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The viability of a fully fledged inflation targeting regime in Egypt

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THE VIABILITY OF A FULLY FLEDGED INFLATION TARGETING REGIME IN EGYPT

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ABSTRACT

Inflation targeting (IT), in simplistic terms, is a monetary policy regime that is based upon the commitment of a country's monetary authority to meeting predetermined, quantitative targets for the annual rate of inflation. IT has attained popularity and widespread acclamation amongst policymakers in the international context over the past three decades. Since Egypt initiated a new economic and structural reform program supported by the Extended Fund Facility from the IMF in November 2016, the search for a new nominal anchor for the Egyptian economy has been underway. In this regard, the new objective seems to be a temporary switch to a monetary targeting regime in the short run, while moving towards the implementation of a full-fledged IT regime in the medium term. Against this background, the Central Bank of Egypt (CBE) recently released a draft law indicating its desire to transition towards IT. This paper aims to answer the question of whether or not Egypt is ready for the implementation of IT. I propose a twofold methodology based on an assessment of the institutional and technical framework currently in place in Egypt, combined with a comprehensive survey of the current international practices of 28 inflation-targeting countries to determine whether or not the Egyptian framework is adequate in meeting the basic preconditions for IT, and to identify the practical considerations that need to be taken into account if the CBE indeed decides to adopt an inflation targeting regime in the near future.

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List of Abbreviations

ADF	Augmented Dickey Fuller
AIC	Akaike's Information Criterion
BOD	Board of Directors
CBE	Central Bank of Egypt
CPI	Consumer Price Index
EFF	Extended Fund Facility
ERPT	Exchange-rate Pass-through
ERSAP	Economic Reform and Structural Adjustment Program
ERT	Exchange Rate Targeting
GDP	Gross Domestic Product
GST	General Sales Tax
IMF	International Monetary Fund
IRF	Impulse-Response Function
IT	Inflation Targeting
MoF	Ministry of Finance
MPC	Monetary Policy Committee
OECD	Organization for Economic Co-operation and Development
SBIC	Schwarz's Bayesian Information Criterion
VAR	Vector Autoregression
VEC	Vector Error Correction
VAT	Value Added Tax

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1. Introduction

Inflation targeting, in simplistic terms, is a monetary policy regime that is based upon the commitment of a country's monetary authority to meeting predetermined, quantitative targets for the annual rate of inflation. Inflation targeting (IT) has attained popularity and widespread acclamation amongst policymakers in the international context over the past three decades. Ever since the Reserve Bank of New Zealand pioneered the new monetary policy regime when it historically became the first central bank to officially set and commit to an explicit quantitative inflation target in 1990, IT has attracted the attention of central banks around the world. The attractiveness of inflation targeting has not been limited to developed countries; many emerging market economies were quick to make the transition to an inflation targeting regime, and the number of developing countries adopting IT seems to be on the rise. Egypt is no exception to this phenomenon. Talks of an IT monetary policy regime in Egypt have been in the works since 2005 (Al-mashat, 2008), but it was only recently that the Central Bank of Egypt (CBE) released a draft law that is currently under review by Parliament in which it formally declared its intention to officially transition towards a full fledged IT regime. The proposed draft law comes in conjunction with the new economic and structural reform program that Egypt initiated in November 2016 supported by the Extended Fund Facility (EFF) from the IMF. One of the major objectives of the IMF program is the transition to a fully-fledged IT regime in the medium term.

In defining the main characteristics of an IT regime, Mishkin (1999) lists the defining features of inflation targeting as follows:

- the setting, and public announcement of quantitative, specific targets for inflation that are to be met within a specific time horizon,

- an official commitment on the part of the country's monetary authority to price stability as its overriding objective,
- less emphasis on intermediary targets such as money growth,
- more transparent policy-making on the part of the central bank,
- and a high degree of accountability of the central bank towards meeting its announced policy objectives.

It is also important to understand an inflation-targeting regime in the context of other monetary policy regimes. The four major monetary policy regimes practiced currently by central banks globally are (1) exchange rate targeting, (2) monetary targeting, (3) inflation targeting, and (4) monetary policy with an implicit nominal anchor (but not an explicit one). Exchange rate targeting involves fixing the value of the practicing country's domestic currency to that of a large, low inflation country. Monetary targeting, which is the monetary policy regime currently in place in Egypt, revolves around stabilizing price levels through an intermediary target, namely, money growth. In doing so, the central bank targets inflation indirectly, which is the major difference between monetary targeting and inflation targeting. Implicit nominal anchor targeting involves the central bank committing to an implied nominal anchor without explicitly announcing it. The most prominent example of the use of this type of strategy is the Federal Reserve, which has, for many years, pursued an implicit nominal anchor exemplified in the overriding concern by the Federal Reserve to keep inflation low and stable without explicitly pursuing an IT regime.

Inflation targeting is the youngest of the four regimes, meaning it has the shortest history and track record. Nonetheless, after the New Zealand experience in introducing inflation targeting proved successful in achieving its objectives (Sherwin, 1999), Canada, the United Kingdom, and Australia were early followers in the

adoption of an IT framework, all enacting a formal IT framework in 1991, 1992, and 1993 respectively (Roger, 2010). Despite it being a relatively demanding regime, inflation targeting was also adopted by a number of emerging countries, with Brazil and Chile being the first two emerging economies to formally enact inflation targeting in 1999. Since then, IT has been officially adopted by almost 30 countries, with a number of countries attempting a transition toward it.

The question then becomes: if IT has exhibited such widespread success in numerous developed and emerging economies alike, what motivation there is to study the viability of IT in Egypt? The fact of the matter is that despite its success, IT has not been immune to a fair share of criticism. Indeed, especially for the case of a developing country such as Egypt, one must take into consideration the demanding nature of the IT framework compared to other monetary regimes: an extremely high degree of central bank independence and accountability, the absence of fiscal dominance, having a sound financial system as well as a deeply banked economy are just some of the many institutional prerequisites needed for a successful implementation of IT. A near impeccable understanding of transmission mechanisms of monetary policy and a solid capacity to accurately forecast inflation are some of the technical prerequisites that are needed (Youssef, 2007).

The motivation for this research is two-fold. Firstly, since the global financial crisis of 2008, the global debate around the validity of a strict IT regime has intensified, so much so that some economists have asserted, “inflation targeting died when the Lehman Brothers died” (Reichlin & Baldwin, 2013). Many economists and policymakers have questioned the ability of IT to stabilize economies after the significant downturn of the U.S. economy during the crisis, despite its low inflation levels. Some have argued that IT, in its strict form, hinders the capability of central

banks to address other important macroeconomic outcomes such as growth and employment (Woodford, 2012). Hence, the first, somewhat peripheral, motivation for this research is to contribute to the global dialogue on IT.

The second, more focal, motivation is the relevance of the topic to the Egyptian economy today. Since Egypt initiated a new economic and structural reform program supported by the Extended Fund Facility from the IMF in November 2016 - which encompassed the floatation of the exchange rate as one of the major reforms required - the search for a new nominal anchor has been underway. In this regard, the new objective seems to be a temporary switch to a monetary targeting regime in the short run, while moving towards the implementation of a full-fledged IT regime in the medium term. In order to achieve this objective, the Central Bank of Egypt (CBE), released a draft law indicating its desire to transition towards IT. The draft law is currently undergoing review by the Egyptian Parliament. Despite the fact that the CBE claims to have been working towards a transition to IT since 2005, the new draft law will be the first official, explicit announcement indicating the movement towards a formal adoption of IT in Egypt. National media outlets have since been extremely active in stirring up controversy about the CBE draft law as a whole, and in particular about article 19, which explicitly stipulates the adoption of an IT monetary policy regime (Abdelrazek, 2017; Moustafa, 2017). This research, is hence motivated by the desire to develop a solid ground on which to build a case on whether or not Egypt is prepared for the adoption of an IT regime.

The objectives of the research are contemplated as follows:

- Gauge the implications of IT for small, open, developing economies like Egypt;

- Determine whether IT is the best monetary policy for Egypt under the current circumstances, taking into account the advantages and disadvantages of IT in relation to its alternatives;
- Examine in detail the basic technical and institutional framework required for adoption of an IT regime;
- Assess thoroughly and comprehensively the country experiences with IT to determine how an IT regime can be tailored to the specific case of Egypt;
- Evaluate Egypt's situation in terms of its progress in preparing the economy for IT adoption and pinpointing the potential implementation challenges;
- Provide recommendations regarding steps that can be taken to better prepare Egypt for IT

A twofold methodology is employed based on an assessment of the institutional and technical framework currently in place in Egypt, combined with a comprehensive survey of the current international practices of 28 inflation-targeting countries to determine whether or not the Egyptian framework is adequate in meeting the basic preconditions for IT, and to identify the practical considerations that need to be taken into account if the CBE indeed decides to adopt an inflation targeting regime in the near future. Thus, this paper aims to objectively evaluate the research question of whether or not Egypt is ready to adopt a fully-fledged IT regime. In answering this question through the research, this study looks into country experiences with IT, focusing on the implications of IT for developing economies like Egypt. It also intends to dissect in detail the basic technical and institutional preconditions necessary for IT and the degree to which they are fulfilled in Egypt. Finally, it intends to look into what steps can be taken to better prepare Egypt for IT if indeed that is the path the central bank intends to take in the near future.

2. Literature Review

2.1 Conceptual Framework of Inflation Targeting

2.1.1 Monetary Policy Regimes in the Context of the Rules vs. Discretion Debate

In studying the conceptual framework of IT, it is important to first look into the roots of monetary policy as a whole. Indeed, IT as a framework for monetary policy, like all other monetary policy frameworks, was developed as a means to an end. Ultimately, the goal of monetary policy as a part of overall macroeconomic policy is to contribute to the growth of the economy through price stability (Friedman, 1968). The importance of price stability as the overriding objective of monetary policy became even more pronounced starting in the 1990's, a period commonly known as "the low inflation era". This period, also known as "The Great Moderation" was distinguished as a period in which low and stable inflation and moderate growth rates were registered in most advanced economies (Poloz, 2015). The objective of price stability is in its simplest form defined as the achievement and maintenance of low, stable levels of inflation (Svensson, 2000). Price stability is essential to economic growth because it reduces uncertainty and allows for efficient allocation of productive resources without the distortive effect of inflation on economic agents' decision making. Additionally, price stability mitigates the adverse impact that high inflation has on the poorest sectors of society, since inflation contributes to unfair redistribution of income and wealth (White, 2006).

In their attempts to achieve price stability, central banks have historically resorted to different intermediate targets to aid in the attainment of their final goal. This is where the concept of a nominal anchor enters the discussion. In simplistic terms, a nominal anchor is a tool used by a country's monetary authority to contain the price level within that country (Mishkin, 1999). In essence, the ultimate objective

of a monetary policy framework is to provide a nominal anchor to the economy. The literature shows that there are four main nominal anchors, namely, exchange rate targeting, monetary targeting, implicit nominal anchor targeting, and most recently, inflation targeting.

But before delving into an extensive explanation of the three nominal anchor frameworks, the theoretical background of monetary policy encompassed in what is known as the rules vs. discretion debate on monetary policy needs to be explained.

The rules vs. discretion debate is one of the longest-standing debates in the history of monetary policy. It focuses on the relative benefits and costs of designing and implementing monetary policy such that central banks adhere to stringent, predetermined rules, as opposed to allowing them flexibility and placing more emphasis on subjective judgment in responding to macroeconomic shocks as they arise (Van Lear, 2000).

The major argument for rule-based monetary policy proclaims that, when there are no set rules, governments can influence decision-making of central banks in order to achieve short-term goals that are inconsistent with the ultimate goal of price stability. For example, in order to keep unemployment rates low, governments may push inflation up above its natural level (Barro & Gordon, 1983). This gave rise to the "time inconsistency model", the underlying theory of why central bank credibility gains associated with a rule-based framework are important for achieving price stability. The time inconsistency model, which was first introduced by Kydland and Prescott (1977) and later extended by Barro and Gordon (1983), contends that the government suffers from inflationary bias that results in suboptimum inflation outcomes; that is, actual inflation is consistently higher than the optimal level.

While rule-based policymaking may be advantageous in mitigating the effects of time inconsistency, proponents of discretionary policy argue that sticking to a predetermined set of rules does not allow central banks enough flexibility to respond quickly to unforeseen changes in the macroeconomic environment, thereby limiting their capacity to ameliorate the effects of sudden, unexpected shocks to the economy.

Fischer (1989) notes that the concept of rules vs. discretion in monetary policy should be contemplated as a continuum rather than two distinct extremes. Where a monetary policy framework lies on this continuum depends on the degree of autonomy of the central bank, how strictly defined its objectives are, and the strength of the relationship between its policy decisions and the achievement of those objectives.

2.1.2 Alternatives to Inflation Targeting

In practice, no monetary policy regime can be classified as exclusively belonging to either extreme. To better grasp the conceptual background of inflation targeting, it is important to first understand the theoretical advantages and limitations of its major predecessors: exchange rate targeting, monetary targeting, and monetary policy with an implicit, but not explicit nominal anchor.

Exchange rate targeting (ERT), which involves tying the domestic currency to that of another foreign currency or basket of currencies, or to a commodity (such as gold) has been in practice by central banks since the introduction of the gold standard in 1870 (Cooper, 1999). Based on its defining characteristics, ERT could be placed towards the rule side of the rule vs. discretion continuum. Thus, discretion in monetary policy is almost non-existent under ERT, virtually eliminating the problem of time inconsistency. This constitutes the major advantage of ERT. An exchange rate target is also simple and easy for the public to understand. However, as history has

shown, ERT has a fatal disadvantage in that it entails a loss of independent monetary policy for the practicing country (Mishkin, 1999). Indeed, the impossible trinity of monetary policy indicates that tying the domestic exchange rate to that of another economy in the case of an open economy with free capital flows automatically entails the sacrifice of the central bank's ability to conduct autonomous monetary policy (Obstfeld & Taylor, 1998). The central bank's policies become directly tied to those of its anchor country, even when almost certainly, each of them will face different economic conditions and business cycles. The asymmetric shock phenomenon entails that not only will the targeting economy's central bank lose the ability to respond to domestic shocks, but the anchor economy's shocks are also transmitted to the targeting economy (Mishkin, 1999). Additionally, ERT puts countries at risk of speculative attacks on their currency (Obstfeld & Rogoff, 1995). Accountability of the central bank is also not pronounced since the central bank has limited capacity to make operational decisions with regards to monetary policy.

In response to the limitations posed by exchange rate targeting, another monetary policy regime known as monetary targeting (MT) came into practice. Monetary targeting involves targeting price stability through an intermediary target, namely, money aggregates (Neupauerová & Vravec, 2007). Under an MT framework, the monetary authority steers policy decisions towards controlling monetary aggregates, led by the conviction that these aggregates are the main driver of inflation over in the long run. Thus, while an explicit inflation target is not announced, and central bank intervention is focused largely in the money market.

The most important advantage that monetary targeting presents over ERT is that it allows central banks to conduct monetary policy independent from an "anchor country" to respond to domestic considerations. Additionally, monetary targeting

implicitly entails having a floating exchange rate in theory, which acts as a shock absorber that insulates the domestic economy from foreign shocks (Senay & Sutherland, 2007). Since money supply is controlled by the central bank itself, another advantage is that the central bank can easily measure and observe the money aggregates that it targets. This ease of observability and measurability of monetary targets means that real-time information about whether the central bank is achieving its target is easily accessible. Albeit, the major drawback of using an intermediary target (money aggregates) to achieve an ultimate end goal (price stability) is that it mandates the existence of a consistently strong and stable relationship between the two. If the relationship between monetary aggregates and inflation is unpredictable or weak, it becomes nearly impossible to apply monetary targeting successfully, and the credibility of the central bank suffers as a result, casting doubt on the viability of monetary targeting to serve as an effective system to enhance central bank accountability and transparency (Estrella & Mishkin, 1997). This is an especially relevant issue for developing countries. Nevertheless, it follows that monetary targeting is more discretionary than it is rule-based since the central bank targets an intermediary target of monetary aggregates, which are under the direct control of the central bank itself (Mishkin, 1999).

The final monetary policy regime that is often overlooked in theory but remains very much present in practice is the use of an implicit nominal anchor rather than an explicit one. The most prominent example of the use of this type of strategy is the Federal Reserve, which has, for many years, pursued an implicit nominal anchor exemplified in the overriding concern by the Federal Reserve to keep inflation low and stable without explicitly pursuing an inflation targeting regime (Mishkin, 1999). This strategy, dubbed the “just do it” strategy by Mishkin, puts significant weight on

the subjective judgment and decision making abilities of the Board members of the Central Bank. Due to the long lags that exist between the time monetary policy decisions are made and when their impact on inflation is realized, this monetary policy regime emphasizes the need for forward-looking, preemptive policy making that forecasts and takes measures to control inflation before its signs begin to show on the economy. Monetary policy with an implicit but not explicit nominal anchor has proven its propensity to succeed as demonstrated by the Federal Reserve of the United States. Since 1991, the Fed has been successful in keeping inflation low and stable, registering positive inflation rates below 3.5% consistently with the exception of the year 2008, during which inflation peaked at 3.8%, and a negative inflation rate of -0.4% the following year due to the global financial crisis (World Bank). Despite the aforementioned success, the lack of an explicit official nominal anchor inevitably takes a toll on the transparency of the Central Bank and its tendency to communicate with the public. This major disadvantage becomes especially critical when considering the case of developing countries, where credibility of the central bank is often not backed by a strong track record to begin with. Additionally, the fact that the central bank becomes accountable to the general public to a lesser degree entails that it is more likely to succumb to political pressure, and thus more likely to fall into the time-inconsistency problem.

2.1.3 Advantages and Disadvantages of Inflation Targeting

With the aforementioned relationship between money aggregates and inflation starting to break down in countries practicing monetary targeting such as Canada, the United States, and the United Kingdom to name a few, the first seeds of inflation targeting were sown in New Zealand in 1990 (Mishkin, 1999). An IT regime is characterized by five defining features: 1) the setting of quantitative, specific targets

for inflation that are to be met within a specific time horizon, and the public announcement of these targets, (2) an official commitment on the part of the monetary authority to price stability as its overriding objective, and its superiority over any other objectives, (3) less emphasis on intermediary targets such as money growth, (4) increased communication with the public regarding monetary policy, which mandates increased transparency and (5) augmented accountability of the monetary authority to the general public. Under these features, the central bank should have enough freedom to use monetary policy tools to achieve its end goal of price stability. Thus, the concept of defining IT as a framework of "constrained discretion" was introduced by Bernanke in 1997 (Bernanke & Mishkin, 1997).

The classification of IT as constrained discretion is fitting, since it is a framework that incorporates both rule-based elements, through the announcement and commitment to an explicit numerical inflation target, and discretionary elements embodied in the operational freedom of the central bank to make monetary policy decisions as it sees fitting in order to achieve that target (Jahan, 2017).

The strongest advantage of IT is that it circumvents the drawbacks of its predecessors. First of all, like monetary targeting, IT necessarily entails that the country must have a floating exchange rate to enable the central bank to conduct monetary policy independently, and so the issue of asymmetric shocks inherent in exchange rate targeting is avoided and there is capacity to respond to domestic shocks. Additionally, targeting inflation itself as the end goal of monetary targeting rather than an intermediary target of money aggregates decreases the monetary policy regime's reliance on the existence of a strong relationship between the two. By providing an explicit numerical target for inflation, IT also provides the benefit of a rule-based framework in that avoids the time inconsistency problem (Bean, 2016).

Inherent in IT is also increased transparency and accountability of the central bank for attaining the announced inflation objective. Inflation figures are also more easily perceived and understood by the general public than are monetary targets. Advocates of IT claim that a major benefit of IT is increased ability of the central bank to reduce inflation levels and inflation volatility, without adversely impacting output (Ayres, Belasen, & Kutan, 2014).

IT, however, is not without its limitations, especially if it is practiced with too much emphasis on strict and literal rules. It has been argued that inflation-targeting central banks that place too much weight on reaching preset inflation goals implicitly ignore other important macroeconomic variables such as output, employment and the exchange rate, which results in poor outcomes for these variables (Libich, 2011). Sacrifices in output may also be magnified during disinflation if economic agents do not trust the credibility of the central bank to achieve its mandate of low and stable inflation (Jonsson, 1999). The global financial crisis of 2008 also shed light on the shortcomings of IT. While some may argue that the minimal effect that the global crisis of 2008 had on inflation rates despite it being one of the largest economic shocks in recent memory reflects the success of IT, others concur the 2008 crisis only highlights its disadvantages. Even though inflation targeting countries were generally able to keep inflation rates around the target, they were plagued with an economic slowdown that pulled growth rates down to plummeting levels and left countless people unemployed, thereby bringing up the notion that IT could in fact be "a victim of its own success" (Gillitzer & Simon, 2015). Critics of IT thus argue that too much focus on inflation as a sole mandate is detrimental to the economy as a whole. Another issue with IT is that it is a heavily demanding framework that comprises several prerequisites for successful implementation. This in itself is

disadvantageous, because it limits the scope of countries that are eligible to adopt IT to those countries that satisfy most of these prerequisites.

2.1.4 Prerequisites for Inflation Targeting

One of the most well documented disadvantages of IT is its demanding and unforgiving nature as a monetary policy regime in terms of the prerequisites that are purported in the theoretical literature to be crucial for its proper implementation (Eichengreen, Masson, Savastano, & Sharma, 1999). A thorough understanding of these prerequisites (which are generally categorized into institutional and technical prerequisites) is critical in order to completely assimilate the conceptual framework underlying in IT. It should be noted that satisfying some of these preconditions (especially institutional conditions, such as Central Bank independence), is important for the successful conduct of monetary policy in general under any monetary policy regime. However, the weight placed on satisfying these preconditions is even more pronounced under IT, as a result of its heavier reliance on the role of Central Bank transparency and credibility in the formulation of inflation expectations (Masson, Savastano, & Sharma, 1997).

Institutional Prerequisites

- Independence of the Central Bank

Independence of the central bank is the cornerstone, and likely the most important institutional prerequisite for the implementation of IT. This prompts an important discussion about the distinction between instrument and goal independence and whether or not both are conducive to an IT regime. Goal independence implies that the Central Bank would have complete autonomy in setting the inflation target that it will work towards itself, while instrument independence, or operational independence, implies that the Central Bank would have the discretion to conduct

monetary policy towards achieving the target, without necessarily being a part of the decision making process in setting it. As the monetary authority in the economy, the central bank should have complete operational independence in setting monetary policy instruments to achieve the preset inflation target, implying a separation of authority between fiscal and monetary institutions and allowing the Central Bank to focus on its primary mandate of achieving low and stable inflation (Sims, 2016). This implies that the central bank should not be subject to any form of political pressure from the country's fiscal authority on monetary policy decision making under IT (Ćorić, 2007), and that the central bank should have enough autonomy to be entirely focused on achieving its ultimate goal of price stability (Youssef, 2007). For example, the organizational structure board of directors (or the entity responsible for setting monetary policy instruments) should be assembled in a way that eliminates political pressure.

- Absence of Other Nominal Anchors

IT also requires, in theory, the absence of other nominal anchors and a willingness on the part of the central bank to commit to price stability as the overarching goal of monetary policy (A Mishra & Mishra, 2009).

- High Degree of Transparency and Accountability

In compliance with the high level of independence granted to the central bank, an amplified degree of accountability is required. Under IT, there is a need to set in place transparency and accountability measures to enhance the credibility of the central bank and ultimately, the effectiveness of monetary policy.

- Fiscal Consolidation, and Lack of Fiscal Dominance

Fiscal consolidation (which refers to the lack of large, persistent fiscal deficits and government debts) and the absence of fiscal dominance (which refers to a

situation where fiscal authorities have power to intervene in monetary policy decisions to maintain government solvency in a manner that is detrimental to the ultimate goal of monetary policy) are also critical conditions for the assurance of central bank independence, and thus success in IT (Woodford, 2001). Under fiscal dominance, the financial needs of the government overshadow the conduct of independent monetary policy (Khan, 2003). When the government has enough influence on monetary decision-making, it can exert pressure on the central bank to monetize a part of its deficit through printing money (also known as seigniorage revenue), which in turn has an inflationary impact on the economy that is counterproductive to IT (Kumhof, Nunes, & Yakadina, 2010).

Technical Prerequisites

- The need to construct a suitable price index for measurement of the inflation target and progress made towards its attainment constitutes an important technical prerequisite for IT (Silver, 2006; Vredin, 2015).
- Technical capabilities of the central bank to make use of all available data in a forward-looking manner to construct accurate and timely inflation forecasts (and analysis of potential scenarios) is necessary for the adoption of IT (Duman, 2002).
- In order for IT to work, there must be a strong and reliable transmission mechanism that links between monetary policy instruments that are in the direct control of the central bank, and the goal of inflation. This requires the existence of a deep, stable financial system and sophisticated credit markets that allow for tools such as the interest rate to have predictable effects on inflation (Carare et al , 2002; Laurens et al, 2014).

