

# Managing short-term capital flows in new central banking: unconventional monetary policy framework in Turkey

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**Abstract** During the global financial crisis of 2008–2009, both advanced and emerging countries have implemented significant easing policies on monetary and fiscal fronts. Yet, the recovery, especially in advanced countries, was not as quick or strong as expected. These quantitative easing policies, coupled with weak recovery and restricted fiscal positions, have created not only abundant but also excessively volatile global liquidity conditions, leading to short-term and excessively volatile capital flows to emerging markets. To contain potential risks due to such flows, emerging countries have augmented their existing policy frameworks. Central Bank of the Republic of Turkey (CBRT), for example, has introduced two new policy tools in its new monetary policy framework: the asymmetric interest rate corridor and the reserve option mechanism (ROM). From a capital flows perspective, the interest rate corridor helps smooth fluctuations in supply of foreign funds, whereas the ROM helps contain movements in demand for foreign funds. Both policies have been actively used by the CBRT and appeared to be effective in containing financial stability risks stemming from excessively volatile capital flows.

**Keywords** Capital flows · Macroprudential policies · Central banking

**JEL Classifications** E44 · E52 · E58

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The views expressed here are those of the authors and do not necessarily reflect the views of the Central Bank of the Republic of Turkey.

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## 1 Introduction

Last two decades have witnessed significant increase in financial flows for most world economies. The financial globalization was not without challenges, though, especially for emerging countries. These countries have experienced challenges in managing these flows, confronting the risk of amplified business cycles and sudden reversal of such flows.<sup>1</sup> From an emerging country perspective, challenges due to open financial accounts and capital flows have been known long before the global financial crisis of 2008–2009. Nonetheless, the nature of capital flows-related problems has changed during the recent period.

Historically, several emerging countries had financial crises stemming from volatile capital flows. Before the recent global financial crisis, most of these crises were country-specific (e.g. Mexican crisis in 1994, Argentine crisis in 2001, Turkish crisis in 1994 and 2001) or region-specific (e.g. Asian crisis in 1997). Accordingly, it has generally been thought that the crises were by and large related to domestic fundamentals and due to macroeconomic imbalances specific to these countries or regions. Several factors such as currency/maturity mismatches, overborrowing, severe financial market imperfections, unsustainable fiscal positions, or fixed exchange rate regimes with inconsistent fundamentals were put forward as possible explanations.<sup>2,3</sup>

After the global financial crisis of 2008–2009, the nature of capital flows has changed for developing countries. The Fed and the European Central Bank have taken unprecedented steps to boost aggregate spending by reducing the overnight policy rate aggressively to almost zero, while fiscal authorities have allowed large budget deficits (in a comparatively very short period of time). Yet, the recovery was not as quick or strong as expected, and a battery of unconventional policies has been implemented in advanced countries.<sup>4</sup> The required level of household deleveraging, fiscal sustainability issues, and the resulting policy uncertainties<sup>5</sup> have nonetheless restricted the recovery, and in turn have created a volatile global financial environment. Accordingly, unlike the pre-crisis period, the driving force of capital

<sup>1</sup> See Lane (2013) for a detailed survey about the literature on financial globalization, and related discussions on the potential role of globalization in propagating cycles during the recent global financial crisis period.

<sup>2</sup> For emerging country crises (particularly for sudden reversal of capital flows), see Mendoza (2006, 2010), Bianchi (2011), Bianchi and Mendoza (2011) among others.

<sup>3</sup> Many emerging countries have implemented significant reforms during the last decade to strengthen their fundamentals, and have created space for effective policies on both monetary and fiscal fronts. See Frankel et al. (2013) on how developing countries moved from procyclical to countercyclical fiscal policies. Recent global financial crisis, in this sense, can be thought as a test of whether and to what extent stronger fundamentals in emerging countries have helped contain their business cycle fluctuations due to excessively volatile global factors. Even though emerging countries were affected strongly by the recent financial crisis emanating from advanced countries—through channels like trade and global risk taking—, their financial system has withstood the crisis, and to a large extent, they seem to be decoupled from the advanced countries in that respect. See Korinek et al. (2010) for a potential mechanism explaining decoupling/recoupling. For an early discussion on decoupling vs. contagion, see Kaminsky et al. (2003).

<sup>4</sup> See IMF (2013a, b, c) for a detailed overview and Gambacorta et al. (2012) for an empirical assessment of unconventional policies in advanced countries.

<sup>5</sup> See Baker et al. (2013) for political uncertainty in advanced countries.

flows to emerging markets pertains mostly to concerns about advanced economies in the recent era. Moreover, unlike the pre-crisis period, these flows were mostly short-term and very volatile, necessitating emerging country policy makers to follow a new and diverse set of policies.<sup>6</sup>

In response to financial stability challenges due to such volatile capital flows, emerging countries have resorted to quantity-based capital flow measures (e.g. Brazil, Colombia, etc.), or alternatively, implement more general macroprudential policies (e.g. Turkey). Theoretically, capital flow measures (e.g. levying tax on external borrowing) might reduce risks or externalities due to such flows.<sup>7</sup> On practical grounds, however, the empirical literature is inconclusive about the effectiveness of such controls.<sup>8</sup> It is usually easier for market participants to circumvent the controls as these controls are set only on one part of the financial system (e.g. foreigner's transactions). Therefore, implementing more general macroprudential policies might be more practical and effective.

The Central Bank of the Republic of Turkey (CBRT) has devised a new policy mix starting in the last quarter of 2010, acknowledging financial stability concerns and the aim to contain such risks. The new policy tools were not aimed directly on capital flows but were more in nature of general macroprudential policies: active use of reserve requirements, liquidity policy, asymmetric interest rate corridor between overnight borrowing and lending rates, and later the reserve option mechanism (ROM). The latter two are the new policy tools.<sup>9</sup>

This paper provides a detailed introduction on these novel policy tools, discusses their potential advantages in managing capital flows, and presents evidence on the effectiveness of these tools. We would like to briefly discuss these tools upfront:

Interest rate corridor can be thought as a tool to smooth movements in the supply of foreign funds, and ROM as a tool to decrease sensitivity of equilibrium foreign exchange rate to movements in the supply. Under the interest rate corridor policy, the CBRT commits to an average cost of funding of the central bank to stay within a wide (and possibly asymmetric) corridor of borrowing and lending rates (rather than committing to a single policy rate within a narrow and symmetric band in open market operations). The upper and lower bounds of the corridor are determined by regular monetary policy meetings. The central bank ensures that the equilibrium money market rate falls within the corridor through open market operations. The degree of uncertainty about the likely level of equilibrium interest rate inside the corridor affects the volatility of return on Turkish lira assets and therefore the risk-adjusted return. Hence, as global risk perceptions change and supply of foreign

<sup>6</sup> See IMF (2011) for a survey of policy responses in emerging countries.

<sup>7</sup> See Caballero and Krishnamurthy (2004), Lorenzoni (2008), Bianchi (2011) and Korinek (2011).

<sup>8</sup> See Edwards (1999) and Magud et al. (2011). For an alternative view, see Bruno and Shin (2013).

