



CBT RESEARCH NOTES IN ECONOMICS

Financial Conditions Indices for the Turkish Economy¹

Hakan Kara Pınar Özlü Deren Ünalnış

Abstract: Since the end of 2010, Central Bank of the Republic of Turkey has adopted a new policy strategy which jointly uses liquidity, credit, and interest rate policies. The new framework has increased the need to develop and monitor a broad measure of “financial conditions” index that would complement the monetary policy analysis in assessing whether the overall set of policies are restrictive or accommodative. This note seeks to fill this gap by developing financial conditions indices for Turkey using a range of monetary and financial indicators.

Özet: Türkiye Cumhuriyet Merkez Bankası, 2010 yılının sonlarından itibaren yeni bir para politikası stratejisi uygulamaya başlamıştır. Bu yeni çerçevede likidite, kredi ve faiz politikalarının bir arada kullanılması, uygulanan ekonomi politikalarının sıkılık derecesini ölçmek için parasal koşulların yanında “finansal koşullar” gibi daha geniş tanımlı göstergelerin geliştirilmesini ve izlenmesini gerekli kılmaktadır. Bu not, çeşitli parasal ve finansal göstergeler kullanmak yoluyla finansal koşullar endeksi türeterek Türkiye için bu gereksinimi karşılamayı amaçlamaktadır.

¹ We thank two anonymous referees, Harun Alp, Defne Mutluer, Mustafa Kılınç and Hande Küçük for helpful comments and suggestions; Faruk Aydın, Murat Duran, Okan Eren, Mahmut Günay and Gazi Kabaş for their help with the data. The views expressed herein are solely of the responsibility of the authors and do not represent those of the Central Bank of the Republic of Turkey.

1. Introduction

The global financial crisis has highlighted the importance of monitoring and assessing the overall financial conditions for the conduct of sound macroeconomic policy. Moreover, the use of multiple instruments and unconventional policies by the monetary and financial authorities has necessitated the use of broad measures of financial conditions in order to evaluate the net impact of the different policy tools on the overall financial environment. Accordingly, policymakers have increasingly adopted a financial conditions perspective, arguing that overall financial conditions provide a better guide than more traditional measures of the monetary policy stance such as the money conditions index or the real policy rate.^{2,3} The scope of variables was broadened to include long-term interest rates, credit, equity prices and even house prices. These broad measures were called as ‘financial conditions indices’ (FCI) in order to distinguish them from ‘monetary conditions indices’ (MCI). In this context, financial conditions indices, summarizing the information regarding financial indicators relevant for the economic outlook, have become highly popular among central banks.

With the rising popularity of financial conditions indices, there has been an increasing attempt to construct these indices in recent years to assess the relative tightness or looseness of financial conditions. Many central banks and other institutions, including the International Monetary Fund (IMF), the Organization for Economic Co-operation and Development (OECD), Bank of Canada, the Federal Reserve Banks, the US Monetary Policy Forum and many private banks started to construct and use their financial conditions indices extensively to analyze the economic and monetary policy outlook.⁴

This study attempts to develop a financial conditions index for Turkey. Following the global financial crisis, the Central Bank of the Republic of Turkey (CBRT), like many of its peers, has adopted financial stability as a supplementary objective besides price stability. In order to control macro-financial risks arising from global imbalances, CBRT has designed a new monetary policy framework (the policy mix) by modifying its inflation targeting regime. The new regime adopts a more flexible framework, using both credit and liquidity policies along with the short term policy rates in the conduct of monetary policy.⁵ To this end, the CBRT have used an array of conventional and unconventional policy tools such as one-week repo auction rates, the interest rate corridor between O/N borrowing and lending rates as

² Bank of Canada pioneered work on financial condition measures by introducing its monetary conditions index in the mid-1990s.

³ Monetary condition index consisted of a weighted average of the policy rate and the exchange rate.

⁴ Hatzius (2010) provide a detailed survey of studies on financial conditions indices.

⁵ See Kara (2012) for a comprehensive assessment of the new policy framework.

well as reserve requirements. The new framework has increased the need to develop and monitor a broad measure of financial conditions index that would complement the monetary policy analysis in assessing whether the overall set of policies are restrictive or accommodative. This study seeks to fill this gap by developing financial conditions indices for Turkey using a range of monetary and financial indicators.