2.2 Empirical Literature on Inflation Targeting

Relevant empirical studies on IT can be categorized around two main areas of focus: the results and effectiveness of IT as measured by its impact on different macroeconomic variables, and how necessary the satisfaction of preconditions of IT is to its success in practicing countries. Since the first pioneers of inflation targeting were developed, industrialized countries, most of the research pertaining to the evaluation of the results of IT and its impact on macroeconomic parameters is focused on those developed countries that have had the longest history with the framework. On the other hand, emerging and developing countries are more often utilized for research related to the effect of meeting the prerequisites of IT, since many of the IT-practicing emerging and developing countries lacked some (if not most) of the theoretically proposed preconditions for IT when it was first introduced

2.2.1 Empirical Literature on the Results and Effectiveness of IT

Empirical studies on the results of IT include studying the effect of IT and macroeconomic variables such as the level of inflation, inflation volatility, output growth, output gap variability, the sacrifice ratio (the cost of bringing down inflation), the exchange rate, and current account balances, to name a few. In general, it is thought that bringing inflation down, while central to the proper functioning of an economy, is quite costly in terms of its impact on other macroeconomic variables such as output growth and employment (Ball, 1994).

A large body of research has been employed to test the effect of IT on inflation levels and volatility. Much of this research has concluded that inflation levels have dropped significantly in the years after the adoption of an IT regime in most countries. For example, Pétursson (2004) concluded that the first six countries adopting IT exhibited a drop in inflation rates from an average of 9% in the five years prior to adoption of IT to 3.5% in the year after adoption. More generally, for 21

countries that were classified officially as IT'ers in 2004, the inflation rate dropped from an average of 31% in the 5 years prior to adoption of IT to 4.5% the year after its adoption. Neumann & Hagen (2002) compared six inflation-targeting countries and three non-targeting countries across two sample periods (a pre-IT period and a post-IT period). The authors conclude that inflation targeting countries achieved lower levels of inflation and inflation and interest rate volatility as a result of central bank credibility gains associated with committing to inflation targets. C. E S Gonçalves & Salles (2008) found that for a sample of 36 economies (including 13 with an explicit IT regime in place), the countries with IT achieved statistically and economically significant reductions in inflation levels and inflation volatility when compared to countries that employed other monetary policy regimes. Applying the propensity scoring method to a sample of 109 potential inflation-targeting countries, Vega and Winkelried (2005) find that significantly lower inflation levels and volatility are achieved when IT is adopted. Valera, Holmes and Hassan (2017) employ a GARCH model and find that for eight Asian economies, IT has a significant effect on lowering inflation rates but its the effect is not significant on lowering inflation volatility.

While the aforementioned evidence supporting the success of IT in bringing down inflation levels and volatility may seem convincing and ample, not much supplementary investigation is needed to demonstrate that a comparable amount of evidence exists that suggests the contrary. Indeed, many researchers have questioned whether the association between the drop in average inflation rates and IT is one of causality, or merely correlation. Debelle et al (1999) critically scrutinize the purported success of IT, arguing that non-inflation targeting economies experienced similar reductions in inflation levels and volatility during the 1990's, which points to the

proposition that the 1990s represented a period with conditions conducive to inflation reduction in general, regardless of whether countries employed an IT regime or not. Cecchetti and Ehrmann (1999), who also find that inflation rates were reduced by the 23 countries surveyed in the 1990's relative to the 1980's regardless of the level of development, geography, or whether or not an inflation-targeting regime was in place, reached a similar conclusion. Honda (2000) finds that the adoption of IT had no significant impact on the reduction of inflation levels and volatility for New Zealand, Canada, and Australia, three of the pioneering economies in IT. Similarly, Lin and Ye (2007) use a propensity scoring method to evaluate the treatment effect of IT adoption on inflation levels and volatility in seven countries, and find that IT has no significant effect on both outcomes, discrediting the importance of IT in attaining even its most basic objectives. These sources, to name a few[1], make it difficult to suggest a strong causal relationship between the implementation of IT and the reduction of inflation rates and volatility.

Some empirical research looks beyond the obvious macroeconomic effects of an inflation-targeting regime and instead focuses on the effect of IT on output, output volatility and the sacrifice ratio (the cost of disinflation) when compared to other monetary policy regimes. This prompts an important discussion about the inherent tradeoff between inflation and output. Indeed, it is well established both theoretically and empirically that disinflations do not come without the cost of a subsequent reduction in output: this is the basis on which the concept of the sacrifice ratio is built. The sacrifice ratio is defined as the percentage loss in output relative to the percentage drop in inflation (Ball, 1993). For countries that wish to embark on disinflationary reforms to bring inflation down, the question then becomes what monetary regime

[1] (Dotsey, 2006; Rogoff, 2003; Walsh, 2009) also conclude that the effect of IT in bringing down inflation is questionable.

achieves disinflation at the lowest cost, i.e. with the lowest sacrifice ratio. In this regard, the empirical literature pertaining to how an IT regime compares to other regimes in terms of the cost of disinflation is quite divided. Corbo & Schmidt-Hebbel (2000) find that for five Latin American IT economies, the output sacrifice ratio and output volatility are reduced in the period following the adoption of inflation targeting when compared to the pre-IT period, and are either lower than or comparable to other non-inflation targeting industrialized economies. Consistent with this finding, Gonçalves and Carvalho (2009) find that among a sample of OECD countries, those with IT regimes in place experience smaller sacrifice ratios than non-targeting economies during periods of disinflation. Debelle (1999) finds that in practice, IT regimes have proven flexible enough to allow for a lower degree of output variability than other monetary policy regimes.

Brito and Bystedt (2010), on the other hand, find that the implementation of an IT regime has no impact on the cost of disinflation. Additionally, Cecchetti and Ehrmann (1999) find that across a sample of 23 countries, 9 of which are explicit inflation targeting economies, the inflation targeting countries suffer the highest output volatility. Roux and Hofstetter (2012) conclude that the effect of IT on the reduction of output sacrifice ratios depends on the length of the disinflationary process; IT adoption only reduces the sacrifice ratio when the disinflationary process is implemented gradually over a longer time period as a result of the credibility gained as a result of the Central Bank committing to an explicit target for inflation. However, in the event of an abrupt disinflation, IT countries experience higher sacrifice ratios. Thus, the literature on the effect of IT on output volatility and output sacrifice ratios seems inconclusive and subject to debate.

The divide on literature pertaining to the empirical macroeconomic outcomes of IT extends to the effect of IT on exchange rate volatility and the current account. Rose (2007) assesses panel data across 45 countries and concludes that the credibility gains associated with IT result in lower exchange rate volatility, less "sudden stops" in capital flows, with no negative effect on the current account balance. Sobrino (2010), however, critiques Rose's approach, and contends that accounting for global economic shocks produces contradicting results, whereby IT is actually found to have negative impacts on the current account balances in 19 countries. Additionally, Edwards (2006) concludes that exchange rate volatility increases in three out of five IT countries studied as a result of these countries adopting a floating exchange rate regime to implement IT.

Despite the fact that the empirical research on IT in the last two decades has been immense in quality and quantity, the effect of IT on macroeconomic performance is still not conclusive, and the literature has yet to establish a strong causality relationship between IT and macroeconomic performance, possibly pointing to the proposition that IT may not be a "one-size-fits-all" tool for bringing inflation under control.

2.2.2 Empirical Literature on Linking the Satisfaction of IT Prerequisites to its Success

The second part of the empirical literature on IT is concerned with the applicability of IT to developing and emerging market economies. The theoretical literature on IT stresses the importance of key "preconditions" that should be satisfied in order to guarantee the success of IT. A large body of literature has been dedicated to the investigation of the feasibility of IT in these countries where preconditions are lacking. In other words, this part of the empirical literature revolves around testing the degree to which satisfying the aforementioned prerequisites is indeed essential to

successful adoption and implementation of IT. Batini & Laxton (2006) argue that most emerging market economies do not satisfy all (or even most) of the prerequisites proposed in the theoretical framework, and hence, they represent a prolific ground on which the degree of necessity of meeting the theoretical preconditions can be investigated. This instigates a dialogue on how developing and emerging market economies differ in practice from developed ones in the context of IT. Mishkin (2000) cites high degrees of fiscal dominance as evidenced by a high incidence of seigniorage financing, lack of fiscal consolidation, shallow credit markets, unstable financial systems, and lacking technical capabilities, including difficulty in selecting an appropriate measure for inflation and modeling accurate forecasts for inflation, as major impediments to the successful implementation of IT in the emerging market context when compared to developed economies.

Government dependence on seigniorage, a form of revenue that fiscal authorities collect as a result of their ability to influence monetary policy towards printing more money to finance government deficits, is a significant indicator of fiscal dominance. Debelle, Masson, Savastano, & Sharma (1998) found that developing countries rely on seigniorage revenues that account for an average of 1.4%-3% of GDP, which is significantly higher than the reliance on seigniorage in developed countries which averaged less than 1% of GDP during the same 16-year time span. Ismailov, Kakinaka and Miyamoto (2016) find that the tendency of less developed, low-income countries to have larger fiscal deficits and public debts makes them less likely to adopt IT regimes than high-income countries as a result of their governments' constant reliance on central bank financing. Additionally, it has been shown historically that less developed countries are less capable of conducting fiscal adjustments in a sustainable way which in turn harms investment, with 30%-70% of

the decrease in fiscal expenditures being cut from spending on infrastructure in less developed countries, thereby questioning the viability of IT in these countries (Buffie & Atolia, 2016).

Empirical research as also been extensively conducted to test one of the preconditions of a well-functioning IT regime in emerging economies: the proper and accurate understanding of the relationship between monetary policy tools and its ultimate goal, inflation. The vector autoregressive model (VAR) and Granger causality tests in the bivariate and multivariate forms have been used extensively in the literature to test the aforementioned relationship. In line with the methods undertaken by Gottschalk and Moore (2001), Tutar (2002) and, more recently, by Bakradze and Billmeier (2007), and more recently Mishra and Mishra (2010) and Odior (2012), this paper intends to use the VAR methodology and subsequent bivariate and multivariate Granger-causality tests to determine the strength of the relationship between monetary policy tools and inflation, taking into account the effects of other interrelated macroeconomic variables[2].

Some of the literature highlights the significant weight given to level of fulfillment of the prerequisites for IT in determining whether or not implementing countries will succeed. These sources tend to conclude that emerging markets where prerequisites are lacking could achieve better results by abiding by a more "conventional" monetary policy framework, such as exchange rate targeting (Eichengreen et al., 1999). For example, the World Economic Outlook of 2001 suggests that absence of necessary institutional preconditions in general, and fiscal discipline in particular, in most developing economies will pose as a massive threat to the sustainability of IT success. Angeriz and Arestis (2007) also find that the lack of

[2] An in-depth review of the studies conducted using this methodology and their results are presented in Section 6.2 of this paper.

institutional and technical capabilities of emerging markets undermines their capacity to achieve success under IT. Carare and Stone (2006) employ empirical analysis that supports the notion that that emerging market economies wishing to transition into fully-fledged IT regimes should first work towards improving their fiscal position and the depth of the financial system in order to warrant the adoption of IT.

Despite the anticipated challenges associated with adoption of IT in emerging market countries, thirteen out of 28 countries classified by the IMF officially as inflation targeting economies are developing/emerging market economies as of today. A study on IT in 21 countries shows that almost 80% of the emerging economies in the sample lacked the basic institutional and technical prerequisites proposed by the theoretical framework, but that this did not prevent them from reaping the economic benefits of IT. For example, Israel and the Philippines were characterized by high public debt/GDP ratios and sizeable government budget deficits at the time of IT adoption (Batini & Laxton, 2006). In another survey conducted by the IMF on 21 inflation-targeting central banks, it was concluded that not a single country (including developed economies) had *completely* satisfied all the prerequisites at the time of adoption of IT (Batini & Kuttner, 2005).

The theoretical notion that the pursuit of a successful IT regime automatically entails giving up any sort of control over the exchange rate has also been questioned by empirical data. A recent controversial IMF working paper strongly contradicts the theoretical literature and in fact that argues that proper management of the exchange rate actually enhances the results and efficacy of IT in less developed countries (Airaudo, Buffie, & Zanna, 2016). Building on the observation that foreign currency still carries significant weight as a supplier of liquidity services in less developed

countries, the authors concur that expectations of higher inflation can materialize in a self-fulfilling manner once capital flight triggers rapid depreciation of the currency.

These empirical results point to a more neutral stance regarding the importance of fulfilling the preconditions of IT. One can argue that the prerequisites suggested in the theoretical framework should not be perceived as a rigid, stringent set of conditions that must be *fully* satisfied *before* central banks can even approach the prospect of IT adoption, rather, an amalgamation of circumstances that reduce the costs associated with adopting an IT regime, and bolster the possibility and speed of its success. For example, although the implementation of IT in Chile is considered to have been essential to getting inflation under control, the low degree of fulfillment of many of the necessary preconditions at the time of IT adoption resulted in Chile converging to stationary inflation levels only after 36 quarters, which is six times as long as the average time it takes developed economies to stabilize inflation levels (Khalid, 2005). Similarly, the Colombian experience with IT targeting can be regarded as a success in terms of macroeconomic performance today, but at the time of IT adoption, fiscal mismanagement and the overall lack of fulfillment of institutional prerequisites triggered one of the country's longest recessions.

Thus, central banks of emerging or developed economies that are considering a transition to an IT regime should not feel pressure to completely and fully satisfy all theoretical IT preconditions before adoption, but they should systematically assess the stance of the economy with regards to achieving these conditions, acknowledge them as important determinants of success, and subsequently work to make significant progress in the lacking areas during the introduction and implementation of an IT regime.

3. Recent Developments of Monetary Policy in Egypt

For the purpose of analysis, this section divides the evolution of monetary policy in Egypt since 1990 till the present into four distinct phases. The end of one phase (and the start of the next) is determined by a major, relevant event that I find to be a defining incident in monetary policy evolution in Egypt. These four phases are:

Phase One: The Economic Reform and Structural Adjustment Program (ERSAP) until the Transition to a Managed Float of the Exchange Rate (1990-2004)

Phase Two: The Adoption of a New Monetary Policy in 2005 (2005-2011)

Phase Three: The January 2011 Revolution Onwards (2011- 2016)

Phase Four: Liberalization of the Exchange Rate Onwards (November 2016 – Present)

Phase One: The ERSAP until the Transition to a Managed Float of the Exchange Rate (1990-2004)

Prior to 1990, the Central Bank of Egypt set limits on bank borrowing and lending interest rates that were below the inflation rate during that period. This was representative of the overall subjugated nature of the banking system in Egypt at the time. In general, growth of money circulating in the economy was driven by the government's needs for finance, and preferential borrowing rates were given to public firms and establishments (Handy, 2001).

In the early 1990's, in line with Egypt's Economic Reform and Structural Adjustment Program (ERSAP), the Central Bank took steps towards reforming the banking sector and giving more weight to market forces in the distribution of credit and in the conduct of monetary policy. Direct credit ceilings that had previously been in place were gradually replaced with the development of indirect tools. The limitations on bank deposit and lending rates and on credit to the private sector were removed in 1991 (Moursi, Mossallamy, & Zakareya, 2007). Thus, the Central Bank

began a move towards the use of indirect monetary policy instruments for the conduct of monetary policy. Instead of directly limiting credit expansion in the banking sector, the Central Bank hosted weekly auctions of treasury bills with a maturity of three months (longer maturities were introduced subsequently). It thus managed liquidity growth indirectly through the purchase and sale of treasury bills. The reforms put in place under the ERSAP were successful in bringing inflation down from an annual average of over 20% between 1986 and 1992 to less than 10% by 1997. Inflation levels remained at single digits until the end of 2001 (Al-mashat, 2008).

In spite of the progress made in the liberalization of the banking system and monetary policy during the ERSAP, there still remained the challenge of selection of a single, ultimate objective for the CBE, rather than multiple, often conflicting ones. Indeed, the period between the introduction of the ERSAP in 1990 and the float of the Egyptian pound in January 2003 was a period of obscurity in terms of the CBE's objectives (Awad, 2005). At the time, the CBE was targeting high economic growth, while at the same time attempting to contain inflation with a pegged exchange rate, which presented a dilemma for the conduct of monetary policy (Awad, 2005). Growth of M2 was the intermediate target for the Central Bank, while its operational target was the excess reserves of banks up until 2005 (Abou El-Eyoun, 2003).

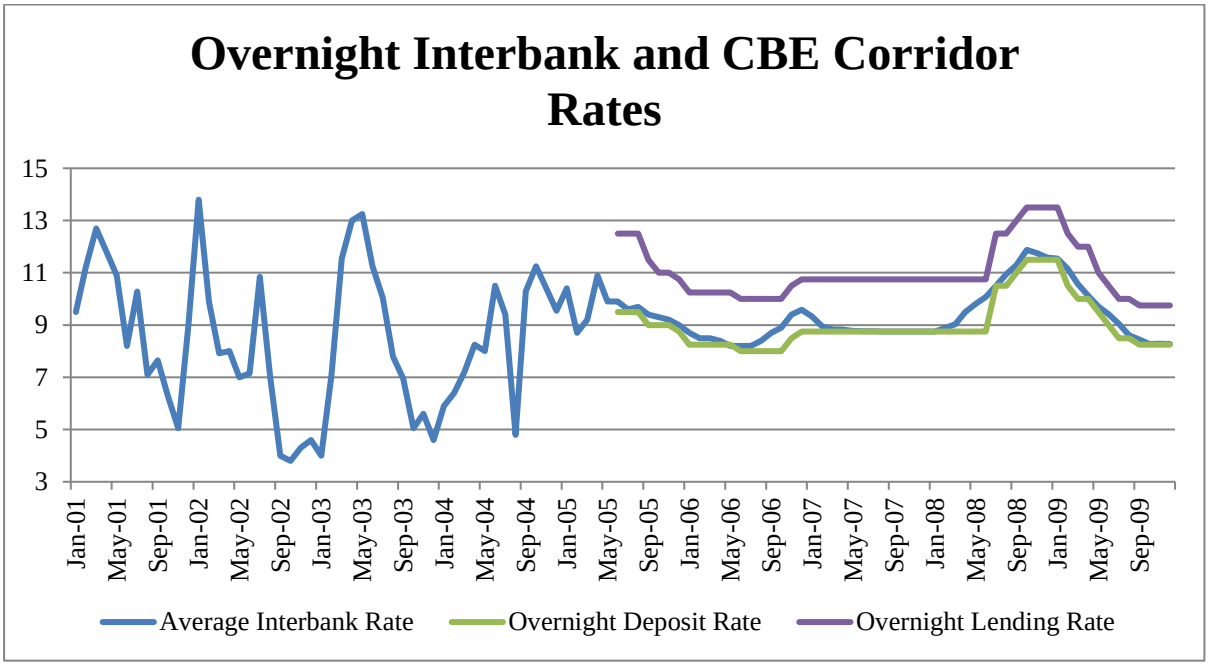
In January of 2003, the CBE announced it would transition from a crawling peg exchange rate regime to a managed float. The decision was regarded as an attempt to relieve pressure on international reserves, and bring more consistency to monetary policy by allowing the exchange rate to be more flexible (Galal, 2003). With the first attempt to float the exchange rate in January 2003, the exchange rate pass through (ERPT) effects of the subsequent depreciation of the pound caused inflation to skyrocket once again, reaching a peak of 21.7% in early 2004.

Additionally, the CBE continued to cite exchange rate stability as one of the key objectives of monetary policy throughout 2004 and 2005 despite the official announcement to float the exchange rate (Awad, 2005). The volatility of excess reserves (Al-mashat, 2008), the inconsistency in monetary policy management and the existence of multiple targets for monetary policy were all factors in the Central Bank's decision to transition towards a new monetary policy framework of IT in June 2005.

Phase Two: The Adoption of a New Monetary Policy in 2005 (2005-2011)

With the CBE's announcement of its decision to transition towards an IT regime whenever the fundamental prerequisites were achieved, changes were made to the framework governing monetary policy in Egypt. Towards the ultimate objective of low and stable inflation, the intermediate target would be growth of money supply and the Central Bank would also monitor developments in the inflation forecast and domestic liquidity. The overnight interbank rate, which is a price target, would take the place of excess reserves (a quantitative target) as the CBE's operational target. The Central Bank would set the overnight lending facility (the ceiling) and overnight deposit facility (the floor), which together form the overnight interbank corridor, within which the interbank rate fluctuates (Monetary Policy Department, 2015). As the effect of the devaluation of the pound started to wear off, and with the Central Bank's attempts to contain inflation with tighter monetary policy, inflation levels fell during the second half of 2004 and throughout 2005 (Al-mashat, 2011).

Figure 1: Overnight Interbank and CBE Corridor Rates (2001-2010)



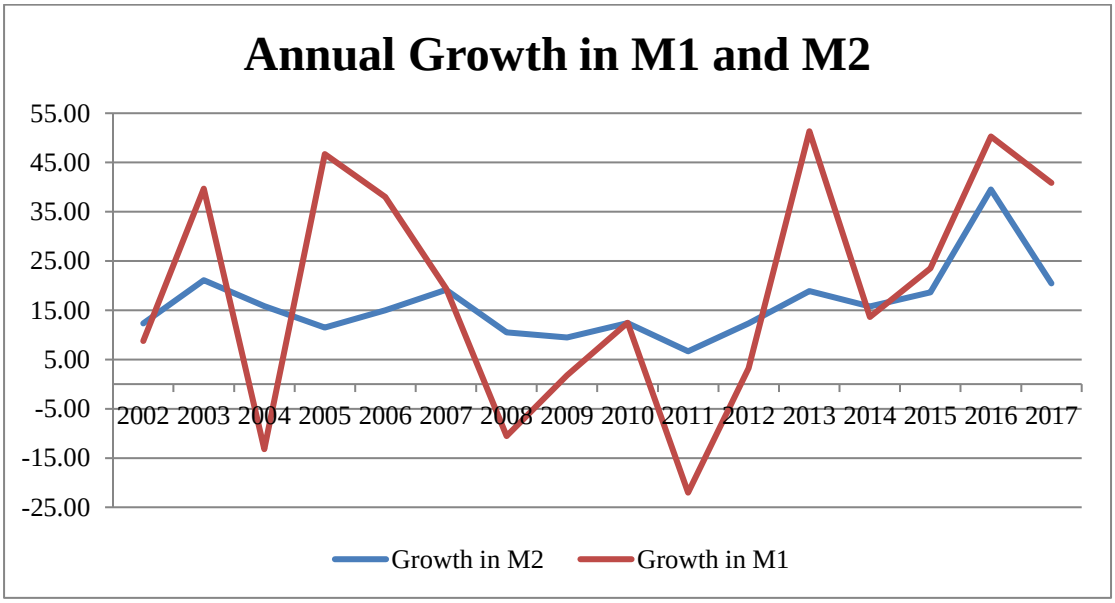
Source: Central Bank of Egypt

Due to the second round effects of supply shocks due to oil subsidy cuts and the spread of bird flu, inflation picked up in 2006, increasing gradually from 9.6% in annual CPI in September 2006 to 12.4% in December 2006 to 12.8% in March 2007. As a result, the CBE continued its efforts towards achieving price stability leveraging the operational target of the overnight interbank rate, which was reflected in the MPC's decision to raise the overnight lending and deposit rates by 0.5% in November and again by 0.25% in December 2006 to reach 8.50% and 10.50% in November and 8.75% and 10.75% in December 2006 respectively. Inflationary pressures were eased as the annual CPI inflation rate declined to 8.5% in June 2007. During the same period, the CBE attempted to absorb excess liquidity in the market as a result of higher foreign direct investment flows by reactivating deposit auctions in January 2007, and using its certificates of deposits (CDs) and notes.

Inflation remained under control for the remainder of the financial year, and the CBE's policy rates were stabilized accordingly. However, during the second

quarter of FY 2007/08, the CBE was faced with soaring inflation rates once again due to a surge in global food prices towards the end of 2007, an adjustment in subsidized oil and gas products, and accelerating economic growth. Annual CPI accelerated to reach 19.7% in May, 20.2% in June 2008 and 21.5% in September 2008. In anticipation of higher inflation expectations, the MPC made several subsequent decisions to increase the policy rate during the period between February and September 2008, bringing the overnight deposit and lending rates up to 11.5% and 13.5% respectively by the end of September 2008. Furthermore, attempts to control excess liquidity were starting to pay off, with the annual growth in M2 decelerating to 15.7% in 2007/2008, down from 18.3% in 2006/2007.

Figure 2: Annual Growth in M1 and M2



Source: IMF International Financial Statistics

Egypt's economy was considered generally resilient to the effects of the global financial crisis during 2008, and by the end of the first half of 2009, inflation was brought down to single digits once again, reaching 9.9% in June 2009, down from 20.2% during the same month one year before. The MPC thus decreased the CBE's policy rate in an attempt to stimulate investment and growth once inflation was down

to moderate levels. At the same time, the width of the corridor was narrowed from 2% to 1.5%, bringing the overnight deposit and lending rates down to 9% and 10.5% respectively in June 2009. Towards the end of the year, policy rates were lowered twice in simultaneous MPC meetings to reach 8.25% and 9.75% in September 2009. With the construction of a suitable price index being a core technical prerequisite of an IT framework, in October 2009, the CBE prepared a measure of core CPI that excluded regulated goods, and hence the impact of temporary price shocks on inflation. The purpose of this indicator was to provide a complementary indicator to headline CPI that would help to separate the core trend of inflation and its transitory movements, to depict a more accurate picture of the dynamics of inflation.