<sup>9</sup> For an overview of the CBRT's new policy framework, see Basci and Kara (2011), Kilinc et al. (2012), Akcelik et al. (2013a, b), and Alper et al. (2013); and for an empirical assessment of the policy framework in general, see Aysan et al. (2013), and Binici et al. (2013a). For studies that focus on a single policy tool (rather than the framework in general), see Binici et al. (2013b) on the interest rate corridor; Oduncu et al. (2014) on additional monetary tightening; and Alper et al. (2012), Kucucusarac and Ozel (2012), Degerli and Fendoglu (2013a, b), and Oduncu et al. (2013) for the ROM. For studies on the new monetary policy frameworks across the globe after the global crisis, see Di Giorgio (2014) and Shirai (2014).

exchange in Turkey responds to the global risk factors (the managed) uncertainty generated by the corridor can serve as another risk factor, and the corridor can be steered so as to smooth the movements in the supply of foreign funds.

ROM, in contrast to the interest rate corridor policy, works through the demand for foreign funds. For domestic currency liabilities, banks are given an option of fulfilling their domestic currency reserve requirement by bringing in foreign instead of domestic currency (hence the term ROM).<sup>10</sup> The mechanism helps smooth movements in the exchange rate as follows. When risk appetite in the global financial markets rises, i.e. capital inflows surge, foreign funding is usually more favorable than domestic funding, and hence, banks would prefer keeping some of the extra foreign funds in the central bank rather than extending them to the economy. In case of capital outflows, i.e. a decrease in the supply, banks would prefer drawing down their reserve option at the central bank. This behavior then tilts down the demand for foreign funds, decreasing the sensitivity of equilibrium exchange rate to shifts in the supply. Accordingly, the mechanism decreases the volatility of exchange rate, and importantly, in a market friendly manner.

Rest of the paper is organized as follows. Section 2 analyses financial stability in the theoretical literature and discusses the financial stability concerns related to capital flows. Section 3 explains the new monetary policy mix devised by the Central Bank of the Turkey to support financial stability, and explains the interest rate corridor and ROM. Section 4 discusses the effects of the new monetary policy tools on economic variables, and Sect. 5 concludes.

## 2 Capital flows and financial stability

During the surge in global liquidity in early 2000s, capital flows to emerging countries increased almost ten-fold from US\$139bn in 2002 to US\$1,237bn in 2007. With the global financial crisis in 2008, however, capital flows have dropped by almost half (to US\$679bn) and have been highly volatile since then (Figs. 1, 2). These fluctuations can largely be attributed to factors exogenous to emerging country domestic factors, e.g. debt ceiling concerns in the US, sovereign debt problems in some Euro-zone countries, or a likely change in the pace of quantitative easing policies in advanced economies.

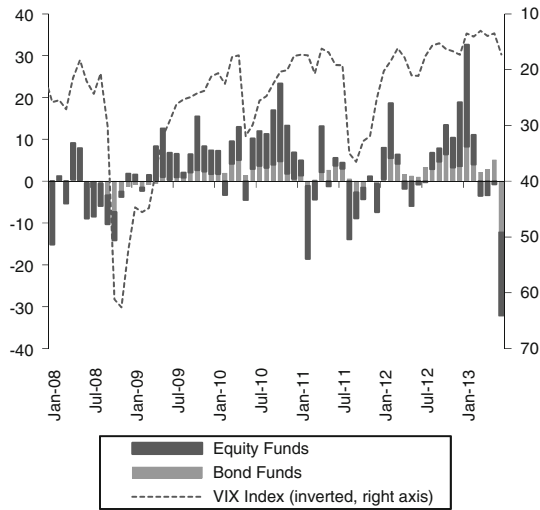
We, therefore, conceptualize volatile capital flows as exogenous movements in the supply of foreign funds (see Fig. 3). Fluctuations in the stance of global risk appetite (e.g. the VIX, VDAX, VSTOXX), quantitative easing by advanced countries, foreign interest rates, risk-adjusted interest rate differentials or other risk factors can be thought as potential determinants of shifts in the supply. For example,

<sup>10</sup> Since foreign yields are generally lower than domestic yields (particularly for emerging countries compared to major advanced countries), banks occasionally find it optimal to utilize the mechanism. Accordingly, the central bank requires extra foreign currency option for the same amount of domestic currency reserve requirement, exploiting the differential between the two yields. Interest rate differential can be so large that using the option even with the extra required foreign exchange might still be profitable for banks.

**Fig. 1** Private capital flows to emerging countries (billion US dollar). Source: Institute of International Finance (IIF)

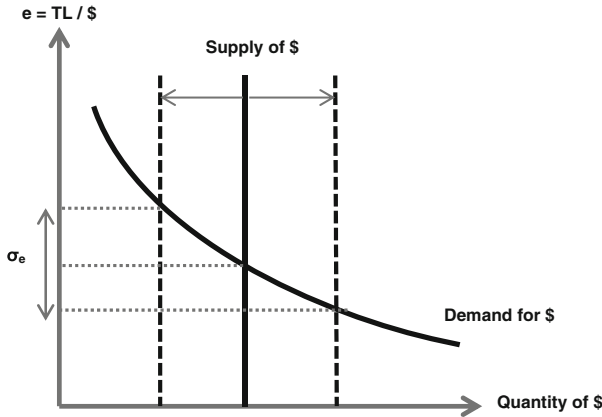


**Fig. 2** Capital flows to emerging countries (billion US dollar). Source: Emerging Portfolio Fund Research (EPFR), Bloomberg



a new round of quantitative easing or an increase in global risk appetite might shift the supply to the right, generating capital inflows to domestic economy and putting an appreciation pressure on the domestic currency. If such flows got reversed subsequently, then the economy would experience a depreciation pressure on the exchange rate (among many others, e.g. a likely crunch in economic activity). One important effect of volatile capital flows would then be the resulting volatility in the exchange rate,  $\sigma_e$ , in the absence of any policy measures.

Such fluctuations in capital flows, if not contained properly by policy actions, may lead to large cycles in domestic credit and in turn impede domestic financial stability. Accordingly, many emerging market economies have implemented a set of unconventional policy tools such as active use of reserve requirements and other



**Fig. 3** Supply and demand for foreign exchange ( $\$$ )

macroprudential policies to mitigate adverse effects of such fluctuations in capital flows and support domestic financial stability.<sup>11</sup>

Before the global financial crisis, however, it has been a highly controversial issue whether policy makers should take financial stability as an additional policy target.<sup>12</sup> Even from a strict inflation stabilization perspective, though, it would be unrealistic to state that financial variables are not useful in policy making. On the contrary, financial variables convey invaluable information about the current and future real activity and inflation. For instance, movements in asset prices affect household wealth (and thus aggregate consumer spending), cost of capital and investment dynamics. Moreover, they have direct implications on the provision of credit by affecting the value of collateral. Hence, severe downturns or rallies in asset prices can affect the overall health of the economy. Similarly, credit spreads reflect the ease at which firms can borrow, and hence, an increase in which would drive down aggregate investment demand and lead to a contraction in real activity.<sup>13</sup> Hence, the question is not whether financial variables are useful in policy making, but rather how financial variables should re-shape the design of policy making.

Recent financial crisis has shown that when there are imperfections in financial markets, low and stable inflation as the sole objective of monetary policy cannot ensure macroeconomic stability. Curdia and Woodford (2010) show in a model with costly financial intermediation that financial stability as a second policy objective (in particular, containing fluctuations in credit spreads via conventional interest rate policy) improves aggregate welfare. Similarly, Angeloni and Faia (2013) conclude

<sup>11</sup> See IMF (2013a, b), Gambacorta et al. (2012), Galati and Moessner (2013), and Federico et al. (2012) for a general overview of the use of macroprudential policies in emerging markets.