Our financial conditions indices provide an intuitive account of the post-crisis monetary and financial stance, incorporating the policies pursued by different authorities. For example, the indices suggest that following the onset of the global financial crisis, there has been a marked tightening in financial conditions despite a substantial easing in policy rates. Moreover, when external conditions are properly controlled, it is possible to observe the tightening impact of the policy mix adopted by the CBRT throughout 2011. However, the credit conditions seem to have tightened significantly only after the measures taken by the Banking Regulation and Supervision Agency (BRSA) on risk weights and general loan provisioning.

The literature on financial conditions indices mainly focuses on advanced countries.⁶ On the other hand, financial conditions indices constructed for emerging markets are relatively new and rare.⁷ To the best of our knowledge, there is no documented attempt for constructing a financial conditions index for Turkey.⁸

2. Methodology and Data

A variety of methodologies for constructing FCIs have been developed in the literature. The most popular methodologies are the weighted-sum and the principal component approach. In the first approach, the weights of each financial variable in the index are set according to the estimated impact on real GDP growth in an unrestricted VAR model or single equation reduced form estimation.⁹ In the second approach, the financial conditions index is derived using the principle common factor extracted from a group of financial indicators, which captures the common variation among the variables.

Our study uses the weighted-sum approach, VAR methodology in particular.¹⁰ The weight on each variable reflects the relative importance of that variable in explaining the future

⁶ Matheson (2012) and Brave and Butters (2012) are two recent examples for studies on advanced countries.

⁷ See Osorio et al. (2011) for China, Indonesia, India, Korea, Malaysia, Philippines and Thailand; Gomez et al. (2011) for Colombia; Sales et al. (2012) for Brazil and Gumata (2012) for South Africa.

⁸ BNP Paribas and Goldman Sachs use monetary and financial conditions index for Turkey in their reports; however, there is no documented study regarding the exact methodology for these indices.

⁹ Although not as common as these two approaches, another way to derive the weights is to extract them from a macro-model.

¹⁰ Guichard and Turner (2008), Swinston (2008) and Osorio et al. (2011) are studies which also use the VAR methodology.

output growth. We prefer the VAR approach to the reduced form approach since it allows us to attach more economic meaning to the indices by decomposing the contribution of each variable with respect to their predictive power on the variable of interest (GDP, in our case). Moreover, the VAR estimation is able to account for the endogenous interactions between the financial variables and the economic activity, as well as the interplay between the financial variables themselves. Incorporating this feature is important due to high correlations between financial indicators. In a related context, the VAR approach provides a simple framework to control for relatively more exogenous factors. This is particularly important for small-open-emerging economies where global conditions play a central role in driving financial conditions. In fact, as will be shown later, the results change significantly in some cases once the external (global) factors are controlled.

The system of equations estimated is given in equation (1). In this setup, Y_t denotes a vector of endogenous variables where X_t is a vector of exogenous (control) variables, B and C are coefficient matrices and ε_t is a vector of error terms which is assumed to be i.i.d.

$$Y_t = \sum_{i=1}^p B_i Y_{t-i} + \sum_{i=0}^p C X_{t-i} + \varepsilon_t \quad (1)$$

Our analysis covers the sample period of 2005Q2-2012Q2.¹¹ The starting date is constrained by the data availability on credit standards. Similar to other studies in the literature, we select several financial and monetary indicators that are deemed relevant for economic activity. The endogenous variables used to explain annual GDP growth are: the ratio of annual change in total credit stock¹² to annual GDP, quarterly data for credit standards, the real effective exchange rate, real ex ante benchmark rate¹³, quarterly capital inflows,¹⁴ the spread between credit and deposit rates¹⁵, and the annual percentage change in real ISE-All equity return index. In a small-open-emerging economy like Turkey, domestic financial indicators are not independent from global factors. Thus, in order to better identify

¹¹ Under current conditions, due to the large number of variables in the model and a limited sample size it is not possible to use more than one lag in the VAR. For this reason, it is not also possible to carry out statistical tests to determine the optimum lag length. Hence, in this version of the study, we make a discretionary choice and conduct the estimations with one lag.

¹² The credit volume is calculated as the sum of business enterprises loans and consumer loans. The series is corrected for the changes in the exchange rates.