In general, inflation remained manageable and stable from the second half of 2009 until mid-2010, with an average headline CPI of 11.5%, prompting the CBE to stabilize policy rates throughout that period.

Phase Three: The January 2011 Revolution Onwards (2011- 2016)

In response to the economic instability that followed the events of January 2011, and its impact on financial markets and liquidity, the CBE introduced weekly repo operations with a maturity of one week at an interest rate to be set on a regular basis by the MPC to address the liquidity crisis in the banking sector. The interest on 7-day repo operations was first set at 9.25% annually, and then later increased to 9.75% in November of the same year. While previous years had witnessed the weighted average overnight interbank rate consistently gravitating towards the deposit rate as a result of the excess liquidity in the banking sector, the beginning of 2011 witnessed the interbank rate hovering towards the middle of the corridor in response to the liquidity crisis.

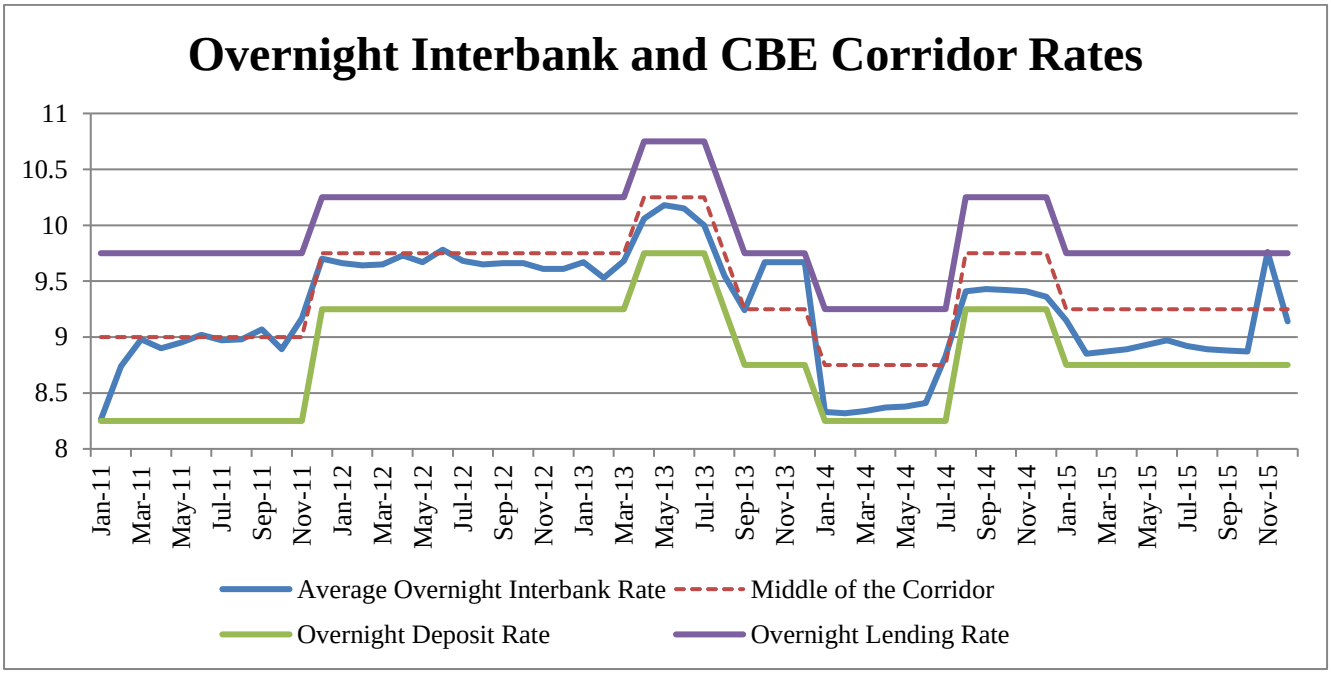
Annual headline CPI picked up to 11.8% in June 2011 up from 10.1% in June 2010. Additionally the appreciation of the US dollar in relation to the Egyptian pound led to a rise in import costs. The political instability that shook the country earlier that year had led to local supply bottlenecks and shortages and weak demand, both of which contributed to expectations of higher inflation. In November of 2011, the MPC increased the deposit and lending rates by 100 bps and 50 bps to reach 9.25% and 10.25% respectively, thereby narrowing the width of the corridor once again to 1%. The decision to increase the key policy rates was backed by the MPC's desire to hedge the aforementioned inflationary pressures.

More efforts were made by the Board of Directors of the CBE in 2012 to address the lack of liquidity in the money market as the effects of the events of 2011 continued to take their toll on the economy. These include reducing the required reserve ratio (RRR) from 14% to 12% in March (and later to 10% in May), and the introduction of repo operations with a maturity of 28 days in July. Eventually, the decisions taken by the CBE started to bear fruit, whereby the liquidity deficit in the banking system shrunk until it eventually turned into a surplus during the second half of 2012.

During FY 2011/2012, the annual headline CPI (urban) moderated to 7.3% in June 2012, on the back of lower prices of food and non-alcoholic beverages. During the second half of 2013 and the first half of 2014, the MPC decided in three consecutive meetings to lower the overnight lending and deposit rates by a total of 150 bps till they stabilized at 8.25% and 9.25% respectively. These rates were maintained until July 2014, but were then increased by 100 bps in response to the government's revision of the prices of several regulated items in the CPI basket, which pushed inflation up. At this point, inflation was at a moderate level, with

headline CPI recording 8.2% in June 2014, however, the government's overall fiscal consolidation effort carried an inflationary effect was inevitable, and the MPC thus embarked on a series of "preemptive rate hikes" to limit the associated inflationary effects. Additionally, to absorb the excess surge in liquidity in the banking sector, the CBE continued its bank deposit acceptance operations, using the seven-day deposit auctions that had been introduced in mid-2013. In December 2015, the MPC started the first of what would be a long series of consistent hikes in policy rates to contain inflation expectations in support of the government's fiscal consolidation program. Thus, between December 2015 and June 2016, policy rates were increased by 3% to curb the continuous rise in both annual headline and core inflation, which had reached 13.97% and 12.37% respectively by the end of June 2016.

Figure 3: Overnight Interbank and CBE Corridor Rates (2011-2015)



Source: Ministry of Finance, Central Bank of Egypt

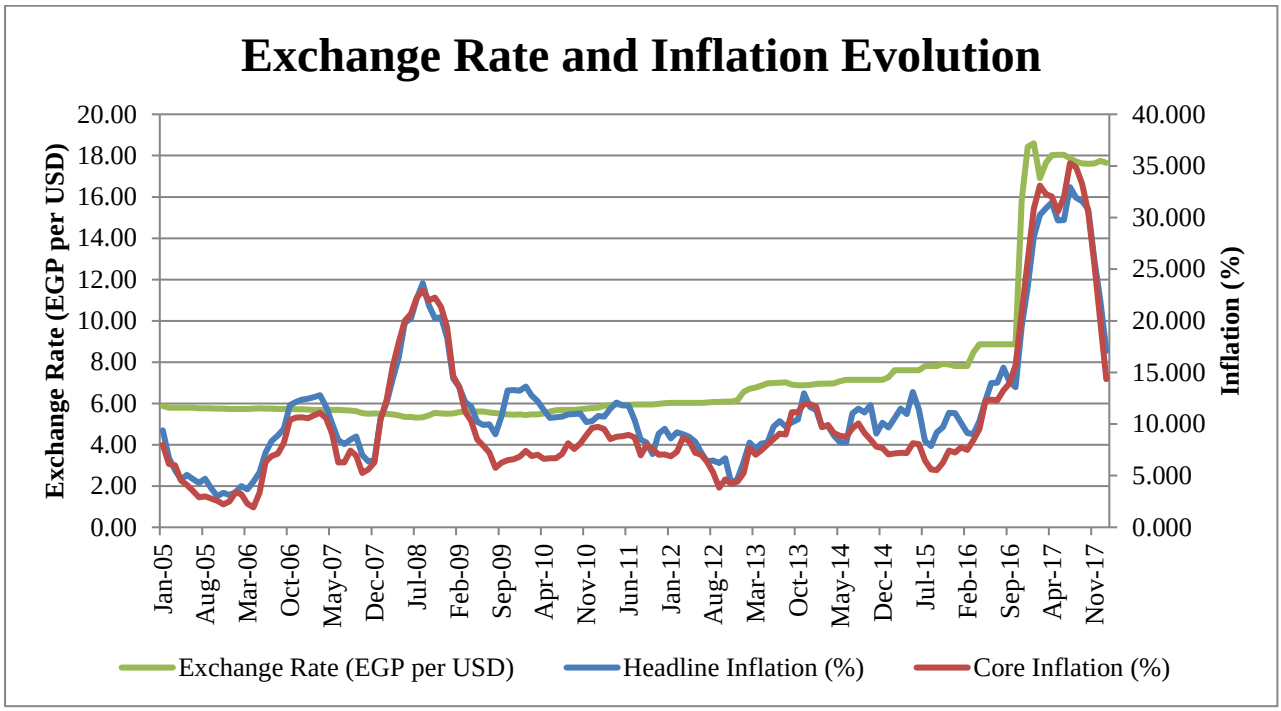
Phase Four: Liberalization of the Exchange Rate Onwards (November 2016 – Present)

The decision to liberalize the exchange rate on November 3rd 2016 was a critical one taken by the CBE amidst a broader reform agenda to restore macroeconomic stability to the country. Egypt initiated a new economic and structural reform program supported by the Extended Fund Facility from the IMF in November 2016. The main objectives of the program include (1) eliminating foreign exchange shortages to encourage investment and exports, (2) developing a monetary policy framework aimed at getting inflation under control, (3) consolidating the fiscal deficit and ensuring sustainability of pubic debt, and (4) undergoing structural reforms that promote higher and more inclusive growth. The decision to float the pound was backed by the authorities' plan to bring foreign exchange trade back to formal channels and away from the black market, and to improve the competitiveness of Egyptian exports and build up reserves while simultaneously reducing exports. Nonetheless, the exchange rate pass through (ERPT) effects, as well as the transitory effects of such a decision were expected to significantly take a toll on inflation rates, and so the MPC increased policy rates by 300 bps again in concurrence with the liberalization of the exchange right to reach 14.75% for the overnight deposit rate and 15.75% for the overnight lending rate in November 2016.

The prices of more than half of the items of the CPI basket were significantly impacted by the exchange rate reform measures in 2016. This transitory cost-push effect, along with inflation expectations linked to a history of inflation hovering around 10%, were the main drivers of the skyrocketing inflation that was registered towards the end of 2016, with headline and core CPI reaching 23.3% and 25.9% by the end of the year. Other factors included the introduction of the value-added tax

(VAT) at a higher rate than its predecessor (the general sales tax), and further fiscal consolidation measures including the gradual removal of subsidies on certain items.

Figure 4: Exchange Rate vs. Inflation Evolution (2005-2018)



Source: IMF International Financial Statistics, and Central Bank of Egypt

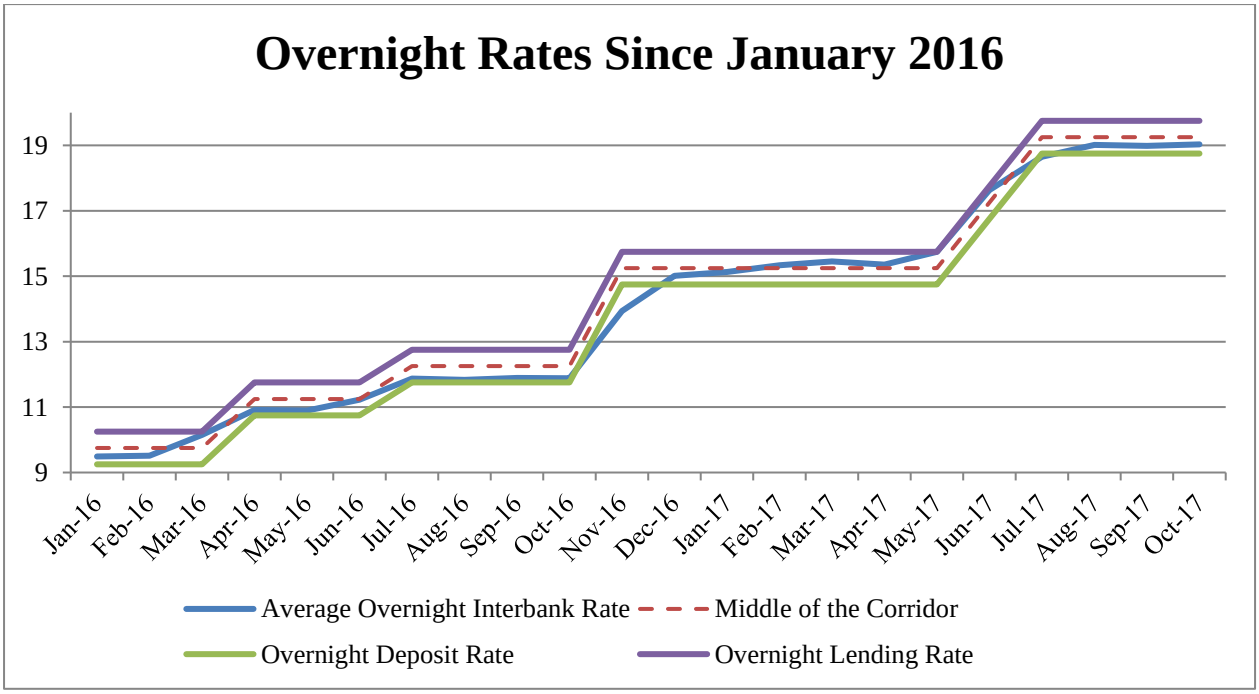
Throughout 2017, the situation with regards to inflation was to deteriorate before it got better. By July of 2017, headline CPI had reached its peak of 33%. The MPC tightened its interest rate stance even further by raising policy rates another 700 bps between the date the exchange rate was liberalized and July 2017, placing the overnight deposit rate at 18.75% and the overnight lending rate at 19.75%. Moreover, the CBE and the Ministry of Finance agreed to gradually phase out monetary financing of the fiscal deficit and abide by the legal limits to limit fiscal dominance. The CBE further tightened conditions via the introduction of flexible rate auctions to absorb excess liquidity over maturities greater than 7 days.

In March of 2017, the CBE also published its first "Monetary Policy Report", a step that symbolized a commitment to enhanced transparency and communication

with the public in the conduct of monetary policy. The CBE announced its intention to publish the report on a quarterly basis. Additionally, in May 2017, the CBE announce an explicit inflation target of 13% (+/-3%) to be achieved by the fourth quarter of 2018.

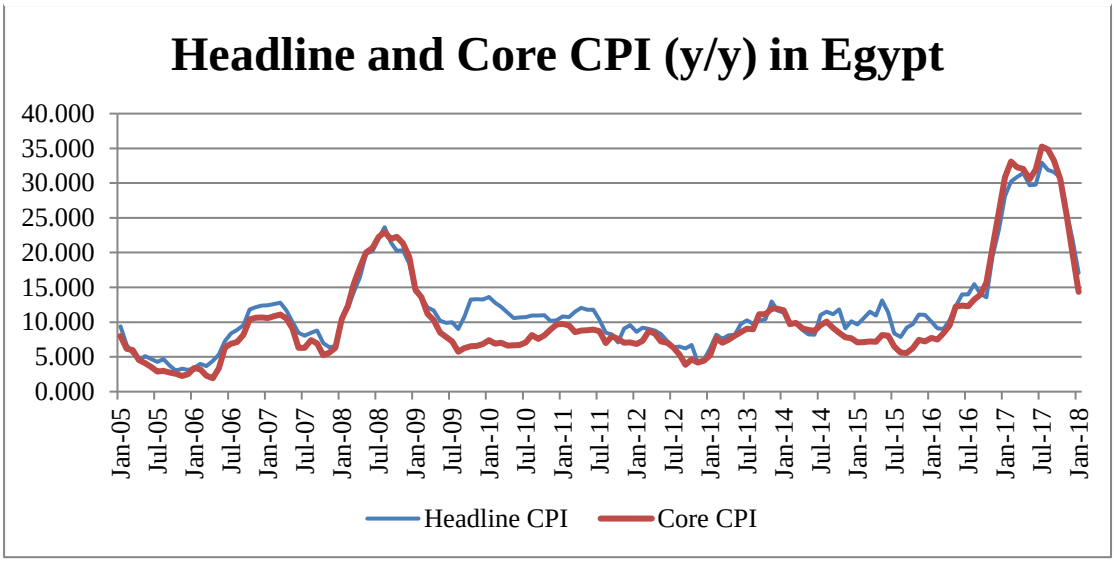
M2 growth (excluding revaluation) averaged 20.4% between November 2016 and May 2017 compared to 15.9% between July and October 2016, owing largely to the positive contribution of net foreign assets to the banking system for the first time since 2011. To supplement these decisions, the CBE also took measures to sterilize excess liquidity by decelerating the growth of monetary aggregates, and particularly by targeting shorter-term maturity instruments. To that extent, the CBE was successful in reducing excess liquidity in maturities less than or equal to seven days from 3.5% of GDP in November 2016 to 0.6% in June 2017. The weighted average overnight interbank rate gravitated towards the ceiling of the corridor, reflecting these developments.

Figure 5: Overnight Rates Since January 2016



Source: Ministry of Finance, Central Bank of Egypt

Figure 6: Headline and Core CPI (y/y) in Egypt



Source: Central Bank of Egypt

The following table depicts the weight of items in the CPI basket, as determined by the household income and expenditure survey of 2010 (January 2010 = 100%), and trends in the prices of its components between June 2011 and June 2017. The largest percentage change was an increase of 160.8% in culture and recreation, followed by an increase of 152.8% and 150.6% for alcoholic beverages and tobacco, and food and non-alcoholic beverages respectively. Unsurprisingly, the smallest positive percentage change was in housing, water, electricity, gas and other fuels, due to the subsidies on many of these items that were only partially and gradually removed during the end of the period.

Table 1: Changes in Major CPI Component Prices

	Relative Weights	June 2011	June 2012	June 2013	June 2014	June 2015	June 2016	June 2017	% change 2011 - 2017
All Items	**100.0**	**114.5**	**122.8**	**134.8**	**145.9**	**162.5**	**185.2**	**240.3**	**109.9**
Annual Growth Rate		*11.8*	*7.2*	*9.8*	*8.2*	*11.4*	*14.0*	*29.8*	
Food & Non- Alcoholic Beverages	**39.9**	**126.0**	**137.6**	**155.0**	**172.6**	**191.4**	**225.1**	**315.8**	**150.6**
Annual Growth Rate		*19.0*	*9.2*	*12.6*	*11.4*	*10.9*	*17.6*	*40.3*	
Alcoholic Beverages, Tobacco & Narcotics	**2.2**	**169.9**	**201.8**	**217.4**	**235.2**	**314.6**	**320.8**	**429.5**	**152.8**
Annual Growth Rate		*69.9*	*18.8*	*7.7*	*8.2*	*33.8*	*2.0*	*33.9*	
Clothing & Footwear	**5.4**	**102.2**	**106.8**	**113.0**	**114.3**	**123.1**	**135.7**	**176.0**	**72.2**
Annual Growth Rate		*2.2*	*4.5*	*5.8*	*1.2*	*7.7*	*10.2*	*29.7*	
Housing, Water, Electricity, Gas & Other Fuel	**18.4**	**100.4**	**107.7**	**113.1**	**117.1**	**124.2**	**130.8**	**140.9**	**40.3**
Annual Growth Rate		*1.1*	*7.3*	*5.0*	*3.5*	*6.1*	*5.3*	*7.7*	
Furnishings, Household Equipment	**3.8**	**105.2**	**114.4**	**122.1**	**134.5**	**139.1**	**157.7**	**202.1**	**92.1**
Annual Growth Rate		*2.5*	*8.7*	*6.7*	*10.2*	*3.4*	*13.4*	*28.2*	
Health	**6.3**	**101.9**	**102.0**	**114.8**	**128.6**	**131.2**	**172.5**	**194.3**	**90.7**
Annual Growth Rate		*1.9*	*0.1*	*12.5*	*12.0*	*2.0*	*31.5*	*12.6*	
Transport	**5.7**	**101.7**	**104.5**	**107.3**	**114.2**	**139.2**	**144.2**	**181.6**	**78.6**
Annual Growth Rate		*1.1*	*2.8*	*2.7*	*6.4*	*21.9*	*3.6*	*25.9*	
Communications	**3.1**	**100.0**	**95.5**	**95.5**	**97.0**	**96.8**	**96.9**	**98.6**	**-1.4**
Annual Growth Rate		*0.1*	*-4.5*	*0.0*	*1.6*	*-0.2*	*0.1*	*1.8*	
Culture & Recreation	**2.4**	**108.4**	**117.8**	**126.7**	**145.3**	**168.1**	**190.6**	**282.7**	**160.8**
Annual Growth Rate		*5.9*	*8.7*	*7.6*	*14.7*	*15.7*	*13.4*	*48.3*	
Education	**4.6**	**124.3**	**136.6**	**152.2**	**157.9**	**196.9**	**219.0**	**246.0**	**97.9**
Annual Growth Rate		*24.3*	*9.9*	*11.4*	*3.7*	*24.7*	*11.2*	*12.3*	
Restaurants& Hotels	**4.4**	**112.4**	**116.5**	**141.7**	**148.7**	**177.5**	**215.4**	**268.2**	**138.6**
Annual Growth Rate		*12.2*	*3.6*	*21.6*	*4.9*	*19.4*	*21.4*	*24.5*	
Miscellaneous	**3.7**	**103.2**	**104.5**	**105.3**	**106.3**	**111.5**	**121.1**	**159.8**	**54.8**
Annual Growth Rate		*2.5*	*1.3*	*0.8*	*0.9*	*4.9*	*8.6*	*32.0*	

Source: Central Bank of Egypt

4. Testing for the Viability of an Inflation Targeting Regime in Egypt

4.1 Methodology

A thorough review of the theoretical literature and empirical studies on the applicability of inflation targeting provides a preliminary platform for the conduct of a feasibility study of the implementation of inflation targeting in Egypt. The study will attempt to tackle the question of whether or not inflation targeting should be

adopted by the CBE given the current circumstances based on an assessment of the institutional and technical framework currently in place in Egypt, and whether or not this framework adequately satisfies the basic preconditions for inflation targeting. To achieve this, this paper employs a twofold methodology divided into (1) the conduct of a comprehensive survey of country practices and experiences with IT and (2) an assessment of the Egyptian framework through a thorough review of the legislation and institutional framework and an empirical assessment of the strength of the relationship between monetary policy tools and inflation via a VAR methodology.

- The comprehensive survey of the current international practices of 28 countries classified by the IMF as "inflation targeters" will be used to identify the practical considerations that need to be taken into account if the CBE indeed decides to adopt an inflation targeting regime.
- This survey will be complemented by a thorough review of Egyptian legislation, and the analysis of studies that have previously tackled the areas of interest in the Egyptian context based on past practices. In assessing the strength of the relationship between monetary policy tools and inflation, a VAR model and subsequent Granger-causality tests are employed. This analysis is extended to include impulse response functions (IRF) for monetary policy tools and inflation, and variance decomposition analysis.