<sup>12</sup> See, for instance, Bernanke and Gertler (2001), Cecchetti et al. (2002), Gilchrist and Leahy (2002), Gilchrist and Saito (2008), and Faia and Monacelli (2007). For a literature review for the pre-crisis consensus view, see Gilchrist and Saito (2008).

<sup>13</sup> Among others, see Cecchetti et al. (2002), Gilchrist and Leahy (2002), and Gilchrist et al. (2009) for potential channels through which movements in financial variables transmit into business cycles. The first two papers focus on asset prices, and the latter on credit spreads.

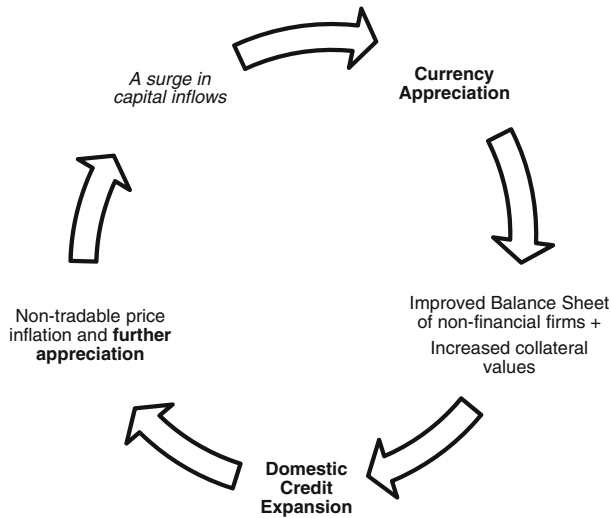
that containing movements in asset prices (using interest rate policy, coupled with mildly acyclical capital requirements) achieves higher aggregate welfare. Gilchrist and Zakrajsek (2011) also show for a medium-scale otherwise-standard financial accelerator model that responding to credit spreads induces smoother business cycle fluctuations. In a similar model, Fendoglu (2013) show that containing fluctuations in credit spreads (in general) or asset prices (only when shocks to credit market imperfections are the dominant driver of business cycles) achieves the highest aggregate welfare possible.

Another strand of literature, Gertler and Karadi (2011), Gertler and Kiyotaki (2010), Gertler et al. (2012), and Dedola et al. (2013), focus on unconventional policies (direct lending, equity injection, among others). They introduce a non-trivial banking sector (which can collect only limited deposits from the households due to asymmetric information), and study the effect of balance sheet of the banking sector, imperfections in the interbank market, or international coordination of unconventional policies on the domestic business cycles. They point out the use of unconventional policies to improve aggregate welfare.

Another line of literature has burgeoned at the outset of the crisis which points out the importance of financial disturbances (shocks that have a direct effect on credit market conditions) in driving business cycles. Examples include disturbances to non-financial firms' net worth (Gilchrist and Leahy 2002; Nolan and Thoenissen 2009; Christiano et al. 2011), of financial firms' net worth (Mimir 2013); disturbances to the credit spreads (Gilchrist et al. 2009); disturbances to the sensitivity of credit spreads to borrowers' leverage (Dib 2010; Gilchrist and Zakrajsek 2011); to borrower's ability to raise funds (Jermann and Quadrini 2011), disturbances to the quality of capital (Gertler and Karadi 2011), to name a few. This strand emphasizes the contribution of financial disturbances on business cycle fluctuations.

Moreover, from a small open economy perspective, large swings in capital flows can trigger an amplification mechanism. In particular, as suggested by Mendoza and Terrones (2008), Bianchi (2011) and Bruno and Shin (2013), a surge in global liquidity and capital inflows put an appreciation pressure on the exchange rate, possibly leading to (1) improved balance sheet of non-financial firms—which are mostly net borrowers from abroad—, and increased collateral values encouraging banks to extend more lines of credit; (2) easier access for the banks to foreign assets. These factors lead to an expansion of domestic credit, which potentially results in a rise in non-tradable prices, feeding back into a further appreciation pressure. Figure 4 below presents the feedback mechanism graphically.

Another facet of such amplification cycles is that private agents might not be fully internalizing the externalities present in such cycles. Several papers including Caballero and Krishnamurthy (2004), Lorenzoni (2008), Bianchi (2011) and Korinek (2011) show that when private agents do not internalize such pecuniary externalities of external borrowing stemming from financial market imperfections, private external borrowing might be sub-optimally high. They show that weakening the strength of amplification and containing private overborrowing improves aggregate welfare.



**Fig. 4** A generic financial instability cycle for a small open economy

To wrap up, these strands of literature points out that (1) disturbances to credit market conditions are important for business cycle fluctuations; (2) financial stability should be an independent policy target; (3) unconventional policy tools support financial stability and potentially ease the trade-off between price and financial stability; and (4) containing excessive movements in domestic credit expansion or exchange rate due to large swings in short-term capital inflows (and hence lowering the strength of such an amplification or avoiding overborrowing) is welfare improving.

### 3 Financial stability concerns and new monetary policy framework in Turkey

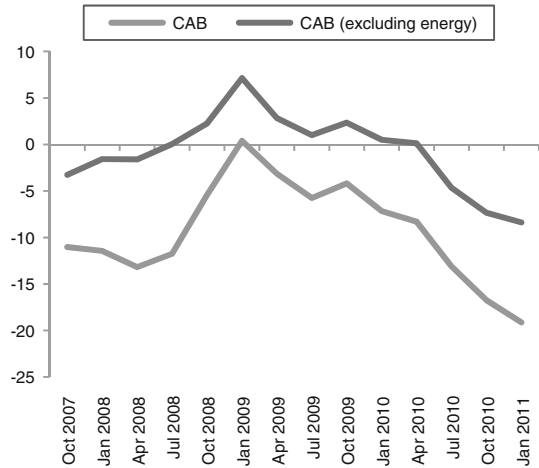
Emerging market economies have a long (and only partially successful) history of mitigating adverse effects of excessive volatility in short-term capital flows on macroeconomic stability. Historically, many emerging countries have experienced sudden reversal of capital flows, often called ‘sudden stops’, i.e. a surge in capital inflows associated with an expansion in domestic credit, a steady appreciation of the currency, excessive borrowing and building up currency mismatches, which then ignites a sudden stop of capital flows, a sharp depreciation, and a large contraction in output.<sup>14</sup>

Turkish economy, for example, was adversely affected by the recent global financial crisis (mainly through trade and financial channels). Exports dropped sharply due to economic downturn in potential export niches (e.g. Europe), and foreign funding dried up significantly. Yet, the Turkish economy has recovered

<sup>14</sup> The term “sudden stop” is coined by Dornbusch et al. (1995). See also Calvo (1998), Edwards (2004), Calvo et al. (2006), and Mendoza (2010).



**Fig. 5** Current account balance (seasonally adjusted, quarterly average, billion USD). Source: TURKSTAT, CBRT



from the crisis quickly due to effective countercyclical monetary and fiscal measures in pushing the economy towards a recovery phase. Also strong macroeconomic fundamentals (e.g. low sovereign debt and low private sector leverage) have helped having a sustainable recovery. The low interest rates and quantitative easing policies in advanced countries coupled with strong domestic fundamentals have then led to a strong capital inflow to Turkey (as was the case for emerging markets with relatively sound fundamentals). However, these capital inflows have brought important challenges for financial stability.

