IMF Working Paper

The Monetary Transmission Mechanism
in Egypt

Rania Al-Mashat and Andreas Billmeier

INTERNATIONAL MONETARY FUND

WP/07/285

IMF Working Paper

Middle East and Central Asia Department

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Prepared by Rania Al-Mashat and Andreas Billmeier[1]

Authorized for distribution by Klaus Enders

December 2007

Abstract

This paper examines the monetary transmission mechanism in Egypt against the background of the central bank's intention to shift to inflation targeting. It first describes the changing transmission channels over the last decade. Second, the channels are evaluated in a VAR model. The exchange rate channel plays a strong role in propagating monetary shocks to output and prices. Most other channels (bank lending, asset price) are rather weak. The interest rate channel is underdeveloped but appears to be strengthening since the introduction of the interest corridor in 2005, which bodes well for adopting inflation targeting over the medium term.

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I. Introduction

Since the completion of the Economic Reform and Structural Adjustment Program (ERSAP) in 1996, Egypt has made great strides to reform and enhance its monetary policy framework.[2] Major structural changes include the abolition of the de jure exchange rate peg—which also served as a nominal anchor—in 2000, the change in monetary operations with the introduction of the domestic currency overnight interbank market in 2001, the launch of the foreign exchange interbank market in 2004, and the introduction of the corridor for overnight facilities as main policy instrument in June 2005.

Over this period, the lack of an explicitly announced nominal anchor however, has made it increasingly difficult to assess monetary policy actions. Against this background, the Central Bank of Egypt (CBE) embarked on the transition to a new monetary policy framework in June 2005 by announcing its intention to adopt inflation targeting (IT) over the medium term. Consistent with this monetary strategy, price stability became the CBE's overriding policy objective , and preparations are underway to put in place a full-fledged inflation-targeting framework to anchor monetary policy once the fundamental prerequisites are met. Key institutional and operational steps are being implemented in the transition.

As the CBE continues to reform its monetary policy framework, a deeper understanding of the empirical ramifications of conducting active monetary policy is crucial, in particular regarding the relationship between the central bank's instruments and economic variables such as output and inflation. Especially in the context of full-fledged IT, the exchange rate would no longer be the primary instrument to actively seek to engineer a certain inflationary outcome if the inflation forecast becomes incompatible with the declared target for inflation. In that context, other channels of transmitting the monetary stance would need to function well to guarantee a successful attainment of the target. In other words, the introduction of IT rests on a sufficiently developed monetary transmission mechanism (MTM) to guide monetary policy choices.

There appears to be limited empirical evidence on the MTM in Egypt as the literature has focused almost exclusively on selected aspects of the MTM—for example the exchange rate pass-through—and has not discussed these in a unified empirical framework. The present paper intends to fill this gap. To this end, we combine a descriptive review of Egyptian monetary policymaking over the last decade with a baseline VAR model that describes the

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[2] In the early nineties, Egypt launched an Economic Reform and Structural Adjustment Program (ERSAP) to eliminate the internal and external disequilibria caused by many years of high inflation, intolerable fiscal deficits, lack of competitiveness in world markets and soaring degrees of external indebtedness. Central to the process were three critical elements: a massive fiscal adjustment, the liberalization and unification of the exchange system, including the adoption of an exchange rate anchor and a supportive monetary policy comprising quantified targets in the context of successive financial programs. Monetary policy during this period was primarily designed to defend the exchange rate, which did not conflict with achieving the country's growth objectives. The ERSAP was largely successful at restoring the desired macroeconomic stability.

Egyptian economy. By adding extensions to the baseline model, we investigate specific MTM channels to the extent feasible given the data constraints.

The main empirical results of this paper are that (i) the interest rate channel of monetary policy is still weak in Egypt; (ii) the exchange rate channel is very pronounced, especially in light of the infrequent but significant exchange rate movements in Egypt over the last decade; (iii) other transmission channels play a very limited role in transmitting monetary shocks to the economy; and (iv) the introduction of the corridor for the overnight rate may have started to contribute to a firmer interest rate channel.

The main policy recommendations include: (i) enhancing competition in the banking system to reduce the spread between lending and borrowing rates and to strengthen the link between the monetary stance and macro variables via the interest rate channel; (ii) improving the CBE's communication strategy to enhance the expectations channel; (iii) adding financial instruments to lengthen and deepen the yield curve (e.g., mortgage financing), possibly including instruments that reflect inflation expectations (inflation-indexed bonds); (iv) allowing greater flexibility in the exchange rate, a precondition for successful inflation targeting; and (v) persevering with other governmental reforms, including resolving the remaining non-performing loan (NPL) issue in the banking system and fiscal consolidation.

From a purely statistical perspective, improvements in price statistics and the availability of an indicator of true economic activity—as opposed to a production factor (electricity)— at a monthly frequency and for a sufficient amount of time would enhance this and similar empirical evaluations. Expanding the available indicators could be a useful contribution from Egypt's statistical agency.

The remainder of this paper is structured as follows. In the next section, we briefly distinguish the conventionally described channels of MTMs, and review some results in the literature related to Egypt's monetary policy that are relevant in the present context. In Section III, we present a descriptive analysis of the major transmission channels in Egypt. In Section IV, we develop a baseline VAR model describing the Egyptian economy and investigate several model extensions to probe empirically into the MTM channels described in the previous section. The last section summarizes the findings and presents some conclusions.

II. BACKGROUND AND LITERATURE

Over the last three decades, there has been a surge in empirical research on the monetary transmission mechanism, enabled by Sim's (1980) introduction of vector autoregressive models into macroeconomics.[3] Mishkin's (1995) preface to a symposium organized by the

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[3] For an interesting account of the chronological research progress, see Favero (2001).

Journal of Economic Perspectives provides a descriptive overview of the channels that have been discussed in the literature. Commonly, these include the following channels:[4]

- The (direct) *interest rate channel*. This Keynesian angle on monetary policy stresses the central bank's capability to have an impact on the real cost of borrowing by changing nominal policy interest rates. Changes in the latter would be transmitted through the banking system to longer-term lending rates and would, therefore, modify the relative demand for credit vs. deposits by the private sector.

- The *exchange rate channel*. A rise in domestic interest rates attracts foreign capital inflows and the domestic currency appreciates in nominal and/or real terms.[5] The nominal appreciation affects the cost of imported goods in the consumer basket, potentially lowering overall inflation. A possible real appreciation, on the other hand, reduces competitiveness and can lead to a fall in net exports.

- The *asset price channel*. This channel is linked to the monetarist view of the MTM and stresses the importance of asset prices for the investment behavior of firms. Since investment decisions are taken in light of the relative value of the firm's capital compared to the replacement value (Tobin's q), lower asset prices—following a monetary tightening and a substitution of investors from equity into bonds—would reduce investment expenditures. Moreover, Mishkin (1995) underlines the associated wealth effect on household consumption, that also occurs through equity prices.

- The *bank lending channel*. This channel focuses on changes in the financial environment for a specific class of firms—whether small companies are able to tap financial markets directly or depend solely on bank borrowing for investment financing. Contractionary monetary policy will exert special impact on this borrower class as they are directly affected by lower bank reserves and hence less loanable funds.

- The *balance sheet channel*. This channel postulates that higher interest rates have ultimately a dampening effect on the economy by worsening corporate balance sheets as the available cash flow falls and retained earnings available for financing investment become scarce. Moreover, the firm is able to borrow less funds for investment purposes due to lower net worth that can be used as collateral.

- The *expectations channel*. The effectiveness of this channel depends on the credibility of the central bank and works through steering expectations of market participants

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[4] See Dabla-Norris and Floerkemeier (2006) for a concise discussion of the various channels and impediments in the context of Armenia, a country at a broadly similar level of development in terms of per capita income (around US$1700 per year).

[5] Of course, central banks can also intervene directly on the foreign-currency market to steer the exchange rate in a specific direction.

about future economic conditions. This mechanism is particularly relevant in advanced economies and can enhance other MTM channels.

In the vast literature on industrial countries' MTMs, the main channel of transmission has been found to work through interest rates, which are passed on to households and firms through a competitive financial sector. There is also a sizeable body of empirical evidence on MTM in emerging markets, transition economies, and developing countries.[6] Contrary to the evidence for industrial countries, most studies on less developed economies find a limited role of the direct interest rate channel, chiefly due to a weak banking system, which, at least in principle, would be responsible for the interest pass-through.

Research on the monetary MTM in Egypt is scarce. Only selected channels of transmission have been investigated. Investigating the exchange rate pass through, Rabanal (2005) finds that the wholesale price index (WPI) reacts significantly to changes in the nominal exchange rate after 6–12 months, whereas the consumer price index (CPI) reacts after 12–24 months, but not significantly. This result is interpreted as evidence for specific structural weaknesses of the CPI measure used until 2003—beyond the fact that a significant share of administered prices contributes to a slow pass-through.

Internal research at the CBE has extended Rabanal (2005) with an updated CPI data series, showing that 26 percent of the shock is passed on to consumer prices after 12 months of the shock.[7] Related research finds that movements in the money gap explain 90 percent of WPI inflation dynamics between 1999 and late 2005, while the explanatory power of the output gap is limited to 12 percent of the fluctuations in the WPI series during the same period.[8] Noureldin (2005) provides similar results.

Hassan (2003) examines the effectiveness of monetary policy, showing that the nominal interest rate does not have a significant impact on real domestic credit to the private sector. Moreover, the relative importance of interest rates in explaining movements in international reserves of the CBE is small compared to that of real domestic credit and the real exchange rate.

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[6] Studies on emerging markets include: India (Al-Mashat, 2003), Thailand (Baqir, 2002), and South Africa (Smal and de Jager 2001). Examples of transition economies include Armenia (Dabla-Norris and Floerkemeier, 2006), Georgia (Bakradze and Billmeier, 2007), and Macedonia (Besimi, Pugh, and Adnett, 2006); see Egert and MacDonald (2006) for an overview of MTM issues in transition economies. Montiel (1990) investigates the monetary transmission channels for developing countries.

[7] See Al-Mashat (2007a). Given the ongoing structural changes in the economy, reliable estimates of money demand are not available. Therefore, the real money gap—defined as the deviation of the actual real money supply from its Hodrick-Prescott (HP) filtered trend value—is used as a proxy for excess money supply. Similarly, demand pressures are modeled by the output gap, constructed as the difference between the real GDP composite index—the weighted average of industrial utilization of electricity, tourist nights, and real credit to the private sector—and its trend value, which is constructed using the HP filter.

[8] See Al-Mashat (2007b).

Several descriptive papers provide some background on monetary policymaking in Egypt. Abu El Eyoun (2003) reviews historical developments of monetary policy since the early 1980's and explores the shift from using the exchange rate as a nominal anchor to targeting inflation and increasing the reliance on indirect instruments. Similarly, Al-Asraj (2004) reviews the performance of monetary policy between 1997 and 2003 and provides a number of recommendations, including on benchmarking the Egyptian pound to a basket of currencies (as opposed to a de facto peg to the U.S. dollar), improving the CBE's liquidity management practice, and strengthening the CBE's supervisory role. The effectiveness of monetary policy is studied from a different angle by El-Refaie (2001) who reviews the coordination between fiscal and monetary policies and operations.

In a recent empirical paper, Moursi, Mossallamy, and Zakareya (2007)—MMZ henceforth—compare various strategies developed during the 1990s to identify the monetary policy stance in Egypt.[9] After providing an insightful discussion on monetary policy in Egypt since 1990, they estimate a structural VAR, paying particular attention to deriving a consistent measure of the monetary policy stance. They also estimate and simulate a series of monetary policy rules and contrast these with the present discretionary approach. MMZ conclude that the direct impact of monetary policy shocks on real output is negligible—supporting the assumption of money neutrality—but argue in favor of an indirect positive growth effect via the target to achieve long-run price stability.

In what follows, we will focus on the first four channels due to the lack of reliable data that would allow investigating the balance sheet and the expectations channel. We are not aware of detailed balance sheet data by currency over a sufficient time period and frequency that covers a sizeable fraction of the corporate sector. From the counterparty perspective, the CBE's monetary reporting to the IMF's International Financial Statistics (Standardized Reporting Forms, or SRFs) does not date back far enough to allow for this type of analysis. Similarly, data on inflation expectations are limited; for example, there are no inflation-indexed bonds, and we are not aware of a representative survey on inflationary expectations similar to the ones available in some advanced economies.

III. MONETARY TRANSMISSION CHANNELS IN EGYPT: A DESCRIPTIVE ANALYSIS

The launch of the CBE's new monetary policy framework in June 2005 marks the beginning of a new approach to formulating monetary policy. In light of this structural change, the remainder of the paper distinguishes between the period from 1996 until June 2005 and the period beginning after the introduction of the new framework and the interest rate corridor, but focuses on the former.

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[9] The identification strategies explored include Bernanke and Blinder (1992), Christiano and Eichenbaum (1992), Strongin (1995), and Bernanke and Mihov (1998).