¹³ We use inflation expectations reported in the CBRT survey in constructing the real series. The benchmark rate is detrended using a linear trend.

¹⁴ Net quarterly capital inflows are constructed by using the balance of payments data published by CBRT. We calculate this series by excluding the following items from portfolio investment: foreign assets of general government, banks and other sectors, and debt securities of the general government issued abroad; and then adding the loans used by banks and other sectors from abroad.

¹⁵ Total credit standards and total credit rate are calculated by using a weighted average of sub-items, namely series for business enterprises and consumers. Weights are the relative volumes of corresponding credits.

the contribution of domestic financial factors, we control for the external conditions using two exogenous variables representing global demand and global risk appetite. To this end, we use the annual growth of quarterly export weighted global production index¹⁶ constructed by the CBRT for a proxy of external demand and the volatility index (VIX) to capture international investors' appetite for risk.^{17,18}

The weights of FCI are derived by using the impulse responses of the VAR.¹⁹ This allows the FCI to incorporate the transmission from financial markets to economic activity.²⁰ Since it is difficult to make plausible assumptions regarding the ordering of the financial variables, we use generalized impulse responses.²¹ The weight for each financial variable, denoted by w_j , is calculated as the four quarter cumulative responses of GDP growth to one unit of shock to each variable $y_{j,t}$. Then the FCI is calculated as a weighted average of all variables in standardized form, which is shown in equation (2), where \bar{y}_j , and σ_{y_j} are the mean and the standard deviation of $y_{j,t}$ over the whole sample period.

$$FCI_t = \sum_{j=1}^n w_j \frac{y_{j,t} - \bar{y}_j}{\sigma_{y_j}} \quad (2)$$

3. Financial Conditions Indices

In a small-open-emerging economy like Turkey, domestic financial indicators are highly sensitive to global financial and economic environment. Hence, controlling for the external conditions may not only reveal additional information regarding the financial conditions but also help to better identify the contribution of each variable to the overall index. In this respect, we construct two different financial conditions indices—one with controlling (FCI^C) and the other without controlling (FCI^{NC}) external conditions.²²

Figure 1 presents the two indices.

¹⁶ The export weighted global production index is calculated by taking into account each country's share in Turkey's exports.

¹⁷ We use the average values of the variables for each quarter.

¹⁸ Appendix provides the plot of all data used in the study.

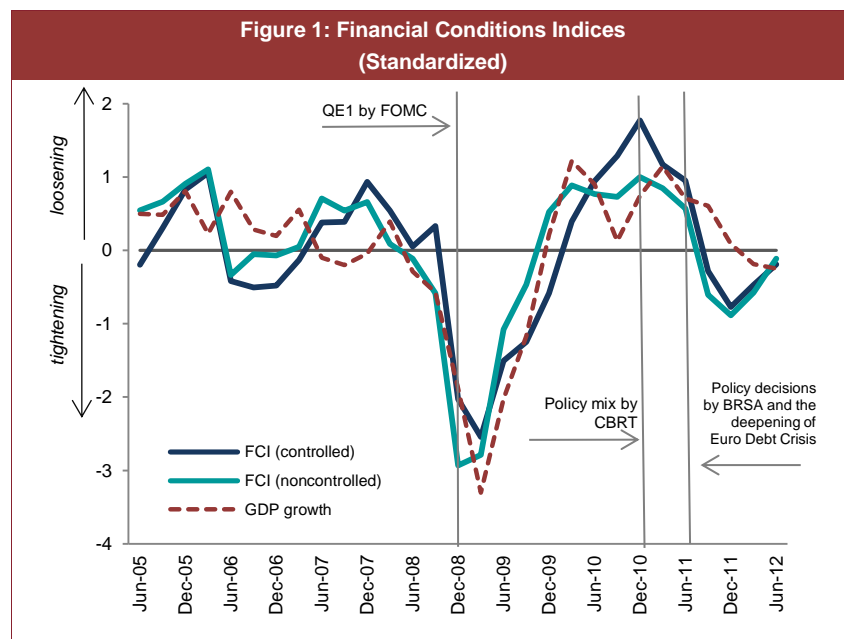
¹⁹ The impulse response function measures the impact of any variable on another variable in the system by shocking the error term for that variable in equation (1) and tracing out the effects through all equations.

