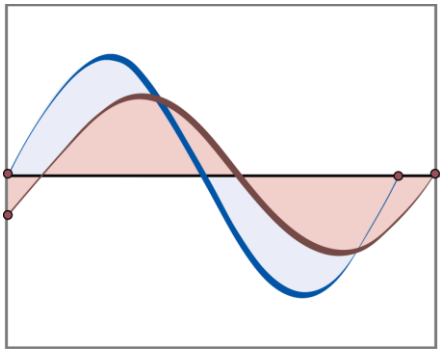
CENTRAL BANK OF TRINIDAD & TOBAGO

WORKING PAPER SERIES



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Is Central Bank Communication a Complement or Substitute for Monetary Policy?

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Abstract

Central bank's communication strategies have been shown to support the efficacy of monetary policy. Following the global financial crisis, numerous central banks concluded that communication and transparency assist in the understanding and transmission of monetary policy. This study investigates whether communication by the Central Bank of Trinidad and Tobago (CBTT) is complementary, where communication supports the bank's monetary policy tools in achieving policy objectives, or a substitute, where the bank can directly achieve policy objectives through communication. Using text mining software, the study established a communication frequency index, the MPA communication index (MPACI), from the primary source of monetary policy communication by the CBTT. The MPACI was evaluated using Vector Autoregressive (VAR) and Vector Error Correction (VEC) models and suggests that CBTT communication complements monetary policy as it supports responses in the market for credit despite the direction of change in the key policy rate. However, the index was shown to have little to no impact on economic activity or inflation.

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Keywords: Vector Autoregression, Vector Error Correction, Text Mining, Central Bank Communication, Transparency, Monetary Policy Communication, Information and Forward Guidance

Is Central Bank Communication a Complement of Substitute for Monetary Policy?

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1.0 Introduction

Central banks' communication strategies have been shown to support the efficacy of monetary policy, and over time monetary authorities have come to understand that communication and transparency assist in the understanding and transmission of monetary policy. As the determination of monetary policy decisions and practices are shared with the public, the question arises whether more transparent communication is a complement or substitute for monetary policy actions. A communication strategy that is complementary to monetary policy suggests that central banks' targets are achieved via a combination of traditional monetary policy tools and the use of policy communication. On the other hand, communication can be considered a substitute for monetary policy when communication by the bank can replace the reliance on monetary policy tools and guide market changes.

Historically, a veil of secrecy consumed central banks and their policies. This sometimes nullified the intended impact of policy actions as markets were unsure of the messages dispersed and, in some instances, responded unfavourably. As such, mysterious and vague communication strategies with confusing messages have cost central banks in the past. The notion was made apparent when former IMF Managing Director Rodrigo de Rato remarked that Alan Greenspan, Chairman of the United States Federal Reserve, once said, "if I turn out to be particularly clear, you've probably misunderstood what I said" (de Rato 2006). The lack of trust in central banks along with public pressure regarding the achievement of policy goals is a direct result of the prior communication strategies undertaken by central banks. However, since the global financial crisis monetary authorities have found it advantageous to communicate their policies as openly and clearly as possible. The change in communication strategy comes on the heels of markets requiring palatable communication from central banks and central banks seeking to build public trust.

Formal communication[1] consists of official and regularised information that is occasionally exchanged through predefined channels within an organisation, whereas informal communication is often spontaneous and non-regularised, and moves more freely and frequently in the organisation. Given these definitions, formal central bank communication often consists of official reports, published minutes, research papers, and official presentations. Whereas informal communication from a central bank can arise from interviews and testimonies of policymakers. Research has indicated that informal communication tends to have a greater impact on influencing markets than formal communication (Su et al. 2019), however, potentially at the cost of central bank credibility and policy flexibility (Vissing-Jorgensen 2020). Furthermore, a more recent dynamic influencing the communication strategies of a central bank is that of technological advancements and social media communication. The increasing use of technology and the altering of communication channels has propelled both formal and informal central bank communication, enhancing the transparency of policies.

The discussion surrounding communication as a complement or substitute must take account of the transmission of monetary policy by first examining the objectives of monetary policy and the achievement of these objectives. In Trinidad and Tobago, the monetary policy objectives are stated as; (1) a low and stable inflation rate, (2) an orderly foreign exchange market and, (3) an adequate level of foreign exchange reserves. It is often assumed that central banks can achieve all objectives simultaneously, however, in reality central banks are often faced with monetary policy trade-offs known as the impossible trilemma where authorities can only ever satisfy two of the three objectives concurrently (CBTT 2019). Nonetheless, the CBTT can alter its

[1] "Formal central bank communication is generally defined as central bank reports and minutes that are published, while informal communication can take the form of speeches" Su et al (2019).

policies to prioritise particular objectives. Another point of contention is that the speed of transmission has historically been perceived as slow (Cheong and Boodoo 2008). Given an already weak transmission mechanism, investigating the impact of monetary policy communication will provide insight as to whether and how it supports the transmission.

This study is the first of its kind for the CBTT. As part of the strategic plan for FY2016/17-FY 2020/21, the Bank has sought to enhance its communication strategies, inclusive of a social media drive to reach its target audience. Given the potential of social media forums to reach a wider audience, the CBTT began to circulate its message surrounding monetary policy decisions to a broader audience. Given that the Monetary Policy Announcement (MPA) is the main tool of monetary policy communication, this study will first quantitatively assess the MPA releases over 2004 to 2019, using text mining software to estimate the frequencies of specific key words and phrases. The frequencies are then used to compute an MPA communication index (MPACI) which would be used empirically to determine how monetary policy communication affects target variables of domestic monetary policy, in addition to domestic credit conditions. The empirical evaluation employs a Vector Autoregressive (VAR) model, or a Vector Error Correction (VEC) model. Four models were examined, each with the MPACI, the Repo rate, a measure of economic activity and inflation, in addition to one of four private sector credit (PSC) variables: total, business, consumer and or real estate mortgage credit. The results were then evaluated to determine the effect of the Bank's policy communication.

Following the introduction, this paper will review the literature surrounding central bank communication of monetary policy mainly surrounding the benefits of increased communication regarding central bank objectives along with exploring issues related to reputational costs, time-consistency, forward guidance and anchoring expectations. Section three outlines a brief history of communication in the CBTT, while section four presents the data and empirical methodology. The results are discussed in section five, followed by a discussion of the limitations and scope for future work in section six, and a conclusion and policy recommendations in section seven.

2.0 Literature Review

Central bank communication can be defined as the provision of information to the public regarding matters on the monetary policy stance, objectives and strategies, and economic outlooks. Historically, central banks have been very reserved with information disclosure, frequently being accused of lacking clarity and transparency. However, the transformation of central banks into more independent institutions, reducing the political interference factor, has induced an increased level of accountability, transparency, and clarity of the monetary authorities (Tomuleasa 2015). Furthermore, communication has become an increasingly important aspect of monetary policy for numerous central banks in both advanced and developing economies. According to Blinder et al. (2008), evidence suggests that communication can be a crucial part of a central bank's toolkit; however, large variations exist in communication strategies, and no consensus has emerged on what constitutes an optimal communication strategy. Generally, views on monetary policy effectiveness confirm that managing expectations is part of the monetary policy strategy as this can influence financial markets. However, poorly designed and executed communication can be undesirable, resulting in excessive market volatility.

A survey on monetary policy communication in the Central-Eastern and South-Eastern Europe and the Euro area by Popovska-Kamnar (2017) concluded that many central banks pay close attention to transparency and provide meaningful information on policy decisions. This approach was driven by communication weaknesses leading up to the 2008/09 global financial crisis (GFC), in addition to movements towards floating exchange rates and inflation targeting regimes. Additionally, the relevance of forward guidance[2] became more apparent following the GFC. Interestingly, a study by Blinder et al. (2017) examined if the monetary policy communication changes, post-GFC, will be temporary or permanent. The results suggest that while scholars typically support keeping unconventional tools such as forward guidance, central bank governors are considerably more

[2] Forward guidance is a tool that central banks use to provide communication to the public about the likely future course of monetary policy to influence households' and firms' consumption and investment decisions, and economic activity today.

sceptical, reflecting the uncertainty about this policy tool. Nevertheless, there is consensus that central bank communication has become more frequent post-GFC, and it is anticipated that central banks in the future will have broader mandates, employ more macro-prudential tools, and communicate more actively (Blinder et al. 2017).

In the past, central banks operated with a great deal of discretion, secrecy, and flexibility. However, the mysteriousness surrounding policy actions often resulted in public confusion about the goals of monetary policy, amplifying central banks' vulnerability to political pressures. According to Vergara (2014), the move towards greater openness and transparency could provide some protection from political pressures. Likewise, the growing challenges from zero lower bound policy rates, substantial capital flows, and doubts about fiscal policy sustainability have encouraged central banks to adopt new transparent and open policy tools (Vergara 2014). Furthermore, to understand the level of scrutiny, authorities should acknowledge that "changes in communication are very keenly noticed and analysed. And it is not only what is said but also what is left unsaid that can send a message" (Weidmann 2018). Communication should therefore clearly and precisely convey the objectives and deviations of monetary policy to avoid unnecessary uncertainty. Additionally, "communication serves to steer expectations, and the better expectations are steered in line with the monetary policy mandate, the better the central bank will stabilise aggregate demand and price" (Weidmann 2018).