As Fig. 5 shows, the current account balance deteriorated quickly in 2010. Although Turkey, as a developing country and an energy importer, has been experiencing a current account deficit for a long time, the recent increase in the deficit was rather quick and large (even hitting record levels). Moreover, the composition of current account deficit has been an additional risk factor: as Fig. 6 shows, almost all of the capital inflows were portfolio and short-term flows unlike the pre-crisis period.<sup>15</sup>

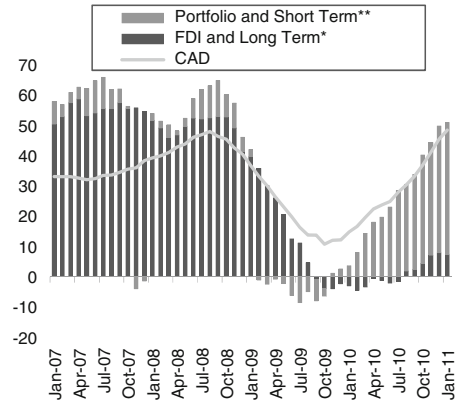
Recall that we have emphasized two key variables for gauging financial stability for an emerging economy: the exchange rate and credit growth. As presented in Fig. 7 below, TL/USD as well as most emerging market nominal exchange rates against the US dollar have appreciated around 20 % between March 2009 and October 2010 (which are likely to be driven mostly by global factors). Moreover, the real exchange rate in Turkey appreciated significantly relative to its long-term trend (Fig. 8).<sup>16</sup>

The other key variable for financial stability is the domestic credit growth. Although Turkey is in the process of financial deepening for which nominal growth rate of credit exceeding the nominal growth of GDP may seem natural on economic

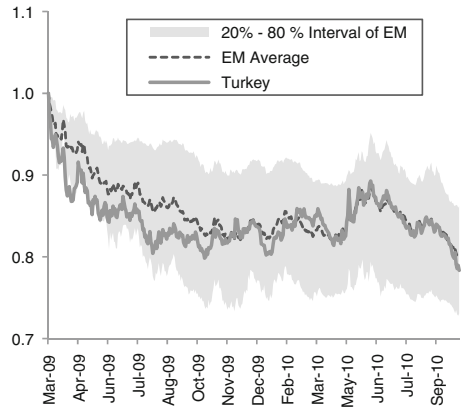
<sup>15</sup> We can think of these short-term inflows as a large increase in the supply of foreign funds (as conceptualized in Fig. 3).

<sup>16</sup> See Caballero and Lorenzoni (2009) for a possible explanation on how and when a persistent appreciation may be welfare reducing and call for a policy intervention.

**Fig. 6** Main sources of current account deficit finance\* (12-month cumulative, billion USD). Source: CBRT



**Fig. 7** TL and other EM currencies against USD (9 March 2009 = 1). Source: TURKSTAT, CBRT

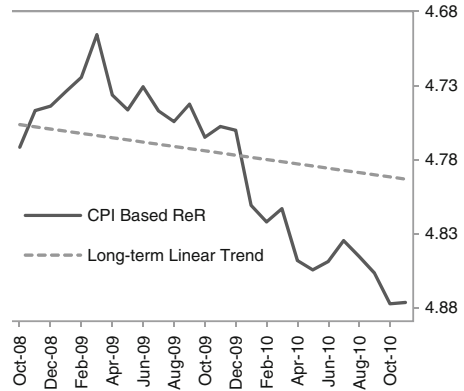


grounds, annualized nominal credit growth rates have reached as high as 40 % after the crisis (on a 13-week moving average basis, see Fig. 9). Such an expansion in credit might result in asset price bubbles, presumably pushing the economy towards the edge of a crisis. From an external vulnerability perspective, capital flows being the main source of financing the domestic credit expansion (as suggested in Fig. 10) raises the risk of a severe credit and output crunch once these flows are reversed.

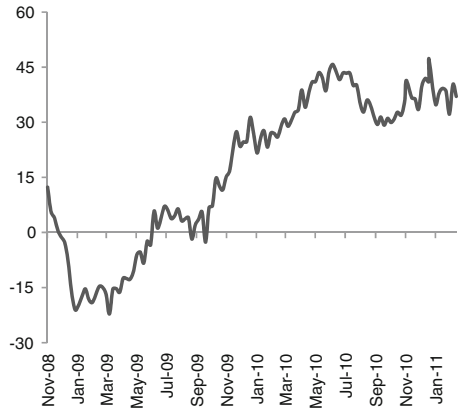
In sum, all these developments, i.e. large inflows of short term capital, overvaluation in the exchange rates and the credit boom, indicated a strong credit cycle. Casting from the supply and demand analysis in Fig. 3, there had been a large increase in the supply of foreign funds (mostly portfolio flows), generating a large current account deficit, an overvalued currency and a credit boom. These developments have created risk of a sudden reversal of capital flows (“sudden stop”). Therefore, imminent policy actions to ensure corrections in the current account, the exchange rate and the credit growth, and a soft landing of the economy have been called for at the time.<sup>17</sup>

<sup>17</sup> For policy options against bubbles or overborrowing see Bianchi (2011).

**Fig. 8** Real exchange rates (ReR) in Turkey (2003 = 100, logarithmic scale, reverse order). Source: CBRT



**Fig. 9** Total loan growth rates (13 weeks moving average, annualized, FX adjusted, percent). Source: TURKSTAT, CBRT

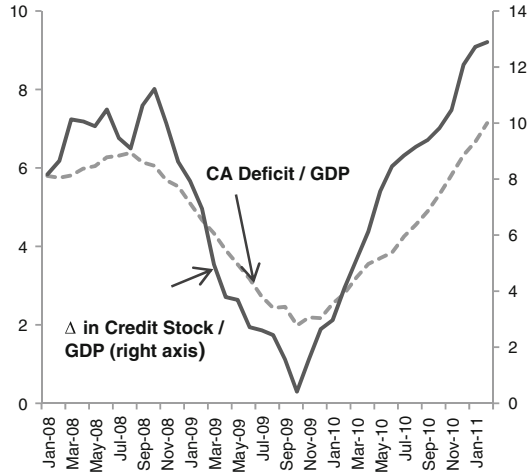


The CBRT, in these regards, has devised a new policy framework in late 2010 to contain the effect of volatile short term capital flows on the domestic business cycles. The new framework, called the New Policy Mix, incorporates two policy objectives; price and financial stability, compared to the conventional framework that focuses only on the former (Table 1).

To operationalize the financial stability objective, the CBRT has been explicit about the financial variables to assess the level of financial stability: the credit growth and the exchange rate. While there is no unique definition of financial stability (i.e. which variables can best reflect the level of financial stability), these variables are particularly relevant for monitoring financial stability for small-open economies. The strength of the feedback mechanism (see Fig. 4), for instance, can be traced back by these two key variables.

Having two objectives which possibly entails policy trade-offs under a rigid inflation targeting framework, the CBRT has introduced the interest rate corridor (as a cyclical tool) and the ROM (as a structural tool) as additional policy tools.