²⁰ Swiston (2008) presents a detailed justification on the use of impulse response functions as the weights in an FCI.

²¹ Generalized impulse responses do not require orthogonalization of shocks and is invariant to the ordering of the variables in the VAR.

²² Osorio et al. (2011) as well controls for the external conditions in their analysis for a group of Asian countries. However, they do not compare the indices that are constructed with and without controlling for external conditions.

As depicted in Figure 1, an upward movement of the index implies more accommodative financial conditions while a decline reflects tighter financial conditions. Although the two indices exhibit similar behavior over time, they depart from each other during the periods of large global or domestic shocks. For example, we observe that the FCI^{NC} displays tighter financial conditions preceding the collapse of Lehman Brothers, yet recovers faster during the post-crisis period. In fact, this latter period witnessed rapid capital inflows due to increasing risk appetite driven by quantitative easing policies of developed economies.²³ It is particularly interesting to note that both indices report historically expansionary financial conditions at the end of 2010, which coincides with the date of the adoption of the new policy mix by the CBRT. It is also worthwhile to note that, following the onset of the policy mix, there is a marked tightening in financial conditions. The tightening is more evident in FCI^C , suggesting that the tightening was mostly driven by domestic factors such as monetary and credit policies. The tightening becomes more significant with the restrictive credit policy measures taken by the Banking, Regulation and Supervision Agency (BRSA) by mid-2011.



The four quarter cumulative impulse response of the GDP growth to the financial variables, which are used to compute the relative weights, are shown in Table 1. As expected, the responses change significantly when external conditions are controlled. For example, while the shocks to the stock market have a relatively high and significant weight in

²³ Federal Reserve Open Market Committee (FOMC) has adopted the first quantitative easing (QE1) in the last quarter of 2008, while the second quantitative easing (QE2) is implemented in the last quarter of 2010.

FCI^{NC}, they are no longer significant when external conditions are controlled. Since the global risk appetite (VIX index) has been one of the main drivers of emerging countries' stock markets in the post-crisis period,²⁴ it is not surprising to see that the stock market itself ceases to have explanatory power once the global conditions are controlled. Moreover, main variables for monetary and financial conditions such as credit and interest rates become significant only after external conditions are controlled. These observations suggest that, when interpreting the individual contribution of each financial variable to the overall index, it may make more sense to use the controlled index FCI^C.

Table 1: Four Quarter Cumulative Response of GDP growth to the Financial Variables (Control variables for external conditions are VIX and global demand-yoy %)		
	External conditions are not controlled	External conditions are controlled
Change in Credit/ GDP (%)	-0.12 (0.29)	0.49*** (0.18)
Stock Market Index (real, yoy % change)	0.84*** (0.31)	0.06 (0.18)
Benchmark Rate (ex ante real, detrended)	-0.34 (0.34)	-0.39** (0.18)
Credit-Deposit Spread	-0.57* (0.33)	-0.35** (0.18)
Real Effective Exchange Rate	0.09 (0.35)	0.41* (0.21)
Credit Standards	0.97*** (0.32)	0.39** (0.19)
Capital Inflows	0.93*** (0.33)	0.28* (0.18)

Notes: Standard errors are in parentheses below coefficients. *** denotes significance at 1% level, ** denotes significance at 5% level, and * denotes significance at 10% level.

All significant coefficients in Table 1 have the expected sign except the exchange rate. The sign for the real effective exchange rate is positive, indicating that an appreciation of the domestic currency is associated with a loosening in financial conditions. Although this may look at odds with the conventional literature of monetary conditions indices, this is a common finding for the studies of emerging markets financial conditions indices (for example, see Gumata et al., 2012). An appreciation of the domestic currency in emerging markets typically reflects improved prospects for growth and/or a surge of capital inflows, along with easier access to finance by domestic agents. Although, we control for many of these factors by adding variables related to global risk indicators and capital inflows, exchange rate may be

²⁴ See Inflation Report 2012-IV, Box 2.1.

still reflecting nonlinear effects associated with the balance sheet channel. In this respect, another explanation for the positive coefficient of the exchange rate may be the balance sheet channel. When nonfinancial firms are indebted in foreign currency as in the case of Turkey, an appreciation in domestic currency may increase net worth of the firms, relaxing the borrowing constraints and thus supporting economic activity through the financial accelerator mechanism.²⁵

The standardized weights, which are calculated by using the impulse responses in Table 1, are reported in Table 2. Moreover, as expected in a small open emerging economy like Turkey, relative weights change substantially when external factors are controlled. This indicates that many of the variables we use to construct the indices have close interactions with the external variables. Interestingly, the only variable whose share stays same in the two specifications is credit spread, which is used as a domestic policy variable in the new policy framework.