Despite these conditions, communication and forward guidance can present additional challenges for monetary authorities (Vergara 2014). The first challenge relates to a time-inconsistency problem, where forward guidance depends on a credible policy commitment. However, for unanticipated changes in economic conditions, authorities may suffer reputational costs if they renege on a policy commitment. The second problem is that a more comprehensive contingency plan could have a communicational complexity cost which might create more confusion. Third, knowledge of the future is limited, and policy changes may be needed as new information is received. Lastly, if forward guidance is successful in contributing to improved economic conditions, this could create incentives for strategic financial market actions in order to pre-empt a change in policy direction. Such strategic moves could trigger herd behaviour and introduce volatility into the financial markets.

The key challenge for central bank communication in increasing the effectiveness of monetary policy is therefore guiding and anchoring expectations. A major risk, according to Sinha (2020), is that markets will interpret announcements as unconditional commitments, despite the presence of uncertainty in economic forecasts. As a result, time-inconsistency and credibility issues can plague a central bank following policy announcements. Sinha (2020) indicated that central banks must communicate with broad audiences, from academics to financial markets, to the broader public. Each audience group has its unique information processing mode, and central bank communication can be exposed to the subjectivity of the receivers. As a result, communication must be designed to cover the wider audience while ensuring clarity. Furthermore, transparency and openness should be limited not to overload the audience with information and reduce the intended level of clarity.

In discussing the future of monetary policy, Blinder (2017) predicted that monetary policy transparency would increase over time, and forward guidance will remain a potential instrument. Given that many central banks have been encountering the effective lower bound (ELB) on short-term nominal interest rates, Blinder (2017) suggests that monetary authorities will need to undertake more frequent unconventional monetary policies such as forward guidance. However, considering that forward guidance relies on complicated expectations of the term structure, this unconventional tool will likely remain a "highly conditional prediction" and not a commitment (Blinder 2017). Furthermore, despite increased communication with the public, Blinder (2017) suggests that the message will mostly fail due to central bank communication primarily being designed to address experts, versus the general public who sometimes lack both expertise and interest. For this same reason, the Central Bank of Jamaica (BOJ) undertook an innovative approach educating the population on monetary policy and providing effective forward guidance through reggae music videos, social media advertising, and even children's publication for Jamaican schools (Plata and Coley-Graham 2019).

On examination of the communication output of the US Federal Reserve, Moschella and Pinto (2018) employed a structural topic model to evaluate a corpus of speeches delivered by members of the Federal Board of Governors. The results confirm the author's reputational argument that central banks face reputational costs for future policy reversals, and their communication is strategically oriented to minimise those costs. According to Moschella and Pinto (2018), although central banks communicate

through a variety of channels, their analysis focuses on speeches since they address multiple audiences, are less constrained and strategically delivered, and they offer a unique opportunity to observe reputation protection behaviour.

An innovative approach was adopted by Ernst and Merola (2018) to evaluate central bank communication using a constructed set of communication indices. The study employed an automated text mining procedure to assess a collection of advanced economies central bank speeches from the Bank of International Settlements (BIS) collection. The empirical results concluded that central bank communication could be a complement or a substitute for monetary policy. Ernst and Merola (2018) explain that central bank communication has progressed towards greater transparency for two main reasons. Firstly, central bank independence has to be balanced with accountability. Secondly, central bank goals of economic stability are more easily achieved when economic agents have a clear understanding of the goals of monetary policy.

An analysis of central bank monetary and non-monetary communication using a macro-finance predictive communication model determined that the non-monetary component dominates the market reaction to central bank communication in four leading central banks (Cieslak and Schrimpf 2018). The model investigated the direction of co-movement between equities and government bond yields and explained the relationship using the example of non-monetary communication from Mario Draghi, the former President of the European Central Bank (ECB). The authors outlined that Draghi's comments in 2012, to "do whatever it takes" to preserve the Euro, resulted in a notable fall in bond yields and a rally in European stocks, while money market rates remained relatively unchanged. This example provided strong evidence that the non-monetary communication can influence asset prices through channels not directly related to monetary policy.

Using an experimental learning-to-forecast (LTF) framework, based on an extension of heterogeneous expectations and monetary policy, Kryvtsov and Petersen (2019) examined the causal effects of central bank communication on economic expectations in Canada. The authors found that central bank communication has a stabilising effect and that the size of the effect varies with the type of communication. Furthermore, the study determined that "simpler, more accessible central bank communication tends to be more effective in influencing participants' forecasts".

During crisis periods, central bank communication can be crucial in restoring stability. Using ordered probit models, Lehtimäki, and Palmu (2019) evaluated if central bank communication could be used to explain monetary policy changes in the ECB and US Federal Reserve, under uncertain economic conditions. They concluded that "predictability was reached relatively well at the central bank level during the financial crisis despite the rapid growth of economic uncertainty, and that communication can be a useful tool for central banks during uncertain times".

Similar to advanced economies, central bank communication in emerging economies can prove to be beneficial. Using an exponential generalised autoregressive conditional heteroscedastic (EGARCH) model, Su et al (2019) investigated the extent to which formal and informal communication by the People's Bank of China (PBOC) influences the money market. For this analysis, the authors categorise formal communication as summarised minutes of meetings, and reports on monetary policy, financial markets and financial stability; while informal communications are: interviews, testimonies, conferences and speeches of central bankers. The study found that the PBOCs communication has a significant effect on the money market; however, informal communication appears to be more effective. Conversely, Vissing-Jorgensen (2020) explained that informal communication in a central bank setting can run counter to accountability, can be driven by policymaker disagreements, and can harm the central bank's credibility and decision-making process.

Furthermore, to assess the quality of the Central Bank of Chile's (CBC) monetary policy communication, Pescatori (2018) constructed monetary policy surprise indices and evaluated the macroeconomic impact using a proxy-VAR methodology. The indices captured information from policy meeting statements, minutes and reports, and determined that the CBC is effective in forward guidance as policy actions were predictable. Furthermore, the study determined an asymmetric response of equity prices to minutes, suggesting that market participants extract information (Pescatori 2018). Finally, Ekor et al. (2013) examined the impact of central bank communication on monetary policy in Nigeria by applying a vector autoregressive approach. The study concluded that inflation and market volatility reduced during periods of improved communication. However, the authors

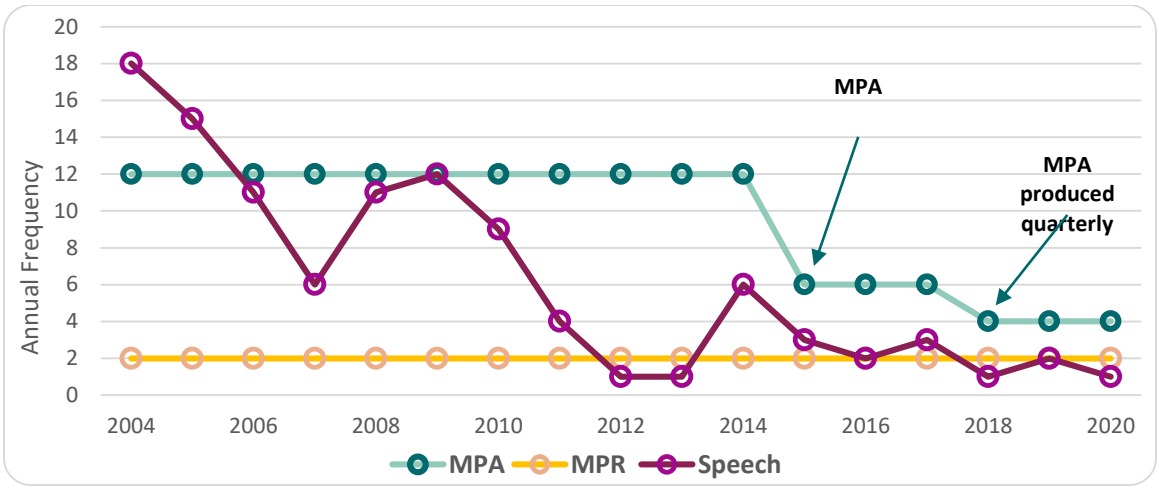
suggested that the "interest rate channel of the transmission mechanism should be given greater priority compared to the asset channel as the money market reverted faster to equilibrium compared to the stock market in the event of a shock".

3.0 Stylised Facts

3.1 A Brief History of CBTT's Monetary Policy Communication

The communication strategies of the CBTT have evolved over the last 16 years. Similar to many central banks, communication constituted both formal and informal communique comprising routine publications, reports, statistical digests, speeches and interviews. The publications and special reports informed the public about the economic climate, and an extensive statistical digest provided information on various aspects of the economy. Notably, informal communication was a driving force behind the CBTT's communication strategies as speeches were at an all-time high between 2004 to 2010 (**Chart 1**).

Chart 1: Central Bank of Trinidad and Tobago Formal and Informal Communication Between 2004 -2020



Source: Central Bank of Trinidad and Tobago.