4.2 Survey of Country Practices

The second part of my methodology involves carrying out a comprehensive survey of the international experiences in the implementation of IT. This survey covers the 28 countries that are currently classified by the IMF as fully-fledged

inflation targeting economies as of today.[3] The major outcome of this extensive review is a multi-dimensional summary table of inflation-targeting country practices that could serve as a convenient, easy-to-access tool for evaluating on a practical basis whether or not IT is suitable for Egypt, and where Egypt stands in the process of fulfilling the institutional and technical prerequisites for IT's successful implementation. Data sources that have been utilized extensively are the IMF International Financial Statistics, the IMF Central Bank Legislation Database, and country Central Bank websites and publications. To better understand the outcomes, implementation challenges and considerations of inflation targeting in practice; the survey will be aimed at depicting a comprehensive picture that includes an attempt to answer the following questions:

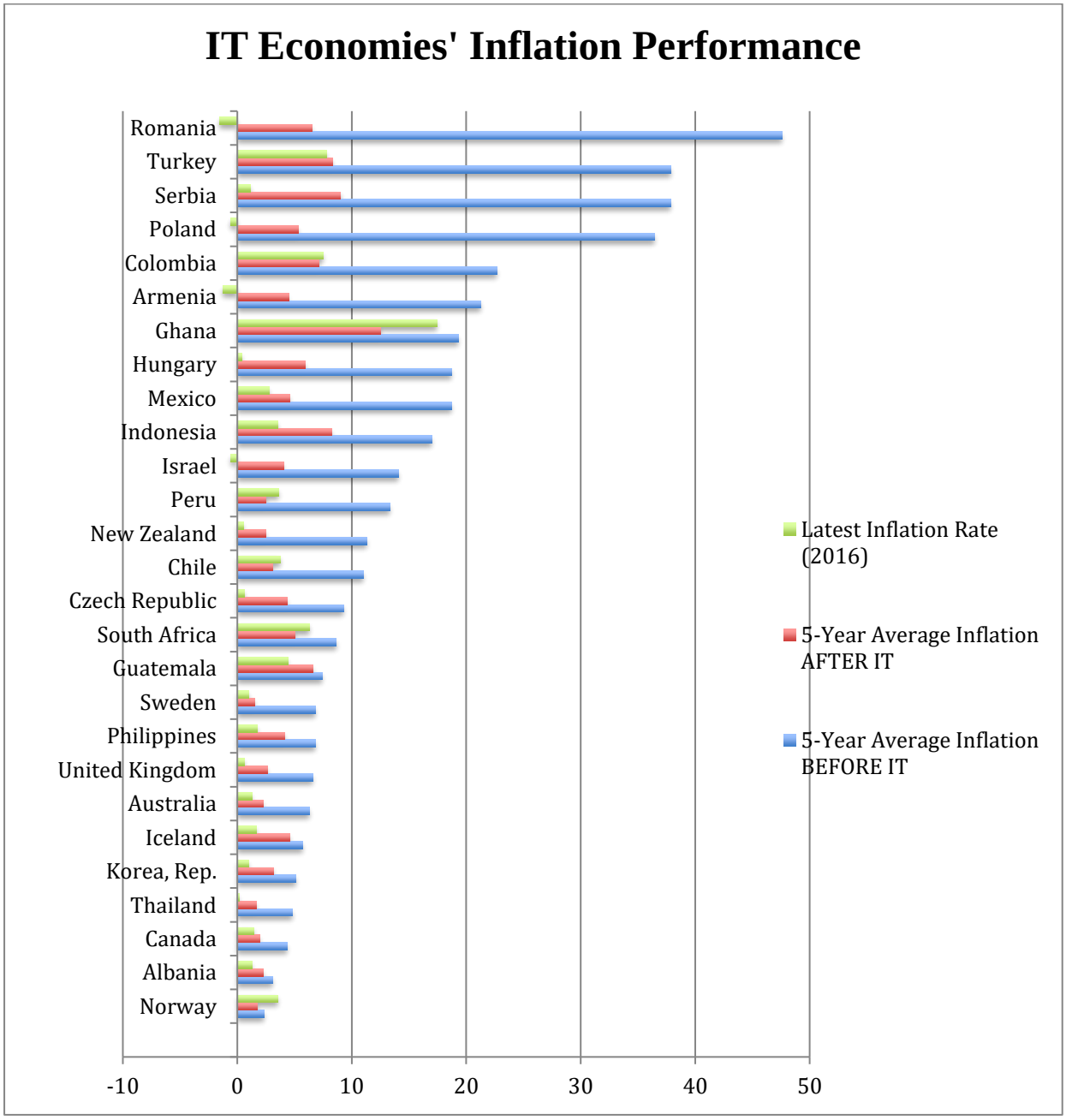
- How successful has inflation targeting been in terms of measurable macroeconomic outcomes?
- What entity is responsible for setting the inflation target? Is it the government, the Central Bank, or is it set jointly?
- How is the target defined? Is it a point or range target? If there is a range, how small or large is the width of the range?
- What measure of inflation is used (headline CPI, core CPI, or another index altogether)?
- What central bank accountability measures are in place? Are these accountability measures informally practiced or does the law mandate them?
- Does the legal framework prohibit or set limitations on central bank financing of government deficit?

[3] The 28 countries are: New Zealand, Canada, Australia, UK, Chile, Brazil, Mexico, Czech Republic, Israel, Sweden, Guatemala, South Africa, Poland, Hungary, Colombia, Thailand, Iceland, Korea, Indonesia, Romania, Serbia, Turkey, Armenia, Albania, Ghana, Norway, Peru, and the Philippines.

The IMF lists 28 economies as official inflation targeters. In general, inflation-targeting economies have been successful at driving inflation levels down, with the average difference between the five-year average inflation rate after and before implementation of IT being 10.28%.[4] The general trend also shows that these countries have been successful in maintaining low and stable inflation, with the latest inflation figures for most countries hovering around the five-year average *after* the adoption of IT, with very few exceptions. The following graph depicts the average inflation rates for inflation targeting economies in the five years before the adoption of IT, versus the average of the five years after the adoption of IT (including the year of adoption), and the latest inflation figures that were registered in 2016:

[4] Brazil was excluded from this calculation and the subsequent graph due to it being considered an outlier, with hyperinflation that averaged 721% in the five years before IT adoption.

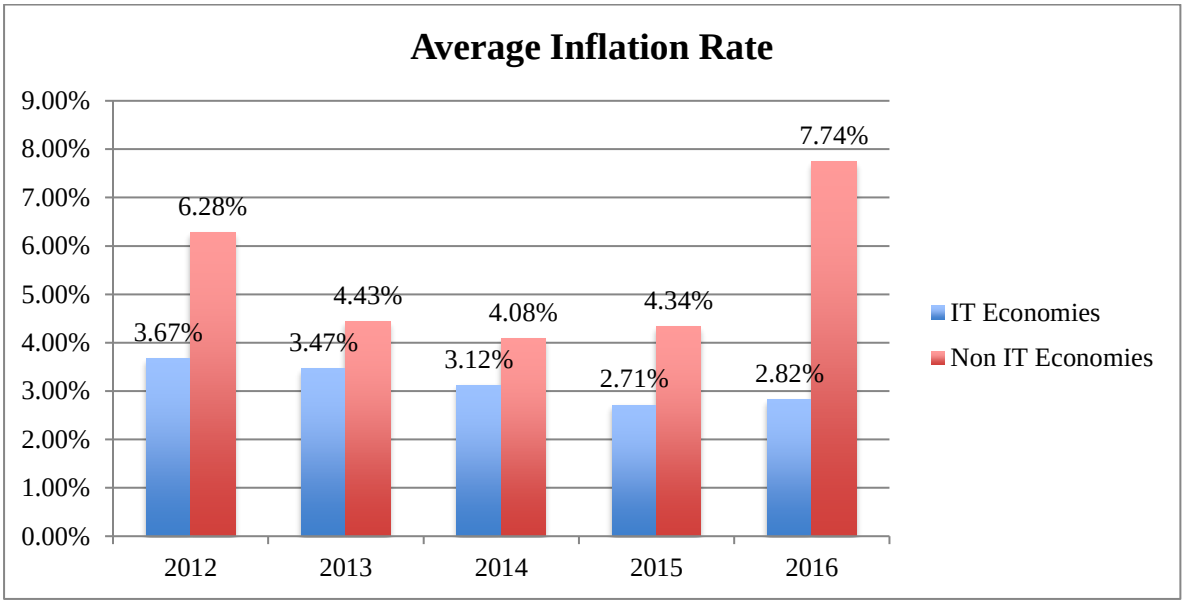
Figure 7: IT Economies' Inflation Performance



Source: World Bank

Additionally, a comparison between the average inflation rates of IT economies and those that do not have in place an official IT regime shows that inflation has been consistently lower in IT countries.

Figure 8: Average Inflation Rate of IT vs. Non-IT Economies



Source: IMF International Financial Statistics and data files.

Given the observed relative success of IT economies in managing their ultimate goal of price stability, the logical next step would be to study individual country practices in the setup of the IT framework. This segment of the analysis will be particularly useful for studying the institutional framework, transparency and accountability measures that need to be set in place to guarantee the proper functioning of an IT regime. The amalgamation and analysis of experiences of other countries will provide an invaluable tool with which policymakers may base their planning of the upcoming transitional phase towards IT. Given the vast amount and complexity of the information gathered, I contemplated that the best way to present it in a clear and organized format would be through a comprehensive summary table.

Comprehensive IT Country Practices Survey

Table 2: Comprehensive IT Country Practices Survey

Country	Year of IT Adoption	Current Target	Institutional Responsibility for Setting the Target	Accountability Measures	Formal Requirement for Explanation of Deviations?	Measure of Inflation Used	Is price stability outlined as the sole/overriding objective in the law?	Legal Framework Governing the Institutional Relationship between CB and Government
1. Albania	2009	3% ± 1%	The Central Bank - pursuant to article 161 of the Constitution of the Republic of Albania and Law No. 8269 "On the Bank of Albania" (as amended).	The Bank of Albania is legally obliged (as per Article 2 of Law No. 8269 "On the Bank of Albania") to report to the Assembly of the Republic of Albania on monetary policy issues twice a year. It should also give its opinion on economic developments every three months. The Bank of Albania sends its monetary policy and decisions to the public through the Monetary Policy Document, which describes the key principles of the Bank of Albania's monetary policy and the quarterly monetary policy report that analyzes the economic, monetary and financial developments that are expected to affect future inflation. It is required to convey its expectations to the public, and explain the implications of monetary policy decisions.	No	Headline CPI	Yes, in: Law "On the Bank of Albania"	Pursuant to Article 3 of Law No. 8269 "On the Bank of Albania", the Bank of Albania may not grant any direct, indirect or any financial assistance to the Government of the Republic of Albania or to any of its Government agencies. However, the Bank of Albania may extend loans to the Government of the Republic of Albania with a maturity of six months. The loan amount shall not exceed the equivalent of 5% of the annual average income of the Government for the three financial years immediately preceding the loan approval.
2.Armenia	2006	4% (±1.5%)	The Central Bank jointly with the Government of Armenia - as stipulated by the Armenian Law on State Budget, and approved by the National Assembly of Armenia.	On a monthly basis, the Central Bank publishes the Central Bank of Armenia bulletin, which includes individual decisions of the CBA's voting members, as well as a statistical supplement and minutes of the CBA Governing Council meeting. The quarterly Inflation Report - which the Bank is legally required to publish, in accordance with Article 17 of the Republic of Armenia Law on the Central Bank - shows the state of implementation of monetary policy, developments in inflation in the previous quarter, domestic and external factors affecting it, and the extent to which inflation target was achieved.	No	Headline CPI	Yes, in: Article 4 of the Republic of the Law on the Central Bank of Armenia	In accordance with the law of the Republic of Armenia concerning the Central Bank, the Central Bank is prohibited from providing any direct or indirect credit or financing to the central Government or to other government bodies.

Country	Year of IT Adoption	Current Target	Institutional Responsibility for Setting the Target	Accountability Measures	Formal Requirement for Explanation of Deviations?	Measure of Inflation Used	Is price stability outlined as the sole/overriding objective in the law?	Legal Framework Governing the Institutional Relationship between CB and Government
3.Australia	1993	Between 2% and 3%, on average, over time.	The Reserve Bank of Australia jointly with the Australian Government – stipulated in an agreement between the RBA and the Australian government and published in the "Statement of Monetary Policy Management"	The RBA releases statements in which each monetary policy decision is announced and explained, and provides minutes giving elaboration on the Council's policy deliberations. It also comments on and analyzes economic prospects through regular publications such as its quarterly Monetary Policy Statement and Annual Report which it is legally obliged to submit to the Treasurer as per the "Public Governance, Performance and Accountability Act" of 2013, for presentation to the Parliament of Australia. In addition, the Governor reports twice a year to the Standing Committee on the Economy of the House of Representatives and to other parliamentary committees as appropriate.	No	Headline CPI	Yes, in: Article 2, Section 10 of the Reserve Bank Act of 1959 as amended.	There is no legislation on restrictions on the provision of credit from the RBA to the government.
4.Brazil	1999	For 2018: 4.50% with a tolerance interval of 1.50%[5]	The National Monetary Council composed of the Minister of Finance, the Minister of Planning, and the Governor of the Central Bank.	The Brazilian Central Bank publishes its Inflation Report quarterly, including charts and graphs depicting the quantitative forecasts of inflation and GDP, the schedule of future monetary policy meetings, and minutes of board meetings with a delay of less than one week. As per Decree 3088, if the inflation target is not met, the governor must submit an open letter to the finance minister on the reasons for the breach and the measures taken to restore inflation to the target and the time required.("Inflation Targeting Regime in Brazil," 2016)	Yes	IPCA (Broad National Consumer Price Index)	Yes, in Decree No. 3088 issued by the President of the Republic in 1999	According to Article 164 of the Brazilian Constitution, the Central Bank is prohibited from granting loans, either directly or indirectly, to the National Treasury and to any body or agency that is not a financial institution.

[5] The target for 2019 is 4.25% ± 1.50%, and the target for 2020 is 4.00% ± 1.50%.

Country	Year of IT Adoption	Current Target	Institutional Responsibility for Setting the Target	Accountability Measures	Formal Requirement for Explanation of Deviations?	Measure of Inflation Used	Is price stability outlined as the sole/overriding objective in the law?	Legal Framework Governing the Institutional Relationship between CB and Government
5.Canada	1991	2% midpoint of a target range of 1% to 3% over the medium term.	Jointly between Bank of Canada and the government, in a joint agreement between the Bank of Canada and the Government of Canada "Renewal of the Inflation-Control Target - October 2016"	The Monetary Policy Report is published quarterly, and indicates the Bank's projections for inflation, in addition to the major risks that could cause inflation to deviate from its target. The "Renewal of the Inflation-Control Target" issued in May 2001, states that 'If CPI inflation persistently deviates from the 2% target midpoint, the Bank will give special attention in its Monetary Policy Reports or Updates to explaining why inflation has deviated to such an extent from the target midpoint, what steps are being taken to ensure that inflation moves back to this midpoint, and when inflation is expected to return to the midpoint.'	Yes	Total CPI	Yes, in The joint agreement between the Bank of Canada and the Government of Canada of 1991	According to Article 18 of the Bank of Canada Act, the Bank of Canada is allowed to "make loans or advances for periods not exceeding six months to the Government of Canada, but such loans outstanding at any one time shall not, in the case of the Government of Canada, exceed one-third of the estimated revenue of the Government of Canada for its fiscal year...and such loans shall be repaid before the end of the first quarter after the end of the fiscal year of the government that has contracted the loan"
6.Chile	1999	3% ± 1%	Central Bank	Policy decisions are announced to the public immediately after the respective monetary policy meeting in an official news release. The central bank publishes the inflation report three times a year, announces the dates of the monthly monetary policy meeting six months in advance, and reveals the minutes of the meetings of the Monetary Policy Committee with a delay of three weeks. The Central Bank of Chile, pursuant to sections 78-80 of the Basic Constitutional Act on Central Bank of Chile, is required to submit an annual report evaluating the effectiveness of monetary policy to the Minister of Finance and to the Senate and to make said report available to the public.	No	Headline CPI	Yes, in Section 3 in Basic Constitutional Act on Bank of Chile	According to Article 109 of the Constitution of the Republic of Chile 1980 and Section 27 of the Basic Constitutional Act on the Central Bank of Chile, the Central Bank may not act as a collateral or secure documents issued by the State, its bodies or institutions. The Central Bank is forbidden from providing credit through direct or indirect means to finance public expenditure or loans to the Government.

Country	Year of IT Adoption	Current Target	Institutional Responsibility for Setting the Target	Accountability Measures	Formal Requirement for Explanation of Deviations?	Measure of Inflation Used	Is price stability outlined as the sole/overriding objective in the law?	Legal Framework Governing the Institutional Relationship between CB and Government
7.Colombia	1999	Between 2% and 4%, with 3% as a specific goal	The Board of Directors of the Central Bank of Colombia [6] in accordance with the Law of Congress No. 31 of 1992 on the Bank of the Republic of Colombia	In accordance with Law of Congress No. 31 of 1992 on the Bank of the Republic of Colombia, the Board of Directors of the Bank of the Republic of Colombia reports twice a year to Congress on the performance and prospects of the economy. Monetary policy decisions are announced after Board meetings. This is done in a press release published on the website of the Bank of the Republic of Colombia. The inflation report, which is intended to give transparency to the Council's decisions, is published quarterly.	No	Headline CPI	Yes, in Decree No. 2520 of 1993 concerning the Central Bank of Colombia, and Law of Congress No. 31 of 1992 on the Republic of Colombia	According to the Constitution of 1991 and its amendments, the Central Bank is prohibited from extending credit to the Government, except under "previously foreseen, special circumstances". Under normal circumstances, the Bank can only extend credit to financial intermediaries that are experiencing temporary problems of liquidity or shortage of resources.
8.Czech Republic	1998	2% (with a tolerance band of ± 1%)	Central Bank (after reaching a consensus with the government)	The Czech National Bank publishes quarterly inflation reports, explaining to the public its views on past and future economic and monetary developments, and on monetary policy decisions. The report also includes minutes of the board meeting of the Czech National Bank. Starting from 2001, the minutes have been expanded to include the votes on interest rate decisions by member name, as well as "Situation Reports on Economic and Monetary Developments", which are described as the "main reference material for the Board's monetary policy discussions". (Czech National Bank, 2007)	No	Headline CPI	Yes, in Article 98 of the Constitution of the Czech Republic and in Article 2 of Act No. 6/1993 Coll., on the Czech National Bank	In accordance with Article 34 of the Act on the Czech National Bank, the Czech National Bank is prohibited from offering overdraft facilities or any other type of credit facilities or from buying debt instruments directly from other European Union institutions, entities, central or regional governments, local authorities or other bodies governed by it Public Law. (Act No. 6 /1993, on the Czech National Bank, as amended, 2017).

[6] It is worth mentioning that the Minister of Finance is the "presiding member" of the Board of Directors of the Central Bank of Colombia.

Country	Year of IT Adoption	Current Target	Institutional Responsibility for Setting the Target	Accountability Measures	Formal Requirement for Explanation of Deviations?	Measure of Inflation Used	Is price stability outlined as the sole/overriding objective in the law?	Legal Framework Governing the Institutional Relationship between CB and Government
9.Ghana	2007	8% ± 2%	Jointly by the Central Bank and the Government in the annual budget statement.	Although minutes of MPC meetings are not published, the minutes of the press briefing are posted on the bank's website within a week of the MPC meeting. The World Economic Outlook, the External Sector Report, the Monetary and Financial Developments Report, the Financial Stability Report, the Real Sector Developments Report and the Inflation Forecast and Analysis Report are published. Although the bank is not legally bound to explain why the target inflation rate is not met, the Governor of the Bank of Ghana can be called to the Finance Committee of Parliament to explain developments within the economy when necessary.	No	Headline CPI	Yes, in Act on the Bank of Ghana (Act No. 612) in 2002	In accordance with the Bank of Ghana Act 2002, the Bank may provide advance loans to the Government for overdrafts and may directly purchase from the Government treasury bills and securities representing the Government's obligations. Loans, advances and purchase of treasury bills and securities with funds borrowed by the Government shall not exceed 10% of the total income of the fiscal year in which the advances were made.
10.Guatemala	2005	4% ±1%	Board of Directors of the Central Bank in accordance with the new Organic Law of the Bank of Guatemala, 2002	The new Central Bank Law states that its governor must appear twice a year to report to the Congress on the progress of monetary policy and the achievement (or lack thereof) of policy objectives. The Bank should also publish every six months a monetary policy report explaining the actions taken to achieve its objectives. The Central Bank should publish an annual study of monetary policy and the monetary program approved by the Board of Directors. The minutes of the Board involving the formulation of monetary policy must also be published.	No	Headline CPI	Yes, in Article 3 of the Decree Number 16-2002 of the Congress of the Republic of Guatemala, Organic Law of the Bank of Guatemala.	In accordance with Guatemala's Constitution, the Monetary Council may not authorize the Bank of Guatemala to grant direct or indirect financing, guarantees or approvals to the State or its decentralized or independent entities or to private entities not involved in the banking sector. Furthermore, the Bank of Guatemala cannot obtain securities issued or negotiated by these entities in the primary market.

Country	Year of IT Adoption	Current Target	Institutional Responsibility for Setting the Target	Accountability Measures	Formal Requirement for Explanation of Deviations?	Measure of Inflation Used	Is price stability outlined as the sole/overriding objective in the law?	Legal Framework Governing the Institutional Relationship between CB and Government
11.Hungary	2001	3 % ±1%	The Magyar Nemzeti Bank (MNB), in accordance with Act on the Magyar Nemzeti Bank, 2013[7]	Minutes of the MPC's meetings are released before subsequent meetings take place, and the MPC issues a statement explaining the reasons behind its action on the day of the interest rate decision. Individual votes are also published. The MNB publishes its inflation report on a quarterly basis. The Bank's performance in achieving the inflation target is assessed on an annual basis in the Annual Report and Financial Stability Report.	No	Headline CPI	Yes, in Article 3 of Act of 2013 on MNB	In accordance with the law of the Hungarian National Bank, the Bank may not extend overdraft facilities or any other type of credit facilities to, and may not purchase debt instruments directly from the public sector as defined in article 123 of the Treaty on the Conduct of the Business of the European Union.
12.Iceland	2001	2.5%	Jointly by the Central Bank and the Government of Iceland in a joint declaration, in accordance with the law of the Central Bank of Iceland No. 36 of 2001	The Act on the Central Bank of mandates the publishing of the MPC meeting minutes with a formal explanation of the rationale behind them two weeks after each meeting. The minutes contain the members' reasons for their votes. The individual votes of MPC members are made public in the Bank's Annual Report. As per the Declaration of the Prime Minister and the Governors of the Central Bank of Iceland (2001), if inflation deflects its target by more than 1.5% in either direction, the bank must submit a public report to the government explaining why inflation has moved from the target, and the policy measures it is taking to deal with it, as well as the period that the MPC expects inflation to return to the target. The governors will also report to the Minister, Government and Parliamentary Committees on the Bank's policy.	Yes	Headline CPI	Yes, in Article 3 of Act on the Central Bank of Iceland	According to Article 16 of the Act on the Central Bank, the Central Bank of Iceland may not grant credit to the National Treasury, municipalities or government institutions other than credit institutions.

[7] The target is set in agreement with the Government of Hungary, although the Hungarian law does not mandate this.

Country	Year of IT Adoption	Current Target	Institutional Responsibility for Setting the Target	Accountability Measures	Formal Requirement for Explanation of Deviations?	Measure of Inflation Used	Is price stability outlined as the sole/overriding objective in the law?	Legal Framework Governing the Institutional Relationship between CB and Government
13.Indonesia	2005	3.5% ±1% for 2018	Government[8] – as stipulated in a Memorandum of Understanding between the Government and Bank Indonesia and published by Decree of the Minister of Finance (KMK).	Bank Indonesia regularly reports to the Indonesian Parliament on monetary policy as part of the Bank's accountability for performing the functions and functions guaranteed by law. Monetary policy is reported through written notes and verbal explanations of monetary policy every quarter, and specific aspects of monetary policy as it deems necessary. In addition, the policy accountability report is submitted to the Government and made available to the public for transparency and coordination. If inflation is not met during the year, the Bank of Indonesia will provide an open explanation of why the government and Bank of Indonesia's objectives have not been met jointly by the Indonesian parliament and the public.	Yes	Headline CPI	Yes, in Act No. 23 of 1999 concerning Bank Indonesia	The 1999 Law of the Republic of Indonesia on Bank Indonesia states that Bank Indonesia will not provide any credit to the Government and is prohibited from buying the State's debt.

[8] Before Act No. 23 of 1999 concerning Bank Indonesia, the inflation target was set by Bank Indonesia. However, the Act stipulates that the inflation target is set by the Government in a move to strengthen the credibility of Bank Indonesia.

Country	Year of IT Adoption	Current Target	Institutional Responsibility for Setting the Target	Accountability Measures	Formal Requirement for Explanation of Deviations?	Measure of Inflation Used	Is price stability outlined as the sole/overriding objective in the law?	Legal Framework Governing the Institutional Relationship between CB and Government
14.Israel	1997	Between 1-3%	Set by the Government of Israel (in consultation with the Bank of Israel Governor) – as stipulated by Article 3b of Bank of Israel Law of 2010	According to Article 55 of the Bank of Israel Law, the Monetary Committee and the Finance Committee of the Bank of Israel shall submit at least twice a year a report on monetary policy. The report includes the policies that the MPC considers necessary to maintain price stability within the range set by the Government. Reports are issued one month after the end of each half-year. Also according to the law: "If the inflation rate deviates, during six consecutive months, from the range determined by the Government as per Section 3(b), said periodic report shall include details about the reasons for the deviation, the policy that the Committee has adopted to readjust the inflation rate to the determined range, and the Committee's estimate of the period of time required for the attainment of this result".	Yes	Headline CPI (Ribon, 2009)	Yes Article 2 of Bank of Israel Law, 5770-2010	According to Chapter 8 of the Bank of Israel Law: "The Bank may not provide a loan to the Government to finance its expenditure. However, the Bank may provide the Government with a temporary advance to fill the temporary gaps in the Government's cash flow in implementing the budget, provided that the total provisional advances at any time does not exceed 1.6% of the total annual budget amounts at that time."
15.Mexico	2001	3% ± 1%	Banco De Mexico – as stipulated by Banco De Mexico Law as amended	Banco De Mexico publishes its quarterly Inflation Report, which analyzes inflation expectations, monetary policy, and future inflation risk balance. The Bank is required to report on its policies and activities to Congress. In line with this practice, the Bank of Mexico in January sends both the President and Congress a document setting out monetary policy to be followed for that year and a source of monetary policy implementation during the first half of this year. In addition, the Bank of Mexico sends to Congress a quarterly report on the evolution of Mexico's inflation and economy, as well as various domestic economic indicators.	No	Headline CPI	Yes, in Article 2 of Banco De Mexico Law	In accordance with article 7 of the Banco De Mexico Law of 1993, the Bank of Mexico is entitled to grant credit to the Federal Government along with credit institutions.