Table 2: Weights of Variables in the Financial Conditions Indices (%)		
	External factors are not controlled	External factors are controlled
Change in Credit/ GDP (%)	3	21
Stock Market Index (real, yoy % change)	22	3
Benchmark Rate (ex ante real, detrended)	9	16
Credit-Deposit Spread	15	15
Real Effective Exchange Rate	2	17
Credit Standards	25	16
Capital Inflows	24	12
Total	100	100

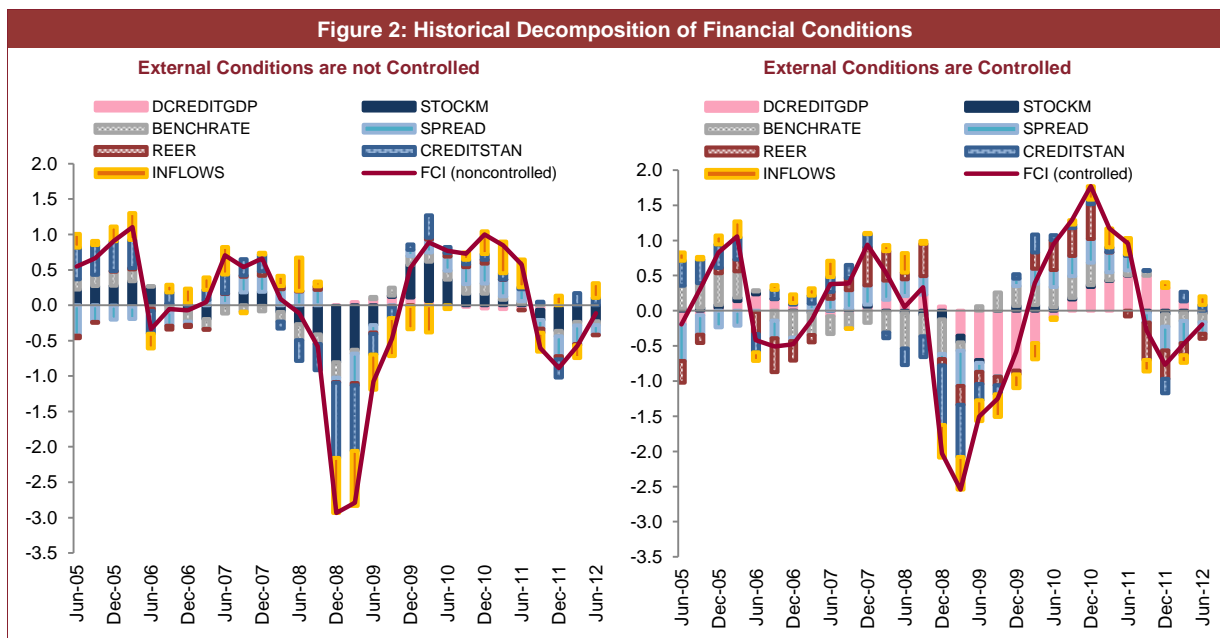
Historical Decompositions

Assessing the contribution of each variable on financial conditions is as important as the monitoring the index itself. Decomposing the index may provide valuable information regarding the individual drivers of financial conditions, enabling us to assess the contribution of each factor to the financial conditions over time. This selective information is especially useful for the policy makers who have to decide on the specific type of the policy reaction needed to smooth the financial conditions.

²⁵ See Shin (2012) for an exposition of the mechanism on how the exchange rate appreciation may lead to an easing in credit conditions through external finance channel.

Figure 2 reports the contributions of each financial indicator to financial conditions. One of the main aims of this study is to use the financial conditions index to provide a retrospective evaluation of the domestic monetary and financial policies across different episodes. For example, we are interested in evaluating the impact of the policies taken by monetary and credit authorities following the adoption of the new policy mix since the end of 2010. Therefore, as explained above, it makes more sense to control for the external conditions because of the close interaction of these factors with domestic monetary and financial variables. Hence, in what follows, we will focus on the controlled index (FCI^C) to interpret the relative contribution of each factor to the financial conditions which is shown at the right panel of Figure 2.