**Fig. 10** Change in credit/GDP and CA deficit/GDP (12 months cumulative, percent). Source: CBRT



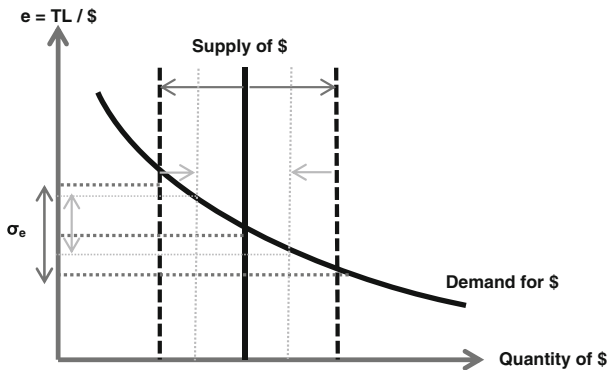
**Table 1** Monetary policy framework

	Former approach	New approach
Objectives	Price stability	Price stability Financial stability
Instruments	Policy rate	Structural instruments (ROM) Cyclical instruments (policy rate, liquidity management, interest rate corridor)

### 3.1 Interest rate corridor

Central banks offer two standing facilities, a lending and a deposit facility, in overnight money markets. The interest rate corridor is defined as the wedge between the lending (the ceiling) and the deposit rate (the floor). Conventionally, central banks set a narrow and symmetric corridor around the target rate to ensure that the money market rate is close to the policy (target) rate.<sup>18</sup> We here discuss the asymmetric interest rate corridor, the width of the corridor as well as its upper and lower limits, as a potential policy tool and its particular relevance for capital flow management.

<sup>18</sup> For a brief discussion on the use of (symmetric) interest rate corridor in central banking, see Woodford (2003) and Bindseil and Jablecki (2011a, b). Note that the equilibrium market rate should reside within the corridor, since the central bank lends (borrows) at a rate more favorable than the most favorable lender (borrower) in the overnight money market. Suppose, for instance, that the money market rate occurs above the upper limit of the corridor. Then those in need of funds would find it more favorable to borrow from the central bank (which lends at a lower rate). Accordingly, the money market rate would be driven down to the upper limit. Similarly, suppose the money market rate is below the lower limit of the corridor. Then, banks that would like to lend to other parties would find it more profitable to lend to the central bank. Accordingly, the rate would be pushed towards the lower limit of the corridor.



**Fig. 11** The smoothing role of interest rate corridor

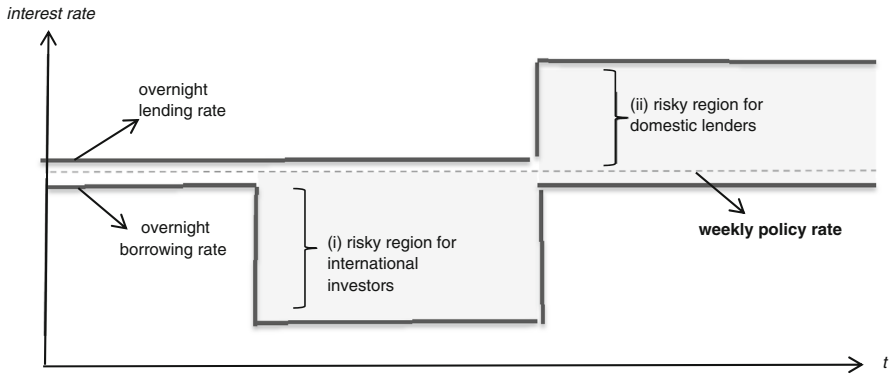
The corridor policy can be used to discourage short-term capital flows (e.g. carry trade flows) by creating a managed uncertainty about short-term yields. The policy maker can increase the width of the corridor (consider, for example, a simple mean–variance optimization problem of portfolio investors), or alternatively, decrease the lower limit of the corridor making a lower short-term yield more likely (creating a low-probability extreme-event risk for international portfolio investors).<sup>19</sup> Accordingly, reducing the lower limit during capital inflow periods and increasing the limit during capital outflow periods would in principle induce milder fluctuations in supply of foreign funds (hence change in the supply of foreign funds (blue arrows) is moderated (red arrows)). The corridor policy, in other words, has a direct (and smoothing) effect on the supply of foreign funds and in turn on the volatility of the exchange rate (Fig. 11).

The corridor policy can also be used as a macroprudential policy to contain domestic credit expansion. In particular, the upper part of the corridor (the difference between the ceiling and the policy rate) reflects a risk for domestic banks which depend on central bank funding (Fig. 12). Existence of a wider upper part makes a higher cost of funding from the central bank more likely, hence discouraging banks to borrow from the central bank to extend credit. Accordingly, the equilibrium lending rate (the volume of credit) in the economy would likely to be higher (lower).

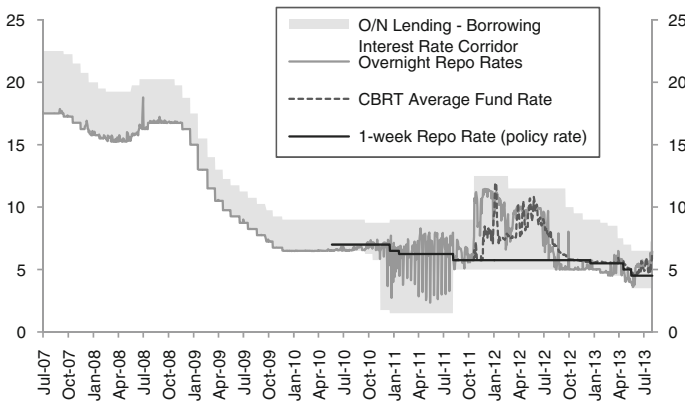
In these regards, the corridor policy can be thought as a policy-induced uncertainty shock on the money market rate to smooth capital flows, accordingly to ensure milder fluctuations in the exchange rate, and in turn domestic financial stability.

Another use of the corridor policy is that the central bank can steer the money market rate (within the unconventionally wide corridor) on a daily basis via liquidity operations, as opposed to setting the policy rate for a predetermined period as in the conventional framework. In this case, the corridor provides flexibility for the monetary policy to react to volatile capital flows in a timely manner.

<sup>19</sup> See Barro (2006) for extreme event risks.



**Fig. 12** The interest rate corridor and its asymmetric effect on domestic/global lenders



**Fig. 13** The implementation of the interest rate corridor

To steer the short-term interest rates inside the corridor, it is necessary that banking sector is a net borrower from the central bank. In the Turkish case, this was achieved initially by increasing the required reserve ratios. Another way would be the foreign exchange sale auctions where central bank shifts its balance sheet from net foreign assets to net domestic assets thereby increasing the liquidity need of the banking sector.

The CBRT introduced the interest rate corridor as a policy tool in late 2010, and actively use the upper and lower bounds over the course of its implementation (see Fig. 13). Due to surge in capital inflows after the Fed's second round of quantitative easing (QE2), the CBRT has cut the lower bound aggressively and widened the corridor to discourage short-term capital flows. In late 2011 and 2012 when the Euro debt crisis intensified, the upper bound was increased to prevent reversal in capital flows. As concerns about the Euro-zone economies have decreased gradually after mid-2012, the upper bound was steadily decreased to contain the effects of the resulting short-term capital inflows.

### 3.2 Reserve option mechanism

The ROM is a market-friendly tool that acts as an automatic stabilizer of exchange rate fluctuations which aims at containing amplified effects of volatile short-term capital flows on the domestic business cycles.

