

Strength of the Pass-Through of the Policy Interest Rate: The implications for Trinidad and Tobago

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This study examines the pass-through of the monetary policy rate to the credit market lending rates of commercial banks in the presence of potential domestic and external frictions. By frictions to the pass-through we imply factors that can potentially cause inertia to the pass-through to the retail lending rate. The frictions we consider are excess liquidity, credit risk and macroeconomic expectations in Trinidad and Tobago. Employing Generalised Method of Moments estimation (GMM), we find that there is less than full pass-through when the frictions are excluded from the model. Further, we find that when the frictions are considered, they are significant, and the pass-through is even weaker than when frictions are excluded. The inclusion of frictions to the pass-through causes the pass-through to the lending rate to shrink by 22.5 per cent, and the pass-through to the mortgage rate to shrink by 42 per cent. As a result our findings suggest that the exercise of market based monetary policy in Trinidad and Tobago is weakened by these market frictions and more so on longer term rates. We therefore submit that these frictions must be considered in the transitioning to the market based style of monetary policy.

Key Words: Interest Rate, Pass Through, Frictions, GMM

JEL Classification: E43, E58

1.0 Introduction

The discussion on policy interest rate pass-through has become increasingly relevant as industrialised countries began shifting from the use of direct instruments to market based instruments. Further, Hammond (2012) noted that 27 emerging markets and industrialised countries pursued inflation targeting, using a policy rate. For the rest of the world IMF (2004) noted that up to 2004, the fund rendered assistance to 109 countries to make the transition to market based monetary policy. Cas et al (2011) observed that several central banks in Central America are making the transition to a market style monetary policy.

¹ I am deeply indebted to Professor Christopher Martin for his kind advice while I worked on the paper. All errors and omissions are mine.

Since the suggestion that countries follow inflation targeting via market based style of monetary policy, there have been discussions on whether or not this would allow countries to achieve complete pass-through of the policy rate to commercial bank credit market rates. Many of these studies have found that there was less than full pass through of the policy rate to the retail rates, see for example Cas (2011),² Wang et al (2008),³ and Kwapil and Scharler (2006)⁴. However, these studies did not seek to measure the relative strength of the pass through. Yet we argue that in the context of embryonic markets of developing countries, the success of this new style of monetary policy would depend on the strength of the pass-through of the policy rate.

An example of a developing country with embryonic markets is that of Trinidad and Tobago. As shown by Demirguc-Kunt and Levine (2001), Trinidad and Tobago reflects a bank based system so that the pass-through of the policy rate to retail lending rate by its commercial banks is critical to examining the impact of monetary policy on aggregate demand. Given that the economy is a bank based one, we contend that the frictions arising from the bank based system can seriously retard the transmission of the policy rate.

²Cas (2011) found that the pass-through of the short term interest rate to commercial bank lending is weakened by the non flexibility of the exchange rates in Central America.

³ Wang et al (2008) reported that the pass-through of money market rate and loan rate in Taiwan was incomplete.

⁴They found that there was less than full pass through of the policy rate to retail rates in the Euro Area and U.S.

The study is therefore applied to Trinidad and Tobago, a small open energy producing economy that is at a nascent stage in its money market development accompanied by a managed float.⁵ Here, commercial banks constitute the major form of financial intermediary and so they play a major role in the transmission of monetary policy.⁶ The country is seeking to implement a market based style of monetary policy where the central bank is attempting to use a policy rate to guide domestic markets. To this end, the central bank introduced the repo rate in 2002 in a bid to signal its monetary stance to the market. This was done in conjunction with moves to build its money market in terms of the interbank market and the regular auctioning of Treasury bills. The repo rate is the rate at which the “central bank purchases a security at a higher price at a specified date”.⁷ Accordingly, it is the “rate that the central bank charges the commercial banks for the use of overnight funds”.⁸ Buzeneca (2007) reported that the repo rate is widely used by developing countries as many of them seek to transition to indirect monetary policy.

Narrowing the focus of the study to Trinidad and Tobago allows us to investigate the extent to which frictions to the transmission channel in this market undermines the strength of the pass-

⁵ IMF (2004), points out that the ideal is to use a policy rate to reduce central bank intervention in the conduct of monetary policy. This type of intervention allows for the development of money and interbank markets so as to foster the realisation of monetary policy through increasing reliance on market prices.