A. General Background

Since the conclusion of the stabilization program in 1996, the CBE was concerned with achieving multiple objectives simultaneously, which were conflicting in several instances. These objectives included attaining high economic growth while maintaining low inflation and preserving a stable exchange rate.[10] The multiplicity of objectives in the presence of increasing capital mobility (which manifested primarily as inflows) made conducting an independent monetary policy virtually impossible, and clouded the measurement of the monetary policy stance during that period (1996–2005).[11]

Between 1996 and 2005, the CBE's operational target was excess reserves of banks, and given the strong link between monetary aggregates and inflation, growth in M2 was the intermediate target.[12] In its toolkit, the CBE used various quantitative and price instruments at different points in time to achieve its multiple objectives, leading to a lack of consistency in monetary management. These instruments included reserve requirements, government securities, repo and reverse repo operations, and the CBE discount rate.[13] The structure of the banking sector complicated linking the policy decisions to macroeconomic outcomes. The dominance of the state in the banking sector until very recently tended to create rigidities in the interest rate structure.[14] Therefore, the quantitative measures adopted by the CBE at various junctures are likely to have played a more important role in the transmission mechanism compared to price instruments, mainly interest rates. Distortions created by the existence of a substantial amount of NPLs compounded the disconnect between price measures and macroeconomic outcomes. In addition, the exchange rate was the key nominal anchor and policies were geared to maintain its stability vis-à-vis the U.S. dollar, which in

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[10] According to Banking and Credit Law 163 of 1957 and the amendments in decision 59 of 1993, supporting economic development in light of the government's economic plan while maintaining the stability of the Egyptian pound were the final targets.

[11] Amar and Bakardzhieva (2003) argue that the decision to float came as an attempt to resolve policy inconsistency, originating from a combination of (i) exchange rate rigidity; (ii) reluctance to use international reserves to support the peg to the dollar; and (iii) an attempt to reduce the interest rate to activate the economy. Obstfeld and others (2003) discuss the history of the trilemma and the tradeoffs among exchange rates, monetary policies, and capital mobility.

[12] See, e.g., Noureldin (2005) and International Monetary Fund (2006).

[13] During this period, interest rates on treasury bills provided some indication of market conditions as they served as a basis for open market operations and they were traded on a secondary market, but given their role in fiscal policy, it would be misleading to consider them as a monetary policy instrument.

[14] In the mid 1990s, public banks accounted for about two-thirds of the sector assets. In 2006, the government of Egypt privatized the smallest of four public banks, with an approximate market share of 5 percent. Together with buy-outs (by the private sector) in almost all private-public joint-venture banks over the past two years, only three smaller specialized banks and three larger public banks remain. The third-largest public bank is scheduled to be privatized soon, which would bring the market share of public banks significantly below 50 percent.

turn theoretically supported price stability (as long as low inflation prevailed in the United States). As shown in the empirics, the exchange rate channel of monetary transmission was more effective than the interest rate channel.

Under an inflation targeting regime, central banks commonly use price instruments as they are expected to be the most effective tool to conduct monetary policy. In addition, inflation targeting relies on a functioning and competitive banking system. Only in these circumstances can the interest rate channel become strong and, thus, the most convenient mechanism since the exchange rate channel cannot be relied upon actively. Under IT, the exchange rate is abandoned as the nominal anchor and replaced by an explicit price-stability objective.[15] Being easy to interpret and communicate to the public, interest-rate decisions and the interest rate transmission channel become important.[16] Schmidt-Hebbel and Tapia (2002) argue that central banks need to thoroughly understand the intensity and lags with which their policy interest rate impacts the economy and in particular the dynamics of their policy objectives—the inflation target in the case of inflation targeting, for example.

Accordingly, the CBE launched a comprehensive and far-reaching banking sector reform program in 2004. The reform program included the (NPL-related) restructuring and privatization of banks with state participation, a new banking law and other regulatory reforms, the liberalization of the foreign exchange and money markets, and ongoing efforts to strengthen the supervision of banks. This program contained important steps to help overcome the previous shortcomings in the banking sector and fulfill the prerequisites for inflation targeting. The institutional and operational changes initiated under the program to help facilitate monetary policy formulation and assessment and to lay the ground for formally adopting an inflation-targeting regime over the medium term are outlined in Box 1.

Against this background and in light of the multiplicity of objectives and instruments over the whole period 1996–2005, monetary policy making underwent a number of structural breaks. For each transmission channel, there are very specific constraints related to the identification of the proper instruments as well as data availability issues. We discuss each channel in turn.

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[15] Although a functioning exchange rate transmission channel may add to the effectiveness of monetary policy under IT, it is likely that actively manipulating the exchange rate along with inflation is likely to worsen the performance of monetary policy; see Jonas and Mishkin (2003). However, this does not imply that central banks should not pay attention to the exchange rate (Mishkin and Hebbel, 2001).

[16] As described in Schaechter, Stone, and Zelmer (2000), earlier experiences of IT countries involved a combination of exchange rate and inflation targeting. For example, Chile spent more than 10 years in a transition from quasi inflation targeting to fully fledged inflation targeting. During this period, the monetary policy framework was based on a crawling peg exchange-rate regime as well as announcements of an inflation target. The aim in announcing inflation targets was to gradually reduce inflation by providing a focal point anchor for monetary policy that supplemented to the existing crawling exchange-rate band. In Israel, the long transition to inflation targeting similarly began with the move to a crawling exchange-rate band that required inflation targets to define the upward slope of the crawl. Also see Roger and Stone (2005).

Box 1. A New Monetary Policy Framework: Steps Toward Inflation Targeting

Several institutional and operational changes were initiated to help facilitate monetary policy formulation and assessment, and lay the ground for formally adopting an inflation-targeting regime over the medium term.

Institutionally,

- *The Coordinating Council on Monetary Policy* headed by the Prime Minister was established in January 2005 to ensure that government policies are consistent with the objectives of monetary policy. In its first meeting, the objectives of monetary policy and the importance of CBE independence were discussed.

- To carry out its better-defined mandate, the CBE established a *Monetary Policy Committee* (MPC), which convenes on Thursdays every six weeks to decide on key policy rates. The MPC consists of nine members: the Governor, the two Deputy Governors, and six members of the CBE's Board of Directors.

- *The Monetary Policy Unit* was established as a satellite unit within the CBE to play a key role in providing objective monetary policy analysis, assessment, and modalities of communication with the market through its research and other functions.

- To enhance transparency, bolster the credibility of the CBE, and help anchor inflation expectations, MPC's decisions are communicated to the market through a *monetary policy statement*, which is released on the CBE's external web-site after each meeting.

Operationally,

- On June 2, 2005 the CBE introduced *an interest rate corridor*. The CBE's two standing facilities, the overnight lending and a deposit facility. The interest rates on the two standing facilities define the ceiling and floor of the corridor, respectively. By setting the rates on the standing facilities, the MPC determines the corridor within which the overnight rate can fluctuate. Effectively, steering the overnight rate within this corridor is the operational target of the CBE.

- Starting in August 2005, in addition to deposit auctions, central bank notes were added to the CBE's toolkit as the primary instrument for liquidity management via open market operations.

- Alternative models to forecast inflation have been developed.

B. The Interest Rate Channel

During the period 1996–2005, the Egyptian central bank did not control a consistent interest rate-based indicator of the monetary stance. The overnight domestic currency interbank market was only introduced in 2001 and the overnight interest rate proved extremely volatile at the beginning, hardly a good measure of the monetary stance.[17] There are, however, several

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[17] After the liquidity problems that surfaced in the market during 2000 and 2001, the CBE supported the launch of a domestic-currency interbank market. The CBE's change of monetary-policy framework in 2001 enhanced the degree of market determination of the short-term interest rate. Before the introduction of the overnight interbank market, the short-term policy rate only moved within a very limited range, rendering it a rather weak signal of the monetary policy stance.

interest rates that could serve as alternative indicators of the monetary policy stance.[18] The 3-month treasury bill rate could be considered, to some extent, a short-term policy rate given that the securities were issued in coordination with the CBE in order to sterilize capital inflows, with the amount issued substantially exceeding the financing needs of the government (El-Refai, 2001). Although a "policy rate," the CBE's discount rate cannot be considered a key signaling device between 1996 and 2005 in light of the continued downward trend (as opposed to a cyclical behavior).

Casual inspection reveals that movements in these interest rates appear to be secular, with no evident cyclical pattern, which suggests that the interest-rate channel did not materially contribute to economic fluctuations in Egypt.

Figure 1. Interest Rate Developments, 1996–2007
(In percent)
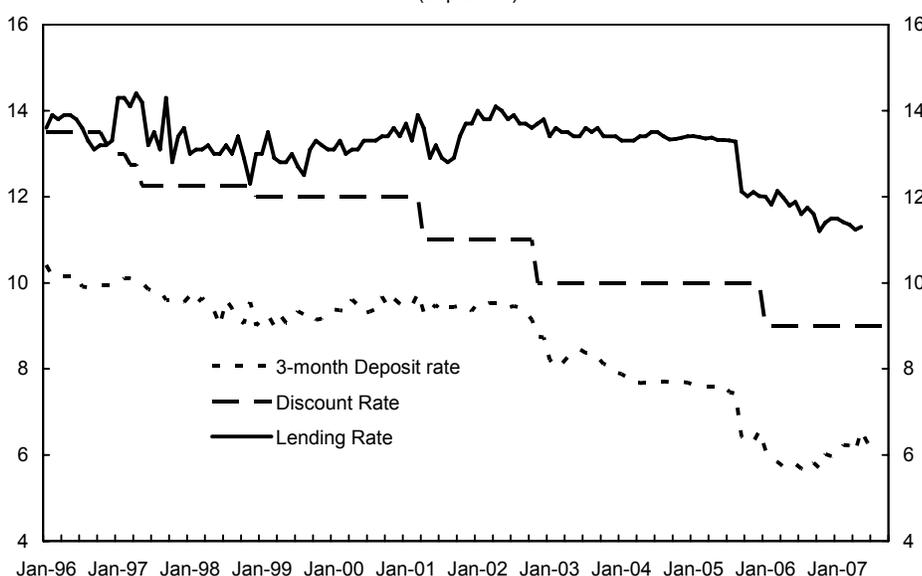
Source: Central Bank of Egypt (CBE); and authors' calculations.

During the period under investigation (1995–2005), the coefficient of variation in the nominal policy interest rates (treasury bill rate and discount rate) was quite low ranging between 0.1 and 0.3 throughout the period.[19] This was reflected in the nominal retail rates as well which also demonstrated low variability ranging between 0.04 and 0.1. In addition, Granger causality tests (see Section IV. C) suggest a weak interest rate transmission channel for Egypt during the period under investigation.

[18] MMZ (2007) argue that the CBE, between 1980 and 2005, did not rely on a single short-term policy rate but used several interest rates, see Section IV.A.

[19] The coefficient of variation is defined as the standard deviation divided by the sample mean.

Excess reserves
(In LE million)

June, 5 2005: Adoption of interest rate as operational target
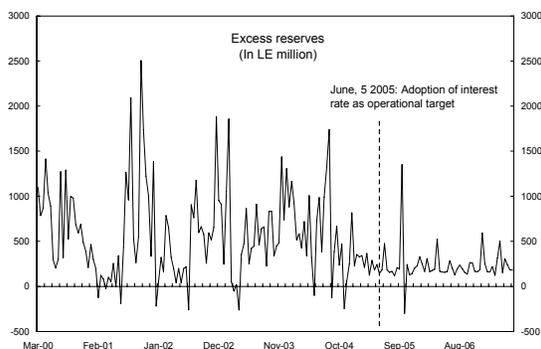
This result is not surprising given that the CBE's operational target at the time was the banks' excess reserves, which were very volatile (see text chart), while the intermediate target—M2—grew at a broadly constant rate. In other words, the quantitative measures undertaken by the CBE were considered more effective in steering aggregate demand.

For example, a succession of exogenous shocks in 1996/97—the decline in international oil price, the East Asian crisis, and the Luxor attack—triggering a rapid weakening of Egypt's external position as capital inflows and tourism revenues subsided. These shocks combined with loose monetary and fiscal policies led to a widening of the current account deficit, to about 3 percent of GDP in 1997/98 as the trade balance worsened.[20]

This deterioration of Egypt's balance of payments between 1997 and 2000 presented a predicament in terms of developing a proper policy response in light of the CBE's multiple objectives. On the one hand, strong economic growth was a key priority, especially given the importance of generating new employment opportunities in the private and public sectors. On the other hand, sustaining confidence in the Egyptian pound and retaining the exchange rate anchor were of similar importance and required maintaining high official reserves.

These largely self-imposed constraints on policy responses to the weakening external position effectively precluded monetary tightening, a rundown of official reserves, and a depreciation of the pound. These inconsistencies posed a substantial challenge to monetary policy and led to a series of adverse events, since domestic credit continued to grow at high and rising rates (around 25 percent annually through end-1999 on average) while interest rates remained flat. Notwithstanding the continued credit expansion, real GDP growth started to slow after 1997/98, including due to the collapsing share of investment in GDP. Drastically slowing goods imports (by volume), together with a decrease of the value (in U.S. dollars) of investment and intermediate goods between 1998/99 and 2001/02 point to growing difficulties to import intermediate goods vital for the production process.