Along with the introduction of its main policy tool, the Repo rate, in 2002, the bank also launched the Monetary Policy Announcement which was a major form of formal policy communication which would explain and discuss the reasons for the CBTTs policy rate decision. The MPA was initially published monthly up to 2017 when the report moved to a bi-monthly publication rate and then to quarterly in 2018. Although the number of MPAs declined, the Bank boosted communication through visual summaries of reports on its website, a Facebook page, a YouTube channel and an Instagram account to share information with a broader audience.

Figure 1 shows an example of CBTT website usage data. The data shows the number of public views, the main areas of the website visited, and the main documents downloaded. The data provided here can be used to evaluate the reach of Central Bank communication.

Figure 1: Summary of Website Usage - January 2019

Number of Visitors

Current Month	16,210
Previous Month	11,973
Comparable Period*	13,968

Average Session Duration (minutes)

Current Month	2:42
Previous Month	2:14
Comparable Period*	2:41

Number of Returning Visitors[3]

Current Month	4,741
Previous Month	3,469
Comparable Period*	4,269

Number of New Visitors

Current Month	11,469
Previous Month	8,504
Comparable Period*	9,699

Most Popular Pages

# 1	Data Centre
# 2	Careers
# 3	Currency

Most Popular Downloads

# 1	MPA - December 2018 (588)
# 2	Economic Bulletin– July 2018 (251)
# 3	SEIB – Sept 2018 (162)

Source: Central Bank of Trinidad and Tobago.

3.2 A Brief History of the CBTT's Monetary Policy Tools

Prior to the empirical examination of central bank communication, a brief discussion on the trends in the Bank's key policy tool, the Repo rate, is warranted. During the 1960s, the Central Bank relied largely on moral suasion to regulate borrowings from the commercial banks. Following this period, over the 1970s to the 1980s, monetary policy in Trinidad and Tobago was implemented via direct instruments such as administratively-set interest rate ceilings, bank credit ceilings, and reserve requirements. Credit ceilings were set on the maximum borrowing by non-residents and companies controlled by non-residents, while the Bank issued guidelines relating to ceilings on interest rates on loans (CBTT 2005).

However, following the oil boom in the 1970s and early 1980s, the domestic economy began to experience balance of payments difficulties, reflected in expanding current account deficits, and the eventual signing of a Stand-by Agreement with the International Monetary Fund (IMF) in 1989 (Fontaine 2003). During this era, monetary policy played a supporting role to the structural adjustment programme through two objectives: (1) eliminating the subsidy on government short-term domestic borrowing, and (2) reducing commercial bank borrowings from the Central Bank (Cheong 2019).

Subsequently, in the 1990s the Central Bank switched focus towards the use of Open Market Operations (OMOs) as it provided more flexibility for monetary policy compared to direct reserve requirements. Later on, empirical evidence suggested that the credit channel explained inflation and long-term economic growth much better than changes in monetary aggregates, resulting in an increased focus on influencing short-term interest rates (CBTT 2005). By mid-2002, this finding resulted in the Bank adopting a new monetary policy framework, the Repo rate, as the main policy tool. The Repo rate directly impacts market interest rates which influence bank credit conditions via the credit channel (CBTT 2005). A change to the policy rate would therefore sway domestic demand, leading to either expansionary or contractionary economic conditions.

Soon after introducing the Repo rate at 5.5 per cent in May 2002, the Bank eased monetary conditions by lowering the rate by 25 basis points to 5.25 per cent in September 2002, given the slow pace of credit growth. This accommodative period, which

[3] Returning visitors are measured by IP Address.

lasted roughly 10 quarters, assisted in boosting economic conditions and increasing employment levels. Over time, reduced spare capacity resulted in inflationary pressures. As a result of a potentially overheating economy, monetary policy reversed course in early 2005. This period of tight monetary conditions lasted roughly 16 quarters until the end of 2008, when the domestic economy began to feel the effects of the GFC. Over the next five years ending mid-2014, the Bank pursued loose monetary policy as the Repo rate fell to its lowest at 2.75 per cent. Although the financial crisis created numerous challenges, the domestic economy remained relatively resilient and began to show signs of recovery and strength during 2013. As a result, the Bank began to tighten monetary policy conditions by increasing the Repo rate from 2.75 per cent to 5.0 per cent over the next four years; however, the rate remained somewhat neutral[4], mainly owing to the effects of the 2014 oil price shock.

Overall, since the introduction of the Repo rate, monetary policy has mostly adopted either an accommodative or a neutral stance, apart from the pre-financial crisis period when the policy was primarily restrictive. Given this dynamic, the Monetary Policy Announcements which indicate the policy rate and associated monetary policy position, would have largely communicated an accommodative policy position. This dynamic was considered important when examining the impact of monetary policy communication.

Despite the use of the Bank's operational policy tool to achieve its mandated monetary policy targets, evidence on the success of the key policy rate suggests that the domestic monetary policy channels may not be efficient. The CBTT (2005) mentions that the implementation of monetary policy by itself is insufficient to achieve inflation control since inflation has numerous proximate causes. Therefore, monetary policy, fiscal discipline, income restraint and exchange rate stability required coordination and harmonisation in order to effectively control inflation, especially since monetary policy affects inflation with lags of uncertain duration (CBTT 2005). Furthermore, on investigating the strength of the Repo rate pass-through on the various monetary policy targets, Cheong and Boodoo (2008) determined that generally, the interest rate pass-through was relatively weak, largely due to the existence of high levels of liquidity in the financial system, however, they nevertheless do exist. Given that monetary policy changes may not be optimally transmitted through the financial system, the effect of central bank communication may work to complement or substitute the Bank's operational tools and aid in achieving targets.

4.0 Data and Methodology

Formal monetary policy communication by the CBTT primarily arises from the release of the Monetary Policy Announcement (MPA) which communicates changes in monetary policy and policy instruments, in addition to a description of economic conditions and concerns that gave rise to the policy decision. Given that the MPA is the main tool of monetary policy communication, this study first quantitatively assesses the MPA document using text mining software to create the MPA communication index (MPACI). The index is then used to empirically determine how monetary policy communication affects major targets of domestic monetary policy, in addition to domestic credit conditions.

4.1 MPA Qualitative Index Measurement & Dataset

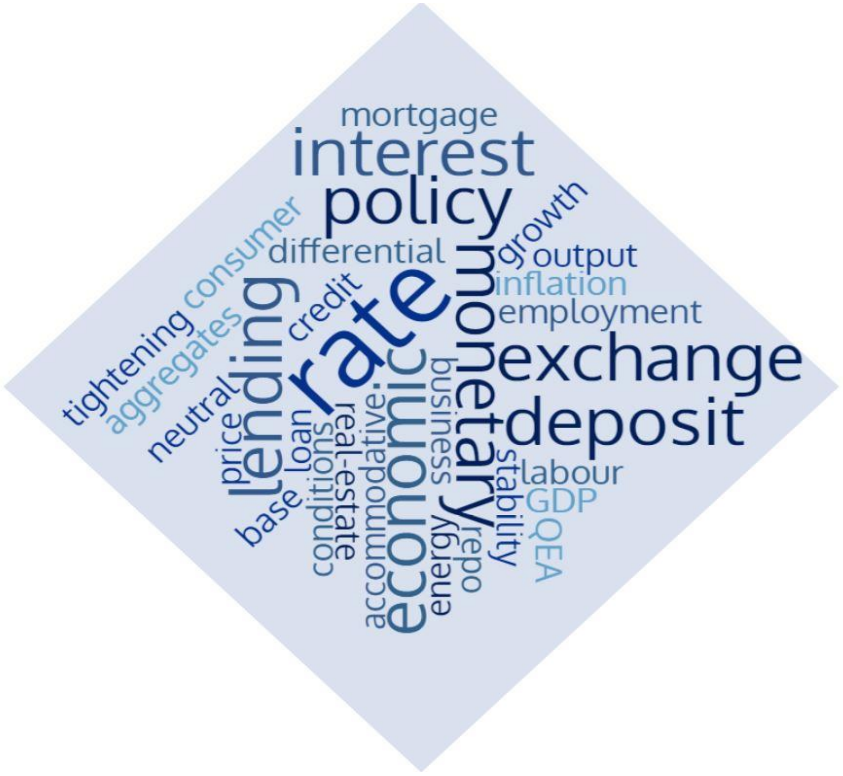
In order to quantitatively assess the MPA document and create an empirically inferable MPACI, a list of key words and phrases was selected to represent monetary policy communication (**Figure 2**). These key words and phrases were chosen to cover the main factors that influence monetary policy decisions and the main targets of the policy decision. Voyant Tools[5], which is an open-source, web-based, text reading and analysis software, was employed to extract the key words and phrases in the MPA releases. All MPA documents released in a particular quarter, and available on the CBTT website, were uploaded to the Voyant Tools software creating a corpus of MPA releases.

[4] In this context, a neutral monetary policy position refers to a policy rate that is neither accommodative nor restrictive on economic growth.

[5] Sinclair, Stéfan and Geoffrey Rockwell, 2016. Voyant Tools. Web. http://voyant-tools.org/.