There are several important observations to make: First of all, the sharp tightening in financial conditions in the aftermath of the collapse of Lehman Brothers can be mostly attributed to a tightening in credit supply (lending standards and the spread) rather than monetary conditions. Secondly, the tightening in financial conditions following the adoption of the new policy mix at the end of 2010 seems to be initially driven by the depreciation of the Turkish lira. Third, the significant tightening in financial conditions after mid-2011 can be mostly attributed to an increase in the lending-deposit rate spread, reflecting the measures taken by the Banking Regulation and Supervision Agency to curb credit growth.



4. Evaluating the Predictive Power of Financial Conditions Indices

In this section, we investigate the in-sample and out-of-sample predictive power of the indices' in explaining future GDP growth. In order to assess the in-sample predictive ability of the FCI, we start by obtaining the residuals of the GDP growth and the FCI with respect to the lags of the GDP growth. Then, we regress the residuals of the GDP growth on the residuals of the FCI. The R^2 from this regression is the marginal contribution of the FCI in explaining the GDP growth (partial R^2).

For assessing the out-of-sample predictive ability, the following equation is estimated recursively to calculate the root mean squared error (RMSE):

$$Growth_{t+1} = \beta_0 + \sum_{i=1}^4 \beta_{1i} Growth_{t+1-i} + \sum_{i=1}^4 \beta_{2i} FCI_{t+1-i} + \varepsilon_t \quad (3)$$

RMSE gives the sum of differences between values predicted by model (3) and the growth values actually observed. Hence, it is useful in comparing the predictive powers of different explanatory variables.

Table 3 presents our findings. In-sample statistical properties of the indices suggest that both indices help to predict GDP growth. The marginal explanatory powers of FCI^{NC} and FCI^C on GDP growth are 48% and 41%. This implies that the errors in predicting GDP growth by using an autoregressive model could be reduced by 48% (41%) if the lags of FCI^{NC} (FCI^C) are included in the estimation. The finding that FCI^{NC} is better in forecasting GDP growth than FCI^C is not surprising, since the latter—by construction—does not utilize some of the predictive power embedded in global factors. This observation also suggests that the information content of the FCI^{NC} is relatively higher for the assessment of the impact of overall financial conditions.

Table 3: Predictive Power (Dependent Variable: GDP Growth)		
	With lags of FCI^{NC}	With lags of FCI^C
In-sample predictive power		
Partial R^2	0.48	0.41
Out-of-sample predictive power		
RMSE	0.54	0.79

Therefore, we conclude that the particular usefulness of the FCI's we develop depends on the question we need to answer. If we are interested in the overall tightness of the financial conditions, it is better to use FCI^{NC} . On the other hand if we wish to assess the relative contribution of the domestic variables in driving financial conditions, FCI^C (particularly, a historical decomposition of FCI^C) would provide a better metric.