⁶ IMF (2004) discusses three stages of monetary intervention based on the degree of financial intermediation. The second stage involve the fostering the development of development of money markets though relying on rule based instruments until the country can move to the final stage where its markets are diversified and liquidity management can fully rely on the money market.

⁷ Definition taken from “The implementation of Monetary Policy in Trinidad and Tobago” CBTT, Public Education Pamphlet Series, Issues 1, September 2005.

⁸ Taken from The Implementation of Monetary Policy in Trinidad and Tobago” CBTT, Public Education Pamphlet Series, Issue 1, September 2005. Pp 20.

through of the central bank policy rate under specific frictions. The frictions we consider are chronic excess liquidity, credit risks and spillovers arising from changes in the slope of the US yield curve.⁹ We argue that these frictions can potentially undermine the success of the market based style of monetary policy and therefore limit the ability of the pass-through of the policy rate to transmit through to aggregate demand. Consequently, these frictions can potentially cause the central bank policy rate to have a less than predictable effect on the credit market rate. As a result they can therefore disrupt the effect of changes in the repo rate upon the credit market rate.¹⁰

In order to execute the study, we pattern a model using frameworks developed by Lowe (1995) and Martin and Milas (2010). A difference between our study and that of previous studies is that we try to estimate the effect of frictions on the pass-through of the policy rate. We then examine stylised facts related to Trinidad and Tobago. This informs our model specifications to investigate the strength of the pass-through via GMM estimation. The estimation equation is laid out followed by the methodology and data. Following this we report our results and the study concludes.

⁹ We use excess liquidity and excess reserves interchangeably. Moreover we consider excess liquidity of the banking system to be representative of excess market liquidity for two reasons. Firstly commercial banks dominate the financial sector and secondly, the central bank during the period of the study only regulated the banking sector and therefore its monetary measures were directed at commercial banks.

¹⁰ Kobayashi (2008) explores the idea that the central bank aims to stabilise the credit market rate in the presence of productivity and preference shocks. This stems from the idea that the lending rate follows a cost channel. We assume however that the central bank is engaged in policy rate smoothing where it has more control, rather than through loan rate smoothing.

2.0 Theoretical Framework

A basic model illustrating interest rate pass-through from the short term rate to the lending rate was by Lowe (1995). He examined the notion that while short and long term interest rates commove in the long run, there are short run differences that may exist. Accordingly he investigated whether changes in short term rates may be transmitted to the long term.

In the aftermath of the global turbulence in 2008, Martin and Milas (2010) examined the situation where the spread between the short term rate and the policy rate widened. They noted that countries faced the challenge concerning how best to set their short term policy rates in the context of widening of the spread between short term and medium term rates. As such they sought to investigate the spread between the interest rate set by the policy makers and interest rate in the money market.

To explore this Martin and Milas (2010) allowed for a base rate to work sequentially through the system of the IS and Open Economy Phillips curve (OEPC) equations, to stabilise the output gap and inflation rate around a targeted rate. In doing so, they incorporated risk and liquidity measures in order to impact on the interbank rate. By applying their model to the UK, they found these parameters to be significant to the monetary policy rule. In their framework, the policy rate is transmitted through the money market to the Libor rate. Accordingly, they use the

3 month LIBOR rate as the benchmark money market rate, which in itself could be treated as the floor for lending to the private sector.¹¹

An important difference between the LIBOR rate as used by Martin and Milas (2010) and the market lending rate we use in this study, is that while the former is representative of the cost of credit to banks in the interbank market, the latter is the base interest rate cost of borrowing by households, firms and government in the economy. Another advantage of using the market lending rate is that its impact on demand is more immediate as, theoretically, lending rates impact upon credit demand in the economy, so that the eventual effect of changes in the policy rate upon demand is through the lending rates. It is critical therefore for the central bank to be able to gauge the extent to which the market rate changes are tied to its changes in the policy rate, in a bid to forecast reactionary demand changes.¹²

We refer to the Lowe (1995) Model as the base line model and the Martin and Milas (2010) type model as the generalised model. This is a convenient way to benchmark the strength of the pass-through of the generalised model relative to the base line model.

¹¹The 3 month Libor rate is obtained daily from surveys reported by the British Bankers Association based on banks in the interbank market declaring how much they are prepared to pay to borrow from each other on the interbank market.