Subsequently, the text mining software provided information on the frequencies of selected key words and phrases which was used to compute the quarterly MPACI (**Appendix Table D**). This technique allows the researcher to quantitatively assess the intensities[6] of the key words and phrases over each quarterly period. This is intended to provide information on communication intensity, and provide an MPA reader with relevant information on economic conditions, associated policy changes, and possible forward guidance. However, it should be noted that this technique is unable to capture the tone of central bank communication or distinguish between pessimistic and optimistic statements.

Figure 2: MPACI Word Cloud: Key Words & Phrases



Source: Voyant Tools.

To examine the impact of the MPACI on the targets of monetary policy and to control for confounding factors, the main monetary policy tool, the Repo rate, was included in the model to account for the policy position, in addition to macroeconomic and financial market indicators (**Table 1**). A key macroeconomic indicator employed was the CBTTs Quarterly Index of Real Economic Activity[7] (QEA). The QEA is used as a proxy for quarterly economic activity, and is often used to assist policymakers in monitoring changes to economic conditions. Another macroeconomic variable used is headline inflation (INF_HEAD), as measured by changes in the Index of Retail Prices. Inflation indicates the relative price level stability and the "temperature" of the economy. Finally, the model includes domestic private sector credit (PSC) variables as a measure of the banking sector's contribution to economic activity. This measure captures how financial resources, or bank savings are channelled to private sector investments/consumption over the period. The study will examine total private sector credit (PSC_TOTAL), total business sector credit, (PSC_BUS), total consumer credit (PSC_CONS), and total real estate mortgage credit (PSC_REM). All macroeconomic and financial market indicators are represented in quarter-on-quarter percentage changes, to provide an

[6] The intensities of key words and phrases refers to the frequency or number of times a specific key word or phrase was mentioned within each MPA document.

[7] The QEA is compiled by the CBTT and is used to gauge short-term economic activity.
https://www.central-bank.org.tt/sites/default/files/page-file-uploads/economic-bulletin-january-2020_5.pdf

indication of the relative quarterly changes, which may be due to the MPACI. However, the Repo rate was included as a level variable due to the extended periods of infrequent changes in the rate.

Table 1: List of Model Variables

Variable	Model Notation	Description	Period	Source
Monetary Policy Announcement Index (MPACI)	MPA	Monetary policy key words and phrases intensity index constructed from MPA documents and text mining software.	Q4:2004 to Q4:2019	CBTT
Repo Rate	REPO	Indirect policy instrument – the rate at which the bank provides overnight financing to commercial banks. Included in levels.	Q4:2004 to Q4:2019	CBTT
Quarterly Index of Real Economic Activity	QEA_QOQ	Proxy for economic activity – a gauge of short-term economic activity – quarter-on-quarter percentage change.	Q4:2004 to Q4:2019	CBTT
Headline Inflation Index	INF_HEAD_QOQ	Headline inflation – RPI index - quarter-on-quarter percentage change.	Q4:2004 to Q4:2019	CSO
Total Private Sector Credit	PSC_TOTAL_QOQ	Total Private Sector Credit - quarter-on-quarter percentage change – by the commercial banks.	Q4:2004 to Q4:2019	CBTT
Total Business Private Sector Credit	PSC_BUS_QOQ	Total Business Private Sector Credit - quarter-on-quarter percentage change – by the commercial banks.	Q4:2004 to Q4:2019	CBTT
Total Consumer Private Sector Credit	PSC_CONS_QOQ	Total Consumer Private Sector Credit - quarter-on-quarter percentage change – by the commercial banks.	Q4:2004 to Q4:2019	CBTT
Total Real Estate Mortgage - Private Sector Credit	PSC_REM_QOQ	Total Real Estate Mortgage - Private Sector Credit - quarter-on-quarter percentage change – by the commercial banks.	Q4:2004 to Q4:2019	CBTT

4.2 Methodology – Empirical Examination

A time-series approach was adopted to examine the relationships between macroeconomic and financial market variables, and the MPACI. An Unrestricted Vector Autoregressive (VAR) model, as outlined by Sims (1980)[8] and Lütkepohl (2005)[9], is estimated and if evidence dictates, the VAR will be re-specified as a Vector Error Correction (VEC) model for further estimations.

The basic form of a VAR model consists of a set of $\boldsymbol{K}$ variables $\boldsymbol{Y_t} = (\boldsymbol{Y_{1t}}, \boldsymbol{Y_{2t}}, \dots, \boldsymbol{Y_{kt}})$ observed at time $\boldsymbol{t} = \boldsymbol{0, 1, 2, \dots, T})$ and defined with order $\boldsymbol{p}$ as: $\boldsymbol{Y_t} = \boldsymbol{\omega} + \boldsymbol{A_1 Y_{t-1}} + \boldsymbol{A_2 Y_{t-2}} + \cdots + \boldsymbol{A_p Y_{t-p}} + \boldsymbol{\varepsilon_t}$

and $\boldsymbol{A_i}$ are $(\boldsymbol{K} \times \boldsymbol{K})$ coefficient matrices for each $\boldsymbol{i} = \boldsymbol{1, 2, \dots, p}$ ($\boldsymbol{p}$ is a positive integer); $\boldsymbol{\omega} = (\boldsymbol{\omega_1}, \dots, \boldsymbol{\omega_k})'$ is a fixed $(\boldsymbol{K} \times \boldsymbol{1})$ vector of intercept terms; $\boldsymbol{\varepsilon_t} = (\boldsymbol{\varepsilon_{1t}}, \dots, \boldsymbol{\varepsilon_{Kt}})'$ is a K-dimensional white noise with covariance matrix $\sum u$; and $\boldsymbol{n}$ is the number of lags in the VAR system.

[8] Sims, Christopher A. (1980). "Macroeconomics and Reality." *Econometrica* (The Econometric Society) 48, no. 1: 1-48.

[9] Lütkepohl, Helmut. (2005). "New Introduction to Multiple Time Series Analysis." Springer. Berlin.

The VAR model to be estimated can be denoted as follows:

$$Y_t = \sum_{p=1}^{n} \omega_t + A_p Y_{t-p} + \varepsilon_t$$

The ordering of the variables, a requirement for Cholesky orthogonalization, takes the following form and is based on the monetary policy transmission mechanism as outlined by Cheong and Boodoo (2008):

$$\boldsymbol{Model\ 1}: \boldsymbol{MPA \rightarrow QEA\_QOQ \rightarrow INF\_HEAD\_QOQ \rightarrow PSC\_TOTAL\_QOQ}$$

$$\boldsymbol{Model\ 2}: \boldsymbol{MPA \rightarrow QEA\_QOQ \rightarrow INF\_HEAD\_QOQ \rightarrow PSC\_BUS\_QOQ}$$

$$\boldsymbol{Model\ 3}: \boldsymbol{MPA \rightarrow QEA\_QOQ \rightarrow INF\_HEAD\_QOQ \rightarrow PSC\_CONS\_QOQ}$$

$$\boldsymbol{Model\ 4}: \boldsymbol{MPA \rightarrow QEA\_QOQ \rightarrow INF\_HEAD\_QOQ \rightarrow PSC\_REM\_QOQ}$$

The estimation of a VAR or VEC model requires that the preconditions of stationarity and cointegration be determined, in addition to satisfying statistical tests (**Technical Appendix 1**). Unit root tests were undertaken and found that all variables were integrated of order zero, I(0), except for the MPACI and the Repo rate which were both integrated of order one, I(1), and therefore first differenced. Subsequently, lag length selection criteria were determined for each model and used to examine model cointegration. Following this, robustness tests based on residual serial correlation, heteroskedasticity, and unit root stability were conducted to confirm the methodology selected for each model. Based on the relevant examinations, Models 1 and 2 were estimated using a VAR, due to the presence of no cointegrating equations, while Models 3 and 4 were estimated using a VEC, due to the presence of cointegrating equations.

In the following section, the VAR or VEC Impulse Response Functions (IRF) will be used to examine the relevant relationships. The IRF shows the effect of a hypothetical one standard deviation exogenous shock to one of the innovations on current and future values of the endogenous variables, allowing the researcher to observe the changes of the endogenous variables and to detect the dynamic relationships among contemporaneous variables.

5.0 Results and Analysis

Model 1 examines the effect of a positive one standard deviation shock to the MPACI on the QEA index, headline inflation, and total PSC. Based on the initial criterion and diagnostic checks, Model 1 was examined using a VAR methodology, and the VAR impulse response functions (IRF) are shown in **Figure 3**.

The resulting short-run dynamics given by the VAR IRF suggests that the MPACI has little to no impact on the quarterly QEA index or quarterly headline inflation. This result reflects the findings, by Cheong and Boodoo (2008), that the interest rate pass-through effects are relatively weak. However, the last IRF indicates that a shock to the MPACI has a small positive impact on total PSC. Considering that the MPACI should reflect the sentiment of the monetary policy stance and that since inception, the Repo rate has been largely accommodative, this suggests that an increase in the MPACI will reflect an increase in policy accommodation, or neutrality. Given this dynamic, monetary policy communication of accommodation appears to have little to no effect on economic output or inflation, but a small positive impact on total PSC. Suggesting that monetary policy communication may act as a weak complement for monetary policy.