Country	Year of IT Adoption	Current Target	Institutional Responsibility for Setting the Target	Accountability Measures	Formal Requirement for Explanation of Deviations?	Measure of Inflation Used	Is price stability outlined as the sole/overriding objective in the law?	Legal Framework Governing the Institutional Relationship between CB and Government
16.New Zealand	1990	Between 1% - 3% over the medium term (with a focus on maintaining inflation near the 2% target midpoint.)	Jointly between the Minister of Finance and the Governor of the Reserve Bank of New Zealand (RBNZ) – as stipulated by the Law of the Reserve Bank of New Zealand, and published in the Policy Targets Agreement.	The Law of the RBNZ states that the Bank shall publish the Monetary Policy Statement at least every six months; there shall be a select committee of the parliament whose task is to review the bank's monetary policy statement and to review the implementation of the monetary policy; that the non-executive members of the BoD of the RNBZ will be tasked with reviewing the performance of the governor in relation to the declared monetary policy, and submitting a report to the Minister of Finance, who may dismiss the Governor of the Central Bank in the event of failure to achieve the agreed upon inflation targets – even if only for one quarter.	Yes	Headline CPI	Yes, in Section 8 of the Reserve Bank of New Zealand Act 1989.	There is no legislation on restrictions on the provision of credit from the central bank to the government
17.Norway	2001	About 2.5% over time.	The Government of Norway - in accordance with the Royal Decree of 2001.	The Bank of Norway is required by law to submit a monetary policy report three times a year with the announcement of the interest rate decision and to submit the annual report on the implementation of monetary policy. Whenever inflation is outside the target range, the central bank provides a comprehensive assessment in its annual report explaining the reasons behind the breakthrough and the next steps to reach the declared inflation target again. Special emphasis will be placed on any deviations greater than ± 1%.	Yes	Headline CPI	Yes, in Ministry of Finance Letter of 2001 on Monetary Policy Guidelines pursuant to section 2 and section 4 of the Bank of Norway Act 1985.	According to the Bank of Norway Act 1985, the bank may not provide credit directly or indirectly to the government.

Country	Year of IT Adoption	Current Target	Institutional Responsibility for Setting the Target	Accountability Measures	Formal Requirement for Explanation of Deviations?	Measure of Inflation Used	Is price stability outlined as the sole/overriding objective in the law?	Legal Framework Governing the Institutional Relationship between CB and Government
18.Peru	2002	2% ± 1%	Central Reserve Bank of Peru (BRCP)	The BCRP publishes an Inflation Report every four months. In addition to analyzing the recent evolution of inflation and the actions adopted by the Central Bank, as well as the Bank's vision on the evolution of economic variables and on how they might influence on inflation's future trend, it also examines the main factors that could deviate inflation one way or another. Monthly press releases on the monetary program for the month are usually based on the Inflation Report or refer to it.	No	Consumer Price Index for Metropolitan Lima	Yes, in Article 2 of Organic Law of the Central Reserve Bank of Peru	According to Article 77 of the Organic Law of the Central Reserve Bank of Peru, excluding securities in the secondary market issued by the Treasury, the Bank may not grant funding to the Treasury. It also prohibits the financing of state-owned promotional financial institutions.
19.Philippines	2002	3% ± 1% over the medium term	Government sets the target and it is approved by the Development Budget Coordination Committee (DBCC) through its Resolutions (most recently in 2015).	The Inflation Report is published every three months. According to Section 40 of the New Central Bank Act, the Bangko Sentral must publish its annual report indicating the degree to which monetary policy objectives have been achieved and the underlying causes which will be submitted to the President and to Congress. When the inflation target is not met, an open letter is sent to the President and the general public that determines the reasons for not achieving the inflation target, and future actions to be taken to restore inflation to the target as set out in Section 63 of the new Central Bank Act 7653.	Yes	Headline CPI	Yes, in Republic Act: New Central Bank Act 7653	There is no legislation on restrictions on the provision of credit from the central bank to the government.

Country	Year of IT Adoption	Current Target	Institutional Responsibility for Setting the Target	Accountability Measures	Formal Requirement for Explanation of Deviations?	Measure of Inflation Used	Is price stability outlined as the sole/overriding objective in the law?	Legal Framework Governing the Institutional Relationship between CB and Government
20.Poland	1998	2.5% ± 1% over the medium term	Narodowy Bank Polski's (NBP) Monetary Policy Council[9] - under Article 12 of the Act on the NBP.	Short-term inflation targets (one year) and medium-term targets (six years) are announced. The NBP publishes its inflation reports on a quarterly basis, which contain an assessment of inflationary processes and determinants of inflation, and elaboration of the monetary policy conduct during the last three months. The NBP also publishes the individual voting records of the members of the MPC. The MPC's decisions are published in press releases and accompanying press conferences, as well as the MPC minutes of meetings, the NBP's monetary policy guidelines and the Monetary Policy Implementation Report.	No	Headline CPI	Yes, in The Act on Narodowy Bank Polski of 29 August 1997 (Journal of Laws of 2013, item 908, as amended)	The NBP may provide credit to the Central Government by issuing securities in accordance with Article 49 of the National Bank of Poland Act.
21.Romania	2005	2.5% ± 1%	Jointly between the National Bank of Romania and the Government of Romania[10]	The Inflation Report is published on a quarterly basis and it includes the following sections: Inflation developments; Economic developments; Monetary policy and financial developments; Inflation outlook, uncertainties and risks, implications on monetary stance. Developments in key statistical indicators are analyzed in detail in the monthly, semi-annual (Financial Stability Reports) and the annual reports.	No	Headline CPI	Yes, in Article 2 of Law No. 312 in 2004 on the Statute of the National Bank of Romania	Article 7 of Law 312 of 2004 prohibits the National Bank of Romania from purchasing debt securities issued by the government in the primary market. The use of overdraft facilities or any other type of credit facility for the benefit of the Government is prohibited.

[9] Although the MPC constitutes one of the directing bodies of Narodowy Bank Polski as per Article 6 of the Act on NBP, the government is heavily representative in its composition. The MPC is comprised of the President of the Narodowy Bank Polski in addition to nine members selected by the President of the Republic of Poland, the Sejm and the Senate.

[10] As stated on the National Bank of Romania's website.

Country	Year of IT Adoption	Current Target	Institutional Responsibility for Setting the Target	Accountability Measures	Formal Requirement for Explanation of Deviations?	Measure of Inflation Used	Is price stability outlined as the sole/overriding objective in the law?	Legal Framework Governing the Institutional Relationship between CB and Government
22.Serbia	2008	3% ± 1.5%	Jointly in cooperation between the National Bank of Serbia, and the Government in accordance with the "Agreement on Inflation Targeting" and "Memorandum on Inflation Targeting as Monetary Strategy".	The National Bank of Serbia publishes press releases from the meetings of the Executive Board on the same day when the meeting was held. Occasionally, the Governor appears in press conferences to elaborate on the rationale behind Executive Board's decisions and answer any questions the public may have. A quarterly Inflation Report is published, and if inflation deviates from the set target for more than six consecutive months, the National Bank of Serbia is obliged to notify the Government about the reasons for the deviation, measures to be taken and the time needed for inflation to return to target level.	Yes	Headline CPI	Yes, in Article 3 of the Law of the National Bank of Serbia	In accordance with the Law of the National Bank of Serbia, "the National Bank of Serbia may not approve credit, loans, overdraft facilities or any other form of credit facility to the Government of the Republic of Serbia, nor may it issue guarantees to settle the obligations of the Government or ensure the settlement of its obligations otherwise". The National Bank of Serbia may not purchase securities issued directly by the Government
23.South Africa	2000	3%-6%	Government - as per the Minister of Finance's Medium Term Budget Policy Statement	At the conclusion of every MPC meeting, an MPC statement is issued through a press conference by the Governor of the Reserve Bank of South Africa explaining the reasons for the MPC's policy stance. The Bank also publishes its Monetary Policy Review (MPR) twice a year, which includes analysis of the domestic and international developments that have impacted on inflation, an assessment of the future outlook for the factors determining inflation as well as the Bank's forecast of the future path of inflation. The Governor of the Bank is required to submit an annual report on the implementation of monetary policy to the Minister of Finance. The Governor also appears regularly in Parliament to explain the monetary policy stance adopted by the MPC.	No	CPI excluding cost of mortgages (CPIX)	Yes, in Article 3 of South African Reserve Bank Act 1989 as amended)	According to the South African Reserve Bank Act No. 90 of 1989, the Bank may grant loans and advances to the Government of the Republic.

Country	Year of IT Adoption	Current Target	Institutional Responsibility for Setting the Target	Accountability Measures	Formal Requirement for Explanation of Deviations?	Measure of Inflation Used	Is price stability outlined as the sole/overriding objective in the law?	Legal Framework Governing the Institutional Relationship between CB and Government
24.South Korea	2001	2%	Bank of Korea in consultation with the Ministry of Strategy and Finance - based on Article 6, item 1 of the Bank of Korea Act	The Bank of Korea publishes the Monetary Policy Report to the National Assembly four times a year to explain how to monetary policy was implemented towards achievement of the inflation target. If inflation deviates from the target by more than 0.5% in either direction for six consecutive months, the Bank of Korea will explain the reasons for the deviations, the projected amount of time, and the monetary policy strategy towards the return of inflation to the target, through the Governor's press conference. If adjustment of the inflation target becomes necessary, for example, in the case of unexpected local or international economic shocks, the Council will adjust the target in consultation with the Ministry of Strategy and Finance.	Yes	Headline CPI	Yes, in The Bank of Korea Act of 1998	In accordance with Article 75, the Bank of Korea "may extend overdrafts or another form of credits to the Government and accept government bonds directly from the Government." provided that "the total amount of credits and directly accepted government bonds shall not exceed the debt limit decided by the National Assembly putting all debts together borne by the Government to financial institutions and the general public".
25. Sweden	1993	2%	Sveriges Riksbank – in accordance with The Riksbank's Memorandum on the inflation target: clarification and appraisal	Minutes of the Executive Board meetings on monetary policy are published including individual votes of members. Pursuant to Article 4 of Chapter 6 of the Riksbank Act, the bank compiles the report "Account of Monetary Policy", in conjunction with the evaluation of monetary policy, which is conducted by the Riksdag Committee on Finance on a biannual basis. . This describes how inflation and the real economy have developed over the past year. The Riksbank publishes its Monetary Policy Report six times a year. Within the report lie the executive board's inflation expectations, monetary policy deliberations, and future inflation projections. Each report also contains a description of the new information received since the previous report and an assessment of how the Riksbank views the current economic situation.	No	CPIF (the CPI with a fixed interest rate)	Yes, in Article 2 of Chapter 1 of the Sveriges Riksbank Act of 2007 (The Sveriges Riksbank Act, 2016)	According to Chapter 8 of the Riksbank Act of 2007, "the Riksbank shall not extend credit to or purchase debt instruments directly from the state, another public body or an institution of the European Union". The Riksbank may, however, pursuant to Chapter 6, Article 7 paragraph 2, "grant intraday credit to the state" and "may also grant credit to and purchase debt instruments from financial institutions owned by the state or another public body."

Country	Year of IT Adoption	Current Target	Institutional Responsibility for Setting the Target	Accountability Measures	Formal Requirement for Explanation of Deviations?	Measure of Inflation Used	Is price stability outlined as the sole/overriding objective in the law?	Legal Framework Governing the Institutional Relationship between CB and Government
26.Thailand	2000	2.5%± 1.5%	Jointly between the Government and with the Bank of Thailand - in accordance with the Law of the Bank of Thailand. [11]	The Bank of Thailand publishes quarterly Monetary Policy Reports to present the latest economic forecasts and developments on inflation, and to inform the public about the views of the MPC in reaching its monetary policy decisions. As stated in a mutual agreement between the MPC and the Minister of Finance: "If the inflation target is not met, the MPC should submit an open letter on why inflation deviated from the target, the policy measures it is taking to deal with it, as well as the period that the MPC expects to return Inflation to the target. The MPC should also report progress in policy actions to the Minister of Finance in due course".	Yes	Headline CPI	Yes, in New Bank of Thailand Law, 2551 (2008)	There is no legislation on restrictions on the provision of credit from the central bank to the government

[11] The Minister presents the agreed upon to the Council of Ministers for approval.

Country	Year of IT Adoption	Current Target	Institutional Responsibility for Setting the Target	Accountability Measures	Formal Requirement for Explanation of Deviations?	Measure of Inflation Used	Is price stability outlined as the sole/overriding objective in the law?	Legal Framework Governing the Institutional Relationship between CB and Government
27.Turkey	2006	5% ± 2%	Jointly between the Government and the Central Bank of Turkey – in accordance with Article 4 of the Law on the Central Bank of Turkey	Minutes of meetings of the MPC are issued within five working days following the meeting. The Inflation Outlook Report is published on a quarterly basis. If the inflation rate at the end of the year falls outside the range of 3% - 7%, the bank writes an open letter to the government as part of the accountability procedures as stipulated in Article 42 of the Central Bank Act. Furthermore, if quarterly inflation rates exceed the uncertainty level around the end-of-year target, the central bank will explain in the inflation reports the causes of the deviation and measures already taken, as well as those that will be taken in the future to achieve the target. In addition, the Governor appears semi-annually in before the Council of Ministers and the Planning and Budget Committee of the Grand National Assembly of Turkey to report on the activities of the Central Bank and the implementation of monetary policy.	Yes	Headline CPI	Yes, in Article 4 of the Law on the Central Bank of the Republic of Turkey (As amended by Law No. 4651 of April 25, 2001)	In accordance with the Central Bank of Turkey Law of 2008, the Bank may not grant advances and provide credit to the Treasury and public institutions. Debt instruments issued by the Treasury and public institutions may not be purchased in the primary market.
28.United Kingdom	1992	2% over the medium term	The Government – as mandated by Article 12 of the Act on the Bank of England, announced through an annual letter from the Chancellor to the Bank of England (known as the "Remit for the MPC")	Minutes of the MPC meetings are published monthly with a two-week delay; the Bank's inflation report is prepared on a quarterly basis. These publications give insights into the analysis of the Bank's inflation expectations and the way this analysis affects the decision-making process of the MPC. If the inflation target is breached by more than 1%, the Governor of the Bank of England should write an open letter to the Treasury Secretary explaining why the breach occurred and what the central bank intends to do to bring inflation back to the target.	Yes	CPI including housing costs (CPIH)	Yes, in Article 11 of the Bank of England Act of 1998	There is no legislation on restrictions on the provision of credit from the central bank to the government

Table 3: Main Findings of the Survey of Country Practices

Institutional Responsibility for Setting the Inflation Target		
	Number of Countries (out of 28)	**Percentage of Countries**
Government	5	17.86%
Central Bank	7	25%
Jointly	16	57.14%
Official Document Defining Institutional Responsibility for Setting the Inflation Target		
	Number of Countries (out of 28)	**Percentage of Countries**
Central Bank Law	17	60.71%
Presidential/Congressional Decree	4	14.29%
Other	7	25%
The Institutional Relationship Between the Central Bank and the Government		
	Number of Countries (out of 28)	**Percentage of Countries**
The law prohibits the direct provision of credit or financing of the government by the Central Bank.	16	57.14%
The law places quantitative restrictions on the direct provision of credit or financing of the government by the Central Bank.	5	17.86%
There are no restrictions on the direct provision of credit or financing of the government by the Central Bank.	7	25%
Obligation of the Central Bank to Explain Deviations of Inflation from its Target		
	Number of Countries (out of 28)	**Percentage of Countries**
The central bank is legally obliged to address any deviations in inflation from the target	12	42.85%
The central bank is NOT legally obliged to address any deviations in inflation from the target	16	57.14%

Definition of the Inflation Target		
	Number of Countries (out of 28)	**Percentage of Countries**
Point target	5	17.86%
Range	6	21.43%
Point target with a tolerance band	17	60.71%
Bandwidth of the Target Range for Countries that Use a Range or Point Target with a Tolerance Interval (out of 23)		
	Number of Countries (out of 23)	**Percentage of Countries**
2 Percent	15	65.22%
3 Percent	5	21.74%
4 Percent	2	8.70%
Measure of Inflation Used for Expression of the Inflation Target		
	Number of Countries (out of 28)	**Percentage of Countries**
Headline CPI	24	85.71%
Core CPI	4	14.29%

Analysis of Country Practices

It was found that in approximately 57% of IT countries (16 out of 28 countries), the inflation target is set in a collaborative manner between the Central Bank and the Government. In these countries, the Central Bank has some degree of goal independence, and the degree to which the Central Bank can influence the inflation target varies from one country to another. This figure is reflective of the actual experiential practices that are observed in the country, regardless of whether or not they are backed by legislation. For instance, in Hungary the inflation target is set by the Central Bank only after a consensus is reached with the Government of Hungary, although the Hungarian law does not mandate this. In another 18% of countries (5 out of 28 countries), the government alone sets the inflation target without consulting the Central Bank. For these countries, the Central Bank has a minimal degree of goal independence. In total, 75% of IT countries' governments are involved in the setting of the inflation target (either

independently or by coordination with the Central Bank). The common view shared among these countries is that the practice of involving the government in the process of setting the inflation targets delivers a high degree of accountability of the Central Bank to the government and to the public for achieving them. In Indonesia for example, legislation was passed to transfer the authority to set the inflation target from the Central Bank to the government in a move to "strengthen the credibility" of the Central Bank according to Bank Indonesia's website. In the remaining 25% of countries (7 out of 28 countries), the Central Bank has institutional responsibility for setting its own inflation targets. Central Banks in these countries possess a high degree of goal independence.

In all countries, some form of official documentation is used to define institutional responsibility for setting the target. Around 61% of countries (17 out of 28 countries) have a clause or provision within the chief Law or Act governing the Central Bank that outlines the procedure by which the target is set and the institutional responsibility for setting it. A Presidential, or Congressional (or Royal, in the case of Norway) Decree is the official document in which institutional responsibility for setting the target is expressed for approximately 14% of countries. In the remaining 25% of countries, another form of official documentation is used. In Sweden, for example, there are two documents that delegate responsibility of setting the target to the National Bank of Serbia, namely the "Agreement between the National Bank of Serbia and the Republic of Serbia on Inflation Targeting" and the "Memorandum of the National Bank of Serbia on Inflation Targeting as Monetary Strategy".

Often, central banks with inflation targets are directly accountable to the government or the parliament. Having the Central Bank Governor appear before Parliament, as well

as the legal obligation of the Central Bank to submit annual reports to relevant government officials are the principal means of accountability. For example, since the introduction of IT in New Zealand in 1990, the Governor of the Reserve Bank of New Zealand is required to submit a biannual Monetary Policy Statement discussing the extent to which the central bank has achieved inflation targets announced over the past six months and the proposed monetary strategy for the next six months. This document and the procedure by which it is presented served as a platform for holding the central bank accountable, prompting other countries to follow a similar model. The publication of minutes of MPC meetings is another widely established means of guaranteeing increased transparency of Central Bank decision-making. In most countries (around 78%, or 22 out of 28 countries), the Central Bank is legally required to prepare and submit some form of documentation or report directly to the Government or Parliament on a regular basis explaining the developments in monetary policy and the strategy for the forthcoming period. In 11% of countries, the Central Bank is not bound by law to submit said documentation to the Government or to Parliament, but it is legally compelled to publish the decisions and results of monetary policy to the general public. Although, in practice, all 28 countries surveyed do produce a regular report dedicated to assessing inflation outcomes, prospects and projections for the reporting period, the remaining 11% of countries, are not formally required to do so by law.

In 43% of the countries, there is a formal legal obligation (either a provision or article in the law governing the Central Bank itself, or in another law or decree), that states that the Central Bank is responsible for addressing any deviations away from the inflation

target to the Government and the general public, either in an open letter or in the periodic Inflation Report.

Since IT necessitates that the Central Bank operate in the absence of fiscal dominance, my analysis on country practices includes a look into the legal framework governing the restrictions (or lack thereof) on political pressure on Central Bank to finance government deficits. As such, it was found that 57% of countries that have an IT framework in place have legal provisions that prohibit or interdict the direct provision of credit or financing of the Government by the Central Bank. In some cases, such as in Brazil, the emphasis on the prohibition of the Central Bank financing of Government deficit is so significant that it is spelt out in the Constitution, the highest or most supreme law of a country. Some countries allow the provision of credit to the government with certain quantitative restrictions. For example, in Canada, the Bank of Canada may extend loans or advances for periods not exceeding six months to the Government of Canada or the government of a province, provided that at any one time the existing loans do not exceed one third of the Government of Canada's estimated revenue for the fiscal year, or one quarter of estimated revenue in the case of provincial governments. These countries represent 18% of the total. On the other side of the spectrum, some countries such as New Zealand do not mention any restrictions on Government borrowing from the Central Bank; they represent 25% of the total.

International experiences with IT also shed light on the operational framework of the IT regimes in different countries in terms of defining the inflation target itself. Some countries – 5 out of 28 - define the target as a specific level of inflation, or a point target (for example, 2%), others – 6 out of 28 - define it as a range (for example, between 1%

and 3%), but most countries -17 out of 28 - use a point target with a tolerance interval (for example 2% ± 1%). International experience has shown that the design of the target involves a tradeoff between flexibility and credibility (Dennis, 1997). Using a point target may provide credibility gains to the Central Bank since it implies more commitment committing to a specific inflation target but since it is virtually impossible to control inflation completely, consistent and significant deviation from the target could in fact undermine credibility. If the Central Bank in question does not use a point target, the same logic is applied to the bandwidth of the range or the tolerance band of the inflation target: the narrower the tolerance/range bandwidth, the higher the credibility gains of the Central Bank *if* it stays on target, and the more difficult it will be to achieve the target consistently without persistent deviations. Out of the 23 countries that use a range or a point target with a tolerance interval, 15 countries have targets with a bandwidth of 2%, 5 countries have targets with a bandwidth of 3%, 2 countries (namely Ghana and Turkey) have targets with a bandwidth of 4%, while Australia is the only country with a target bandwidth of 1%.

Almost 86% of countries (24 out of 28 countries) express their inflation target in terms of the year on year change in headline (total) CPI. Some of these countries, such as Korea, have only recently switched to using headline CPI. The remaining four countries use some form of underlying or core CPI as their target. For instance, South Africa employs the consumer price index excluding mortgage costs (CPIX). It should be noted, however, that all countries keep a close eye on measures of core or underlying inflation that exclude the most volatile items.

4.3 Egypt's De Jure and De Facto Institutional Framework

Since Egypt initiated a new economic and structural reform program supported by the Extended Fund Facility from the IMF in November 2016, the search for a new nominal anchor has been underway. In this regard, the new objective seems to be a temporary switch to a monetary targeting regime in the short run, while moving towards the implementation of a full-fledged IT regime in the medium term. In order to achieve this objective, the Central Bank of Egypt (CBE), released a draft law indicating its desire to transition towards IT. Towards that end, a new draft law for the CBE amending the previous Law no. 88 of 2003 of the "Central Bank, Banking Sector and Monetary System" is currently under review. Although the draft law contains provisions which strengthen the operational independence of the CBE as the sole entity entitled to the autonomous conduct of monetary policy, it is lacking in terms of defining the mechanisms by which the CBE is held accountable for the achievement (or lack thereof) of its targets; a cornerstone of IT implementation and management. It is also unclear whether or not the government will have a role in the setting of the inflation target in coordination with the CBE.

The independence of the CBE should be considered through the lens of both “de jure” independence, which is the legal independence that the CBE is formally granted in the Egyptian constitution and relevant laws, and also through the lens of “de facto” independence, which is what is observed in reality based on past practices. It should be noted that the two are not always one and the same, especially in developing countries, where law enforcement and the regulatory framework are not always as strong as they should be.

In terms of the legal framework, Article 10 of the "Law of The Central Bank, The Banking Sector And Money", states that the governor of the CBE is selected by the President of Egypt upon nomination from the Prime Minister to serve for a four-year term subject to renewal. The governor then nominates two deputy governors who are also appointed by Presidential Decree for a four-year renewable term. The Board of Directors of the CBE, the responsible entity for the formulation and implementation of monetary policy decisions in the country, is made up of nine members, including the governor, his two deputies, the Chairman of the General Authority for Financial Supervision, a representative from the Ministry of Finance, and four "experienced" members in monetary and financial affairs, also selected by the President of the Republic and appointed by Presidential Decree as per the current law. In the proposed draft law, the composition of the BoD is same, except the number of members is changed from a total of nine, to a total of "up to eleven" members including "one or more Deputy Governors" as opposed to the clear specification of two Deputy Governors in the current law. What this means is that there is a degree of freedom in the new draft law for the Governor of the CBE to select one, two, three, or four deputies. The draft law does not provide justification as to why the number of members of the BoD was increased to a total of eleven, a high number compared to international standards. No clear specification of the number of Deputy Governors is also unnecessary and only complicates the organizational structure and clouds it with ambiguity.

Another important pillar of the legal framework relevant to the discussion is the fact that the President of the Republic ultimately selects (or must approve) all voting members casts doubt on the legal independence of the CBE. Additionally, the relatively

short term of the Governor, as well as the fact that there is no clause granting immunity to the Governor from being fired, indicates that the legal framework puts the Governor of the central bank at a high risk of succumbing to political pressure. In one instance, Ali Negm who was appointed as CBE Governor in 1985 served a tenure of only 1 year, and was replaced by Mahmoud Hamed in 1986 immediately after a new Prime Minister was appointed (Kamaly & Farrag, 2007).