¹² Kobayashi (2008) explores the idea that the central bank aims to stabilise the credit market rate in the presence of productivity and preference shocks. This stems from the idea that the lending rate follows a cost channel. We assume however that the central bank is engaged in policy rate smoothing where it has more control, rather than through loan rate smoothing.

3.0 Potential Effects of Frictions to the Monetary Transmission in Trinidad and Tobago

Given the embryonic stage of development of the money market in Trinidad and Tobago, the models are applied to the economy with some modifications. We contend that use of credit market lending rates of commercial banks can allow the transmission mechanism in the model to utilise a larger information set. This is owing to the fact that credit market rates are ex post, determined after excess liquidity, credit risks and spillovers of external disturbances are taken into consideration. Owing to the dominance of commercial banks in the financial structure in Trinidad and Tobago, we use a combination of representative credit market rates. The idea here is that these lending rates impact on consumption demand.

Internal and external frictions to the pass-through of the policy rate can cause the market rate to become de-coupled from the central bank policy rate. Accordingly, commercial banks may not be forced to adjust their lending rates in congruence with the central bank policy rate, so this can blunt the effectiveness of the policy rate of the central bank.¹³ For example, when excess reserves are persistent, banks may not be forced to return to the central bank to borrow funds and therefore respond to the policy lending rate.¹⁴ Moreover, excess liquidity in Trinidad

¹³ Other energy producing countries seeking to make the transition to market based monetary policy include, Qatar and Nigeria.

¹⁴ Excess Liquidity is common in developing countries. See for example Jayaraman et al (2012) who studied the the implications of excess liquidity for Fiji They found that it affected volatility of loans, exchange rate and lending rate. Also, Anderson-Reid (2011) examined the determinants of excess liquidity in Jamaica and found that excess liquidity was spurred by output gap, income volatility, fiscal deficits among other things.

and Tobago is often prompted by surges in energy revenues occasioned by limited and financial markets.

It should be noted that excess reserves are typical of energy producing countries such as those in the Middle East, North Africa, and Venezuela. These countries tended to record oil related excess liquidity, particularly when oil prices rise. Poghasyan and Hesse (2009) contend that for these countries oil prices positively impact on exports, government revenues, fiscal balances and GDP growth. In spite of this, energy prices tend to be positively correlated with oil related excess liquidity in spite of credit growth. Excess liquidity can occur as the increased inflow of oil revenues may be greater than the ability of the real side of the economy to absorb these revenue inflows.¹⁵

In analysing the pass-through of the policy rate, we must allow for the perceived degree of credit risk by financial institutions, see Martin and Milas (2010) and Lowe (1995). Here, by credit risk we refer to bank perception of default. This can be shaped by banker perception of risks accruing from the global economy and borrower intrinsic risks. Increased credit risk may lead to the widening of the credit market interest rate compared to risk free credit rates.

¹⁵Sanusi (2010) pointed out that in Nigeria, extraordinary oil windfalls between 2004-8 led by heightened oil prices, led to high levels of excess liquidity way beyond the capacity of the real sector in the economy to absorb. Also Saxegaard (2006) observed that rapidly growing excess liquidity presented a challenge to monetary policy in Sub Sahara Africa, where the largest oil producers there are Nigeria and Angola.

Similarly the more integrated the financial markets in Trinidad and Tobago is with that of the US, the more likely that changes in the slope of the US yield curve may have predictive value for the reaction function of Trinidad and Tobago.¹⁶ Essentially, US yield curve is used to derive market expectations in the Trinidad and Tobago credit market. Our candidate hypothesis here is that changes in the slope of the US yield curve may have predictive value of the buoyancy of the Trinidad and Tobago credit market. The spillovers can occur as a result of increasing financial integration of external and domestic markets so that disturbances in one economy can have a contagion effect on interest rates in another economy.¹⁷ This could be manifested through disruption of trade and capital flows given the ties that may exist between economies. We contend that as markets become more integrated, the spillover effects may become stronger and more significant to the transmission mechanism with respect to the policy rate to the market lending rate.