Model 2 (**Figure 4)** examines the same relationship with the MPACI, however substituting Total PSC for Business PSC. Model 2 criterion checks suggest the use of a VAR methodology and the resulting VAR IRF indicates that the MPACI has a positive impact on Business PSC in the short-run, suggesting that the business sector generally had a favourable reaction to monetary policy communication from the Central Bank during the period. This reaction is likely due to the role monetary policy and general

economic conditions play in business planning, as these factors directly influence the cost of doing business and financial performance. Based on this result, monetary policy communication appears to complement the effectiveness of monetary policy.

Figure 3: Model 1 – IRF – The Response of Macroeconomic Variables and Total Private Sector Credit to a One Standard Deviation Innovation in the MPACI

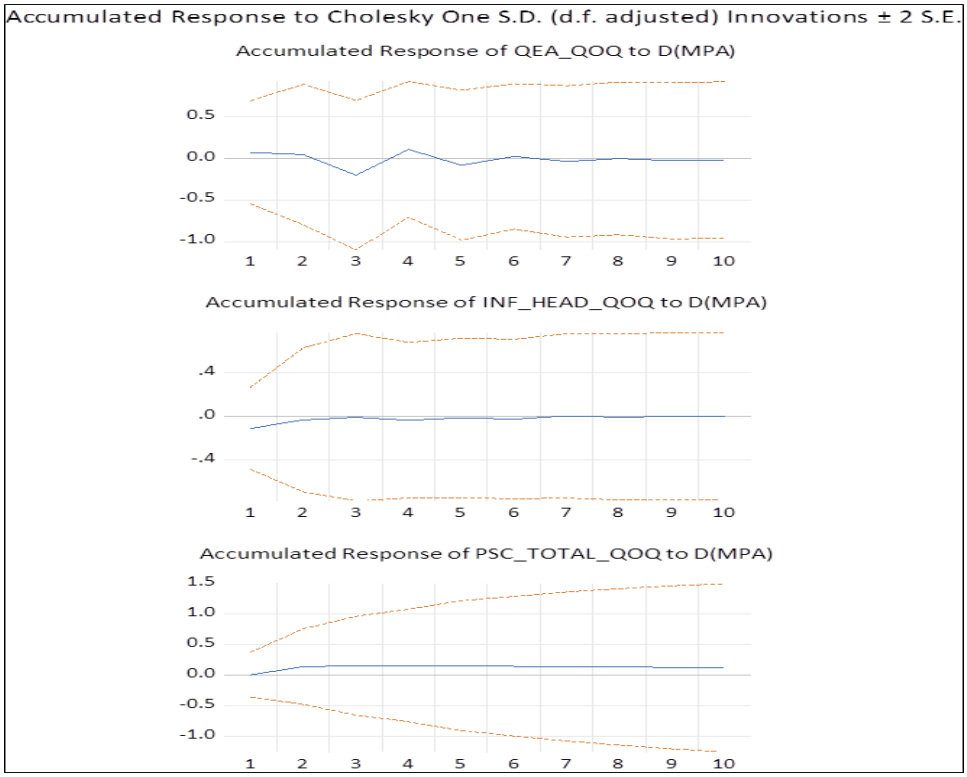
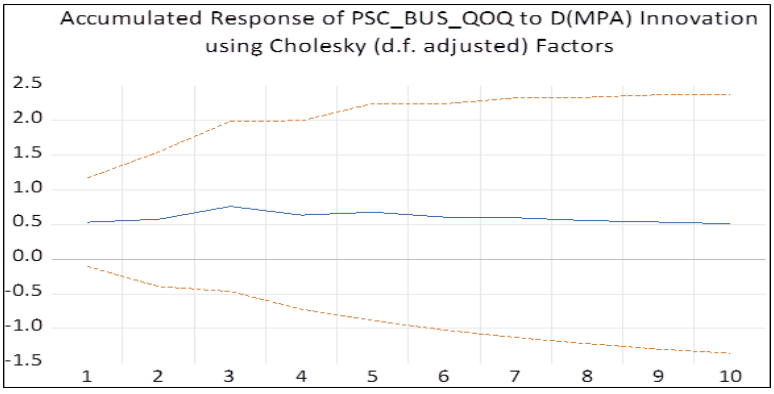


Figure 4: Model 2 – IRF - The Response of Business Credit to a One Standard Deviation Innovation in the MPACI

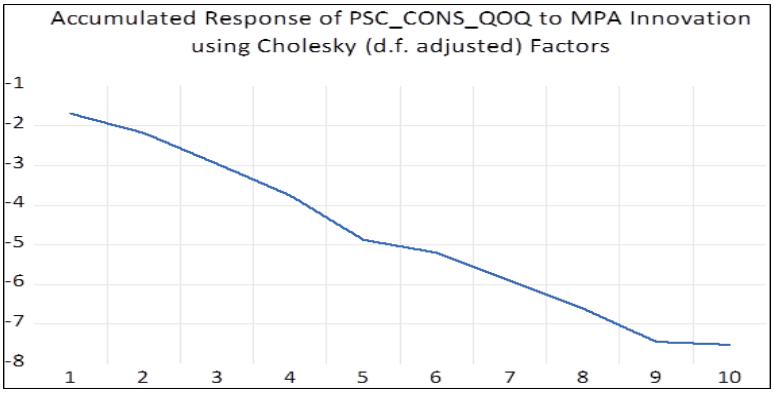


Model 3 examines the same relationship with the MPACI, however substituting Total PSC for Consumer PSC. Model 3 (**Figure 5)** criterion checks suggested the use of a VEC methodology and the resulting VEC IRF suggests that the MPACI had a negative impact on Consumer PSC. Considering that monetary policy tightening would have occurred over a smaller proportion of the examined period, the results therefore suggest that monetary policy communication by the Bank generally informed consumers on economic conditions where higher consumer spending may be counterproductive. This finding was likely associated to lower economic output coupled with initially strong inflation during the start of the global financial crisis, followed by a post-GFC period of weak and subdued economic activity, and then further economic challenges as a result of the 2014 oil price crash. These

conditions would reduce consumer confidence, which was confirmed in the Consumer Confidence Report for the quarter ending 2014, which indicated mild consumer pessimism and concerns on the rising cost of living (CBTT 2014). As such, monetary policy communication in the case for consumer credit, acted as a complement, advising the public on economic conditions and associated monetary policy positions.

Furthermore, since 2019 Trinidad and Tobago has observed increased consumer lending for the specific purpose of debt consolidation and refinancing which suggests consumers evaluate their financial positions and market interest rates and have opted to take advantage of market rates by consolidating and refinancing debt. Given that economic conditions would have been somewhat downcast over much of the examined period, the rise in lending for debt consolidation and refinancing suggests that during periods of low consumer confidence combined with high household leverage and economic stress, consumers attempt to improve their financial position through refinancing and debt consolidation facilities.

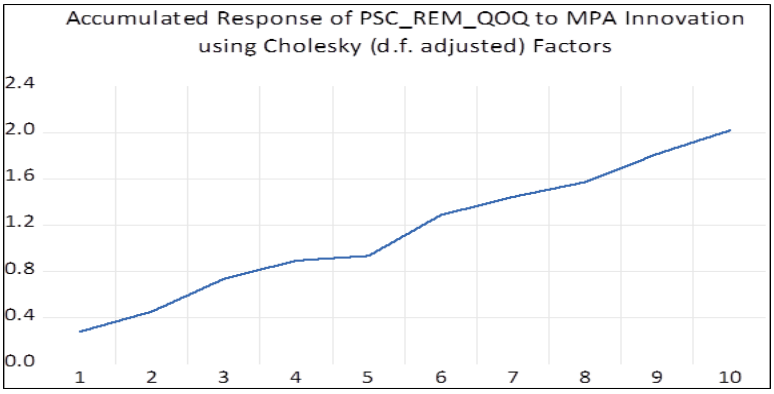
Figure 5: Model 3 - IRF - The Response of Consumer Credit to a One Standard Deviation Innovation in the MPACI



Model 4 (**Figure 6)** examines the same relationship with the MPACI, but substituting Total PSC for Real Estate Mortgage (REM) lending. Model 4 criterion checks suggested the use of a VEC methodology and the resulting VEC IRF suggests that the MPACI has a positive impact on REM lending in the long-run. Given the mainly accommodative stance of monetary policy over the review period, this result could be reflective of a lower interest rate environment, and lower Mortgage Market Reference Rate[10] (MMRR) stimulating an increase in mortgage lending. Additionally, mortgage market lending has been a resilient and competitive lending category in Trinidad and Tobago, and it appears that once individuals are in a position to purchase a home, they are usually willing to take the step regardless of an indication of possible monetary policy changes.

[10] The CBTT (2017) Residential Real Estate Mortgage Market Guideline indicates that the residential Mortgage Market Reference Rate (MMRR) is the interest rate benchmark used to determine the initial mortgage rate on all residential mortgages and for re-pricing variable- and adjustable-rate mortgages.