Article 5 in the Central Bank Law of 2003, which maintained that the goals of monetary policy would be set in coordination between the CBE and the government through a "coordinating committee", is replaced by Article 19 in the new draft law, in which this provision is deleted completely, thereby removing with it the legal framework governing the setting of the inflation target. This sparks an important discussion about whether or not the CBE should have full goal independence in addition to instrument independence. The notion that the CBE would be entitled to full instrument and goal independence without any accountability measures set in the context of a legal framework seems counterproductive and nonconductive to a well-functioning IT framework. Thus, it is suggested that, at least in the first stages of IT adoption, there should be cooperation and consensus between the CBE and the government in setting the inflation target and this cooperation should be formalized and integrated into the legal framework governing the institutional setup.

The de facto level of independence of the CBE is also questionable. A study was conducted in 2007 using four indices, including one legal index and three behavioral indices (based on past practices), in order to measure the degree of independence of the CBE (Kamaly & Farrag, 2007). The three behavioral indices included in the research are

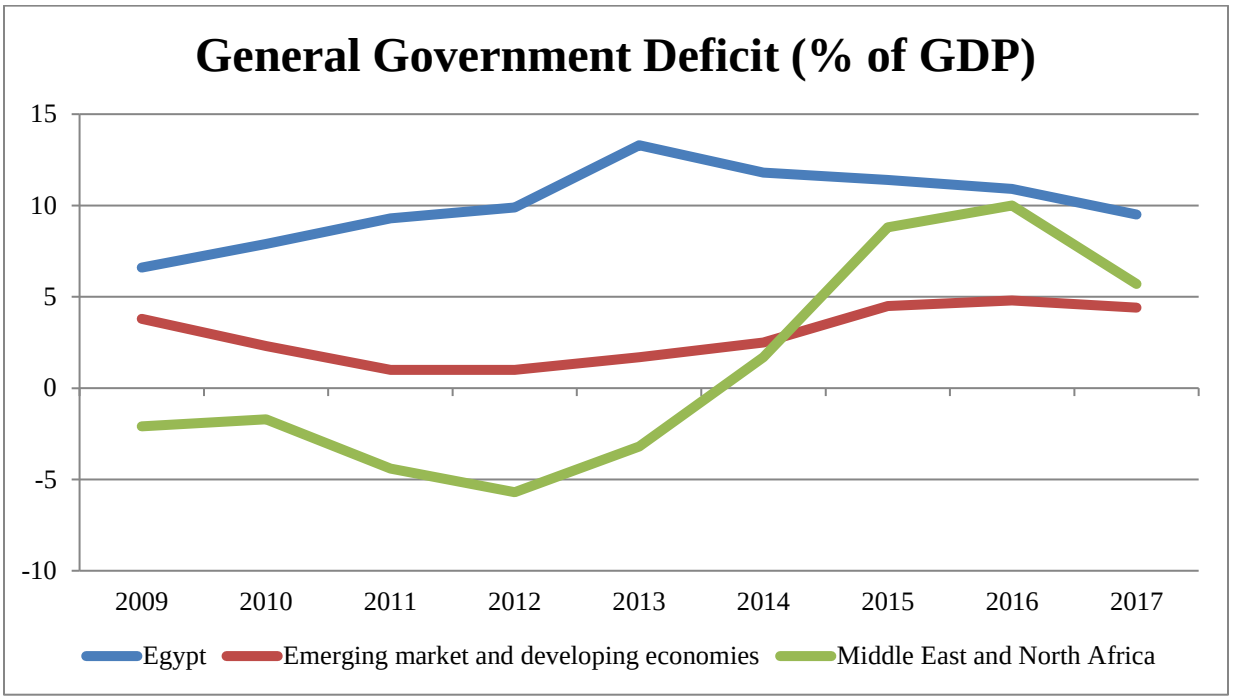
the turnover of Central Bank Governor Index, which is hypothesized to be higher when Central Bank independence is lower, the Political Vulnerability of Central Bank Governors Index, and finally, a Questionnaire-Based Independence Index that is computed based on a survey of monetary and financial experts as an indication of their views on the observed independence of the central bank based on past practices. The general conclusion of the paper is that the degree of independence of the CBE based on the indices studied is relatively low, especially when compared to that of Latin American countries during the 1990's, the same period during which a number of these Latin American countries adopted an IT regime.

A low degree of fiscal dominance is crucial to the conduct of independent monetary policy, and in turn, a successful monetary policy regime. The legislative framework in Egypt does not have a clause that prevents the CBE from financing government deficits. In fact, Article 27 of the law on the CBE states that the CBE shall extend finance to the government, provided that said extension of finance to the government to cover seasonal deficits "shall not exceed 10% of the average revenues of the general budget in the three previous years. The term of said finance shall be three months renewable for other similar periods. It shall be settled in full within twelve months at most from the date of its extension".

Although there is no quantitative measure for fiscal dominance that is set-in-stone, there is a general consensus that consistently high budget deficit to GDP, government debt to GDP, and net claims on government to GDP ratios are an indication of a high degree of fiscal dominance (Bank for International Settlements, 2012). When these ratios are constantly high, the government could resort to pressuring the central

bank to increase the money supply in order to finance its deficit, which has an inflationary impact on the economy.

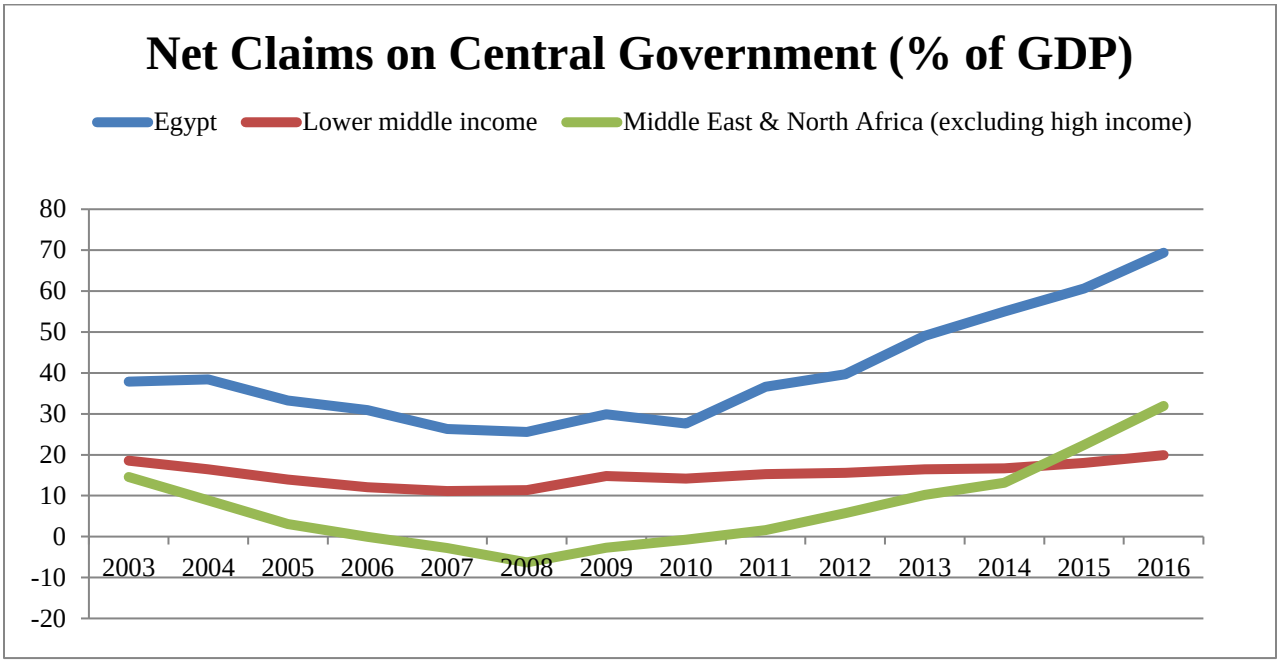
Figure 9: General Government Deficit (% of GDP)



Source: IMF Data Mapper

Egypt has registered unswervingly high rates of general government deficit as a percentage of GDP, with the ratio declining slowly only in the past three years. In comparison to the average for emerging market and developing countries and the average for the Middle East and North Africa, Egypt's deficit to GDP ratio has been significantly larger. While progress is being made to slowly bring down the government deficit to GDP ratio, it is still worryingly high.

Figure 10: Net Claims on Central Government (% of GDP)



Source: World Bank

Comparing Egypt's net claims on government to GDP ratio with that of lower middle-income countries, as well as that of Middle East and North Africa countries (excluding high income countries) shows that Egypt has had a significantly higher ratio on a consistent basis. This discrepancy between Egypt and the average of comparable economies has become even more apparent since 2010. The latest figures for 2016 show Egypt has a staggeringly high ratio of net claims on central government to GDP of around 70%, which is more than three times that of lower middle income countries' average, and around two times that of the average of the Middle East and North Africa excluding high income countries.

Past experiences have displayed the Egyptian government's tendency to finance its deficit through financing from the Central Bank (Awad, 2008). Additionally, an empirical study that aimed at studying the de facto ability of the CBE to resist government pressure for deficit financing found that in practice, CBE succumbed to

political pressure and was unable to keep its money growth targets, indicating a high degree of fiscal dominance (Awad, 2010). It is thus suggested that there should be an official framework in place to curtail fiscal dominance. As demonstrated by international practices or experiences, efforts to achieve this can be embodied in legal provisions that prohibit or place limitations on CBE lending to the government and its entities or the monetization of government debts and deficits.

Due to the intertwined nature of the effects of fiscal policy and monetary policy, fiscal consolidation by means of expenditure rationalization and tax system reform will strengthen the effectiveness of monetary policy by minimizing the degree of fiscal dominance. The government has already made progress towards execution of an impressive fiscal consolidation program by undertaking steps such as the gradual phasing out of inefficient and poorly targeted energy subsidies, streamlining of the public wage bill, and augmenting tax revenues through the introduction of the value-added tax (VAT) in place of the general sales tax (GST) as well as tax administration reform. It is recommended that these efforts be further supported by widening the tax base through formalizing the informal sector, subjecting exempted items to the VAT, and by curtailing tax evasion.

Egypt has made progress towards making price stability the primary, overarching objective of monetary policy. Al-Mashat (2011) previously employed a small open economy structural gap model to test the effect of varying degrees of exchange rate flexibility on inflation and output volatility under an IT regime in Egypt. In doing so, she found that higher exchange rate flexibility is associated with lower inflation and output volatility, and a smaller inflation/output sacrifice ratio. In coherence with Al-Mashat's

findings, and as evidenced by the CBE's recent decision to liberalize the Egyptian pound in November 2016, it is clear that the CBE is taking serious steps towards making price stability its sole target. This commitment to the superiority of the price stability objective is further evidenced by the CBE's amendment of its objective from "overall financial stability in the context of the political and economic goals of the government" to "price stability" in the new draft law.

In terms of technical capabilities, the CBE faces a dilemma in the selection of an appropriate index for inflation that is not uncommon amongst developing countries (Silver, 2006). In Egypt, the problem with headline CPI as an index for inflation is that it comprises all consumer goods and services, including subsidized goods and foodstuffs. Incorporating these two categories is problematic due to the highly volatile nature of their prices. Thus, the use of headline CPI as the measure of inflation will make it substantially more difficult to reliably forecast inflation and set realistic inflation targets, which could severely damage the credibility of the central bank (Youssef, 2007). The use of a core CPI measure that excludes these items, on the other hand, is also inapt because it does not depict a realistic picture of the level of prices due to the significant weight that the two aforementioned categories of goods have in the Egyptian consumer basket. Therefore, the CBE must work towards an appropriate measure of inflation if it is to adopt IT in the near future. In accordance with international practices, it is recommended that headline inflation be used for the inflation target itself, but that core inflation is closely and attentively monitored to enhance understanding of developments in the price level and guide policy making accordingly. Moreover, accurate inflation forecasting will command the timely availability of high-quality data and sophisticated forecasting models. Previous

work was done to assess the quality of data available in Egypt using the Data Quality Assessment Framework (Ghalwash, 2011). It was found that the quality of data in Egypt was subpar and insufficient to produce precise inflation forecasts, and that the areas in which the data was lacking the most were accuracy and reliability.

Another important component towards assessing the ability of the CBE to forecast inflation to a suitable degree of accuracy will be to determine whether a strong and stable relationship can be established between monetary policy tools and inflation. This requires proper econometric analysis, and so a separate section in the paper is designated for the purpose of explaining in detail the sources of data used, the procedure undertaken, and the results obtained.

4.4 Determining the Strength of the Relationship Between Monetary Policy Tools and Inflation in Egypt: A VAR Analysis

The empirical analysis to come dissects one of the preconditions of a well-functioning IT regime: the proper and accurate understanding of the relationship between monetary policy tools and the ultimate monetary policy goal of inflation. Inflation is measured as the consumer price index (CPI). The vector autoregressive model and Granger causality tests in the bivariate and multivariate forms have been used extensively in the literature to test the aforementioned relationship. In line with the methods undertaken by Gottschalk and Moore (2001), Tutar (2002) and, more recently, by Bakradze and Billmeier (2007), and more recently Mishra and Mishra (2010) and Odior (2012), this paper intends to use the VAR methodology and subsequent bivariate and multivariate Granger-causality tests to determine the strength of the relationship between monetary policy tools and inflation, taking into account the effects of other interrelated

macroeconomic variables. In general, VAR systems are often employed to forecast systems of interrelated time series, and to investigate the impact of random shocks on the system of variables.

Table 4: Summary of Studies Testing the Feasibility of IT using VAR Models

Author(s)	Country	Methodology	Variables Used	Results
Aliyu and Englam (2009)	Nigeria	The authors employ the VAR methodology and then perform Granger causality tests to build a case for the adoption of IT in Nigeria.	GDP, CPI, money supply, interest rates, fiscal spending and the exchange rate	Results show that the link between prices and credit and interest rate channels were is weak and unstable. Additionally, evidence of strong inverse link between exchange rate and prices was found. This suggests exchange rate pass-through on the level of prices in the economy. The paper, therefore, recommends the pursuance of initial steps towards IT in Nigeria, rather than a fully-fledged IT regime.
Bakradze and Billmeier (2007)	Georgia	The authors conduct an empirical exploration into the stability of the monetary transmission mechanism in Georgia using extensions to a baseline VAR model, Granger causality tests and variance decomposition analysis.	Output (real GDP), the price level (CPI), a measure of liquidity (currency in circulation), the level of international reserves, and the nominal effective exchange rate.	They find that IT would be a feasible option for Georgia in the medium term, pending the completion of institutional and operational reform of the Central Bank.
Chinaemerem & Akujuobi (2012)	Nigeria and Ghana	The authors start with a two-variable VAR model incorporating money supply and price level, and work their way up to a five-variable VAR system to study the effect of innovations in money supply on inflation in Ghana and Nigeria.	Narrow money supply (M1), consumer price index (CPI), nominal exchange rate and the interest rates on 3 months time deposit.	They find that, even after including financial variables such as the exchange rate and interest rates, the model is not a statistically significant predictor of inflation outcomes in either country

Christoffersen, Slok and Wescott (1999)	Poland	The authors use a VAR methodology and subsequent Granger causality tests to analyze the statistical relationships between monetary policy instruments and numerous variants of inflation, such as headline inflation and underlying inflation.	Monetary aggregates, interest rates, exchange rates, real activity variables, labor market variables, foreign price indices, and CPI.	They find that the relationship between short-term interest rates and headline inflation is weak, and that it is slightly stronger for underlying inflation. They concur that in spite of the seemingly flaky linkage between policy rates and inflation, the linkage would become stronger and more predictable when the Polish economy completed its stabilization period.
Gottschalk and Moore (2001)	Poland	Gottschalk and Moore utilize a VAR framework to analyze the effectiveness of an IT framework in Poland.	The nominal effective exchange rate, and the three-month treasury bill rate as policy variables, plus industrial production, nominal wages, and the CPI.	They find that although the exchange rate served as the prevailing monetary policy instrument throughout the 1990's, the relationship between short-term interest rates and inflation was feeble in Poland. Rather than discarding IT on this premise altogether, the authors suggest modifying some elements in the IT strategy, such as widening the target range, to make it more applicable for Poland.
Hoffimaister (1999)	Korea	Hoffimaister uses the VAR model in conjunction with impulse response analysis to determine the degree of predictability of inflation in Korea.	Import prices, nominal exchange rate, broad money, corporate bond rate, CPI, output	The author asserts that his empirical analysis supports the implementation of IT in Korea, building on the fact that the strength of the relationship between policy variables and inflation in Korea is similar to that of other advanced IT economies prior to the introduction of IT.

Mishra & Mishra (2010)	India	The paper analyzed the preconditions for inflation targeting in India and built sector specific Vector Auto-regression (VAR) models to assess its suitability as a monetary policy framework for India. They	Inflation (measured by a rate of change in wholesale price index), output gap, nominal effective exchange rate, monetary policy instrument, gross bank credit and broad monetary aggregate (M3).	They find that external supply shocks and shocks in the exchange rate cause significant variation in inflation, and that they should be incorporated in the model for evaluation of monetary policy.
Tutar (2002)	Turkey	The authors utilize a VAR framework to analyze the feasibility of an IT framework in Poland.	Money supply (M1), CPI, nominal exchange rate, real gross domestic product (GDP), and the interest rates on 3 months time deposits.	The author's results indicate that the statistical relationship between monetary policy instruments and inflation do not seem to be strong and predictable in the Turkish framework under the VAR methodology, and that inflation seems to be an inertial phenomenon
Woglom (2000)	South Africa	To empirically assess the feasibility of IT in South Africa, Woglom employs a VAR methodology to study the dynamic relationship between monetary policy tools and the price level in South Africa.	A monetary instrument, the price level as measured by the CPI, the level of real GDP, and the nominal exchange rate	The study finds that an IT regime would not be effective for the South African economy, largely due to the fact that the relationship between monetary policy and inflation is not strong enough.

Tarek Ghalwash (2011) adopts a methodology akin to the aforementioned literature to measure the strength of monetary policy tools on steering inflation outcomes in Egypt. He concludes that the baseline VAR and Granger-causality test results point to the fact that the relationship between policy variables and inflation in Egypt is neither

reliable nor predictable, leading him to advise against the implementation of IT in Egypt. This analysis builds on his findings, but nonetheless differs from his study in several ways. While Ghalwash employed annual data over a 12-year period, this analysis will include quarterly data from Q1 2005 till Q3 2017. This implies the data in this study includes the effects of the January 2011 revolution as well as the effects of the recent IMF-driven structural reform program, of which the November 2016 float of the exchange rate is a critical part. Additionally, this analysis will commence with a two-variable model of M2 and CPI and develop gradually into a six-variable model in order to isolate the marginal effects of including other financial variables such as the exchange rate and government expenditure in the model.

4.4.1 Model and Data Specification

The analysis utilizes the VAR methodology and augments it with bivariate and multivariate Granger causality tests on the baseline VAR model. The baseline VAR model can be represented as follows:

$$X_t = A(L)X_{t-1} + B(L)Z_t + \varepsilon_t$$

In the above reduced-form representation, X_t is a vector of endogenous variables, and Z_t is a vector of exogenous variables. The endogenous variables included in the vector X_t are consumer price index (CPI), broad money (M2), the average overnight interbank rate (R), the nominal exchange rate (FX), government expenditure (Gvt) and the real GDP (GDP). The CBE's operational target is set within the boundaries of the overnight lending and deposit rates corridor, and the exact rate determined by market forces within the corridor is the overnight interbank rate. Thus, the average overnight interbank rate was used as a proxy for interest rates since it best represents the monetary

policy stance of the CBE at a given point in time. All variables are included in their logarithmic form, except for the average overnight interbank rate, which is included as a level.

$$Z_t = CPI, GDP, M2, FX, R, Gvt$$

The data utilized for the conduction of this analysis is quarterly data from Q1 2005 till Q3 2017 from the IMF's International Financial Statistics (IFS), the CBE, the Ministry of Finance, and the World Bank. The statistical program being used is Stata 13.0.

4.4.2 Testing for Stationarity using Unit Root Test

As per the literature, the unit root test is employed to first determine whether or not the variables are stationary. To be stationary, a time series needs to have a constant mean, variance, and autocovariance for each given lag. If the time series does not satisfy these conditions, it is categorized as non-stationary. For the purposes of my analysis, the variables must exhibit stationarity to ensure that the effect of shocks is gradually eliminated (shocks remain persistent in non-stationary series) (Brooks, 2008). Additionally, the results obtained by regressing non-stationary data can be misleading and ultimately valueless due to the phenomenon known as "spurious regression", whereby the results of the regression suggest that two independent non-stationary variables exhibit a causality relationship when in fact, they do not. Thus, the Dickey-Fuller test, the most prominent test for stationarity in the literature, is employed (A. Dickey & A. Fuller, 1979). One specific variation of the Dickey-Fuller test, namely, the augmented Dickey-Fuller test includes a constant and a trend. The null hypothesis for each variable in the series is that it has a unit root, or alternatively if the null hypothesis is rejected, the series is stationary at the selected level of significance.

Below is a summary table of the results of the augmented Dickey-Fuller unit root test on all variables:

Table 5: Augmented Dickey-Fuller Unit Root Results

	Level	First Difference
CPI	0.9990	0.0015**
Interest	0.9991	0.0004**
M2	0.9990	0.0000**
Government Expenditure	0.5118	0.0000**
GDP	0.8476	0.0000**
Exchange rate	0.9986	0.0000**

** denotes rejection at the 5% level

The results show that we fail to reject the null unit-root hypothesis at the 5% significance level for all variables. To proceed with the analysis, the first difference of the variables is taken to conduct a second unit root. Taking the first difference and testing again for a second unit root results in the rejection of the null hypothesis for all variables. Now that all variables have been made stationary, the analysis may proceed. The graphs of the variables in their logarithmic forms (except for interest) and their first differences are presented below:

Figure 11: The Logarithm of the Broad Money Supply (M2)

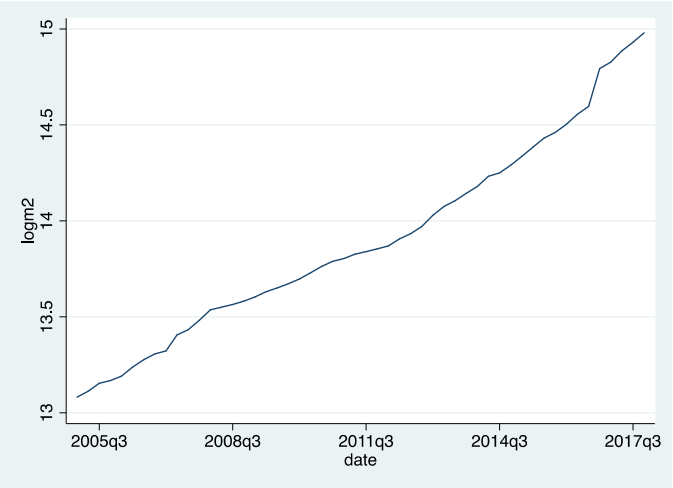


Figure 12: The First Difference of the Logarithm of Broad Money Supply (M2)