Toward the end of 1999, higher bank financing requirements of the government became particularly evident as well.[21] As a result, the exchange rate faced downward pressure and a

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[20] After providing a reliable source of export earnings, oil proceeds were sharply lower in 1997/98 reflecting both the slump in world market prices as well as a further narrowing of the exportable surplus. With non-oil exports remaining more or less flat in nominal terms, total export earnings declined. On the other hand, the prices of non-oil imports declined which allowed imports to remain virtually unchanged in value terms.

[21] At least two factors contributed to the high and rising growth rate of bank credit during this period: (i) the reliance upon commercial bank to cover the bulk of the external financing gap entailed an increase in the banks' domestic liquidity and hence lending capacity. While the process served to alleviate the immediate pressure on

(continued)

divergence between the official rate announced by the CBE and the one quoted by foreign exchange dealers emerged (see next section).

This led the CBE to resort to quantitative trade measures, including requirements for importers to put up a 100-percent cover when opening import letters of credit. Moreover, the CBE tried to affect aggregate demand by reducing the reserve requirement ratio on domestic-currency deposits from 15 to 14 percent. In addition, the calculation of the ratio itself changed (removing the 3-year saving certificates from the denominator) to free additional resources and encourage investment. Furthermore, the maintenance period was lengthened from one to two weeks in 2002, another step to support banks in their liquidity management. These measures, essentially taken to fix the exchange rate problem, however, exacerbated the lending situation and led to a "liquidity crunch" in the banking sector (see Section E below).

Summing up, over the period 1996/97 through 2005, the CBE did not dispose of a continuous indicator of the monetary policy stance. In the empirical section, we will therefore use an constructed measure of the policy stance derived in MMZ (2007).[22] As a robustness test, we will also employ a monetary aggregate: reserve money.

C. The Exchange Rate Channel

This transmission channel assumes that changes in the monetary policy stance are directly reflected in the exchange rate, influencing the external position through changes in aggregate demand and aggregate supply, and, ultimately, output. As the foreign exchange market is relatively fast to emerge compared to other transmission channels, this mechanism generally constitutes the most important channel of monetary policy transmission, especially in countries with underdeveloped financial markets. During the period under investigation, there were significant changes in the exchange rate dynamics in Egypt, which have been largely mirrored in domestic prices via the exchange rate pass-through.

While the relationship to the U.S. dollar is the most prominent in Egypt, in particular in light of the past pegs, this focus does not capture an important share of exchange rate developments against other currencies. In the context of this paper, we use the nominal effective (i.e., trade-weighted) exchange rate in the baseline empirical model in the next section. For the descriptive purposes of this section however, we distinguish four periods in the exchange rate behavior against the main reference currency, the U.S. dollar:

Phase I: January 1997 to December 2000

During this period, the Egyptian pound was de jure (and de facto) pegged to the U.S. dollar. Under this arrangement and in light of difficulties in the external sector, Egypt was incurring

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the CBE's international reserve position, the conversion by the commercial bank of their foreign into domestic assets fuelled domestic demand; and (ii) banks' holdings of government debt fell sharply during this period as sterilization needs subsided.

[22] For more details, see Box 2 in Section IV.A.

substantial balance of payments deficits. To maintain the peg, the CBE had to intervene in the exchange rate market on a periodical basis, reducing its foreign reserves steadily from US$16.8 billion in early 1997 to US$12.9 billion in late 2000. Accordingly, a series of step devaluations amounting to 8.4 percent (against the U.S. dollar) were engineered starting in April 1999 to prevent the dry up of foreign reserves. On the inflation front, wholesale and consumer price inflation—at an annual average of 2.1 percent and 3.2 percent—remained low with minimal signs of volatility even after the first devaluations, supported by the prevailing low international commodity prices and the U.S. dollar peg at the time.

Figure 2. Price and Exchange Rate Movements, 1997–2007
(In 12-month percent change)
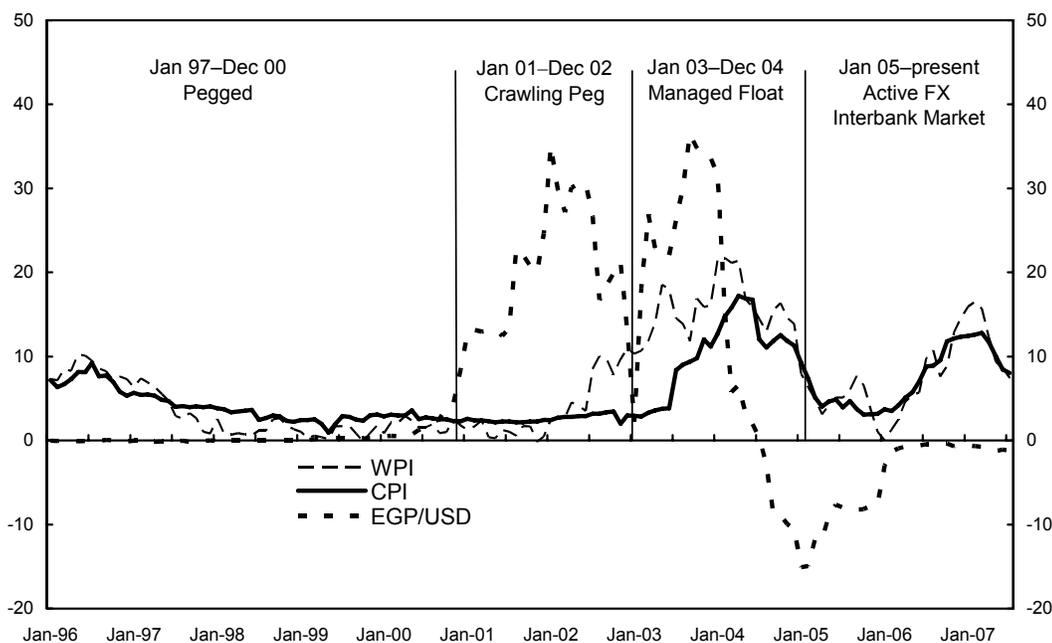
Sources: CBE; and authors' calculations.

Phase II: January 2001 to December 2002

The situation changed in the beginning of 2001, when the exchange rate was set to crawl within horizontal bands in an unsuccessful attempt to reduce emerging shortages in foreign exchange. Initially, a band of ±1 percent was established around the central rate, but it was eventually widened to ±3 percent in August 2001. Nevertheless, the problem exacerbated further, given that the supply of foreign exchange in the official market dropped sharply in 2002 as exporters and holders of foreign currency sought more attractive rates in the parallel market

Multiple Exchange Rates, 2001–2005
(LE per U.S. dollar)

Black market exchange rate
Official exchange rate
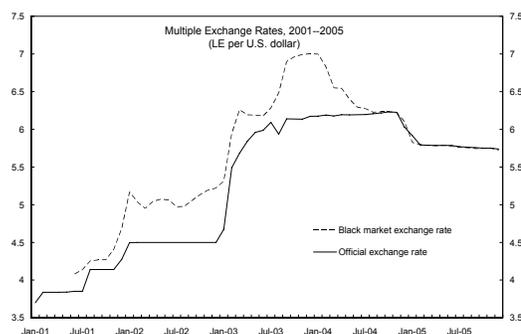
to satisfy the excess demand.[23] With a continuing shortage of foreign exchange in the official market on the one hand and the CBE's reluctance to devalue or allow its foreign reserves to fall below US$14 billion on the other, activity in the parallel market expanded significantly to the extent of trading at a 15 percent premium over the official rate in 2002. Meanwhile, domestic prices remained surprisingly stable until the second half of 2002 finally reflecting a very slow pass-through from the series of step devaluations starting in April 1999.[24] Over the whole period, the annual growth rates of WPI and CPI inflation averaged 3.7 percent and 2.6 percent, respectively.

Phase III: January 2003 to December 2004

In light of the deteriorating situation in the foreign exchange market and its detrimental spillovers into the rest of the economy, the authorities decided to adopt a new exchange rate policy in January 2003 under which the exchange rate was allowed to float. However, the lack of credibility in this new system and the public's expectations of a further drastic depreciation led to the hoarding of foreign exchange receipts and speculative activities in face of an inoperative interbank market. This, in turn, caused shortages of foreign exchange in the official channels which led to the reemergence of the parallel market.

By mid 2004, it was clear that a formal framework for the interbank foreign exchange market was essential to achieve a smoothly functioning foreign exchange market. Hence, in December 2004, the CBE officially launched a new interbank foreign exchange market that accommodated all foreign exchange transactions between banks. By the time the foreign exchange interbank market was fully functioning, activity in the parallel market had already diminished as a result of ample dollar liquidity from current account inflows, reflecting the rising competitiveness that resulted from the real effective depreciation during the preceding years.[25] The turbulence in the foreign exchange market during this phase was reflected in highly volatile domestic prices. The WPI and CPI inflation rates accelerated to double digit levels to reach a peak of 21.7 percent and 17.2 percent in February and April 2004, respectively. On average over the two-year period, WPI and CPI inflation amounted to 15.7 percent and 10.2 percent, respectively. The persistently high inflation levels that prevailed between January 2003 and December 2004 can be traced back to the lagged pass-through effects of the exchange rate changes, which witnessed a cumulative depreciation of 32 percent in the official EGP/USD exchange rate.

Phase IV: Since January 2005

The pound appreciated by about 7 percent within one quarter of launching the foreign-exchange interbank market in December 2004, with a corresponding disinflationary impact

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[23] The parallel market emerged in 1999. However, parallel market data are only available starting 2001.

[24] The long lag between movements in the exchange rate and the price level triggered a revision of the CPI methodology, and a new CPI series was published in 2003.

[25] El Qorchi (2007).

on domestic prices. Between February 2005 and July 2007, however, the nominal exchange rate versus the U.S. dollar has been broadly stable, limiting exchange rate effects on domestic prices. Only very recently, against the background of the mid-2007 market jitters, has the bilateral exchange rate varied somewhat in the context of sizeable capital inflows and outflows. The upward trend in annual inflation witnessed in the previous phase was reversed in early 2005 as inflation rates were generally moving downwards to low single digit levels—3.1 percent for the WPI and 4.1 percent for the CPI—in April 2005. Starting in early 2006, however, inflation started to rise and spiked in March 2007, driven largely by the impact of an avian flu outbreak and adjustments in administered prices in conjunction with some domestic demand pressures emanating from high economic growth.

D. The Asset Price Channel

The asset price channel is based on Tobin's q theory of investment and possible wealth effects on consumption and, ultimately, output. In principle, the asset price channel can work through any asset market, including securities markets and real estate.

In Egypt, the only well-documented asset market for the purposes of this paper is the stock exchange. Established more than 100 years ago, the Cairo and Alexandria Stock Exchanges (CASE) have recently gained much attention in light of the significant increases in market capitalization, turnover, and large swings in valuation (see text chart).[26] After a period of subdued activity since the mid-1990s, it wasn't until 2003 that stock market activity started to pick up (see Table 1.) For example, between March 2003 and

Sources: Shuaa Capital, Cairo and Alexandria Stock Exchanges (CASE); and authors' calculations.

February 2006, the stock market index CASE 30 increased by about 12 times before it lost about 35 percent within four months during the regional stock market correction. Although the stock market index was almost flat between 1998 and 2003, the rapid development since then could have contributed to the impact that the monetary policy stance has on real activity and prices. Similarly, there is anecdotal evidence of a strong increase in real estate prices over the last few years all across Egypt, leading to higher household wealth. However, data are sketchy, rendering empirical analysis in the present context impossible.

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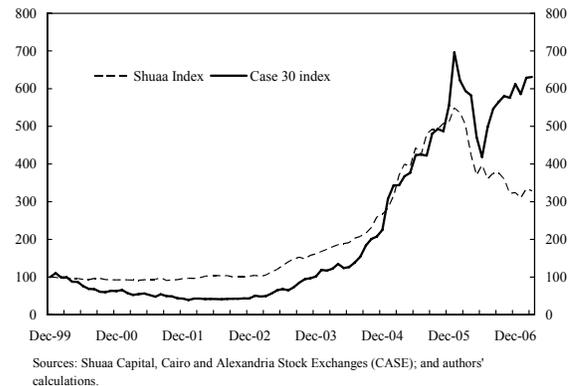
[26] See Billmeier and Massa (2007a) for more evidence on the Egyptian stock market. Billmeier and Massa (2007b) investigate to what extent remittances, the quality of institutions, and hydrocarbon wealth had had an impact on stock market development in a sample of 17 economies in the Middle East and Central Asia.

Table 1. Cairo and Alexandria Stock Exchange Indicators, 1996–2006

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Number of companies listed	646	654	870	1033	1076	1110	1151	978	795	744	595
Number of companies traded	354	416	551	663	659	643	671	540	503	441	407
Market capitalization (L.E. billions)	48	71	82	112	121	112	122	172	234	456	534
Market capitalization (percent of GDP)	19	27	29	36	36	30	29	35	43	74	80
Total volume of stocks (L.E. billions)	0.2	0.4	0.6	1.1	1.1	1.3	0.9	1.4	2.4	5.3	9.1
Total value traded (L.E. billions)	11	24	23	39	53	32	34	28	42	161	287
Number of transactions (L.E. millions)		1.23	0.69	0.91	1.29	1.15	0.83	1.23	1.74	4.2	6.8
Average daily value traded (L.E. millions)		97	96	157	218	129	137	114	170	645	1176
Turnover ratio (%)	23	29	23	29	35	14	10	13	15	31	51
Egyptian investors in terms of value traded (percent)		83	80	78	79	84	81	80	73	70	70
Foreigners investors in terms of value traded (percent)		17	20	22	21	13	17	13	21	16	17
Arab investors in terms of value traded (percent)						3	2	8	7	14	14
CASE 30 index		1000	660	1140	716	490	493	1156	2568	6325	6973

Source: Capital Market Authority.