Figure 6: Model 4 - IRF - The Response of Total Real Estate Mortgage Credit to a One Standard Deviation Innovation in the MPACI



6.0 Limitations and Scope for Further Research

This study sought to undertake a preliminary evaluation of monetary policy communication via the MPA. Although the MPA can be considered the primary monetary policy communication, the CBTT also produces several other publications and routinely communicates to the public via various channels. For example, the Monetary Policy Report (MPR), Annual Economic Survey (AES), Economic Bulletin (EB), Financial Stability Report (FSR) and Summary Economic Indicators Bulletin (SEIB) all provide information on financial and economic conditions, trends in key variables, and policy prescriptions. Additionally, the study examined only MPA publications available on the Bank's website; however, the Bank possesses numerous older monetary policy releases, available as hardcopy in the Bank's library. As such, the full complement of CBTT publications was not included in this study. Further analysis, including all the Banks' economic publications, could provide further insight into the effect of CBTT communication in addition to enhancing the robustness of the examination. However, this will require a more advanced scanning, web scraping and text mining software.

Additional tools in the Bank's communication strategy include speeches, presentations, interviews, and social media posts. These communication mediums can, in different ways, influence the public's understanding of economic conditions and monetary policy actions. Analysis of this data, via advanced speech and text analysis software, could provide additional insight into how different types of formal and informal communication influence economic and financial market activity.

Another area of possible exploration is secondary communication related to press coverage, television news, newspaper articles, and other similar media. Given that a large segment of the population may not often read central bank reports, press coverage will regularly communicate a central bank message to the wider population. Analysis of secondary communication would provide complementary understanding into the overall impact of central bank communication. Likewise, advanced software would be essential.

Lastly, a crucial area this study was unable to capture was sentiment analysis which refers to the tone of central bank communication which distinguishes between pessimistic and optimistic statements. Furthermore, by including the categorising of domestic monetary policy positions, sentiment analysis should provide a deeper understanding into the possible reactions of the public to changes in Bank policies and to the tone within the Bank's various communication products. Such an undertaking would require the use of a flexible language processing software, capable of monitoring sentiment in a variety of communication forms.

7.0 Conclusion and Recommendations

This paper examined the impact of monetary policy communication via the MPACI on macroeconomic activity in Trinidad and Tobago. In particular, the study focused on the Central Bank's communication on its main monetary policy tool the Repo rate, via the release of the MPA. Over the period 2004 to 2017 the MPA was released monthly, this subsequently changed to bi-monthly and then quarterly. Although the frequency of announcements declined, the study examined whether and how the domestic market reacted to the information presented in the MPAs. An extension of the examination seeks to answer the underlying question of whether central bank communication supports monetary policy delivery or if it can act as a supplement. In other words, do markets respond to communication or changes in the policy rate or both.

Based on the results of the study, Central Bank communication appears to complement monetary policy as it supports market response in both times when the policy change occurs and when it does not. The monetary policy tool has remained accommodative for quite some time, yet the market has responded to varying degrees. This dynamic suggests one of two factors; firstly, the market responds to economic conditions informed by business and consumer sentiment. For example, inflation is particularly driven by food prices which in turn is influenced by exogenous phenomena such as weather and international prices. This is generally outside of the scope of domestic monetary policy's control. Secondly, the market takes heed from the Central Bank communication since the MPA announcement gives a wide range of information, apart from the Repo rate movements, which appears to complement monetary policy and influence changes in the public's credit decisions.

The Bank's communication regarding its monetary policy tool seems to have a greater impact on particular segments of the market. When the MPACI was tested against total private sector credit the response was minimal, however, business credit responded more to the MPACI. The latter suggests that the business community closely monitors the Central Bank's communication as changes to the monetary policy tools directly impact interest rates, which influence the business sector's ability and willingness to borrow. Private sector credit and real estate mortgage lending, which was less responsive to the MPACI, show that Central Bank's monetary communication weakly influences consumer borrowing habits and potential homeowners. One possible reason for the weak impact on consumer credit is that communication from the Bank is not fully understood by the population. Alternatively, the decline in consumer credit may not be associated with a generalised absence of loan demand, but the rise of alternative funding vehicles[11] which compete with commercial bank credit. Additionally, the increase in mortgage lending could be driven by the heightened competition for mortgage business by financial institutions. In such an instance, a home buyer might be less influenced by monetary policy communication, and instead predisposed by the demand for a residential home and preferential mortgage interest rates.

Central banks worldwide have altered their communication strategies to aid the delivery of their messages and help guide markets. Increased open communication has been documented in the literature, and the move from secrecy to more transparent explanations of policies have augured well for economies. For example, despite the limited impact of the MPACI along some channels, the Central Bank has also improved its communication strategies apart from announcements of its policy rate. The Bank has engaged in more visual communication of its publications and utilises social media platforms to aid in the delivery of its messages.

The response of macroeconomic variables to Central Bank's communication, in particular the MPA, has presented results that the Bank can use to strengthen communication strategies and aid the delivery of its policy actions. For example, the results suggest that the MPACI has little to no impact on inflation. The CBTT uses the Repo rate as its main monetary policy tool, which has been shown to have minimal impact on inflation since a large portion of the change in domestic inflation is due in part to the food component. Food inflation in Trinidad and Tobago is largely impacted by weather and import prices and may not depend largely on monetary policy changes. In this vein, the Bank may have to improve on its communication of inflation conditions and

[11] Alternative non-bank credit facilities such as hire-purchase and credit union loans.

risks, and associated monetary policy responses. One avenue could be to provide forecasts of inflation or inflation reports which may guide the public's expectations of monetary policy changes associated with changes in inflation.

To deepen and widen the delivery of its monetary policy message and to aid the market's response, the Central Bank can consider publishing economic forecasts and engage in a light form of forward guidance. Published forecasts of the economic outlook and other macroeconomic indicators can inform the public of the projected future direction of the economy. In particular, the business sector pays close attention to the Central Bank's communication. Additionally, the Bank can improve communication effectiveness by including a transparent and simplified report with respect to the Bank's core function of monetary policy, referring to the actions and decisions undertaken by the Bank to create conditions in line with the economic objectives of the Bank. Providing condensed and simplified information to the public on the objectives of monetary policy, the targets, and the responses of the Bank, can likely increase the responsiveness of the public to the Bank's policy changes.

An example of effective forward guidance undertaken within the Caribbean region is the innovative approach to monetary policy communication adopted by the Bank of Jamaica (BOJ). Jamaica suffered from high inflation for many years, and the subsequent transition to an inflation-targeting regime meant that the BOJ would be required to be more transparent and open with its policy decisions. Considering that Jamaica has not achieved a level of financial sophistication that would allow traditional approaches to financial communication to be effective (Plata and Coley-Graham 2019), the BOJ embarked on an education campaign designed to improve the public's understanding of monetary policy and to boost the BOJ's ability to achieve its inflation target. The campaign incorporated online reggae music videos tackling the subject of inflation; educational advertising on social media, billboards, newspapers, and local radio, in addition to a children's publication for Jamaican schools and a future comic-strip on the economic program (Plata and Coley-Graham 2019). Although the CBTT does not operate an inflation-targeting regime, the CBTT can consider adopting a similarly innovative approach to monetary policy communication in order to support the achievement of conditions in line with the core objectives of the bank.

Similar to the BOJ, one way the Bank can ensure that a suitably tailored form of forward guidance and broader monetary policy decisions reach the wider public is by enhancing its public education strategies. The Central Bank's National Financial Literacy Program (NFLP) currently spreads financial management education and awareness to members of the public via publications, commercials, social media, community outreach, and other avenues. The Bank may therefore enhance its monetary policy communication effectiveness by enabling the NFLP to provide further educational information on domestic monetary policy. This would extend financial literacy to include an understanding of the roles, functions and objectives of the Central Bank, enabling communication from the Bank to be better understood by a wider audience.

Technical Appendix

The estimation of a VAR requires that certain preconditions be met. Specifically, the variables must be stationary and not co-integrated. Additionally, if the variables are non-stationary and determined not to be co-integrated, then the first difference can be taken, and a VAR estimated. Alternatively, if the variables are found to be both non-stationary and co-integrated the model can be estimated using a VEC model. The first diagnostic check is, therefore, to assess the time-series properties of the variables using unit root tests. Two conventional unit root tests, namely, the Augmented Dickey-Fuller (ADF) test and the Phillips-Perron (PP) test were used and the results reported in the **Appendix Table A**. If the tests were inconclusive, the Kwiatkowski-Phillips-Schmidt-Shin test statistic was used to confirm the stationarity of the series. The unit root test results show that all variables were integrated of order zero, I(0), except for the MPACI and the Repo rate which were both integrated of order one, I(1).

The next step in the VAR specification is the determination of the lag length using the lag length selection criterion statistics: Likelihood Ratio (LR) statistic, Final Prediction Error (FPE), Akaike Information Criterion (AIC), Schwarz information criterion (SC), and Hannan-Quinn Information Criterion (HQ). Cointegration examination is then undertaken using the Johansen's Maximum Likelihood cointegration approach, which determines the rank of cointegrating vectors. The lag length selections and cointegrating equation tests results are reported in **Appendix Table B**. Given the criteria tests results, the methodology selected for each model was based on a robustness examination of all combinations of lag lengths and cointegrating equations (**Appendix Table C**). All selected models satisfied relevant diagnostic checks.