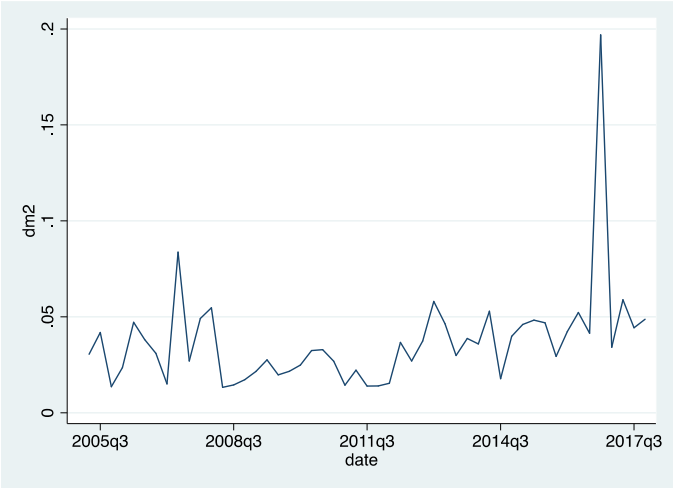


Figure 13: The Logarithm of the CPI

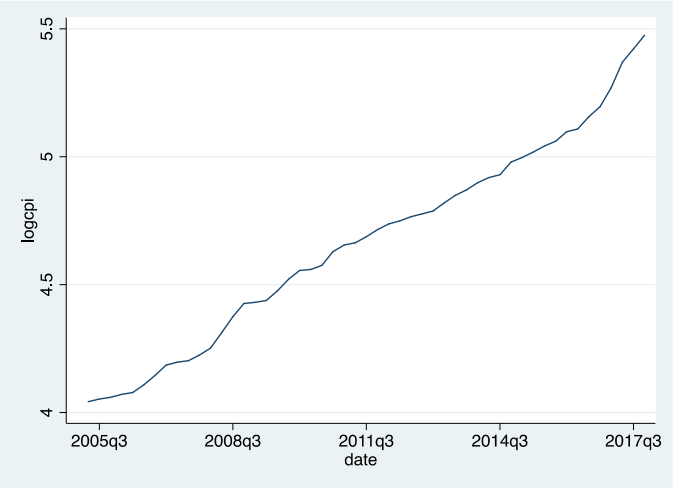


Figure 14: The First Difference of the Logarithm of CPI

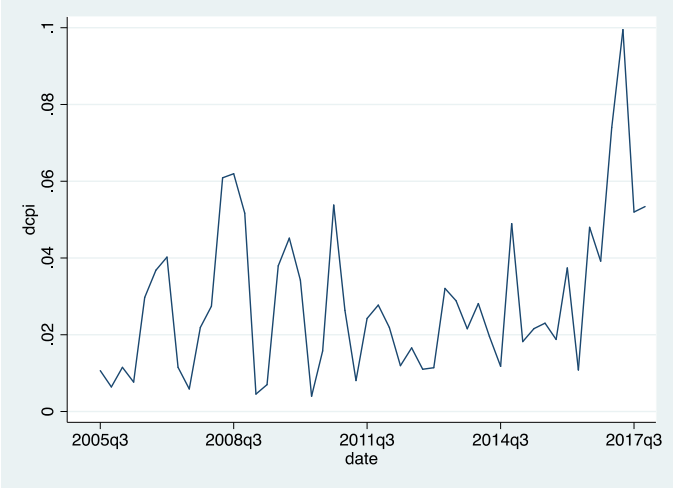


Figure 15: The Logarithm of the Government Expenditure

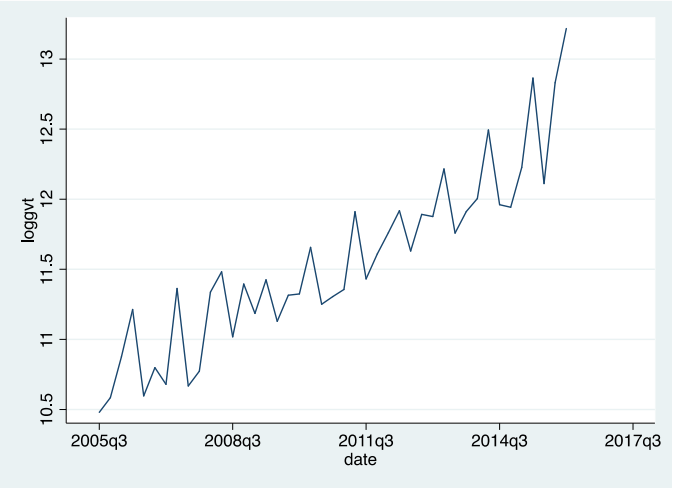


Figure 16: The First Difference of the Logarithm of the Government Expenditure

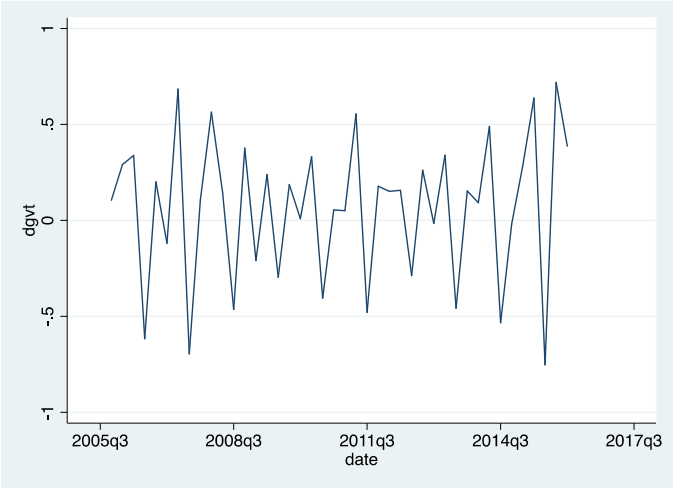


Figure 17: The Interest Rate

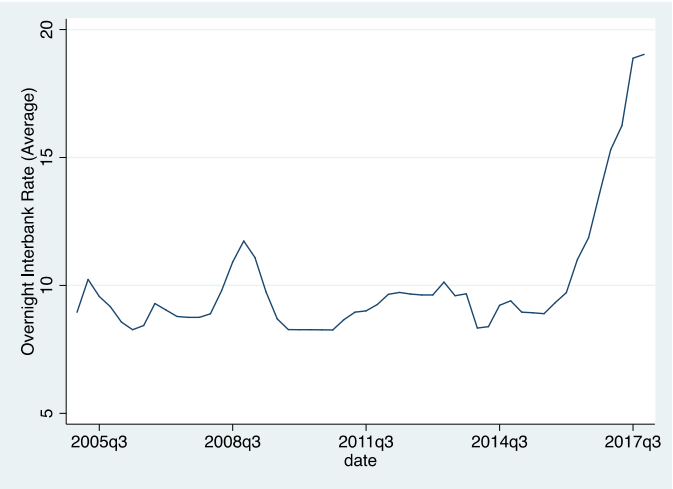


Figure 18: The First Difference of the Interest Rate

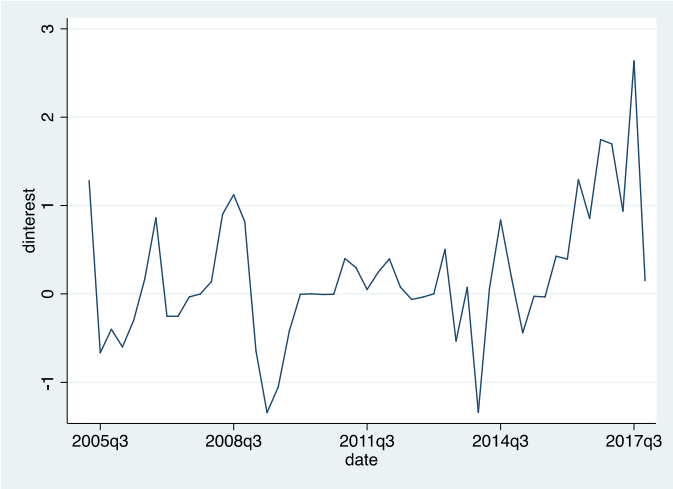


Figure 19: The Logarithm of the GDP

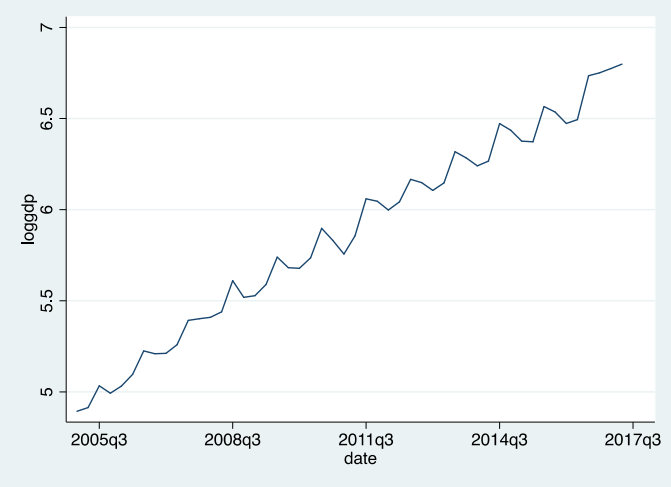


Figure 20: The First Difference of the Logarithm of the GDP

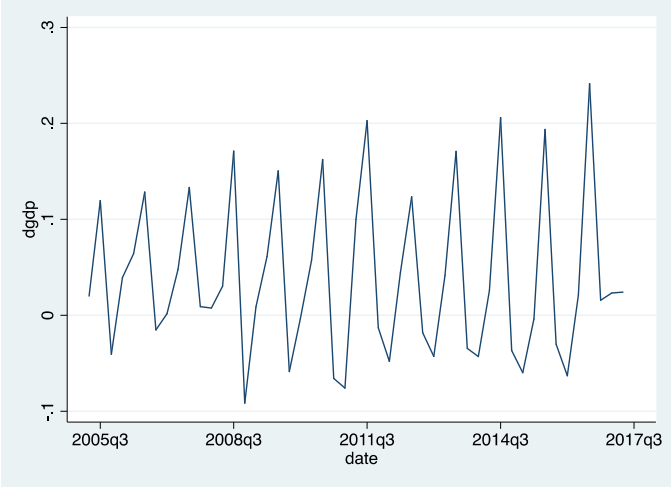


Figure 21: The Logarithm of the FX Rate

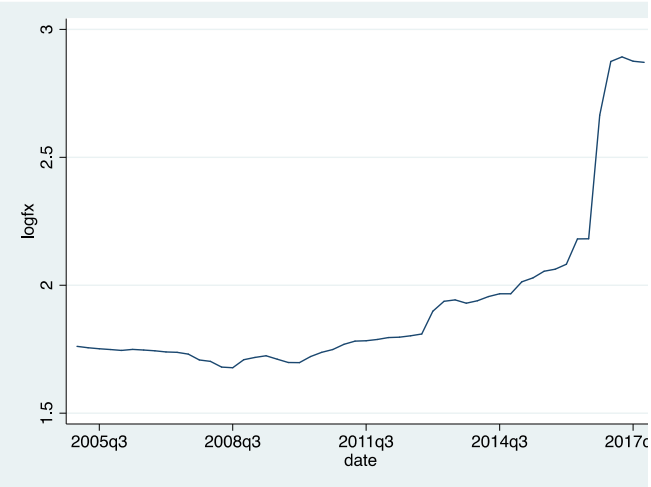
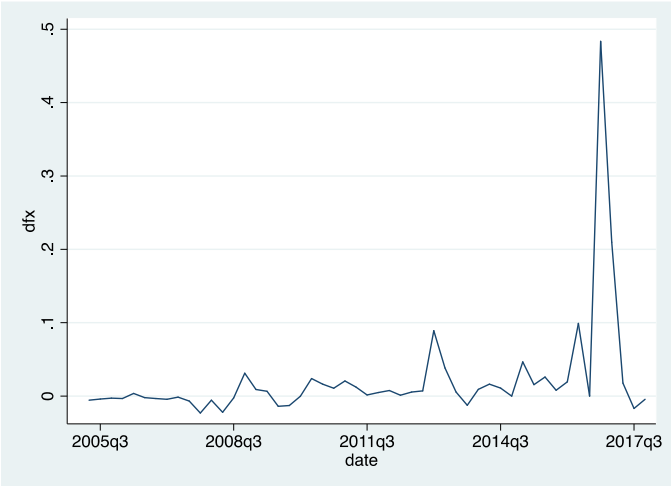


Figure 22: The First Difference of the Logarithm of the FX Rate



4.4.3 Determining the Optimal Number of Lags

The ADF test assumes that the time series follow an AR(p) process, where "p" lagged difference terms of the dependent variable y are included in the equation. Determining the optimal number of lags (p) is thus needed to run the VAR model. This can be done by employing a number of tests. The three most popular tests are Akaike's information criterion (AIC), Schwarz's Bayesian information criterion (SBIC), and the Hannan-Quinn criterion.

Running lag order selection diagnostics was used to determine the optimal number of lags. The SBIC, HQIC and the Akaike's information criterion all recommend four lags, which means we use this number of lags through the rest of the VAR analysis. As per the literature and given the relatively short time span covered by the data (eleven and a half years), a more thorough analysis involving long-run cointegrating relationships is not included in this paper.[12]

Table 6: Selection-order Criteria

Number of obs = 39						
lag	df	p	FPE	AIC	HQIC	SBIC
0	36	0.000	2.0e+23	70.6592	70.7511	70.9152
1	36	0.000	2.3e+18	59.2614	59.9041	61.0529
2	36	0.000	8.3e+17	58.1251	59.3189	61.4523
3	36	0.000	2.7e+17	56.637	58.3817	61.4997
4	36	0.000	2.2e+16	53.2377*	55.5334*	59.636*

Source: Author's Calculations

[12] Although a VEC model, which is more equipped to deal with cointegrating time series, was also run and is also included in the Appendix of this paper to check the robustness of the VAR results.

4.4.4 Results[13]

A dependent variable is said to "Granger-cause" another independent variable if, given a specified set of past values of the second variable, the past values of the first variable assist in predicting values of the second. The null hypothesis for the Granger-causality test postulates that the time series of the variable X does not provide statistically significant information to predict the time series Y (in other words, X does not Granger-cause Y). The rejection of the null hypothesis at a certain significance level would imply the alternative that past values of X are indeed useful in the prediction of values of Y (in other words, X Granger-causes Y).

The following analysis makes use of running the VAR methodology and running subsequent Granger-causality tests to determine whether or not the variables in question have a significant impact on CPI (and on GDP for the six-variable model). Making use of Tutar's (2002) methodology, I start with two simple two variable model's – CPI and M2, and CPI and interest rates- and gradually augment the model with one additional variable until I reach the final model, which includes all six variables. This methodology is especially useful in identifying the effect of complicating the model with one additional variable at each stage of analysis. The results are presented below:

Two Variables: The Effect of M2 on CPI

Effect on CPI	Chi 2	P-value	Remarks	Conclusion
M2	32.132	0.000**	P-value is significant at all significance levels, we reject the null	M2 Granger-causes CPI

Table 7: ***Two Variable VAR Results: The Effect of M2 on CPI***

*, ** denote rejection at the 10% and 5% level, respectively

[13] The VAR model results are presented in the appendix of this paper.

Two Variables: The Effect of R on CPI

Effect on CPI	Chi 2	P-value	Remarks	Conclusion
R	16.792	0.000**	P-value is significant at all significance levels, we reject the null	Interest rate Granger-causes CPI

Table 8: *Two Variable VAR Results: The Effect of R on CPI*

*, ** denote rejection at the 10% and 5% level, respectively

Three Variables: The Effect of M2 and R on CPI

Effect on CPI	Chi 2	P-value	Remarks	Conclusion
M2	19.238	0.000**	P-value is significant at all significance levels, we reject the null	M2 Granger-causes CPI
Interest	6.366	0.041**	P-value is significant at 0.05 significance level, we reject the null	Interest Granger-causes CPI
Jointly	44.936	0.000**	P-value is significant at all significance levels, we reject the null	All variables jointly Granger-cause CPI

Table 9: *Three Variable VAR Results: The Effect of M2 and R on CPI*

*, ** denote rejection at the 10% and 5% level, respectively

Four Variables: The Effect of M2, R and FX on CPI

Effect on CPI	Chi 2	P-value	Remarks	Conclusion
M2	5.0054	0.082*	P-value is significant at 0.1 significance level, we reject the null	M2 Granger-causes CPI
R	5.6466	0.059*	P-value is significant at 0.05 significance level, we reject the null	Interest Granger-causes CPI
FX	1.1513	0.562	P-value is insignificant at all significance levels, we fail to reject the null	FX does not Granger-cause CPI
Jointly	44.936	0.000**	P-value is significant at all significance levels, we reject the null	All variables jointly Granger-cause CPI

Table 10: ***Four Variable VAR Results: The Effect of M2, R and FX on CPI***

*, ** denote rejection at the 10% and 5% level, respectively

Five Variables: The Effect of M2, R, FX and Gvt Expenditure on CPI

Effect on CPI	Chi 2	P-value	Remarks	Conclusion
M2	2.7011	0.259	P-value is insignificant at all significance levels, we fail to reject the null	M2 does not Granger-cause CPI
R	2.8664	0.239	P-value is insignificant at all significance levels, we fail to reject the null	Interest does not Granger-cause CPI
FX	1.8396	0.399	P-value is insignificant at all significance levels, we fail to reject the null	FX does not Granger-cause CPI
Gvt Expenditure	0.50075	0.779	P-value is insignificant at all significance levels, we fail to reject the null	Gvt Expenditure does not Granger-cause CPI
Jointly	10.026	0.263	P-value is insignificant at all significance levels, we fail to reject the null	All variables do not jointly Granger-cause CPI

Table 11: ***Five Variable VAR Results: The Effect of M2, R, FX and Gvt Expenditure on CPI***

*, ** denote rejection at the 10% and 5% level, respectively

Six Variables: The Effect of M2, R, FX, Gvt Expenditure, and GDP on CPI

Effect on CPI	Chi 2	P-value	Remarks	Conclusion

M2	6.3453	0.042**	P-value is significant at 0.05 significance level, we reject the null	M2 Granger-causes CPI
R	0.58833	0.745	P-value is insignificant at all significance levels, we fail to reject the null	Interest does not Granger-cause CPI
FX	4.1727	0.063*	P-value is significant at 0.1 significance level, we reject the null	FX Granger-causes CPI
Gvt Expenditure	5.3137	0.070*	P-value is significant at 0.1 significance level, we reject the null	Gvt Expenditure Granger-causes CPI
GDP	8.8678	0.012**	P-value is significant at 0.05 significance level, we reject the null	GDP Granger-causes CPI
Jointly	21.116	0.02**	P-value is significant at 0.05 significance level, we reject the null	All variables jointly Granger-cause CPI

Table 12: ***Six Variable VAR Results: The Effect of M2, R, FX, Gvt Expenditure, and GDP on CPI***

*, ** denote rejection at the 10% and 5% level, respectively

Impulse Response Graphs of Monetary Policy Tools[14]

Figure 23: Impulse Response of CPI to CPI

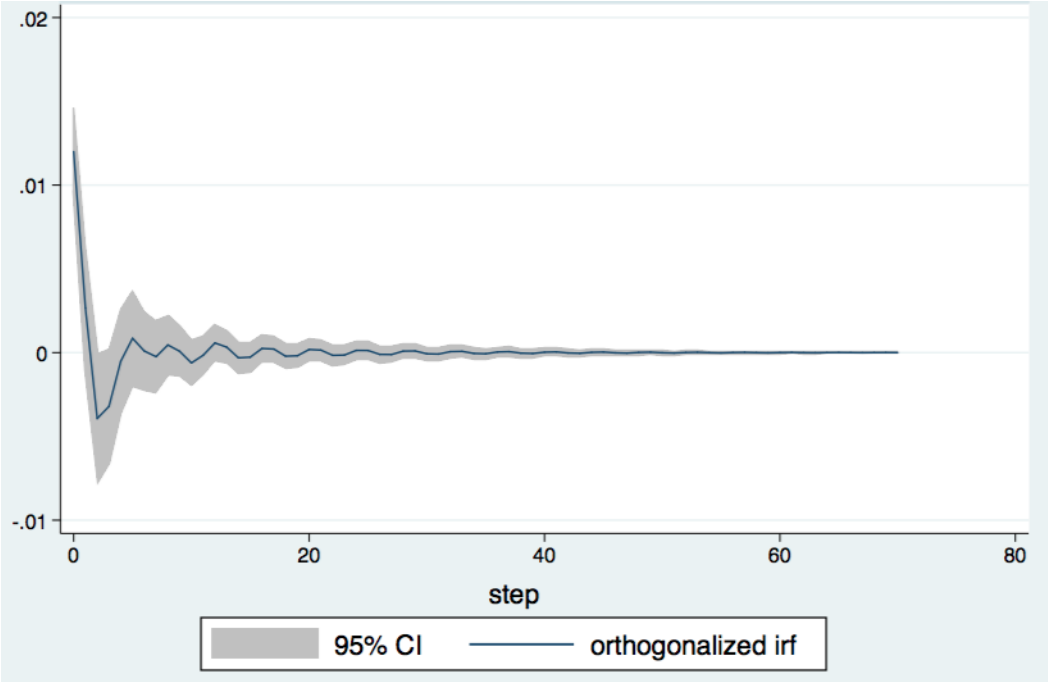
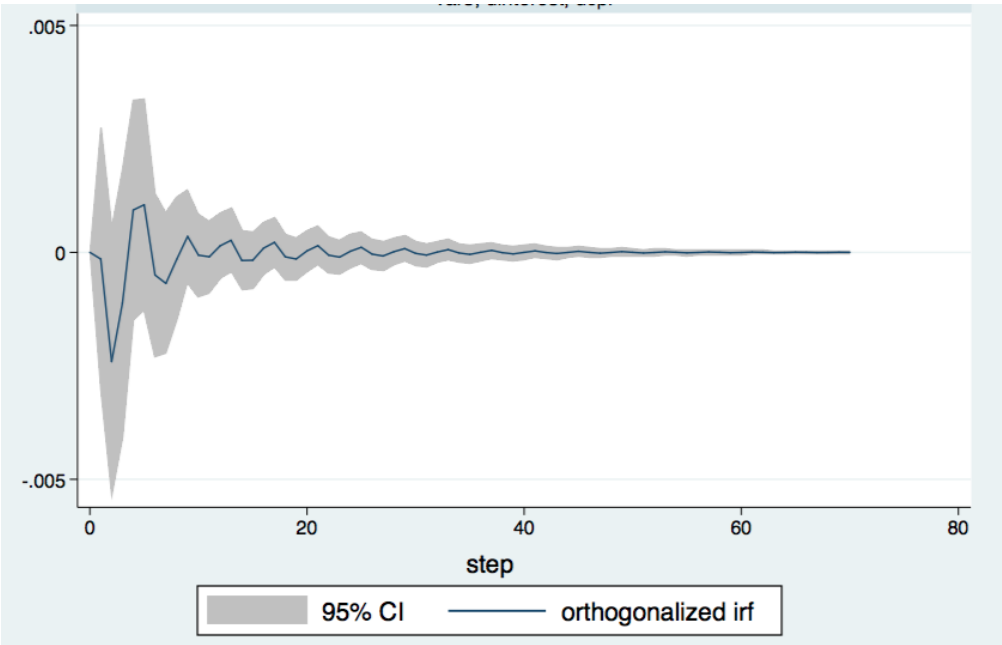
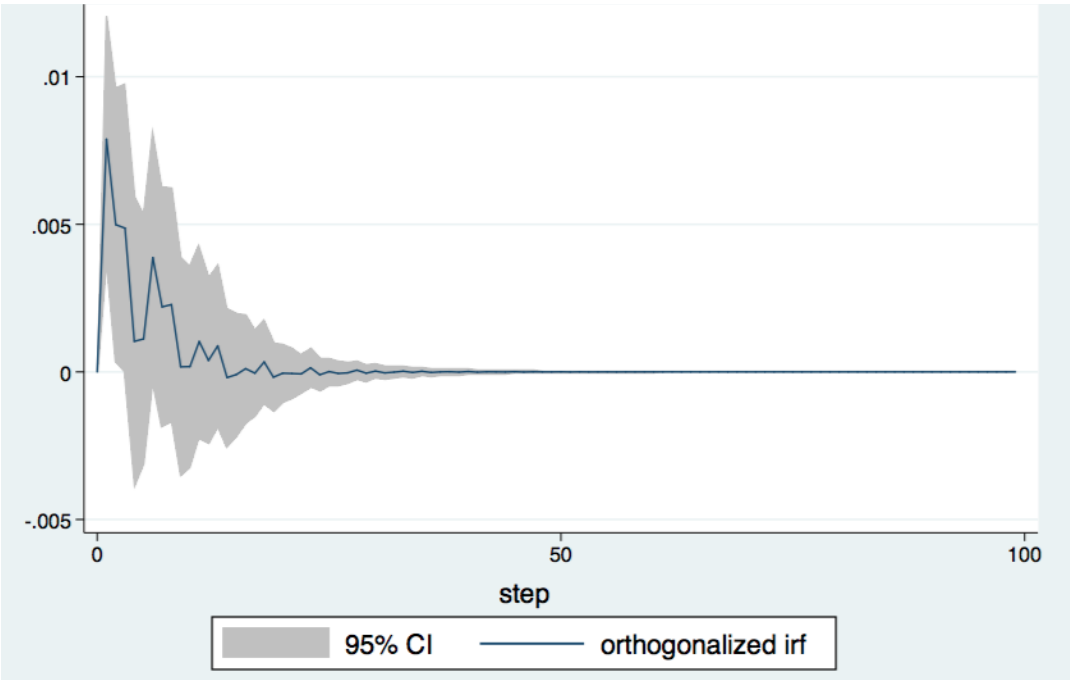


Figure 24: Impulse Response of CPI to Interest Rates



[14] The IRF graphs for remaining variables are presented in the appendix.

Figure 25: Impulse Response of CPI to M2



Variance Decomposition of CPI

Table 13: Variance Decomposition of CPI

Step	dcpi	dm2	dinterest	dfx	dgvt	dgdp
1	0.875962	0.018323	0.003374	0.041781	0.01366	0.0469
2	0.730328	0.014022	0.036693	0.131836	0.033971	0.053149
3	0.690343	0.041802	0.041121	0.114711	0.06625	0.045399
4	0.626243	0.058081	0.039367	0.114755	0.078433	0.083121
5	0.595803	0.04676	0.032262	0.099093	0.071958	0.154124
6	0.543138	0.041092	0.029866	0.159708	0.078759	0.147437
7	0.538591	0.041125	0.030083	0.159058	0.084897	0.146245

Source: Author's Calculations

4.4.5 Discussion of the Results

Starting with the two-variable model, both the average overnight interbank rate and M2 each separately have significant effects on CPI. Combining them both in the same model (the three-variable model) also produces the similar results. Once the exchange rate is added in the four-variable model, both M2 and the interest rate still have a significant effect on CPI at the 10% level, although their significance is weakened since they are no longer significant at the 5% level. The results of the bivariate tests of the six-variable model on CPI indicate that broad money supply (M2), government expenditure, exchange rate and GDP cause significant variation in the CPI at the 10% significance level. The results support the notion that the government's financing needs are a significant driver of inflation, which could be an indication of fiscal dominance (although other factors, such as the sources of financing of government expenditure need to be taken into account in order to validate this claim). Similarly, the significance of the effect of the exchange rate on CPI points to the existence of a significant exchange rate pass through (ERPT) effect on the price level in the Egyptian economy. This was made clear with the

skyrocketing of inflation levels in concurrence with the floating of the Egyptian Pound in November 2016.