Consider first a conventional tool, direct FX market intervention by the central bank, to smooth excessive fluctuations in the exchange rate. In response to an increase in capital flows, the central bank could absorb the ‘excess’ FX inflow by open market operations. The central bank, in other words, shifts the FX demand rightwards by accumulating reserves. This policy, however, requires constant monitoring of fluctuations in the exchange rate, and in principle could distort market participants’ intertemporal decisions.

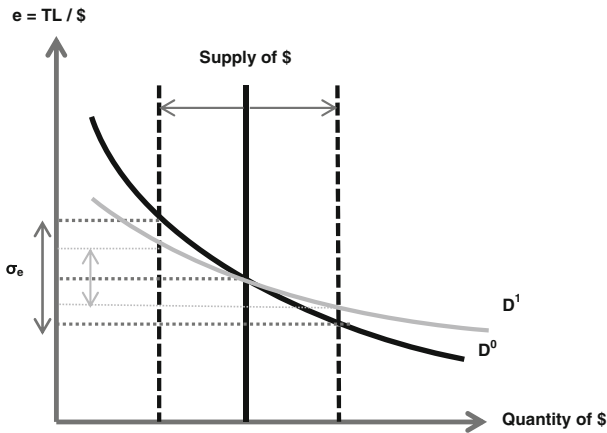
Alternatively, consider a market-friendly policy tool that smooth fluctuations in the exchange rate via changing the effective market demand for foreign exchange. In particular, consider a policy that allows banks to voluntarily hold FX reserves at the margin, tilting the foreign exchange demand from  $D^0$  to  $D^1$  (Fig. 14) so that fluctuations in the FX supply now imply mild changes in the FX rate.

If some of the FX inflows can indeed be retained as reserves during capital inflows and be released during capital outflow periods, the central bank can then smooth fluctuations in the FX rate. The question then is how to give incentive to banks to voluntarily utilize the mechanism?

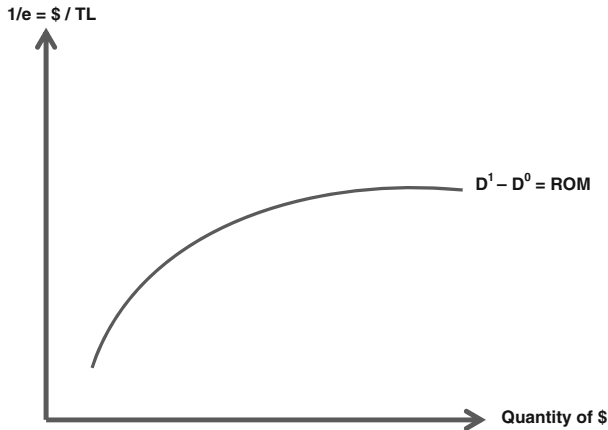
The ROM allows banks to voluntarily hold a certain fraction of their domestic currency (TL) required reserves in foreign currency (FX) or gold. The amount of FX or gold that can be held per unit of TL required reserves is called the reserve option coefficient (ROC). For example, suppose ROM allows banks to hold up to 50 % of their TL required reserves in FX, and the ROC equal to 2. Then, a bank that is obliged to hold 100 TL as required reserves can hold up to 100 TL (50 TL  $\times$  2) worth of FX and 50 TL to fulfill its reserve requirements. Similarly, if the ROC is equal to 3, the bank can hold 150 TL (50 TL  $\times$  3) worth of FX and 50 TL to meet the 100 TL reserve requirement. Since the domestic yields are higher than the foreign yields, it becomes profitable for banks to hold foreign currency in place of TL required reserves even if the ROCs are larger than 1. The difference between the smoother demand curve  $D^1$  and steeper demand curve  $D^0$  would be the reserve holdings of banks as shown in the Fig. 15 below.<sup>20</sup>

The fraction of ROM facility that the bank would like to utilize is market-determined, and depends on the bank’s relative cost of FX funding to the TL funding. In particular, banks utilize the facility up to a certain threshold at which the cost of FX is equalized with the TL funding or at a level their borrowing constraint hits.

<sup>20</sup> Figures 14 and 15 provide a simple conceptual framework for ROM. Figure 14 implies that the ROM can have negative amounts of balance during capital outflow periods since  $D^1$  is lower than  $D^0$  to the left of supply line. A more practical way would be to shift  $D^1$  to the above of  $D^0$  such that they never cross, so that in the equilibrium there would always be a positive amount of reserves in ROM. Then banks can increase or run down their reserves depending on the capital flows and on their individual optimal conditions in a market friendly manner.



**Fig. 14** The ROM and its smoothing effect on the exchange rate



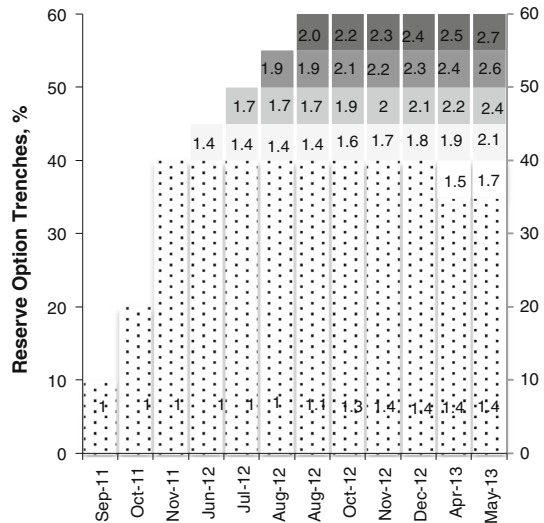
**Fig. 15** The ROM and its effect on FX reserves

During a surge in capital flows, for instance, banks find it easier to borrow FX assets (a decrease in cost of FX funding or a relaxation of borrowing constraints), and hence would optimally choose to utilize the ROM facility at a higher extent. In this regard, the ROM facility gives banks flexibility in liquidity management. From a macro perspective, a portion of the FX would then be held at the Central Bank, which reduces the upward pressure on the currency appreciation and domestic credit growth. Moreover, the accumulated FX assets help cushion the bank's balance sheet from a sudden rise in cost of FX funding.

If, on the other hand, the economy experiences capital outflows (when the cost of FX funding rises or borrowing constraints tightens), banks would optimally choose to utilize a lower fraction of the option. Hence a fraction of ROM-based FX reserves at the CBRT would be released through the economy, decreasing the depreciation pressure and probability of a credit crunch. In these regards, the ROM facility acts



**Fig. 16** FX reserve option coefficients. *Source* CBRT



as a market-friendly automatic stabilizer that potentially smoothens the effect of volatile capital flows on the exchange rate and in turn on domestic business cycles.<sup>21</sup>

Figure 16 below shows the FX reserve option coefficients during the course of its implementation. The CBRT first assumed a gradual implementation, allowing banks to hold 10 % of their TL reserve requirements in USD initially. The fraction is then gradually increased to 60 %. As of July 2013, the facility has been utilized by a large amount, reaching as high as 90 % (Fig. 17).