APPENDIX Table A: Unit Root Testing (MacKinnon (1996) one-sided p-values)

Variable	Notation	LEVEL		FIRST DIFFERENCE		Inference
		ADF	PP	ADF	PP	
Monetary Policy Announcement Index (MPACI)	MPA	0.557	0.0085	0.0000	0.0000	**I(1)**
Repo Rate	REPO	0.5148	0.4466	0.0002	0.0002	**I(1)**
Quarterly Index of Real Economic Activity	QEA_QOQ	0.0000	0.0000	0.0000	0.0000	**I(0)**
Headline Inflation Index	INF_HEAD_QOQ	0.0000	0.0000	0.0000	0.0000	**I(0)**
Total Private Sector Credit	PSC_TOTAL_QOQ	0.3130	0.0000	0.0000	0.0000	**I(0) ***
Total Business Private Sector Credit	PSC_BUS_QOQ	0.9899	0.0001	0.0000	0.0000	**I(0)**
Total Consumer Private Sector Credit	PSC_CONS_QOQ	0.1790	0.0001	0.0000	0.0000	**I(0) ***
Total Real Estate Mortgage - Private Sector Credit	PSC_REM_QOQ	0.0000	0.0000	0.0000	0.0000	**I(0)**

Source: Eviews 11, Author's Calculations.
* Stationarity testing confirmed via Kwiatkowski-Phillips-Schmidt-Shin test statistic

APPENDIX Table B: Lag Length Criteria and Cointegration Testing

Model 1 - Endogenous variables: D(MPA) D(REPO) QEA_QOQ INF_HEAD_QOQ PSC_TOTAL_QOQ

VAR Lag Order Selection Criteria

Lag	*LogL*	*LR*	*FPE*	*AIC*	*SC*	*HQ*
1	-510.666	106.635	5.02E+02	20.4025	**21.51776***	**20.83138***
2**	-481.39	**46.40099***	**438.0453***	**20.24111***	22.28575	21.02738

Johansen Cointegration – number of cointegrating equations:

Lags	*Trace Test*	*Max-Eigenvalue test*
1	***3***	***3***
2**	***3***	***0****

Model 2 - Endogenous variables: D(MPA) D(REPO) QEA_QOQ INF_HEAD_QOQ PSC_BUS_QOQ

VAR Lag Order Selection Criteria

Lag	*LogL*	*LR*	*FPE*	*AIC*	*SC*	*HQ*
1	-542.06	100.2182	1.64E+03	21.58717	**22.70243***	**22.01605***
2**	-510.731	**49.65409***	**1325.489***	**21.34833***	23.39297	22.1346

Johansen Cointegration – number of cointegrating equations:

Lags	*Trace Test*	*Max-Eigenvalue test*
1	***3***	***3***
2**	***3***	***0****

Model 3 - Endogenous variables: D(MPA) D(REPO) QEA_QOQ INF_HEAD_QOQ PSC_CONS_QOQ

VAR Lag Order Selection Criteria

Lag	*LogL*	*LR*	*FPE*	*AIC*	*SC*	*HQ*
1	-562.233	92.41881	2.32E+03	21.93455	**23.03954***	**22.36070***
4**	-479.156	**44.63965***	**2126.052***	**21.63539***	25.50286	23.12692

Johansen Cointegration – number of cointegrating equations:

Lags	*Trace Test*	*Max-Eigenvalue test*
1	***3***	***3***
4**	***2****	***2****

Model 4 - Endogenous variables: D(MPA) D(REPO) QEA_QOQ INF_HEAD_QOQ PSC_REM_QOQ

VAR Lag Order Selection Criteria

Lag	*LogL*	*LR*	*FPE*	*AIC*	*SC*	*HQ*
1	-528.373	92.12678	9.79E+02	21.07068	**22.18594***	**21.49956***
3**	-471.501	**41.94308***	**828.0281***	**20.81136***	23.78538	21.95502

Johansen Cointegration – number of cointegrating equations:

Lags	*Trace Test*	*Max-Eigenvalue test*
1	***3***	***3***
3**	***2***	***1****

Source: Eviews 11, Author's Calculations.

* Denotes the lag length selected by each of the criterion, non-selected lags excluded from table.

** Denotes the selected lag length and cointegrating equation test results that determines the model selection.

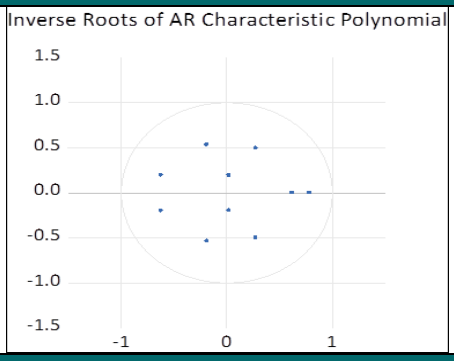
APPENDIX Table C: Model Diagnostics

Model 1 -Endogenous variables: D(MPA) D(REPO) QEA_QOQ INF_HEAD_QOQ PSC_TOTAL_QOQ

VAR Residual Serial Correlation LM Tests

Lag	*Prob.*
1	0.4064
2	0.1073
3	0.7629
4	0.0111

VAR Residual Heteroskedasticity Tests (Levels and Squares)	Prob. = 0.1753

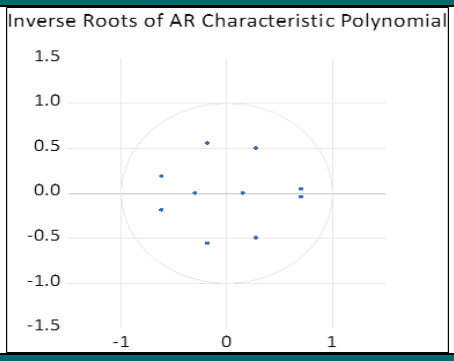


Model 2 - Endogenous variables: D(MPA) D(REPO) QEA_QOQ INF_HEAD_QOQ PSC_BUS_QOQ

VAR Residual Serial Correlation LM Tests

Lag	*Prob.*
1	0.3098
2	0.1912
3	0.6119
4	0.1102

VAR Residual Heteroskedasticity Tests (Levels and Squares)	Prob. = 0.1077

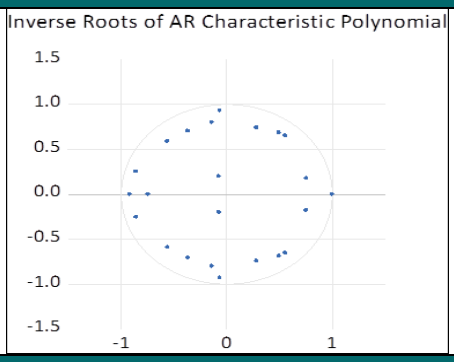


Model 3 - Endogenous variables: D(MPA) D(REPO) QEA_QOQ INF_HEAD_QOQ PSC_CONS_QOQ

VEC Residual Serial Correlation LM Tests

Lag	*Prob.*
1	0.1515
2	0.4597
3	0.6448
4	0.778

VEC Residual Heteroskedasticity Tests (Levels and Squares)	Prob. = 0.3413

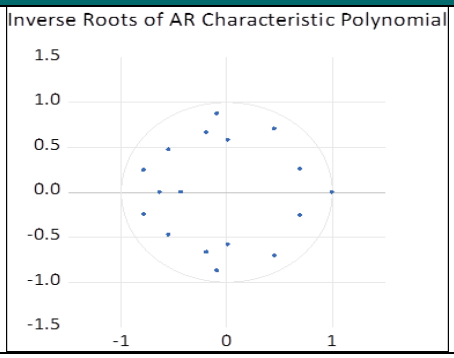


Model 4 - Endogenous variables: D(MPA) D(REPO) QEA_QOQ INF_HEAD_QOQ PSC_REM_QOQ

VEC Residual Serial Correlation LM Tests

Lag	*Prob.*
1	0.1063
2	0.7165
3	0.5431
4	0.2928

VEC Residual Heteroskedasticity Tests (Levels and Squares)	Prob. = 0.1934



Source: Eviews 11, Author's Calculations.