4.0 Stylized facts on Trinidad and Tobago Market

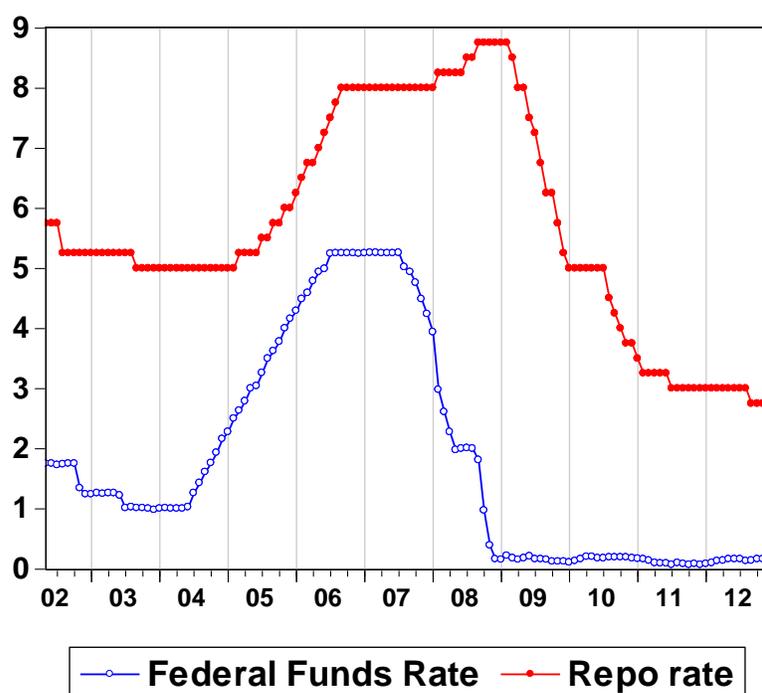
We do an examination between US Federal Reserve Rate and the Trinidad and Tobago repo rate, see Figure 1. Both policy rates are almost identically shaped. This is evident as the turning points off the US Federal Reserve Rate precedes Trinidad and Tobago policy rate. It can also be observed that the Trinidad and Tobago policy repo rate was highly correlated with the US yield curve, given a correlation

¹⁶ See Chauvet and Senyuz (2012). They showed that the yield curve have predictive power of economic cycles in the US economy.

¹⁷In defining spillovers, we benefited from Weyerstrasset al. (2006). They gave a typology of different definitions of spillovers, which included external and internal spillovers, shock vs. Policy induced spillover, direct vs indirect spillover and positive vs. negative spillover.

of 0.63 between the two for the period 2002 to 2012. It can also be observed that the turning points in the interest rate spread of the US yield curve tended to precede changes in the interest rate spread between credit rates and the policy rates in Trinidad and Tobago. Thus it is worth asking the question whether the policy rate is significant to the pass-through.

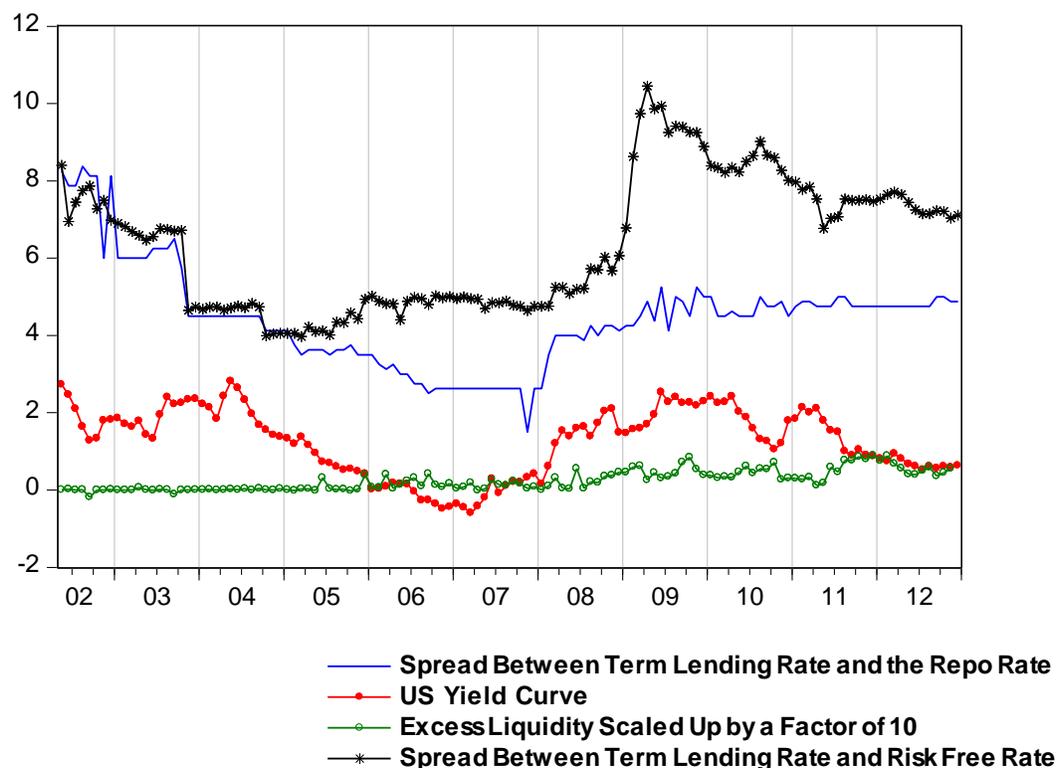
Figure 1Co movement of US Federal rate and TT Repo Rate