One noteworthy observation is that the overnight interbank rate, which forms the operational target of the CBE, is the only variable that does not have a significant effect on CPI. This is especially concerning due to the fact that the overnight interbank rate had a significant Granger-causality effect at all significance levels on CPI when the two variable (CPI and Interest) and three variable (CPI, Interest and M2) Granger causality tests were run. This indicates that adding the FX and the Government Expenditure variables to the model caused the effect of the overnight interbank rate to weaken from significant to insignificant, further supporting the aforementioned claim that the presence of a high degree of fiscal dominance and a high ERPT effect dampen the strength of the relationship between the CBE's operational target and its ultimate one. In general, the results point to the conclusion that although the relationship between the CBE's intermediate target (M2) and its ultimate target (CPI) is significantly strong, the relationship between the operational target (overnight interbank rate) and the ultimate target is neither predictable nor reliable. This could be a significant impediment to the implementation of an IT regime since the monetary policy instruments do not have a sufficient impact on influencing inflation expectations.

The results of the impulse response graphs are in line with those of the Granger causality tests. A positive shock in the interest rates generates a negative response in inflation, which mirrors the theoretical relationship between the two. However, the response generated by the shock in interest rates is not significant. This further bolsters the results of Granger causality test reported in table 13; that the relationship between the overnight interbank rate and inflation is neither strong nor

stable. On the other hand, the impact of a shock in M2 on CPI is initially significant, and wears off gradually in successive lags. One additional finding relevant to the analysis is that inflation can be considered an inertial phenomenon in Egypt, that is, inflation in one period is a significant driver of inflation in the next period. The results of the variance decomposition indicate that in the first stage, CPI itself accounts for around 87.5% of the variation in CPI. This effect wears off gradually in successive stages. The effect of GDP, government spending, and the exchange rate on CPI on the other hand, intensify in subsequent stages. The shares of M2 and interest rates in the variance of CPI reach their highest level at the fourth and third stage respectively. Still, even at its peak, the interest rate accounts for only 4.11% of the variation in CPI, further corroborating the results of the Granger-causality tests and the IRF analysis.

The deficiency of the statistical link between the interest rate as the CBE's operational monetary policy tool and inflation is disconcerting, although unsurprising. Given the rise of both variables almost monotonically since the beginning of 2016, it would be natural to anticipate the difficulty for statistical tests to isolate the normal negative relationship that theory suggests should exist between the two variables. As economic reforms begin to reap their fruits and the economy begins to stabilize, it is likely that the statistical relationship between interest rates and inflation will strengthen over the medium term.

5. Conclusion and Policy Implications

This paper was written with the purpose of answering the question of whether or not Egypt is ready for the implementation of IT. It employs a twofold methodology based on an assessment of the institutional and technical framework currently in place in Egypt, combined with a comprehensive survey of the current international practices of 28 inflation-targeting countries to determine whether or not the Egyptian

framework is adequate in meeting the basic preconditions for IT, and to identify the practical considerations that need to be taken into account if the CBE indeed decides to adopt an inflation targeting regime in the near future. The assessment of the institutional framework currently in place in Egypt involved a thorough review of both the current and proposed legislative framework governing the CBE, and an appraisal of the de facto observed institutional practices, while the relationship between monetary policy tools and the ultimate target of low inflation was assessed by employing a VAR model on data from Q1 2005 till Q3 2017, with subsequent Granger causality tests.

Through a thorough literature review, the advantages and disadvantages of IT in relation to its alternatives were analyzed, the basic technical and institutional prerequisites required for adoption of an IT regime were examined in detail, and the implications of IT for open, developing economies like Egypt were gauged. Egypt's progress towards preparing the economy for IT adoption was evaluated exhaustively, and a thorough and comprehensive assessment of country experiences with IT to determine how an IT regime can be tailored to the specific case of Egypt and to provide policy recommendations regarding steps that can be taken to better prepare Egypt for IT in the near future.

Given the overall success of the IT framework in the international context, the fact that that an IT framework has been in the works under the CBE's agenda since 2005, and the preparatory steps that have already been taken towards a fully fledged IT regime, the issue for Egypt should no longer be framed in terms of whether or not Egypt should transition to IT. The deliberations should instead revolve around when Egypt should move to IT and how the CBE should go about it. Whether countries wishing to adopt IT need to ensure full attainment of the theoretical prerequisites

before making the move to IT is debatable, but the fact that an IT regime is a demanding one in terms of institutional and technical requirements is nearly universally recognized.

A survey of country practices and international experience with IT set the stage for benchmarking Egypt's current position and pinpointing possible implementation challenges. The major takeaway from comparing the Egyptian framework with that of established IT countries is that Egypt's institutional and legal framework is lacking in terms of defining the institutional responsibility for setting the inflation target, inclusion of legal provisions that prohibit central bank lending to the government, and formalizing central bank accountability measures in the legislation. Some practical issues also arise, such as the inherent tradeoff between credibility and flexibility in choosing the width of the tolerance band of the inflation target (or alternatively, selecting a point target). International practices also show that headline inflation is used as the measure of the inflation target in most countries, although all countries keep a close eye on measures of core or underlying inflation that exclude the most volatile items.

Based on the results that emerged from surveying the Egyptian de jure and de facto institutional framework, it seems the current institutional setup in Egypt is not currently adequate for a fully-fledged IT regime. As noted, however, the lack of fulfillment of the aforementioned institutional preconditions undermines the successful conduct of monetary policy in general under any monetary regime and not just IT. Nonetheless, it has been argued that the importance of satisfying the preconditions is more pronounced under IT, as a result of its heavier reliance on the role of Central Bank transparency and credibility in the formulation of inflation expectations (Masson et al., 1997).

As mentioned, a new draft law for the CBE amending the previous Law no. 88 of 2003 of the "Central Bank, Banking Sector and Monetary System" is currently under review. Although the draft law contains provisions which strengthen the operational independence of the CBE as the sole entity entitled to the autonomous conduct of monetary policy, it is lacking in terms of defining the mechanisms by which the CBE is held accountable for the achievement (or lack thereof) of its targets; a cornerstone of IT implementation and management. It is also unclear whether or not the government will have a role in the setting of the inflation target in coordination with the CBE. It is suggested that, at least in the first stages of IT adoption, there should be cooperation and consensus between the CBE and the government in setting the inflation target and this cooperation should be formalized and integrated into the legal framework governing the institutional setup.

Additionally, there should be an official framework in place to curtail fiscal dominance. As demonstrated by international experiences, efforts to achieve this can be embodied in legal provisions that prohibit or place limitations on CBE lending to the government and its entities or the monetization of government debts and deficits. The IMF program that is currently ongoing already limits overdraft facilities by the government from the CBE and prevents the CBE from participating in the primary market for government securities. However, it is proposed that a complete formal legal prohibition of CBE lending to the government be introduced in order to strengthen credibility and free the CBE from any pressure to deviate its monetary policy stance to accommodate government financing needs. Due to the intertwined nature of the effects of fiscal policy and monetary policy, fiscal consolidation by means of expenditure rationalization and tax system reform will strengthen the effectiveness of monetary policy by minimizing the degree of fiscal dominance.

The CBE will need to streamline its policy objectives towards the ultimate goal of price stability and minimize its focus on other policy objectives such as the management of the exchange rate. The liberalization of the exchange rate in November 2016 is already a major step in that direction. It will be necessary to emphasize this by formally including a provision isolating price stability as the overriding objective of monetary policy within the legal framework.

Reforming the Central Bank legislative and regulatory framework will be a fundamental step in the path towards making the institutional setting adequate for adoption of IT. The main takeaways from the analysis of the legal framework currently in place in Egypt, and benchmarking it against the international practices of other IT countries are as follows:

- Price stability should be outlined as the overriding objective of monetary policy. It should be made clear that in the event of a conflict between price stability and other macroeconomic objectives, price stability should take precedence.
- The CBE's operational autonomy should continue to be emphasized and strengthened under any revisions of the current law. However, international experience has shown that, at least in the first phases of IT implementation, it is advisable to provide the CBE with instrument independence but not full goal independence. It has been shown that government involvement in setting the inflation target that the CBE is held accountable for achieving provides credibility gains that are desirable particularly in the IT initial adoption period. In all cases, the mechanism for setting the inflation target should be defined clearly in the legal framework governing the CBE.

- Prohibition of the monetary financing of government deficit should be included within the articles of the Law on the Central Bank. If a full forced ban of this practice is not possible, stricter limitations should be placed on government deficit financing.
- The composition of the BoD of the Central Bank should be revised to ensure a clear and objective stance on monetary policy decision-making. Voting rights should be limited to non-governmental members of the MPC as a safeguard against fiscal dominance.
- Transparency measures and procedures for holding the CBE accountable for the achievement of the inflation target should be instilled in the CBE law. These include the communication strategy for transferring information to the public, as well as the measures that would be taken in case inflation persistently deviates from the target.

On the technical side, the results obtained from fitting a VAR model and performing subsequent Granger causality tests building from a two-variable model up to a six-variable model indicate that the relationship between short-term interest rates and inflation is not significant nor stable in Egypt. The fact that the overnight interbank rate had a significant Granger-causality effect at all significance levels on CPI when the two variable (CPI and Interest) and three variable (CPI, Interest and M2) Granger causality tests were run indicates that adding the FX and the Government Expenditure variables to the model caused the effect of the overnight interbank rate to weaken from significant to insignificant. This supports the claim that the presence of a high degree of fiscal dominance and a high ERPT effect dampen the strength of the relationship between the CBE's operational target and its ultimate one. The deficiency of the statistical link between the interest rate as the CBE's operational

monetary policy tool and inflation is disconcerting, although unsurprising. Given the rise of both variables almost monotonically since the beginning of 2016, it would be natural to anticipate the difficulty for statistical tests to isolate the normal negative relationship that theory suggests should exist between the two variables. Therefore, this paper is optimistic that as economic reforms begin to reap their fruits and the economy begins to stabilize, it is likely that the statistical relationship between interest rates and inflation will strengthen over the medium term.

The CBE will need to select an appropriate index for inflation for the inflation target. It is recommended that headline inflation be used for the inflation target itself in accordance with international practices, but that core inflation is closely and attentively monitored to enhance understanding of developments in the price level and guide policy making accordingly. It is suggested that the CBE take steps towards improving its technical capabilities, including the quality of data, forecasting capabilities, and understanding of transmission mechanisms of monetary policy. It would be beneficial to leverage the IMF's current support of Egypt's economic reform program to acquire technical assistance from the IMF on these issues. Another critical component in building the technical proficiency of the CBE will be to develop a solid communication mechanism that bolsters the transparency of monetary policy. Indeed, the effectiveness of an IT regime largely relies on the degree of credibility of the central bank and ultimately the influence it has on inflation expectations, underscoring the importance of a communication strategy based on transparency and accountability of the central bank. The publishing of a "Monetary Policy Report" on a quarterly basis by the CBE is already a major step in this direction.

What has been made clear throughout the analysis is that the transition to IT needs to be a gradual and sequential process, with the prioritization of the

development of the institutional setting the involved entities at the forefront of the transitional agenda. As evidenced by the experiences in the international context, Egypt faces significant challenges that make the transition to a fully-fledged IT regime in the near term problematic to say the least. The road towards a fully fledged IT regime is still a long, intricate and tedious one for Egypt especially considering the fact that the economy is still battling double-digit inflation and a persistently high budget deficit. Institutional and regulatory reform should be prioritized since these require sustained political commitment that takes time and to assemble and fortify.

Nonetheless, and in line with the current overall economic reform agenda that Egypt has embarked on recently, taking steps that have been formally planned, prioritized and rationalized to prepare the economy for an IT regime will be desirable. In this regard, the CBE has already taken serious steps towards setting the stage for a formal IT regime, including the liberalization of the exchange rate, the announcement of a target for inflation by the end of 2018, embarking on an ambitious fiscal consolidation program, and the development and dissemination of an official "Monetary Policy Report" on a quarterly basis. Overall, this paper is optimistic about the ability of the CBE to overcome the aforementioned challenges towards a fully-fledged IT regime in Egypt, provided sustained political commitment and proper prioritization and implementation of the transitional agenda continue to be realized.

Appendix

VAR Model Results

Table 14: Vector Autoregressive Model (VAR) Results

	No. of Obs =38	R. sq = 0.6347			
	Coef.	Std. Err.	P>|z|	95% CI	
dcpi					
L1	0.0421157	0.019947398	0.012	0.003218274	0.0812126
L2	0.0713739	0.017042602	0.000	0.038140826	0.1047774
L3	-0.0464113	0.018986888	0.015	-0.083435731	-0.009197
L4	-0.0121003	0.017596837	0.492	-0.046414132	0.0223895
dm2					
L1	0.9204492	0.170293744	0.000	0.5883764	1.252522
L2	0.8146206	0.273376615	0.003	0.2815362	1.347705
L3	0.8341559	0.279499385	0.000	0.2891321	1.3791797
L4	-0.1845211	0.198010923	0.349	-0.5706425	0.2016002
dinterest					
L1	-.0022995	.0084922	0.787	-.0189439	.014345
L2	-.0031347	.0062371	0.615	-.0153592	.0090897
L3	-.002695	.0054833	0.623	-.013442	.008052
L4	.0128369	.0078186	0.101	-.0024872	.028161
dfx					
L1	.1134664	.03546	0.001	.043966	.1829668
L2	-.01959	.0397318	0.622	-.0974629	.0582828
L3	.0821728	.0364149	0.024	.0108009	.1535447
L4	-.0255005	.0391652	0.515	-.1022629	.0512619
dgvt					
L1	.0112055	.0135356	0.408	-.0153238	.0377347
L2	.0401185	.0200779	0.046	.0007666	.0794704
L3	.0238942	.0189888	0.208	-.0133231	.0611115
L4	.0186258	.0153889	0.226	-.0115358	.0487874
dgdp					
L1	.0764243	.0801329	0.340	-.0806334	.2334819
L2	.1954687	.0718473	0.007	.0546505	.3362869
L3	.0250606	.0645761	0.698	-.1015063	.1516274
L4	.1456081	.0643253	0.024	.0195329	.2716834
cons	.0527576	.0181577	0.004	.0171691	.0883461

Source: Author's Calculation

Vector Error Correction (VEC) Model Results

As per the literature and given the relatively short time span covered by the data (eleven and a half years), a more thorough analysis involving long-run cointegrating relationships was not included in this paper. In general, the presence of cointegration implies that there exists some form of linear combination of the time series of variables that produces a long-run relationship between them (Murray, 1994). In other words, the presence of cointegration between non-stationary variables would imply the existence of a common stochastic non-stationary process underlying two or more of the variables. A VEC model is more equipped to deal with cointegrated nonstationary time series, since it has limitations on cointegration built into its specification; however, VAR models are preferred if no cointegration exists (Yamada & Toda, 1998). The general specification of the VEC model is based upon an autoregressive distributed lag model:

$$Y_t = A_0 + A_1 Y_{t-1} + B_0 X_t + B_1 X_{t-1} + u_t$$

where the parameter B_0 denotes the short-run reaction of Y_t after a change in X_t . The long-run effect is given when the model is in equilibrium where: Y* = α + βX*. The error correction model (ECM) is then shown as:

$$\Delta Y_t = B_1 \Delta X_t - \Pi(Y_{t-1} - \alpha - BX_{t-1}) + u_t$$

$$\Delta Y_t = B_1 \Delta X_t - \Pi ECT_{t-1} + u_t$$

where $\Pi = (1 - A_0)$

$B = (B_1 + B_0)/\ (1 - A_0)$

The two variables Y_t and X_t are cointegrated and ECM incorporates the short-run and long run effects. This is because the long-run equilibrium $(Y_{t-1} - \alpha - BX_{t-1})$ is included in the model together with the short-run dynamics captured by the differenced term.

To confirm the robustness of the results obtained from the VAR model, a VEC model was also run on the data to compare the results. The results of the VEC model are presented below:

Table 15: VEC Model Results

Effect on CPI	**Coefficient**	**Standard Error**	**P>|z|**	**95% Confidence Interval**	
d.CPI					
LD.	.5407824	.2216468	0.015	.1063626	.9752021
L2D.	.6371643	.1691856	0.000	.3055666	.968762
L3D.	.4256421	.1750348	0.015	.0825802	.7687039
d.interest					
LD.	.0371026	.0633409	0.558	-.0870432	.1612485
L2D.	-.1796681	.0659737	0.612	-.3089742	-.0503621
L3D.	-.0210991	.0659377	0.749	-.1503347	.1081365
d.m2					
LD.	-10.5102	3.222182	0.001	-16.82557	-4.194842
L2D.	-8.131317	3.332772	0.015	-14.66343	-1.599204
L3D.	1.759916	2.869333	0.540	-3.863874	7.383707
d.fx					
LD.	5.455801	1.805757	0.003	1.916582	8.99502
L2D.	3.959595	1.990208	0.047	.0588593	7.86033
L3D.	3.288029	1.858352	0.077	-.3542729	6.930331
d.gvt					
LD.	.6209773	.1761646	0.000	.275701	.9662535
L2D.	.3752333	.1889771	0.047	.0048451	.7456216

L3D.	-.0159461	.1406153	0.910	-.291547	.2596549
d.GDP					
LD.	-1.097554	.7945769	0.167	-2.654897	.4597876
L2D.	-.2301298	.5581327	0.680	-1.32405	.8637902
L3D.	.3216705	.6845124	0.638	-1.019949	1.66329

Source: Author's calculations.

The results of the VECM are consistent with those of the six-variable VAR model. It is found that the interest rate does not significantly affect CPI at all significance levels and at all lag orders. M2 is significant at the 5% at the first and second lag, although it becomes insignificant after the second lag. The same is true for government expenditure and the exchange rate. It is also found that lagged values of CPI have a significant effect on current CPI at the 5% level. This indicates that inflation is an inertial phenomenon in Egypt, driven by expectations of inflation based on historical inflation rates. Overall, the VECM results corroborate the robustness of the VAR model results.

Impulse Response Graphs

Figure 26: Impulse Response of CPI to GDP

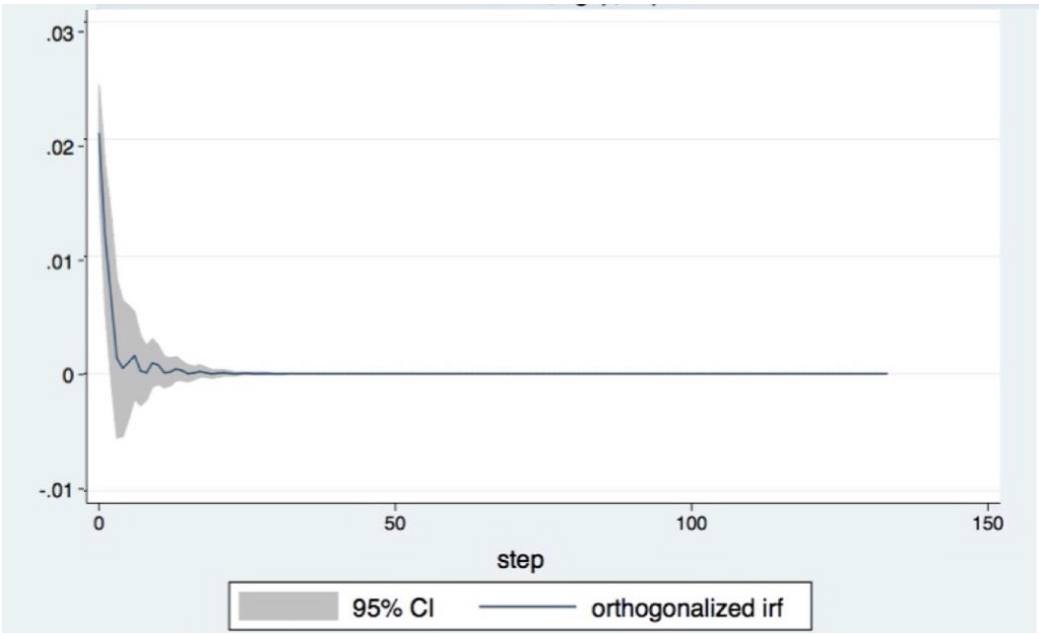


Figure 27: Impulse Response of CPI to FX

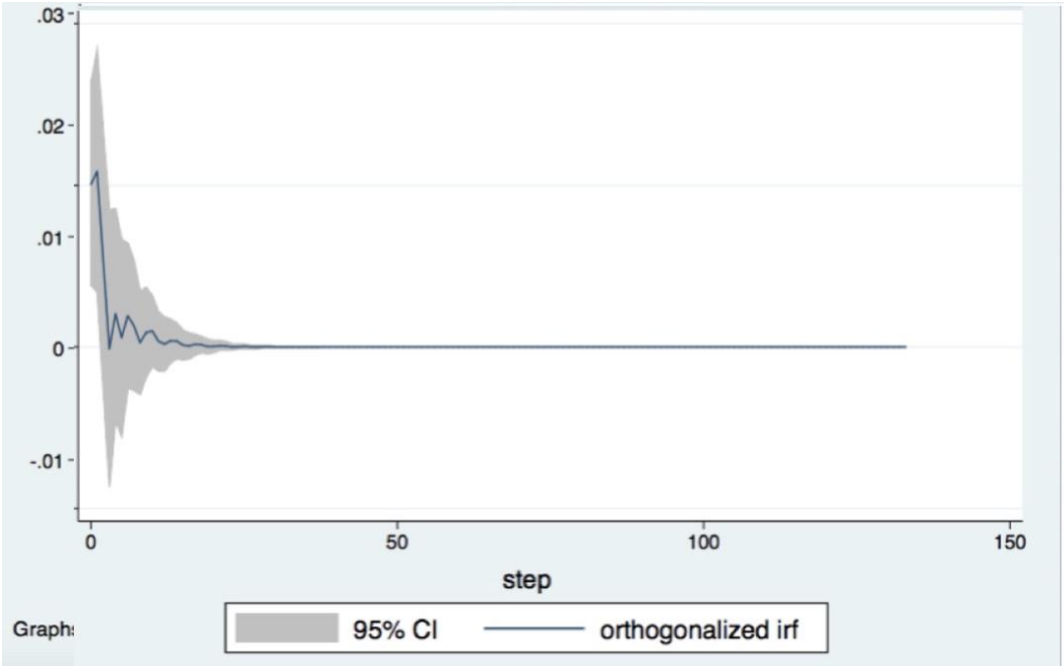
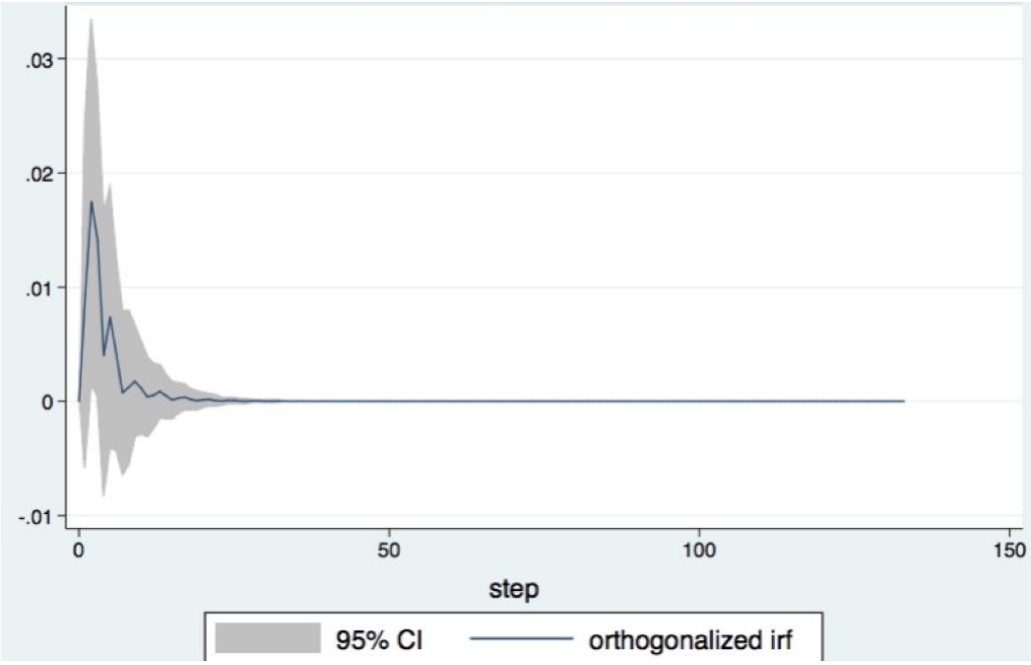


Figure 28: Impulse Response of CPI to Government Expenditure



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