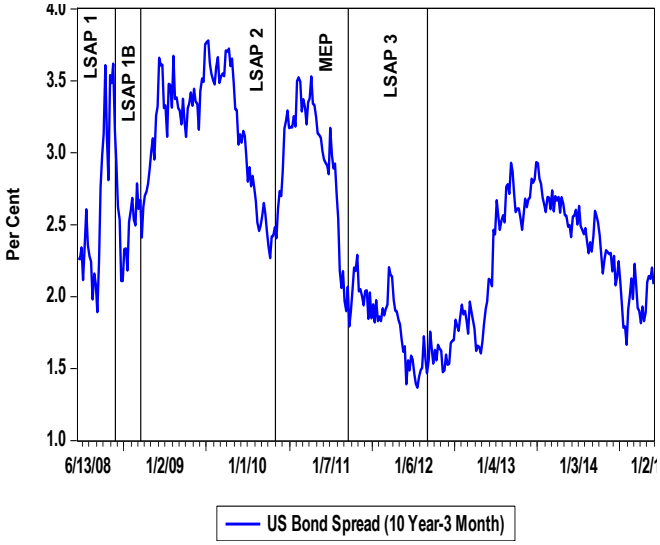


Figure 2 Yield Spread between 10 Year and 3 Month Treasuries

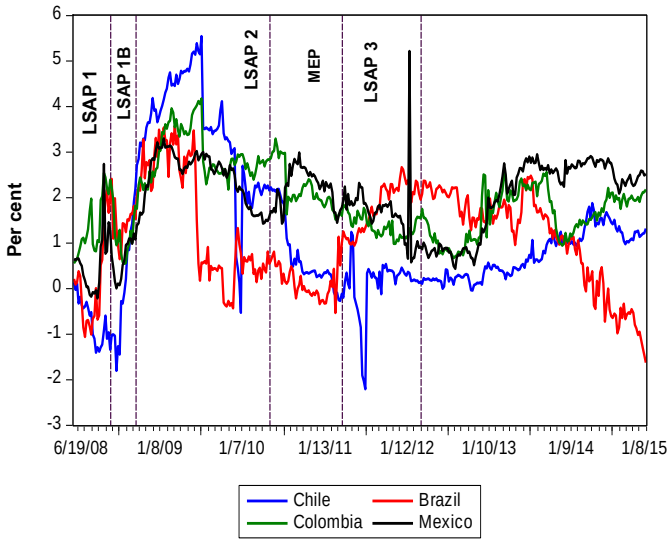


Figure 4 Yield Spread between 10 and 1 Year Sovereign Bonds

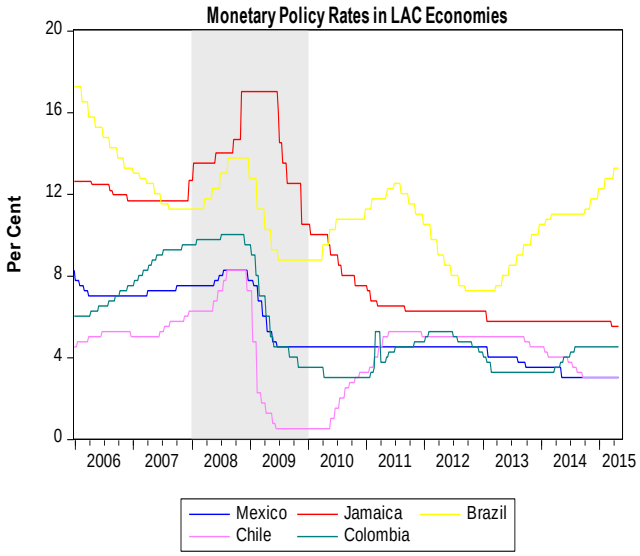


Figure 3 Domestic Monetary Policy Rates