Further, we examine the spread between the term lending rate on the credit market measured in terms of lending rate and the repo policy rate, see Figure 2. We note that the spread between credit market and policy repo rates exhibit an approximate 'U' shape where it declined between 2002 until towards the end of 2007, after which it increased and levelled off by 2009. We also employ the US yield curve to

capture expectations. Like Mehl (2006), we construct the US yield curve by using the difference between the 5 year maturity and the 3 month Treasury bill rate. The US yield curve is calculated as the difference between the 5 year bond rate and the 3 months Treasury bill rate.¹⁸ The degree of the pass-through of the short-term interest rate can be assumed to be dependent on the stability and slope of the yield curve, see for example Baláz et al (2006). As such, the steeper the yield curve, the greater the degree of pass-through that can be expected.

Figure 2 Spread between Credit Market Rate and Policy Rate and Frictions

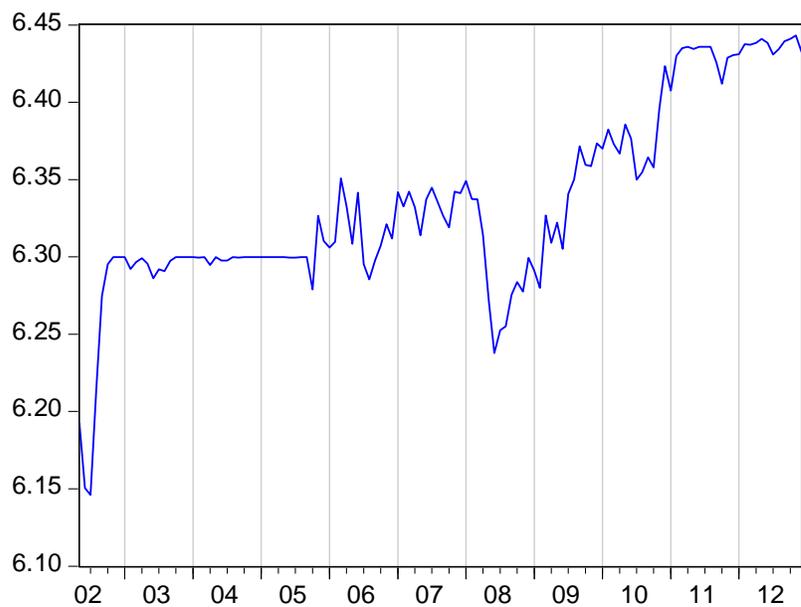


¹⁸ Stock and Watson (2003) cited literature that showed a significant relationship between the positive yield curve and an increase in real economic activity, while an inverted yield curve tended to be indicative of a recession. For example, Estrella and Hardouvelis (1991) found that a positive slope of the yield curve proved useful for forecast of inflation and real economic activity.

We also note that excess liquidity was elevated from 2008 at the same time oil prices were elevated, beyond the levels in the early part of the 2000 decade. At the same time excess liquidity was elevated there was a widening in the spread between the time lending rates and the repo rate. Thus it is possible for this factor to be an explanatory candidate to explain the widening of the spread between the repo rate and credit rates.