E. Bank Lending Channel

Under the bank lending channel, changes in the amount of credit available resulting from changes in the stance of monetary policy—for example, direct controls on the quantity and allocation of credit through changes in the reserve requirements and credit ceilings—have an impact on economic activity. This channel amplifies and propagates the effects of changes in policy instruments referred to in the (direct) interest rate channel.

Summarizing, the evidence on the relationship between bank lending and economic activity appears mixed. Total lending from commercial banks to the private sector as a share of GDP increased until 2001 and has decreased since then (Table 2). On the one hand, this boom-bust cycle in bank lending in the late 1990s and early 2000s is mirrored in the business cycle, implying that even in the case of a weak interest rate channel, the bank lending channel affects aggregate demand. On the other hand, the economic expansion since 2004 has until recently not been accompanied by a sizeable increase in commercial banks' lending to the private sector. Moreover, low variability in lending rates, whether in nominal or real terms, and government ownership of a large share of bank assets contributed to a disconnect between borrowing decisions and prevailing interest rates.

The absence of a competitive environment in the banking sector (especially information asymmetries due to the lack of a credit registry) biased lending in favor of large cooperates with solid reputations. After abolishing the credit ceilings on lending to the private business sector (PBS) in October 1992, loans to the PBS accelerated, reaching a peak in 1994/95 and registering 33 percent (y/y) growth, notwithstanding the relatively high lending rate at the time. During this period, borrowing decisions became increasingly decoupled from price signals in the loan market.

Table 2. Bank Lending by Recipient, 1996–2007
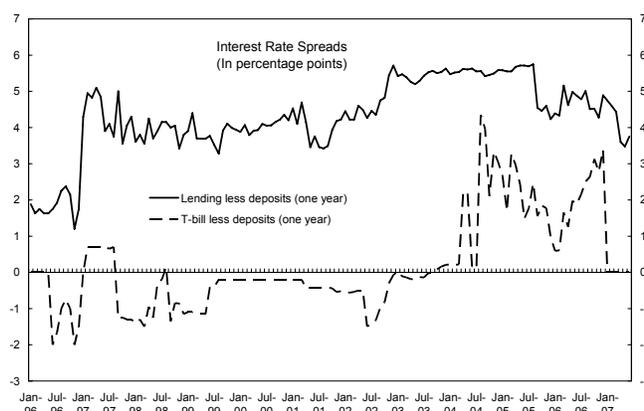(In percent of GDP; end of fiscal year July–June)

	1996	2001	2006	2007
Total bank loans	60.3	72.8	55.8	51.8
Private sector	38.4	59.9	46.6	44.3
Business	30.3	49.6	36.9	35.0
Household	7.5	9.3	9.1	8.8
Foreign	0.6	1.0	0.5	0.6
Public sector	21.9	12.9	9.2	7.4
Public economic authorities	3.4	3.5	3.5	3.8
State-owned enterprises	13.4	8.8	5.6	3.6
Government	5.1	0.5	0.1	0.0
Memo Item:				
Holdings of government securities	16.1	14.8	22.5	16.2

Sources: Central Bank of Egypt; and authors' calculations.

Lending to the PBS continued to rise at a slower pace in the wake of the Asian crisis as the weakening of the Asian currencies triggered higher imports from that region and the need to cover these imports by borrowing from banks. Moreover, in line with the government's growth objective, there was a tendency to increase lending to the PBS, particularly to the real-estate projects related to the tourism sector.

By end-1999, however, the expansive mood had changed, and borrowers experienced a credit crunch. The slowdown in lending was, however, not triggered by higher borrowing costs. Instead, various forms of credit rationing affected the decision to borrow or not to borrow. These measures included (i) the 100-percent cover imposed by the CBE on letters of credit for import purposes given bottlenecks in the foreign exchange market; (ii) a drastic reduction of bank lending to the construction sector as the sales slowed markedly; (iii) significant amounts of government borrowing from the private corporate and the household sector as the fiscal position deteriorated; and (iv) tighter lending requirements that were established after the emergence of a large amount of NPLs, partly tied to the real estate bubble.[27]

Attracted by competitive yields in risk-adjusted terms, the commercial banking sector has, between 2000 and 2006, built up a sizeable position of government securities on its balance sheet, crowding out lending to the private sector (see Table 2). This stable flow of investment income—as opposed to risky lending—has formed the basis for a "quiet" recapitalization of the banking sector, helping banks address

Interest Rate Spreads
(In percentage points)

Lending less deposits (one year)
T-bill less deposits (one year)

[27] As a consequence of the real estate lending crisis, the CBE adopted a prudential regulation that limits the share of banks' lending to the real estate sector to 5 percent of total lending.

the NPL issue. While still decreasing as a share of GDP, lending to the private sector, especially households, has started to pick up again since 2006. This recovery has been reinforced by a recent substantial drop in yields of government securities, exerting pressure on banks' income position, cost of funding, and the interest rate spread. This decrease in yields is related to Egypt's increasing integration into global financial markets, resulting in foreign investors' strong interest in Egyptian government securities due to the perceived low credit and exchange-rate risk and to the sizeable interest-rate differential.

The banking sector reform program, initiated by the CBE and the government in 2003, is transforming the structure of the Egyptian banking sector. Under the reform program, the minimum bank capital has increased and supervision has been strengthened. As a result, weaker banks have left the system through sales, purchases, and mergers, as well as exits of some foreign banks' branches. Their number has declined from 57 in 2004 to 39 in 2007, with a corresponding increase in the average bank size. Moreover, the CBE has tackled the resolution of the remaining NPLs in the sector, thereby cleaning up public banks' balance sheets. Although state banks still account for a large share of sector assets, further progress should contribute to a better functioning of the bank lending channel going forward.

IV. MONETARY TRANSMISSION IN EGYPT: SOME EMPIRICAL RESULTS

A. Data and Choice of Variables

In the baseline specification of the VAR, we use monthly observations running from January 1996 to June 2005, when the overnight corridor was introduced.[28] Our choice of sample span is driven by the regime change in monetary policy implementation related to the successful introduction of the interest rate target corridor. The variables contained in the VAR consist of a measure of economic activity, the price level, a measure of the monetary policy stance, and of the exchange rate. Using monthly observations, however, comes at a drawback: data from the national accounts (consumption, investment, output) are not available at a monthly frequency. In this respect, we are able to build on recent work by MMZ by using one of their measures of economic activity which are distributed from lower (quarterly and annual) data on real GDP to higher (monthly) frequency observations.[29] We also take advantage of the results in MMZ in another dimension—we use their measure of the monetary policy stance (text chart and Box 2) for our baseline VAR, as it yields the most significant

—— Monetary policy stance
----- 3-month deposits interest rate

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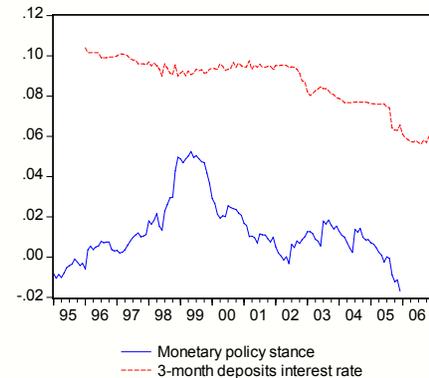
[28] The maximum number of observations for any given model is 114, but some of the series start later, reducing the number of observations slightly in selected models.

[29] MMZ (2007) develop two high-frequency measures, following statistical distribution techniques developed in Litterman (1983) and Chow and Lin (1971). In what follows, we will use the Litterman (1983) measure.

results in most specifications. This indicator is meant to capture both the anticipated and surprise component of monetary policy.[30] We have also estimated most specifications with the interest rate MMZ find most similar to their monetary stance measure, the 3-month deposit rate. Again, most results are qualitatively similar, but less significant, pointing to the CBE's limited ability to control price developments and send a clear signal of the monetary stance during the sample period (i.e., before the introduction of the interest rate corridor).

Box 2. The Monetary Policy Stance Index

Moursi, Mossallamy, and Zakareya (2007)—MMZ—apply a six-variable semi-structural VAR methodology pioneered by Bernanke and Mihov (1998)—BM—to compute a monetary policy stance index for Egypt and assess its impact on the economy. According to BM, measuring the monetary policy stance requires the identification of the monetary instruments that can best describe the policy shocks and the choice of a model that can illustrate the behavioral dynamics that explain the structural responses to those shocks (see Favero, 2001).

The structure of the VAR model suggested by BM and applied by MMZ depends on a simple description of the market for bank reserves that is represented in innovation form by the following equations:

(1) $\qquad u_{TR} = -\alpha u_{IR} + v^d$

(2) $\qquad u_{BR} = \beta u_{IR} + v^b$

(3) $\qquad u_{NBR} = \phi^d v^d + \phi^b v^b + v^s$

Equations (1) and (2) describe banks' demand (expressed as innovations/VAR residual) for total (TR) and borrowed (BR) reserves. The monetary policy interest rate (IR) affects negatively the former and positively the latter; v^d, v^b are the corresponding disturbances. The supply of non-borrowed reserves (NBR) in equation (3) reflects the central bank's behavior in reaction to disturbances to total and borrowed reserve demand as measured by coefficients ϕ^b and ϕ^d. Moreover, variations in non-borrowed reserves may also stem from a genuine monetary policy shocks not related to reserves demand behavior, and v^s in equation (3) represents the monetary policy shock to be identified.

MMZ estimate equations (1)-(3) within a structural VAR, taking into account a number of parametric restrictions, to compute the measure of monetary policy stance. They identify total reserves, non-borrowed reserves and short-term interest rates as policy variables, while real GDP, GDP deflator, and an index of commodity prices are the non-policy variable.[1] The VAR estimates are obtained using monthly data for Egypt during the period 1985–2005. MMZ find that the estimated monetary policy stance index traces the episodes of monetary easing and tightening between mid-1980 and 2005.

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[1] MMZ establish that between 1985 and 2005, the CBE used at least four different rates of interest as policy instruments, including the discount rate, 3-month deposit rate, 3-month treasury bill rate and the interbank overnight rate. MMZ estimate a VAR for each.

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[30] A higher value of the measure indicates monetary easing. The measure is based on the Bernanke and Mihov (1998) model, which MMZ find to fit the Egyptian data best; see Section 3.3 of MMZ for further details. We are grateful to MMZ for providing these series to us.

Given concerns about statistical weaknesses in Egypt's CPI—including those due to a delayed response to exchange-rate changes (see above) and to the sizeable share of administered prices (around one-third of all items)—we have used the WPI in our baseline specification. Most of the qualitative results remain unchanged if we use the CPI, but the significance is often less pronounced, indicative of the statistical problems associated with the CPI.[31] The WPI series (as well as the CPI) are taken from the CBE's database and stem originally from Egypt's statistical agency, CAPMAS.

As for the exchange rate measure, we employ Egypt's nominal effective exchange rate (in most scenarios, including the baseline), but we also experiment with the real effective and the bilateral U.S. dollar exchange rate. The bilateral exchange rate is constructed, as explained above, whereas the effective exchange rates come from the IMF's *International Financial Statistics* database and are based on the official exchange rate.[32] While for the bilateral U.S. dollar exchange rate, an increase in the value (or a positive shock) corresponds to a depreciation, the effective exchange rates are defined as the inverse: a positive shock corresponds to an appreciation.

We also include two exogenous variables, the (log) oil price, and the U.S. federal funds rate, to avoid well-known empirical anomalies such as the price puzzle.[33] The crude oil price (here a simple average of the spot prices for dated Brent, West Texas Intermediate, and the Dubai Fateh) is often seen as a leading indicator for the central bank reflecting looming supply-side-driven price pressures, whereas the federal funds rate captures the opportunity cost of holding reserves. The series are sourced from the IMF's database and from the Fed's website.

As seasonality issues tend to be pronounced with monthly observations, we adjust all data accordingly (except for the monetary stance/interest rate) prior to estimation using the X12 filter. As a consequence, we are able to significantly reduce the number of lags needed in the VAR to correct for residual autocorrelation. For most specifications—including the baseline VAR—three lags are sufficient, as indicated by information criteria and lag exclusion tests.

Some of the series are likely to be nonstationary. We conducted augmented Dickey-Fuller tests, which suggest that the null hypothesis that the four variables in the baseline VAR are I(1) or have unit roots cannot be rejected in levels but can be strongly rejected in first

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[31] See also Rabanal (2005).

[32] More precisely, the effective exchange rates are based on the "representative" exchange rate, a legal rate which shadows—but is not perfectly equal to—the "official" rate. Official inflows and outflows of foreign currency (e.g., Suez Channel) were valued at the latter, whereas foreign currency was made available by banks to private agents at the representative rate.