Note that reserve option coefficients differ across the trenches of TL required reserves. Namely, as of April 2013, a bank can hold 1.4 TL worth of FX to cover 1 TL required reserves for the first 35 % of TL-required reserves. For the second trench, 35–40 %, the bank can hold 1.7 TL worth of FX to cover 1 TL required reserves. The ROCs, in other words, exhibit a concave shape over the trenches, implying that banks who find the FX more easily are the ones that would be willing to utilize the facility at higher trenches. Moreover, since the ROCs are monotonically rising over the trenches, it is increasingly difficult to utilize the mechanism. In sum, the mechanism effectively exploits excess FX returns which are based on banks' own optimization problems. In this regard, the mechanism can be thought as a market-friendly tool.

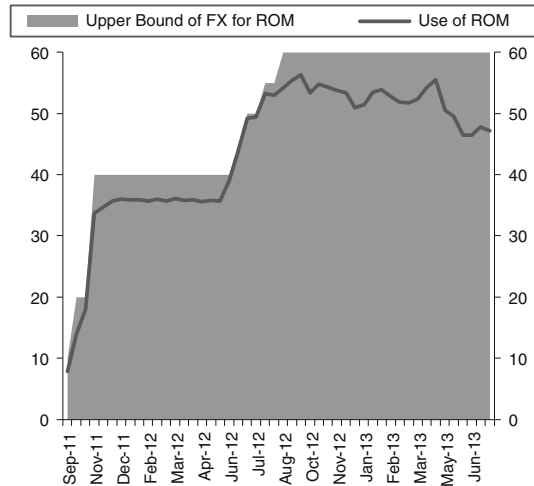
With the introduction of ROM, FX reserve holdings of private banks in the central bank have increased significantly (Fig. 18). These reserves also fluctuated where at some points banks decreased their reserve holdings.

#### 4 Effectiveness of policies

In this section, we first start with a descriptive analysis on the effectiveness of the new policy framework of CBRT for achieving a soft landing in the economy and

<sup>21</sup> Note that empirical evidence on how direct FX interventions by the central banks fare in smoothing domestic credit cycles due to excessive volatility in capital flows is mixed.

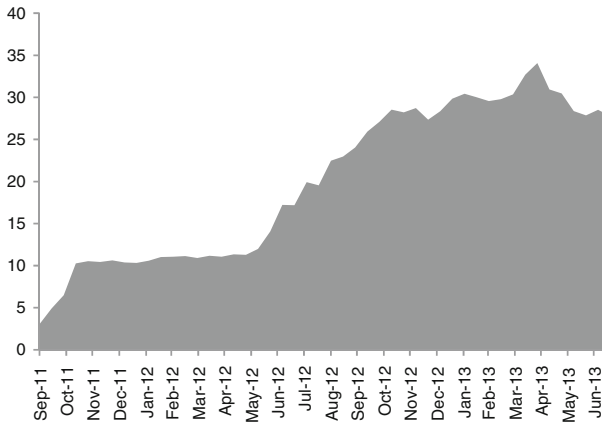
**Fig. 17** ROM usage rates.  
Source CBRT



lessening the financial stability risks. As described in Sect. 3, the main concerns were the size of the current account deficit and its financing by short-term capital flows, excessive volatility in the exchange rate and an overvaluation, and finally, the high pace of credit growth. After discussing briefly the impact of macroprudential policies, we then provide empirical evidence from the related literature on the effectiveness of macroprudential policies in Turkey.

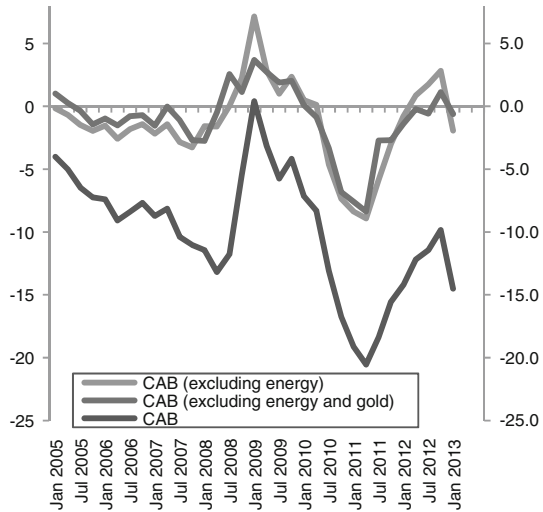
After the implementation of macroprudential policies starting in late 2010, both the current account deficit (Fig. 19) and the maturity of financing (Fig. 20) have improved significantly. From the peak of around 10 % of GDP in 2011, current account deficit decreased to around 6 % of GDP by the end of 2012. During the process, real GDP continued to grow with the largest contributor to growth being net exports. This was unusual for Turkey since a large correction in current account balance and positive growth from net exports in consecutive quarters without a crisis happened for the first time in more than three decades.

One of the main goals of the new policies was to avoid overvaluation and excess volatility in exchange rates. In a relatively short period of time after quantitative easing policies in developed economies, between March 2009 and October 2010, Turkish lira appreciated around 20 % along with other emerging country currencies (Fig. 7). This large appreciation was mostly caused by short-term capital inflows and not in line with the fundamentals. In the initial phase of the new policies, increasing the reserve requirements and lowering the lower part of the interest rate corridor generated 15 % depreciation in Turkish lira until August 2011, when the European debt problems started. In the same period, almost all other emerging country currencies appreciated another 5 % against the US dollar (Fig. 21). This period was like a controlled experiment period for the new policy tools in Turkey. There were not much global financial worries and while capital flows caused emerging market currencies to appreciate, Turkish lira experienced a significant controlled depreciation. Later on with the European debt problems and other global



**Fig. 18** FX reserves of banks in ROM (billion USD). *Source:* CBRT

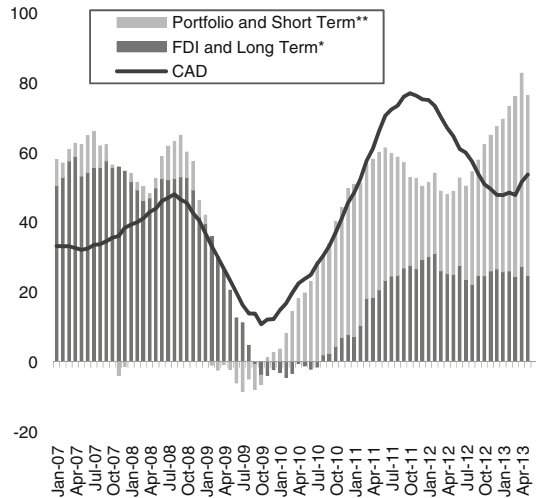
**Fig. 19** Current account balance (seasonally adjusted, quarterly average, billion USD). *Source:* TURKSTAT, CBRT



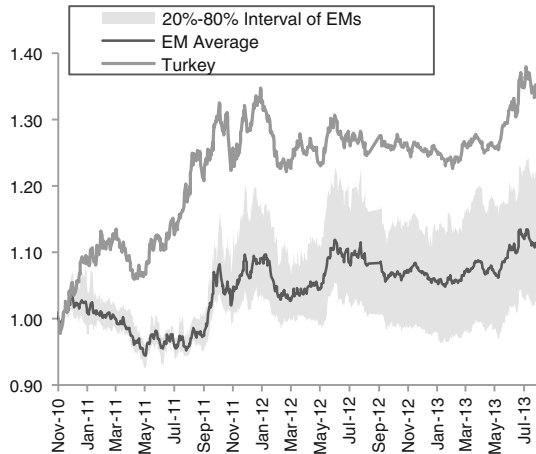
policy uncertainties, emerging country currencies and Turkish lira moved in similar fashion. However, Turkish lira has kept its relative value (of around 15 % higher) against other emerging country currencies.