Figure 3 shows the selling exchange rate between Trinidad and Tobago and the US. The exchange rate is fairly stable. The most significant decline was in 2008 to 2010, but the decline was only by a small percentage points. It can be observed that movement of the rate was within a tight band ranging between 6.15 to 6.45.

Figure 3 Trinidad and Tobago Exchange Rate (Selling) to US



Trinidad and Tobago Exchange Rate (Selling)

5.0 Model specifications

Working through the transmission mechanism of the repo rate, it is expected to impact on market lending rates and through this, on aggregate demand. This can be obtained through the model by Lowe (1995), where we estimate the base line pass-through model as

$$i_t^{borrow} = \omega_{0t} + \omega_{1t} i_t^{base} + \varepsilon_t. \quad (1)$$

In adopting the model for Trinidad and Tobago, we represent i_t^{borrow} as either the term lending rate (i^T) or the mortgage rate (i^m) of the commercial banking industry and i_t^{base} to denote the repo rate charged by the central bank.

Further, we formulate a Martin and Milas type model to include interaction terms. We use these interaction terms to incorporate frictions such that

$$i_t^{borrow} = \beta_0 + (\beta_1 + \beta_2 exres_t + \beta_3 risk_t + \beta_4 X_t^{US}) i_t^{base} + \varepsilon_t \quad (2)$$

where risk is defined as the difference between prime lending rate and the risk free Treasury Bill Rate.¹⁹ Equation (2) is used to compare the strength of the pass-through of the policy rate to that of equation (1). In adopting the model for Trinidad and Tobago, we represent i_t^{borrow} as either the term lending rate (i^T) or the mortgage rate (i^m), while the prime lending rate reported for the commercial banking industry and i_t^{base} to denote the repo rate charged by the central bank.

Equation (2) is formulated to capture the interaction of the base rate by frictions in terms of excess reserves ($exres_t$), credit risk and US yield curve (X_t^{US}) to capture macroeconomic

¹⁹ Prime lending rate is the minimum rate at which commercial banks would lend to its best customers.

expectations. Clearly, the transmission mechanism is expected to work best where the interaction terms are zero so that $\beta_2 = \beta_3 = \beta_4 = 0$. If $\beta_1 = 1$ then we have full pass-through of the repo rate. However, if $\beta_1 < 1$ then we have less than full pass-through. We compare the strength of pass-through without frictions as in the base line model, against the pass-through with frictions as in the generalised model. If β_2 is significant, then it suggests that the interaction of the policy rate and excess liquidity constitute significant inertia to the pass-through of the policy rate. It therefore suggests that by virtue of holding excess reserves, banks are not forced to resort to borrowing from the central bank, so the repo policy rate would not constrain commercial banks' lending rate.

Similarly if there is interaction of interest rate risk and the repo rate, then it would suggest that banks take interest rate risk into account in setting their lending rate. As a result credit rate is linked to the perceived risks of commercial banks. Further, we use the US yield curve, β_4 , to measure expectations in the US market. The idea here is that changes in US yield curve can telegraph changes in expectations of macroeconomic performance. Trinidad and Tobago do not have sufficient trading across maturities of instrument to develop market based yield curve. By employing the US yield curve we are able to use a market based measure of expectations.

Excess reserves represent a cost to commercial banks since they receive no interest on it. Commercial banks may react in two alternative ways. Where there are limited avenues for placing these reserves to gain interest revenues, banks may lower lending rates in a bid to

increase loan demand. On the other hand, they may opt to raise lending rates in order to compensate for the loss of income owing to non-remunerated excess reserves. Saxegaard (2006) also makes the point that the holding of these reserves may be involuntary. We point out that the reaction of these banks to reduce the holding of excess reserves may be dubious, with no certain reaction.

Martin and Milas (2010) contended that higher risk led to a widening of the spread between the lending and the base rates which they attributed to be the result of a rise in unsecured lending risk. We therefore examine whether the risk has the same effect that Martin and Milas (2010) found with respect to the UK, in that the spillover of risk lead to a widening of the spread between the policy and lending rates.

For the relation between lending rate and excess reserves, the direction of the relation is an empirical matter, since it depends heavily on prevailing demand conditions, competitiveness of the environment and individual bank strategy. From equation 5.4.1, if $\beta_2 \neq 0$ then excess reserves impact on the pass-through of the repo rate onto the lending rate. Similarly, if $\beta_3 \neq 0$, $\beta_4 \neq 0$ and $\beta_5 \neq 0$ then international spillovers stemming from the US yield curve impact on the pass-through of the repo rate. We contend that the signage of these spillover coefficients is largely an empirical matter.