[33] Favero (2001).

differences.[34] We refrain from exploring long-run cointegrating relationships more thoroughly in light of the rather short time span covered by the data. Consistent with the literature, the analysis below is conducted in levels as the transmission mechanism is primarily a short-run phenomenon (Favero, 2001).

B. Baseline Model

We present the results of the bivariate and multivariate Granger causality tests (Table 3) as preliminary evidence of the causal links between monetary policy and economic outcomes (prices and output). The evidence suggests a significant effect of the NEER on both output and prices. Elimination of the monetary policy stance as an explanatory variable is not rejected empirically; this holds for both the MMZ measure and the 3-month deposit rate.

Table 3. Granger Causality Tests, Baseline VAR Model, 1995M1–2005M6 1/

	Dependent variable: Output					
Excluded variable	Chi-square	(dof)	p-value	Chi-square	(dof)	p-value
Prices	9.33	3	0.025 **	9.69	3	0.021 **
Monetary policy stance measure	0.50	3	0.919			
Three-month deposit rate				4.32	3	0.229 ***
NEER	8.59	3	0.035 **	13.05	3	0.005
Jointly	25.70	9	0.002 ***	35.72	9	0.000
	Dependent variable: Prices					
Excluded variable	Chi-square	(dof)	p-value	Chi-square	(dof)	p-value
Output	16.45	3	0.001 ***	18.24	3	0.000 ***
Monetary policy stance	4.93	3	0.177			
Three-month deposit rate				4.99	3	0.173
NEER	14.12	3	0.003 ***	18.72	3	0.000 ***
Jointly	32.03	9	0.000 ***	42.59	9	0.000 ***

Source: Authors' calculations.

1/ The block Granger causality test for exclusion of a variable is based on a Wald test and follows a χ^2 distribution; *, **, and *** denote rejection of the exclusion at the 10, 5, and 1 percent level.

Based on this preliminary evidence, we estimate a reduced-form VAR and identify monetary policy shocks through assumptions about variable ordering (using a lower diagonal, or Choleski decomposition). The VAR representation is given by

$$X_t = A(L)X_{t-1} + B(L)Z_t + \varepsilon_t, \tag{3}$$

where X_t is a vector of endogenous variables and Z_t a vector of exogenous variables as discussed in the previous section. In the baseline model, the vector of endogenous variables consists of the real (distributed) monthly GDP (y_t), the wholesale price index (p_t), the
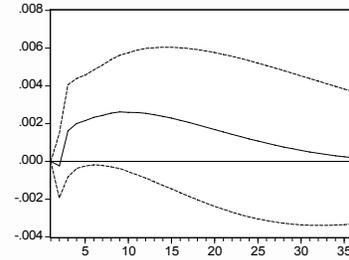
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[34] Traditional unit root tests may have little power to distinguish between unit roots and stationary series in short samples, see the discussion in Dabla-Norris and Floerkemeier (2006). The results are not reported here to contain space but are easily reproducible and can be obtained from the authors.

monetary policy stance measure developed in MMZ (mps_t), and the nominal effective exchange rate (er_t):

$$X_t = \left(y_t, p_t, mps_t, er_t \right)', \tag{4}$$

whereas the exogenous variables include the oil price and the U.S. federal funds rate. With the Choleski decomposition, the variable ordering is important. We order the variables as follows: output, prices, monetary policy stance, exchange rate. Given the monthly frequency, this decomposition implies that within a given month, variables do not have a same-period impact on variables ordered before—a reasonable assumption in our view.

In the baseline model, the price level displays a strongly significant response to exchange rate shocks, but a not quite significant response to the monetary stance measure developed in MMZ (Figure 3).[35] The response of prices to an increase in the monetary policy measure (easing) is closer to significance if we extend the sample until end-2005 (see text chart). While not significant, the response of output to shocks to the monetary policy stance is in line with expectations—after about a year or so, output starts rising in response to an easing stance. The significant positive response of output to a nominal appreciation shock, however, is somewhat counterintuitive and warrants further attention.[36] The strong deflationary impact of a tightening on the WPI is intuitive and consistent with earlier findings (Rabanal, 2005).

Figure 3. Selected Impulse Responses, Baseline VAR
(One standard deviation innovations ± 2 standard errors)

Response of Output to MP Measure

Response of Output to Exchange Rate

Response of Prices to MP Measure

Response of Prices to Exchange Rate
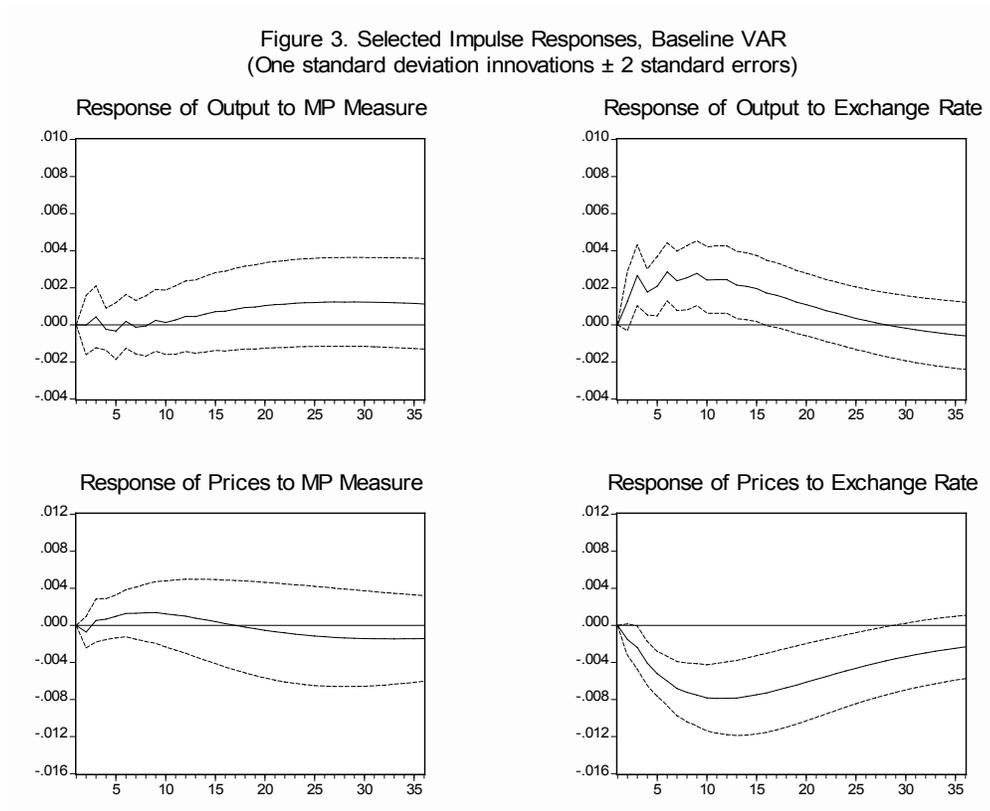
The variance decomposition for the baseline VAR indicates that most variables are highly idiosyncratic: even after five years, the variation of three out of four variables is explained by their own innovations. The exception is the WPI, whose variation after barely one year is mainly explained by the NEER—consistent with a strong exchange rate pass through to the WPI.[37]

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[37] In results not reported here, we found that if we substitute the CPI for the WPI in an otherwise similar model, output and NEER innovations explain about 40 percent each of CPI variation at the 30-to-60-month horizon, confirming the result in Rabanal (2005) that the pass-though to the CPI is weaker than the one to the WPI.

Table 4. Variance Decomposition Baseline VAR, 1995–2005
(In percent of total variance)

Variance Decomposition of Output

Months	Standard error	Output	WPI	MP measure	NEER
1	0.0081	100	0	0	0
2	0.0083	96.0	1.7	0.0	2.3
3	0.0092	83.8	5.7	0.2	10.2
6	0.0118	78.1	4.0	0.3	17.6
12	0.0148	68.4	2.9	0.4	28.4
24	0.0180	66.0	3.7	3.4	26.8
60	0.0251	71.2	4.5	7.2	17.2

Variance Decomposition of WPI

Months	Standard error	Output	WPI	MP measure	NEER
1	0.0085	0.1	99.9	0.0	0.0
2	0.0117	3.1	94.8	0.4	1.7
3	0.0132	2.6	92.3	0.5	4.6
6	0.0178	2.0	68.9	1.2	27.8
12	0.0269	3.9	35.2	1.8	59.2
24	0.0365	7.6	19.9	1.3	71.2
60	0.0409	11.3	16.5	3.9	68.3

Variance Decomposition of Monetary Policy Measure

Months	Standard error	Output	WPI	MP measure	NEER
1	0.3427	0.0	0.2	99.8	0.0
2	0.4708	0.0	2.0	98.0	0.0
3	0.5787	0.3	1.5	98.2	0.0
6	0.7717	0.6	1.3	98.0	0.1
12	0.9575	1.8	1.7	96.3	0.2
24	1.0762	4.8	1.9	93.1	0.3
60	1.1734	13.3	1.8	84.3	0.6

Variance Decomposition of NEER

Months	Standard error	Output	WPI	MP measure	NEER
1	0.0226	0.0	2.3	0.0	97.7
2	0.0355	0.0	1.4	0.5	98.1
3	0.0439	0.1	2.0	1.6	96.4
6	0.0604	0.1	2.0	2.0	95.9
12	0.0791	0.4	1.3	1.3	97.0
24	0.0911	0.6	1.0	3.5	94.9
60	0.0956	1.4	0.9	8.8	88.9

Source: Authors' estimates.

C. Robustness of the Baseline Results

We check these baseline results for robustness in two ways: (i) by using a monetary aggregate (reserve money) to signal the monetary stance; and (ii) by inversing the endogenous variable ordering, exchanging the exchange rate and the monetary stance variable. While the former check is driven by the attempt to employ a quantity measure of the monetary stance (as opposed to artificial or price-based), the latter check is motivated by the fact that the exchange rate may be considered, at least occasionally, a policy target, and hence exogenous to the monetary stance in the short run.

Substituting reserve money for MMZ's monetary policy stance measure does not change the key results from the baseline specification (Appendix II). Output has the same unexpectedly

positive reaction to an appreciation, and prices respond negatively and significantly to an appreciation. Regarding monetary policy shocks (an easing corresponds now to an increase in reserve money), output continues to respond positively but insignificantly, whereas the WPI no longer shows the initial (insignificant) increase from the baseline scenario. Another response also documents the limited use of reserve money as an indicator of the monetary stance—the nominal effective exchange rate appreciates in response to an expansionary monetary shock.

The inversion of the exchange rate variable and the monetary stance variable has no effect on the results, indicating that the baseline specification is rather robust (Appendix III).

D. Exploring MTM Channels

In this section, we present evidence on a variety of MTM channels, augmenting the base model with selected variables that represent the ideas above.

The interest rate channel

As explained earlier, a functioning interest rate channel is crucial to passing on monetary policy actions to the economy, including the banking system. Without a functioning interest rate channel, the capacity of the central bank to influence real activity is limited. To examine the interest rate channel more closely, we have conducted pairwise Granger causality tests between a number of interest rate series and the monetary policy stance measure included in the baseline VAR.[38] Table 3 shows that interest rates in Egypt are rather unrelated to each other, as the null hypothesis of a non-causal relationship can only be rejected in three cases at the 10-percent level. In particular, the monetary policy stance measure appears to Granger cause the 3-month deposit rate but not vice versa, and the 3-month deposit rate, in turn, has some impact on the lending rate.

To corroborate these results, we have re-estimated the baseline VAR, including (in this order) the lending rate, the 3-month deposit rate, and the monetary policy stance measure between the price measure and the exchange rate. Figure 4 presents selected impulse responses. The significant reduction of the 3-month deposit rate after an expansionary shock to the monetary policy measure is consistent with the Granger causality results above. The almost-significant response of the lending rate to the shock in the policy stance, however, is not mirrored in the Granger test statistics above. The absence of an effective policy interest rate before the introduction of the overnight corridor clearly indicates that the transmission mechanism is hampered at the short end—especially as far as the signaling of the monetary stance is concerned. Nevertheless, the results in Figure 4 (left panels) and Table 5 provide some limited evidence of an interest rate mechanism beyond the very short end.

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[38] Lag length is three. The results are qualitatively similar for models between two and six lags.

Table 5. Pairwise Interest Rate Granger Causality Tests, 1995-2005 1/

Null Hypothesis	Observations	F-Statistic	Probability
Six-month t-bill rate does not Granger-cause lending rate	123	0.23	0.87
Lending rate does not Granger-cause 6-month t-bill rate		0.35	0.79
Three-month deposit rate does not Granger-cause lending rate	128	3.48	0.02 **
Lending rate does not Granger-cause 3-month deposit rate		1.30	0.28
MP measure does not Granger-cause lending rate	117	0.01	1.00
Lending rate does not Granger-cause MP measure		0.52	0.67
Three-month deposit rate does not Granger-cause 6-month t-bill rate	123	0.69	0.56
Six-month t-bill rate does not Granger-cause 3-month deposit rate		3.62	0.02 **
Mp measure does not Granger-cause 6-month t-bill rate	112	0.29	0.83
Six-month t-bill rate does not Granger-cause MP measure		0.36	0.78
MP measure does not Granger-cause 3-month deposit rate	117	2.38	0.07 *
Three-month deposit rate does not Granger-cause MP measure		0.99	0.40

Source: Authors' calculations.