Appendix Table D:

MPA - Key Words & Phrases - Frequencies

	accommodative	business lending	consumer lending	credit	deposit rate	differential	economic growth	economic output	employment	energy prices	exchange rate	GDP	inflation	interest rate	labour	lending rate	loan	monetary aggregates	monetary base	monetary conditions	monetary policy	mortgage	neutral	policy rate	price stability	QIEA	real estate	repo rate	tightening	MPACI
Dec-04	0	0	0	2	0	0	0	0	0	0	0	3	3	5	0	2	0	0	0	0	2	0	0	0	0	0	0	9	0	26
Mar-05	1	0	0	2	1	3	0	0	1	0	0	0	10	10	0	0	0	0	0	1	3	0	0	0	0	0	0	9	0	41
Jun-05	1	0	0	2	0	0	0	0	0	0	0	0	9	4	0	2	0	0	0	2	1	0	0	0	0	0	0	13	0	34
Sep-05	0	0	0	2	0	1	0	0	0	0	0	0	8	7	0	1	0	0	0	2	0	0	0	0	0	0	0	10	1	32
Dec-05	0	0	0	8	0	1	0	0	0	0	0	0	11	3	0	1	2	0	0	3	3	0	0	0	0	0	0	11	0	43
Mar-06	0	0	0	9	0	4	0	0	0	0	0	0	10	5	0	1	0	0	0	3	0	0	0	0	0	0	0	9	0	41
Jun-06	0	0	0	12	0	3	0	0	0	1	0	0	14	3	0	1	0	0	0	1	1	0	0	0	0	0	0	9	0	45
Sep-06	0	0	0	10	0	6	1	0	0	0	0	0	25	10	0	0	1	0	0	2	2	0	0	1	0	0	1	11	3	73
Dec-06	0	0	0	3	1	0	1	0	0	0	0	0	14	7	0	0	3	0	0	3	0	1	0	0	0	0	1	11	2	47
Mar-07	0	0	0	3	0	0	1	0	1	0	0	0	30	5	0	0	0	0	0	3	0	0	0	0	0	0	0	9	0	52
Jun-07	0	0	0	6	0	0	0	0	0	0	0	0	34	2	0	0	1	0	0	3	2	0	0	0	0	0	0	9	0	57
Sep-07	0	0	0	6	0	0	0	0	0	0	0	0	29	0	0	0	0	0	0	3	4	0	0	0	0	0	0	9	0	51
Dec-07	0	0	0	7	0	0	0	0	0	1	0	0	29	0	0	0	0	0	0	3	9	0	0	0	0	0	0	9	1	59
Mar-08	0	0	0	6	0	0	0	0	0	1	0	1	28	3	0	1	1	0	0	2	6	0	0	0	0	0	1	10	2	62
Jun-08	0	0	0	11	0	0	1	0	0	1	0	0	27	1	0	2	4	0	0	2	5	3	0	0	0	0	2	10	2	71
Sep-08	0	0	0	12	0	0	1	0	0	6	0	0	45	1	0	0	2	0	0	2	5	1	0	0	0	0	0	9	1	85
Dec-08	0	0	0	8	0	0	0	0	0	1	0	0	33	0	1	0	1	0	0	3	10	1	0	0	0	0	1	8	2	69
Mar-09	0	0	0	19	0	2	2	0	2	2	0	0	33	5	0	1	0	0	0	0	8	0	0	0	0	0	0	9	0	83
Jun-09	0	0	1	13	0	2	1	0	0	0	0	0	33	1	0	0	1	0	0	0	9	1	0	0	0	0	3	9	0	74
Sep-09	0	0	0	20	0	1	0	0	0	0	0	1	47	3	0	0	0	0	0	0	5	3	0	2	0	0	3	9	0	94
Dec-09	1	0	0	11	0	2	0	0	0	0	0	0	37	2	0	0	0	0	0	0	8	3	0	2	0	0	3	10	0	79
Mar-10	0	0	0	16	0	2	1	0	0	0	0	0	30	5	0	0	1	0	0	0	6	5	1	2	0	0	5	9	0	83
Jun-10	1	0	0	8	0	0	0	0	0	0	0	0	25	2	0	0	0	0	0	2	1	2	0	0	0	0	2	6	0	49
Sep-10	1	0	1	17	0	1	0	0	0	0	0	0	29	5	0	1	4	0	0	3	1	5	0	0	0	0	4	8	0	80
Dec-10	0	0	0	9	0	1	0	0	0	0	0	0	10	3	0	0	2	0	0	1	0	1	0	0	0	0	1	7	0	35
Mar-11	0	0	0	13	0	0	0	0	0	0	0	0	30	2	0	2	0	0	0	3	0	2	0	0	0	0	3	9	0	64
Jun-11	0	4	0	17	0	1	0	0	0	0	0	0	33	4	0	1	0	0	0	3	0	2	0	0	0	0	4	11	0	80
Sep-11	1	1	0	8	0	2	0	0	0	0	0	0	21	1	0	0	0	0	0	2	1	3	0	0	0	0	3	6	1	50
Dec-11	2	4	1	12	0	2	0	0	0	0	0	0	26	3	0	0	4	0	0	3	0	3	0	0	0	0	4	9	0	73
Mar-12	2	2	0	15	1	4	0	0	0	0	0	0	27	5	0	1	3	0	0	3	1	3	0	0	0	0	4	9	0	80
Jun-12	0	1	0	15	0	3	0	0	0	0	0	0	33	5	0	0	2	0	0	3	0	3	0	0	0	0	4	9	0	78
Sep-12	1	1	0	5	0	1	0	0	0	0	0	0	20	2	0	0	3	0	0	2	0	1	0	0	0	0	2	6	0	44
Dec-12	1	1	1	11	0	2	0	0	0	0	0	0	28	2	0	1	0	0	0	3	0	2	0	0	0	0	3	11	0	66
Mar-13	2	1	0	8	0	2	0	0	0	0	0	0	17	4	0	0	2	0	0	2	1	2	0	0	0	0	2	6	0	49
Jun-13	3	2	2	9	0	3	2	0	0	0	0	0	22	3	0	2	3	0	0	3	1	1	0	0	0	0	3	9	0	68
Sep-13	2	3	2	5	0	1	1	0	0	0	0	2	14	5	0	0	3	0	0	2	5	2	0	0	0	0	2	5	0	54
Dec-13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mar-14	1	4	2	5	0	5	0	0	0	0	0	0	12	6	0	0	4	0	0	1	5	3	0	0	0	0	3	4	0	55
Jun-14	0	1	1	3	0	2	1	0	0	0	0	0	8	1	0	0	3	0	0	0	4	1	0	1	0	0	1	2	0	29
Sep-14	3	2	2	2	0	2	1	0	0	0	0	0	10	6	0	0	4	0	0	0	10	2	0	1	0	0	3	6	0	54
Dec-14	0	0	0	0	0	1	0	0	0	0	0	0	5	4	0	0	0	0	0	0	4	0	0	0	0	0	0	2	0	16
Mar-15	0	0	0	2	0	3	1	0	0	0	0	1	10	10	2	0	0	0	0	0	14	0	0	2	0	0	0	5	0	50
Jun-15	1	0	0	1	0	0	1	0	1	0	0	1	6	3	0	2	0	0	0	0	9	0	0	0	0	0	0	3	0	28
Sep-15	1	0	0	1	0	2	1	0	0	1	0	0	10	6	0	2	0	0	0	0	10	0	0	1	0	0	0	4	0	39
Dec-15	1	0	0	0	0	0	1	0	0	0	0	0	7	6	0	1	0	0	0	0	7	0	0	0	0	0	0	3	0	26
Mar-16	0	0	0	0	0	3	1	0	1	2	1	0	11	4	1	0	0	0	0	0	6	0	0	3	0	0	0	4	0	37
Jun-16	1	0	0	1	0	1	0	0	0	1	0	0	5	0	1	0	0	0	0	0	4	0	0	0	0	0	0	2	0	16
Sep-16	0	1	0	4	0	0	0	0	0	0	0	0	7	0	1	0	0	0	0	0	7	0	0	1	0	0	0	4	0	25
Dec-16	0	1	0	2	0	0	0	0	0	0	0	0	4	2	1	0	0	0	0	0	4	0	0	0	0	0	0	2	0	16
Mar-17	0	0	0	5	0	2	1	0	1	1	1	0	9	5	0	0	1	0	0	0	7	0	0	0	0	0	0	4	0	37
Jun-17	0	0	0	2	0	1	0	0	0	0	0	0	4	3	1	0	1	0	0	0	3	0	0	0	0	0	0	2	0	17
Sep-17	0	0	0	6	0	4	1	0	0	0	0	0	7	3	0	0	2	0	0	0	8	0	0	0	0	0	2	4	1	38
Dec-17	0	0	0	1	0	1	0	0	0	1	0	0	5	1	0	0	2	0	0	0	3	1	0	0	0	0	1	2	0	18
Mar-18	0	1	0	1	0	2	0	0	0	0	0	0	3	2	0	0	0	0	0	0	4	0	0	0	0	0	0	2	0	15
Jun-18	0	0	0	4	0	3	0	0	0	0	0	0	2	4	0	1	1	0	0	0	4	0	0	1	0	0	0	2	0	22
Sep-18	0	0	0	1	2	1	0	0	0	0	0	0	2	1	0	2	1	0	0	0	4	0	0	0	0	0	0	4	0	18
Dec-18	0	0	0	1	0	1	0	0	0	0	0	0	3	0	0	0	0	0	0	0	4	0	0	0	0	0	0	3	0	12
Mar-19	0	0	0	5	1	0	0	0	0	0	0	0	3	1	0	0	1	0	0	0	4	0	0	0	0	0	0	2	1	18
Jun-19	0	0	0	5	0	0	0	0	0	1	0	0	3	1	0	0	0	0	0	0	4	1	0	0	0	0	0	2	0	17
Sep-19	0	0	0	5	0	1	0	0	0	0	1	0	3	1	2	0	1	0	0	0	3	1	0	1	0	0	1	2	0	22
Dec-19	0	0	0	4	0	0	1	0	0	0	0	0	2	1	2	0	1	0	0	0	3	1	0	0	0	0	1	2	0	18

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