Another aspect of the exchange rate was that its volatility stayed very low compared to other emerging countries (Fig. 22). Especially in 2012 with the active use of corridor and increasing size of the ROM, implied FX volatility of Turkish lira decreased relative to the peer emerging countries with current account deficits. As interest rate corridor smoothed the supply shifts in foreign exchange and as ROM decreased the sensitivity of demand, the volatility of Turkish lira decreased significantly.

**Fig. 20** Main sources of current account deficit finance\* (12-month cumulative, billion USD).  
Source: CBRT



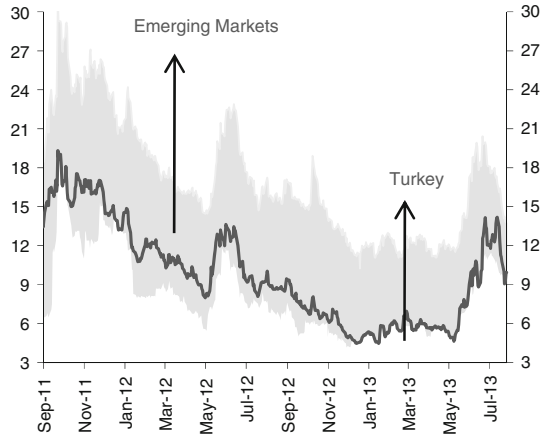
**Fig. 21** Exchange rates in emerging economies (vis-a-vis USD, 01 November 2010 = 1).  
Source: CBRT, Bloomberg



Another main goal of the new policy framework in Turkey was to contain the fast credit growth. Annual credit growth was above 30 % at the end of 2010. This credit growth slowed down to around 25 % at the end of 2011 and around 18 % at the end of 2012, though a continuing effort to monitor the pace of credit growth still appears important in light of the recent data. Last, the decrease in the current account deficit was coupled with the slowdown in the credit growth (Fig. 23).

Empirically, macroprudential policies in Turkey appear successful in containing financial stability risks. We can classify the literature on the effectiveness of macroprudential policies in Turkey into two: The first strand focuses on the policy framework in general, including asymmetric interest rate corridor, the ROM, active use of required reserve policies, as well as other related measures (Aysan et al. 2013; Binici et al. 2013a). The second strand focuses on a specific policy tool

**Fig. 22** Implied FX volatility in emerging economies (1-month maturity). *Source:* Bloomberg



[Binici et al. (2013b) on the corridor policy, and Oduncu et al. (2013) and Degerli and Fendoglu (2013a, b) on the ROM].

Aysan et al. (2013) study the resilience of the economy to external factors with a focus on cross-border capital flows. In particular, they study whether gross capital flows to Turkey have been less sensitive to global factors after the implementation of macroprudential policies. Using a panel of 46 countries, the results suggest that Turkey had been more sensitive to global factors compared to the rest of the economies before the prudential policies, and has become significantly less sensitive afterwards.

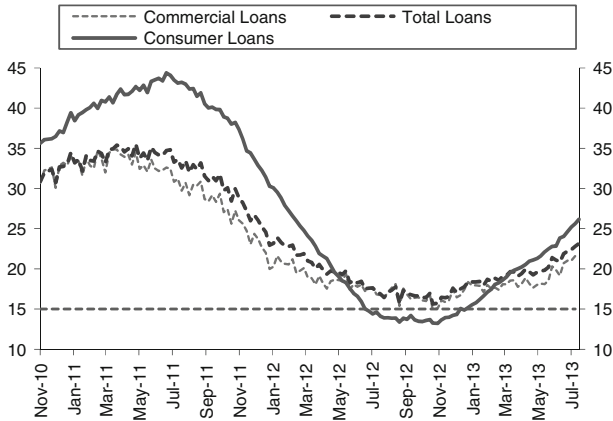
Binici et al. (2013a) focus on the pace of domestic credit growth. They find that unconventional policy tools, in particular the required reserve ratio and the asymmetric interest rate corridor policies, have been effective in containing credit growth, underlining the importance of unconventional tools to ease the trade-off in achieving financial stability within the inflation targeting regime.

Empirical evidence shows that the asymmetric interest rate corridor policy appears as an effective tool for supporting financial stability. Binici et al. (2013b) show that the asymmetric interest rate corridor (together with an active use of liquidity policies) has a significant impact on the bank lending and deposit rates. In this regard, the corridor policy, as a macroprudential tool, can be used to smooth domestic credit cycles.

The ROM appears to be successful in containing excessive appreciation/depreciation pressure on the USD/TL exchange rate despite large swings in capital flows, hence in turn supports financial as well as price stability.

Oduncu et al. (2013) document that the ROM has decreased the (conditional) volatility of USD/TL exchange rate significantly, controlling for international risk appetite and the CBRT's other policy actions.

Similarly, controlling for common external factors, Degerli and Fendoglu (2013a) provide descriptive evidence that the ROM is successful in containing the (implied) volatility, skewness and the kurtosis of USD/TL exchange rate expectations. More noticeably, ROM appears to be helpful in containing the expected USD/TL volatility and kurtosis.



**Fig. 23** Total credit growth (annual percentage change). *Source:* Banking Regulation and Supervision Agency (BRSA), CBRT

Degerli and Fendoglu (2013b) study empirically (1) whether the use of ROM makes the volatility, skewness, or kurtosis of USD/TL expectations lower *relative* to other emerging market currencies; and (2) whether the USD/TL exchange rate expectations become *less sensitive* to fluctuations in common external factors due to the ROM. Estimating a common external factor for each moment (volatility, skewness, or kurtosis), using a large set of emerging market currencies, and controlling for such common external factors and other policy actions by the CBRT, the results suggest that after the implementation of the ROM, market expectations are leaned towards a significantly lower volatility or skewness in the USD/TL relative to other emerging market exchange rates; and ROM appears to be an automatic stabilizer of expectations about excessive movements of the USD/TL exchange rate.

## 5 Conclusion

In the aftermath of the recent global financial crisis, low interest rates, quantitative easing policies coupled with fragile recovery and policy uncertainties in advanced countries have generated an abundant but very volatile and short term global liquidity. These developments have created financial stability challenges for emerging market economies: appreciation pressure on the currencies, worsening current account balances, and possible credit booms in those countries.

Faced with such challenges, the CBRT devised a new policy framework starting in late 2010. Main goal was to achieve a soft landing in the economy by containing the adverse effects of volatile short-term capital flows. In this paper, we focus on the novel tools in the policy toolkit, the interest rate corridor and the ROM. From the perspective of capital flows, interest rate corridor smoothens the shifts in the supply of foreign exchange by changing the risk-adjusted return for international investors.

Alternatively, ROM works on demand for foreign exchange. By letting banks voluntarily hold foreign exchange reserves at the central bank during capital inflow periods and withdraw these funds during outflows, ROM effectively decreases the sensitivity of exchange rate to shifts in FX supply. Empirical evidence supports the view that both mechanisms have been efficient and effective in supporting financial stability in Turkey. As more data becomes available, we will be able to provide a more comprehensive assessment of these policies. Overall, the new framework and the new policy tool offer important policy opportunities for Turkey as well as for other emerging countries.

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