1/ *,** imply signficance at the 10, 5 percent level. Lag length is three.

Figure 4. Impulse Responses, Interest Rate Channel
(One standard deviation innovations ± 2 standard errors)
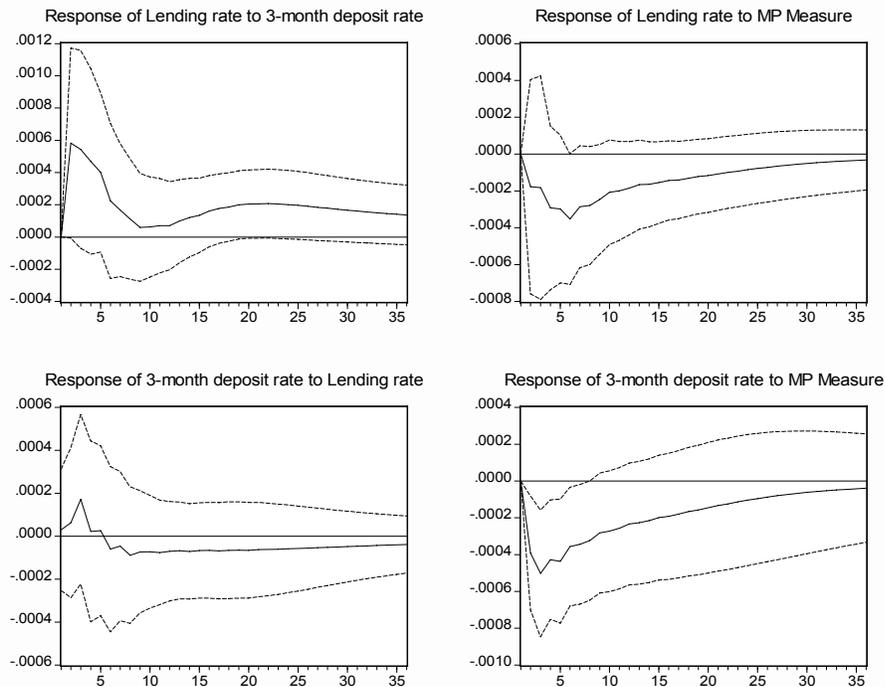
The exchange rate channel

In light of Egypt's recent exchange rate experience, this channel warrants particular attention. A simple way to discern the importance of the exchange rate channel is to shut down the

transmission by including the variable in Z_t, the vector of exogenous variables, as opposed to X_t.[39] By doing so, we avoid the transmission of the initial monetary shock to the exchange rate. In addition to the NEER used in the baseline scenario, we have used the REER and the bilateral exchange rate against the U.S. dollar as discussed earlier.

Figure 5 contains the results using the NEER, both for the monetary policy measure and, for comparison, the interest rate on 3-month deposits. The responses are consistent in shape—a positive shock in the monetary policy measure corresponds to an easing of the monetary stance.[40] In both cases, the exchange rate channel plays an important role. After a monetary easing, an active exchange rate channel doubles or even triples (in response to a deposit rate shock, bottom left panel) the magnitude of the price response, due to the additional effect stemming from the depreciation on the price of imported goods.[41] With regard to the response of output to an unexpected easing in the monetary stance, an active exchange rate channel appears to delay the expansionary reaction for both monetary policy measures stemming from depreciation-induced expenditure switching toward domestic goods (right panels). This somewhat counterintuitive result could be explained by rising import prices, which—by reducing the availability of imports that are critical inputs for production—hamper productive activity. In our sample, this effect could be driven by the monetary easing in the late 1990s, which coincided with a drop in investment and intermediate imports (see descriptive section).

Results for alternative exchange rates are largely similar (Figure 6). One interesting conclusion, however, can be drawn from comparing the responses in the top two panels of Figure 5 with those in the two bottom panels of Figure 6. Contrary to the effective exchange rates—where an active transmission channel broadly doubles the impact of a monetary shock on prices—the U.S. dollar exchange rate channel does not affect the amplitude for the transmission of the monetary policy stance (as measured by the MMZ variable) to the WPI. This does not come as a surprise given that throughout the period the pound was de facto mostly pegged to the U.S. dollar. For all three exchange rates, an active exchange rate channel results in a much smaller price impact of a monetary shock after about 1½ years compared to an inactive exchange rate channel—that is, once the initial depreciation has given way to a small appreciation.

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[39] See Baqir (2002).

[40] For ease of comparison, the lower charts in Figure 5 present the inverse of the impulse response to a regular interest rate shock (which would correspond to a monetary tightening).

[41] See Appendix I Baseline VAR, bottom row, third chart. Given the definition of the effective exchange rates, an initially negative impulse response corresponds to a depreciation. The appreciation of the NEER over the medium term in response to a monetary easing displayed in the same chart also explains why the response of the WPI to the MP measure dies out much more quickly when the exchange rate channel is alive (top left panel in Figure 5).

Figure 5. Impulse Responses with and without NEER Channel
(Cholesky decomposition, one standard deviation innovations)

Response of WPI to MP Measure (with ER channel)
Response of WPI to MP Measure (without ER channel)

Response of Output to MP Measure (with ER channel)
Response of Output to MP Measure (without ER channel)

Inverse response of WPI to 3-month deposit rate (with ER channel)
Inverse response of WPI to 3-month deposit rate (without ER channel)

Inverse response of output to 3-month deposit rate (with ER channel)
Inverse response of output to 3-month deposit rate (without ER channel)

Figure 6. Impulse Responses with and without REER and U.S. dollar Channel
(Cholesky decomposition, one standard deviation shocks)

Response of WPI to MP Measure (with REER channel)
Response of WPI to MP Measure (without REER channel)

Response of Output to MP Measure (with REER channel)
Response of Output to MP Measure (without REER channel)

Response of WPI to MP Measure (with USD channel)
Response of WPI to MP Measure (without USD channel)

Response of Output to MP Measure (with USD channel)
Response of Output to MP Measure (without USD channel)
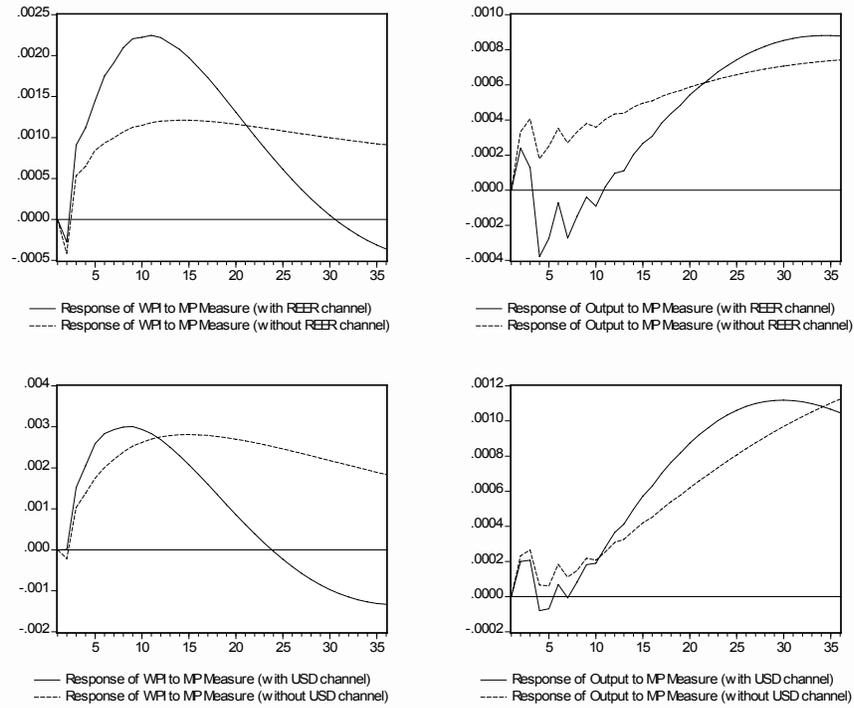
The asset price channel

Assessing this channel relies on a good measure of asset prices. In Egypt, major asset classes include real estate and equity. However, statistical measures of asset prices are insufficient, except for those quoted on the stock market. CASE, Egypt's official stock exchange, offers a stock price index, CASE 30, that covers the 30 major stocks quoted with a minimum free float of 15 percent.[42] As stock market index data is available since January 1998, we have re-estimated the baseline VAR for this limited period, ordering the (log) stock price after output and the WPI but before the monetary policy stance, assuming that monetary policy could react within the same observations period to movements in the stock market.[43]

Figure 7 displays the impulse responses of output and prices with the asset price channel working. Compared to the baseline responses in Figure 3, there are several important differences. First (top left panel), the response of output to expansionary monetary policy is muted when asset price developments are included in the model. Second (top right panel), the response of output to an appreciation of the exchange rate is no longer significant. Third, (bottom left panel), although similar in shape, the borderline significance of the response of prices to the shocks in the monetary policy stance is lost. Fourth (bottom right panel), a functioning asset price channel intensifies the price response to an exchange rate shock: it increases the amplitude but shortens the time during which the response is significant by about one year.

We have two tentative explanations for this last, somewhat puzzling, result. First, it may be evidence of an additional wealth effect on private consumption. As investments in the LE-based stock market become more expensive with an appreciation, foreign investors are likely to reduce their positions (and local investors would tend to shift their investments abroad), and the stock market index decreases significantly (see text chart). Investors—both retail and institutional—experience a decrease in their net worth and adjust their consumption and investment behavior accordingly. Second, the appreciation could deteriorate the outlook for export-oriented sectors (tourism, non-oil goods exports). Lower profit expectations could exert pressure on stock market quotations, reinforcing the wealth effect.

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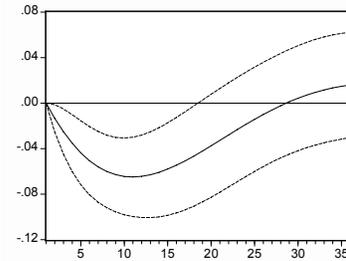
[42] See Billmeier and Massa (2007a) for a discussion of issues related to the Egyptian stock market.

[43] In this specification, we have used one lag as indicated by the Schwarz and Hannan-Quinn information criteria. The Akaike criterion, which puts more weight on goodness of fit (as captured by the log likelihood function) pointed to 12 lags due to several remaining marked outliers. One lag is a local optimum according to Akaike. The results are robust to ordering the stock market index before the monetary policy stance, which is consistent with the assumption that the CBE considers stock market developments as one factor in making (same-period) monetary policy decisions.
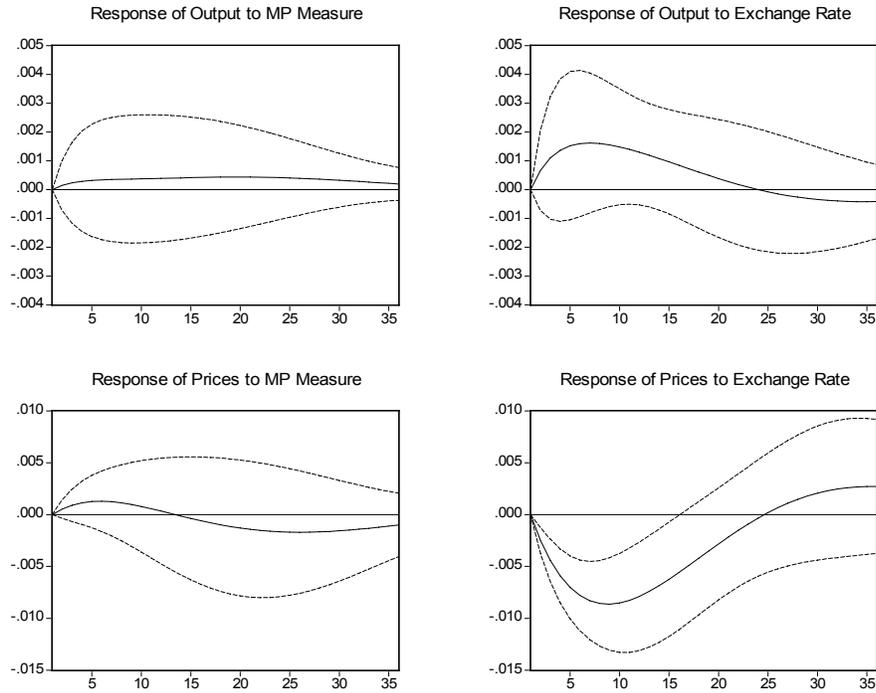
Figure 7. Impulse Responses, Baseline VAR and Asset Price Channel
(Cholesky decomposition, one standard deviation shocks ± two standard errors)


The bank lending channel

In line with the descriptive assessment above, we explore the bank lending channel by including a real credit aggregate in the baseline VAR.[44] First, we include total private domestic and public credit—except for the government proper, but including state-owned enterprises and public economic authorities—consisting of both lending and securities held by banks. For identification purposes, the variable is ordered between the price index and the monetary policy measure.