5.0 Methodology and Data

Following Martin and Milas (2008), Generalised Method of Moments (GMM) is used as the estimation technique used to find estimates of the parameters. The general model to capture the pass-through is given in regressions (1). Systematic risk is captured by β_0 . The pass-through of the repo rate is captured by β_1 along with its interaction with excess reserves. The interaction of the repo rate with the spillover of variables is captured by β_2 .

Martin and Milas (2010) only used lags of endogenous variables as instruments. However, we include both endogenous and an exogenous instrument. Similar to Martin and Milas (2010), the first 6 lags are employed for the overall period with respect to the endogenous variables. The exogenous instrument we include is the Federal Reserve Rate.

Monthly data are used for the period May 2002 following the introduction of the repo rate, to December 2012. As a result, the overall sample contains 128 data points. The data are deliberately used for the period 2002 when Trinidad and Tobago began use of the repo rate as the policy rate to the first quarter of 2009, bearing in mind that a global downturn began in mid-2008.²⁰ This allows us to see how the transmission may have affected the pass-through of the policy rate. As such, we test to see if the pass-through of the policy rate to the credit market lending rate in Trinidad and Tobago is sensitive to excess reserves, credit risk and the US yield curve.

²⁰The transmission mechanism was captured in "The Implementation of Monetary Policy in Trinidad and Tobago" Public Education Pamphlet Series, no. 1 of the Central Bank of Trinidad and Tobago, September 2005.

6.0 Results

6.1 Base Line Pass-through Model

The evidence reported in Table 1 show that all variables are significant. The estimation results show that there is less than full pass-through of the repo rate as the coefficients are less than one, regardless of whether term lending rate or mortgage rate is used as the dependent variable.

Table 1 Degree of Pass-through to the credit market

	Term Lending Rate (2002 to 2012)	Mortgage Rate(2002 to 2012))
	Equation 1a	Equation 1b
β_{00}	6.04 (0.35)***	5.48 (0.15)***
β_{01} (repo)	0.60 (0.07)***	0.81 (0.03)***
$\overline{R^2}$	0.57	0.69
S.E of regressions	1.04	0.94

Notes: Standard error of parameter estimates are placed in brackets.

6.2 Generalised Model with Market Frictions

Like in the base line model, all the variables were significant for the generalised model. Our results show less than full pass-through of the policy rate for both mortgage and lending rates when the frictions are included in the pass-through of the policy rate to the credit rate, see Table 2..The results that the pass-through was not significantly different when the term lending rate was used compared to when the term lending rate was used. Moreover, the pass-through was lower than the base line model

when the frictions are considered. This would suggest that these frictions would make the pass-through of the policy rate less effective.

Table 2 Pass-through of the Interaction of excess reserves and spillovers with repo rate

	Term Lending Rate (2002 – 2012)	Mortgage Lending Rate (2002 – 2012)
	Equation 2a	Equation 2b
β_{00}	5.48 (0.12)***	5.62 (0.15)***
β_{01} (repo)	0.49 (0.05)***	0.57 (0.05)***
β_{03} (Excess Reserves interaction with repo rate)	-2.17 (0.68)***	-4.33 (0.95)***
β_{04} Risk interact with repo rate	0.04 (0.01)***	0.05 (0.01)***
β_8 (US yield Curve interaction with the repo rate)	0.08 (0.01)***	0.01 (0.01)**
$\overline{R^2}$	0.87	0.79
S.E of regressions	0.57	0.77

Notes: Dependent variable is the Prime Lending rate for the credit market. Standard error of parameter estimates are placed in brackets.

7.0 Conclusion

We considered the frictions in terms of excess liquidity, lending risk and expectations captured by the US yield curve. The results suggest that all the frictions considered are significant. For the base line model, there was less than full pass-through of the policy rate to the credit market lending rate. Further, we find that the pass-through is weakened when frictions are included. In particular, we find that the term

lending rate and the mortgage lending rate reduce by 22.5 and 42.0 per cent respectively. Our findings suggest that the central bank should take frictions into account in prescribing policy rate changes.

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