Although domestic credit expands significantly after shocks corresponding to monetary easing and an appreciation of the nominal effective exchange rate (Figure 8), the impulse responses of output and prices to these shocks (not shown) are very similar to the baseline scenario.

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[44] Credit aggregates are deflated with the WPI and seasonally adjusted (X-12 filter).
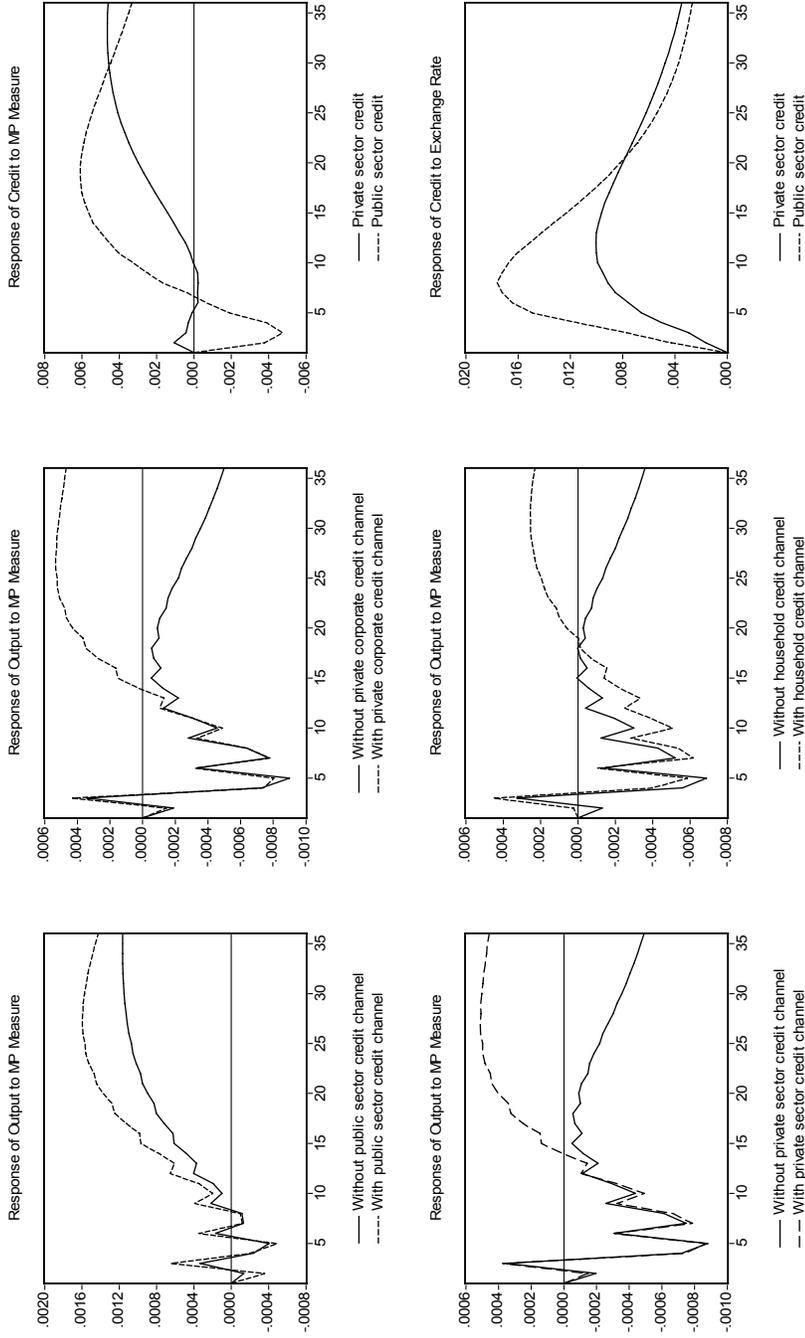
Figure 8. Impulse Responses Baseline VAR and Domestic Credit
(One standard deviation innovations ± 2 standard errors)
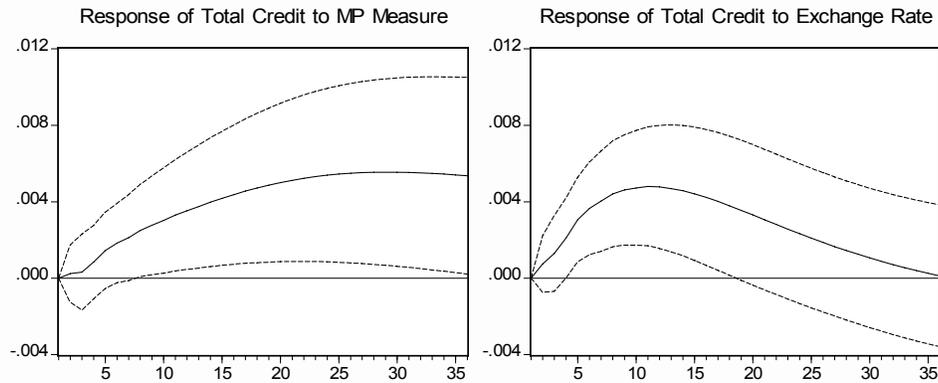
To better discern the growth impact of credit to the private sector from credit to the public sector, we substitute total domestic credit with disaggregate data. In a first step, we distinguish between private and public credit (to state-owned enterprises and public economic authorities). Furthermore, we split private-sector credit between lending to the household sector and the corporate sector. We gauge the importance of the respective channel by including the credit aggregate alternatively as an endogenous and an exogenous variable, effectively shutting down the transmission from the monetary policy stance to the credit aggregate. (Figure 9).

In all cases, an active credit channel increases the positive response of output to a monetary easing. The bank lending channel points to a stronger transmission of the monetary policy stance on output through credit (loans and securities) to the public sector compared to private sector lending (Figure 9, left panels). The response of output is broadly twice as large if we model the transmission via the public sector explicitly compared to the private sector. Similarly, the transmission via corporate lending is quantitatively more important for output than lending to households (center panels). While the responses of public and private credit to a monetary easing are both positive in the medium run, the initial response of public sector credit is negative, pointing to the decoupling of the monetary stance and lending decisions in the public sector (right panels).

Figure 9. Selected Impulse Response Functions, Baseline VAR and Bank Lending Channels

Response of Output to MP Measure

—— Without public sector credit channel
--- With public sector credit channel

Response of Output to MP Measure

—— Without private corporate credit channel
--- With private corporate credit channel

Response of Credit to MP Measure

—— Private sector credit
---- Public sector credit

Response of Output to MP Measure

—— Without private sector credit channel
— — With private sector credit channel

Response of Output to MP Measure

—— Without household credit channel
---- With household credit channel

Response of Credit to Exchange Rate

—— Private sector credit
---- Public sector credit

E. The Impact of the Target Corridor for the CBE's Overnight Standing Facilities

Within the newly adopted framework, the CBE launched the overnight corridor system in June 2005, shifting its monetary operations from a quantity-based target (excess reserves of commercial banks) to a price-based one, the overnight interbank rate. The overnight deposit rate and the overnight lending rate are effectively the floor and ceiling of the corridor, respectively. Steering the domestic currency overnight interbank rate in the middle of the corridor is the CBE's operational target. The CBE manages market liquidity through its open market operations.

Since the introduction of the corridor, the domestic-currency overnight interbank interest rate has become substantially less volatile, and potentially a better indicator of the monetary policy stance (see text chart; interest rate in percent). To investigate whether this fundamental change has had any effect on the interest rate channel over the last 1½ years, we repeat the Granger causality tests carried out above with a different set of interest rates for this very short sample.[45]

Overnight Interbank Interest Rate
(In percent)
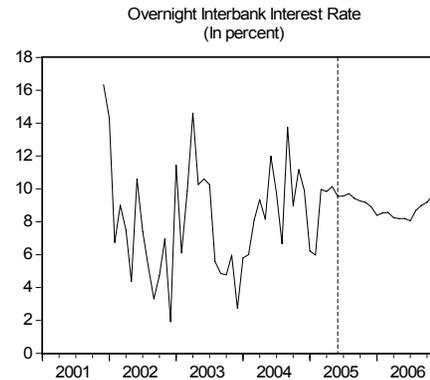
Although Table 6 should be taken with a grain of salt because of the extremely short sample, the results indicate that the overnight interbank rate has started to assume a strong role in the interest rate channel.[46] It Granger-causes interest rates on 3-month deposits and new bank borrowing (the lending rate). This bodes well for the CBE's monetary policy strategy if it maintains the clear signaling function that the overnight rate appears to have assumed in a rather short period. Moreover, the banking sector's decreasing spread between cost of funding and investment return on government securities as stronger competition for lending opportunities to the private corporate and household sector should reinforce the empirical link in the future.

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[45] Due to the limited amount of observations, we are not able to estimate a VAR based on the overnight interest rate.

[46] After the increase in the overnight interest rate in late 2006, the rate has remained close to the floor of the corridor for most of 2007 in light of surplus market liquidity.

Table 6. Pairwise Interest Rate Granger Causality Tests, 2005–06 1/

Null Hypothesis	Observations	F-Statistic	Probability
Lending rate does not Granger-cause 3-month deposit rate	16	1.19	0.37
Three-month deposit rate does not Granger-cause lending rate		1.28	0.35
Overnight interbank rate does not Granger-cause 3-month deposit rate	16	10.15	0.00 ***
Three-month deposit rate does not Granger-cause Overnight interbank rate		0.97	0.45
Six-month t-bill rate does not Granger-cause 3-month deposit rate	16	2.42	0.14
Three-month deposit rate does not Granger-cause 6-month t-bill rate		1.23	0.36
Overnight interbank rate does not Granger-cause lending rate	16	5.60	0.02 **
Lending rate does not Granger-cause Overnight interbank rate		1.68	0.24
Six-month t-bill rate does not Granger-cause lending rate	16	3.94	0.05 *
Lending rate does not Granger-cause 6-month t-bill rate		1.38	0.32
Six-month t-bill rate does not Granger-cause Overnight interbank rate	16	1.18	0.38
Overnight interbank rate does not Granger-cause 6-month t-bill rate		2.18	0.17

Source: Authors' calculations.

1/ *,** imply signficance at the 10, 5 percent level. Lag length is three.

V. SUMMARY AND CONCLUSIONS

The CBE has made many important strides to upgrade Egypt's framework for conducting monetary policy over the last few years with a view to adopt inflation targeting as a new paradigm once the prerequisites are fulfilled. The conduct of an effective monetary policy in inflation-targeting countries requires a clear identification and communication of the policy objective as well as the policy tool. In addition, a thorough understanding of the intensity and lags with which policy interest rates impact the economy and, in particular, the dynamics of the policy objective is essential.

So far, there has been little empirical evidence on the monetary transmission mechanism in Egypt. This paper attempted to fill this gap and foster research in this important area for monetary policymaking.

The main empirical results are that in Egypt, the interest rate channel provides correct signs, but the significance and amplitude of the results are not satisfactory, particularly in light of the planned move toward inflation targeting. Instead, the exchange rate channel continues to play an important role in the transmission of the monetary stance, as it magnifies the impact of policy shocks drastically. The role of the asset price channel is generally subdued, but explicit modeling of this channel intensifies the response of prices to exchange rate shocks. The bank lending channel points to a stronger transmission of the monetary policy stance on output through credit (loans and securities) to the public sector compared to private sector lending. While the responses of public and private credit to a monetary easing are both positive in the medium run, the initial response of public sector credit is negative, pointing to the decoupling of the monetary stance and lending decisions in the public sector.

Summarizing, it appears that some of the preconditions for a successful implementation of IT not discussed here (a competitive banking system and a strengthened monetary policy framework) are not yet fulfilled in Egypt. However, since the launch of the corridor in

June 2005, the overnight interbank rate is less volatile and—although empirical evidence is slow to emerge—has proven to be a better indicator of the monetary policy stance. Moreover, further improving the CBE's communication strategy should be a priority to help strengthen the monetary policy framework and enhance another mechanism not discussed in this paper—the expectations channel.
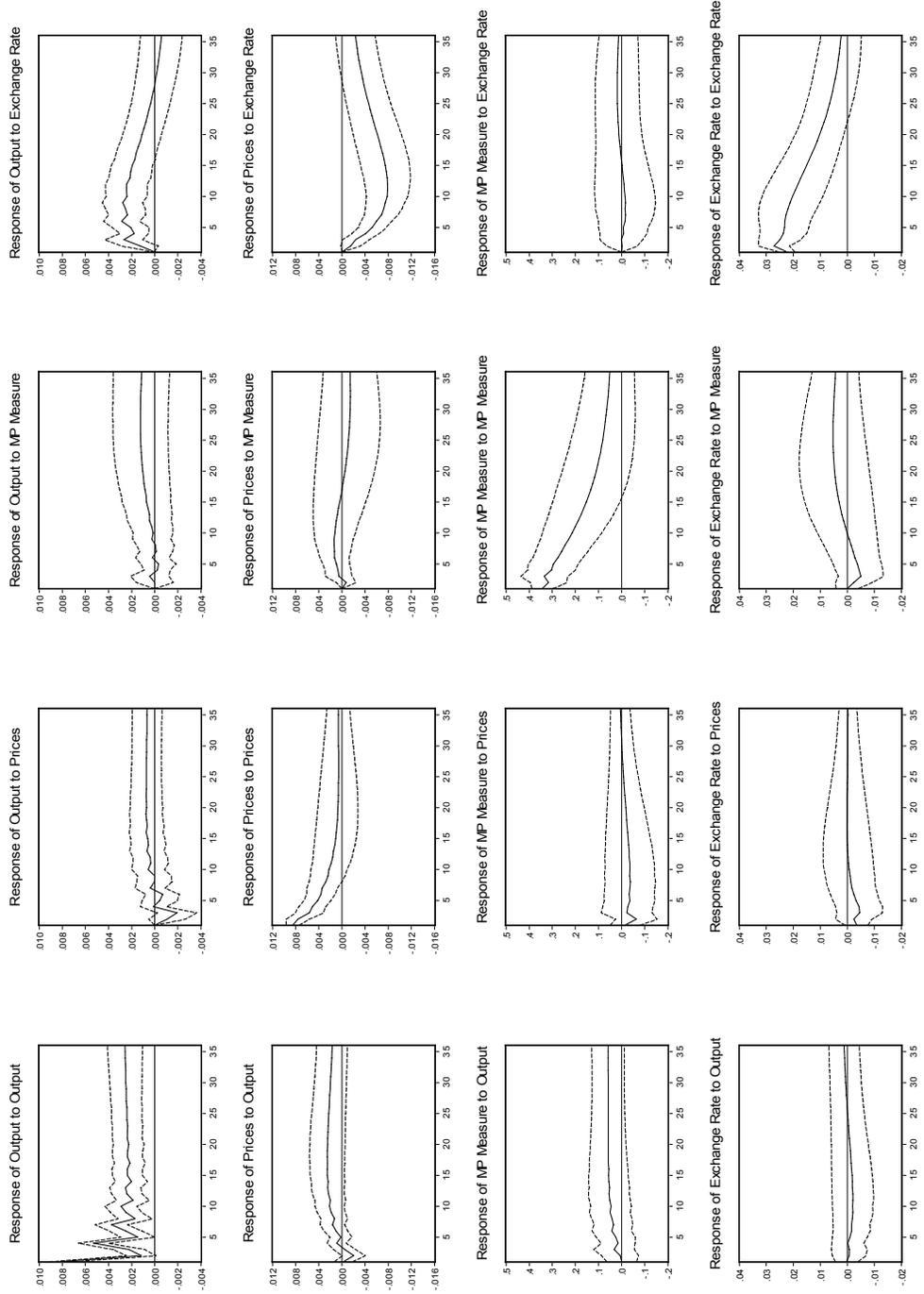
Despite the shift away from the exchange rate as the nominal anchor, the ER channel will continue to play an important role as a large share of the consumer good basket used in the CPI is tradable. In fact, several countries (e.g., Turkey and Chile) have moved toward inflation targeting while paying particular attention to the exchange rate. In the Egyptian context, however, allowing further exchange rate flexibility is an important precondition for successful IT.

Going forward, as the interest rate channel emerges in the transition to IT, the still dominant exchange rate channel should lose prominence. The bank lending channel should grow stronger as competition between banks enhances the sector's effectiveness in intermediating financial flows and translating the central bank's monetary stance into market rates. Especially, the relative strength of transmission via public sector credit should weaken once private sector lending re-emerges as a plank of economic development in Egypt.

The role of the asset price channel will be enhanced by the recent introduction of mortgage finance in Egypt. Even though the relatively small size of operations and the lack of reliable data constitute the main impediment to a more in-depth analysis at this stage, the establishment of a benchmark yield curve will enable mortgage companies to cover long maturities and should contribute to rapid growth. Therefore, adding financial instruments that lengthen and deepen the yield curve (e.g., mortgage financing) and reflect inflation expectations (e.g., inflation-indexed bonds) is important. Moreover, a firmer link between mortgage interest rates and the monetary stance will strengthen the CBE's hand in steering economic activity.

Two other priorities adopted by the government—cleaning up the remaining NPLs in the banking sector and lowering the fiscal burden over the next few years—should also strengthen several transmission mechanisms, especially the bank lending channel and the—not explored in the present context—balance sheet channel as financing for smaller corporates becomes more easily available and firms are in a better position to respond to changes in the interest rate as their balance sheets are no longer burdened by NPLs.

Appendix I. Impulse Responses, Baseline VAR
(Response to Cholesky one standard deviation innovations ± 2 standard errors)

Response of Output to Output

Response of Output to Prices

Response of Output to MP Measure

Response of Output to Exchange Rate

Response of Prices to Output

Response of Prices to Prices

Response of Prices to MP Measure

Response of Prices to Exchange Rate

Response of MP Measure to Output

Response of MP Measure to Prices

Response of MP Measure to MP Measure

Response of MP Measure to Exchange Rate

Response of Exchange Rate to Output

Response of Exchange Rate to Prices

Response of Exchange Rate to MP Measure

Response of Exchange Rate to Exchange Rate

Appendix II. Impulse Responses, Modified Baseline VAR (including Reserve Money)
(Response to Cholesky one standard deviation innovations ± 2 standard errors)
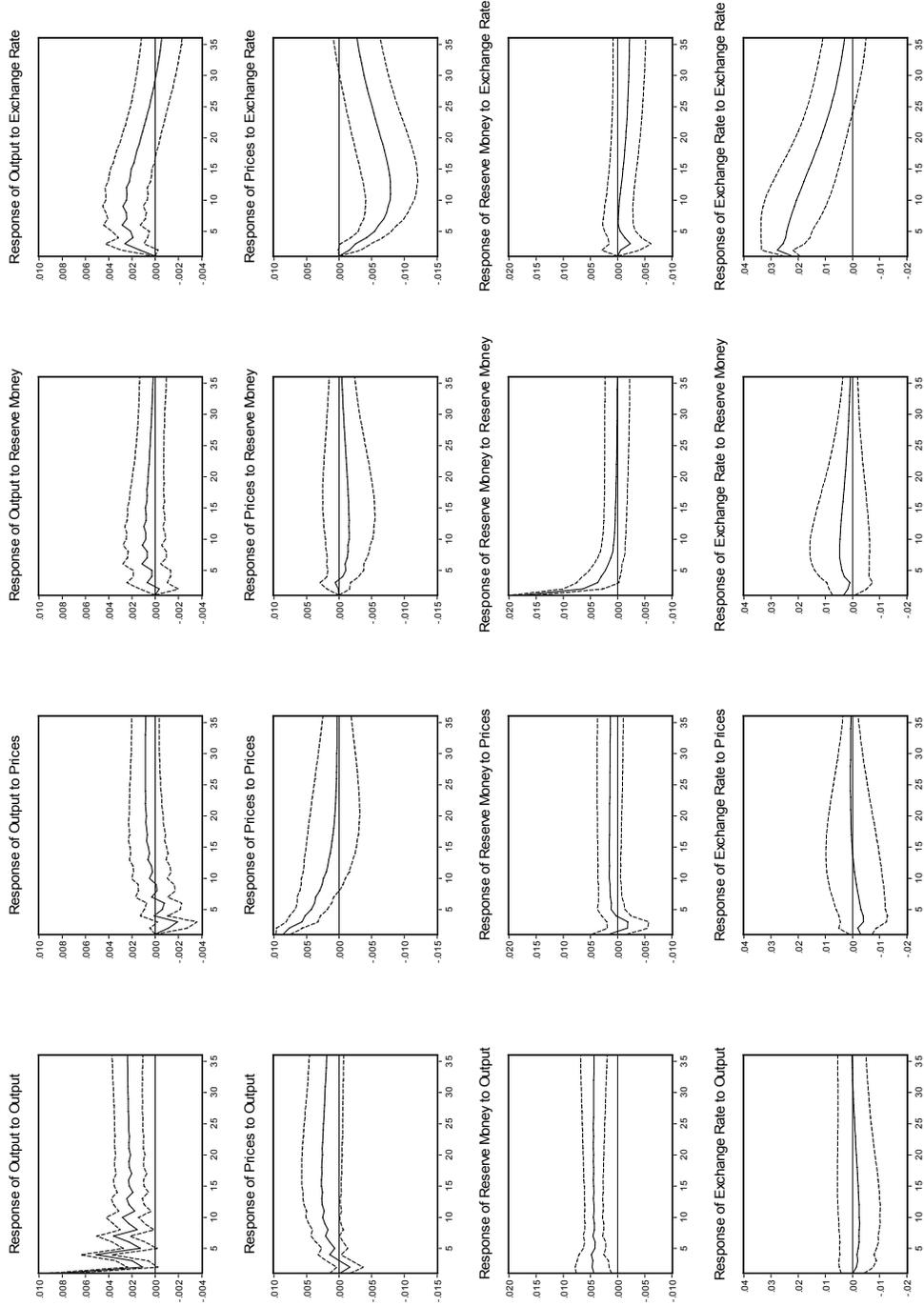
Note: Reserve money is included instead of the monetary policy stance measure as a robustness check.

Appendix III. Impulse Responses, Baseline VAR, Inverted Variable Ordering
(Response to Cholesky one standard deviation innovations ± 2 standard errors)
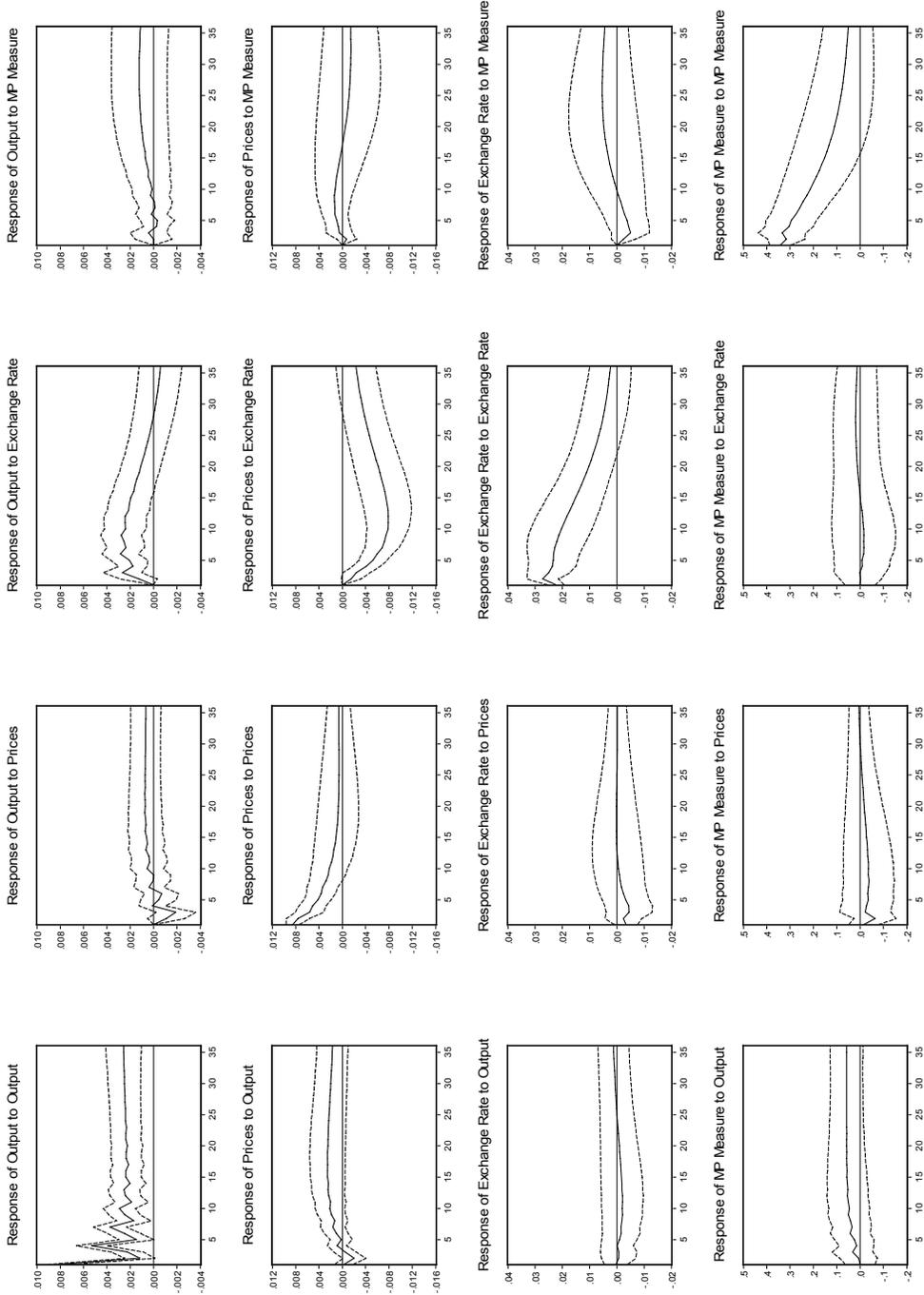
Note: Endogenous variables ordered as follows: X = (output, prices, exchange rate, monetary policy stance measure)'.

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