5. Concluding Remarks

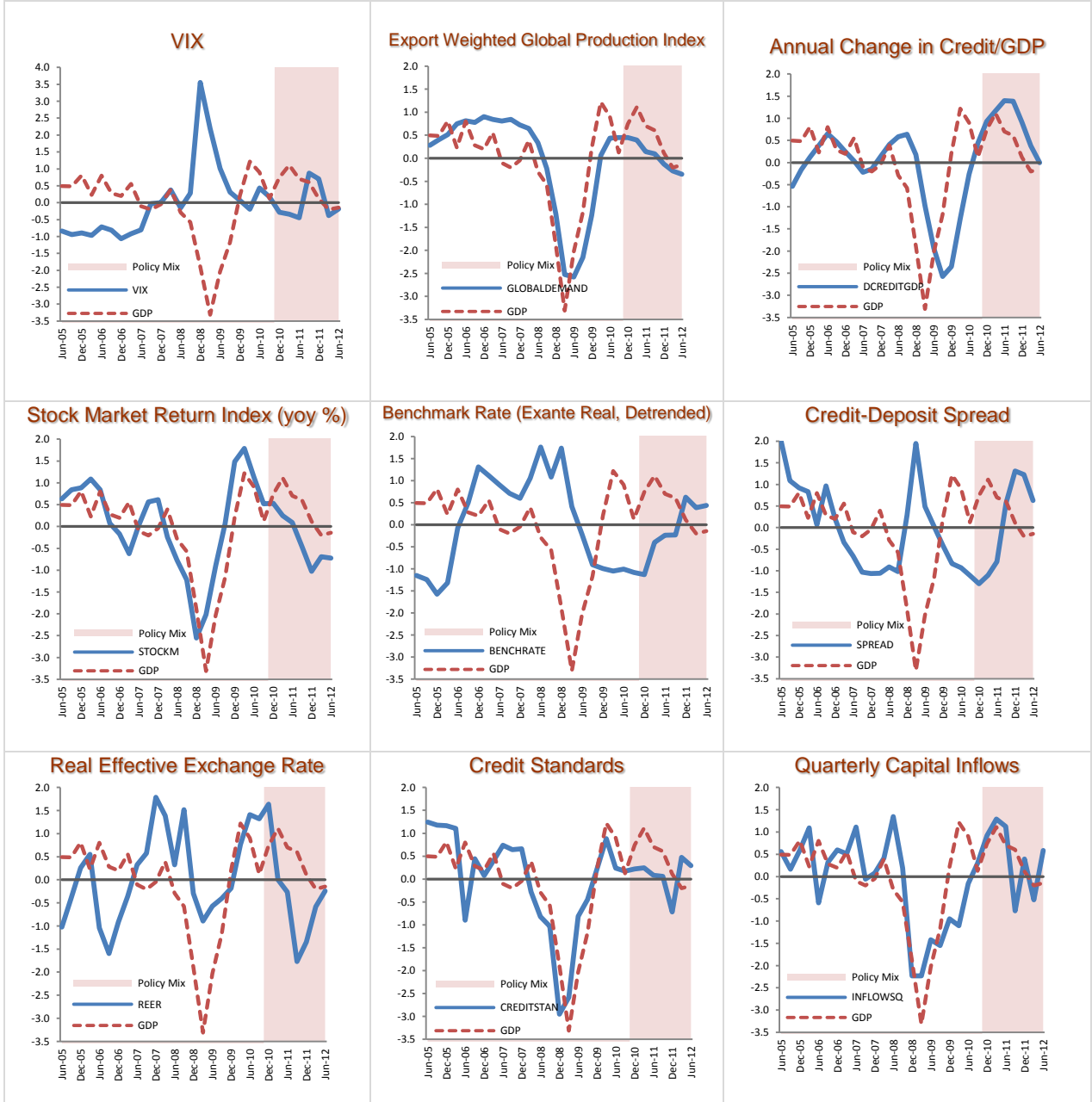
The unprecedented sequence of events following the global financial crisis and the ensuing volatility in cross-border financial flows prompted the CBRT to adopt financial stability as a supplementary objective besides price stability. To this end, CBRT modified its conventional inflation targeting regime and designed a new monetary policy framework in order to contain macro-financial risks arising from global imbalances and the post-crisis spillovers. Unlike the previous “single instrument” regime, the new setup utilizes multiple instruments involving both credit and liquidity policies in the conduct of monetary policy. As a consequence, there is a growing need to develop and monitor broad measures of financial conditions indices that would complement monetary analysis in assessing whether the overall set of policies are restrictive or accommodative. This note seeks to fill this gap by developing financial conditions indices for Turkey using a range of indicators.

We construct two different financial conditions indices—with and without controlling for external factors (global demand and global risk appetite). The financial conditions indices we develop provide an intuitive account of the post-crisis monetary and financial stance, incorporating the policies pursued by the relevant authorities in Turkey. For example, we are able to demonstrate that, following the onset of the global financial crisis, there has been a marked tightening in financial conditions despite a substantial easing of the policy rates. Our indices also indicate that, when external conditions are properly controlled, it is possible to observe the tightening impact of the policy mix adopted by the CBRT throughout 2011.

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Appendix: GDP Growth and Financial Indicators (standardized)



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For questions and comments:

Editör, Ekonomi Notları, TCMB İdare Merkezi, İstiklal Cad, No: 10, Kat:15, 06100, Ulus/Ankara/Türkiye.

E-mail: ekonomi.notlari@tcmb.gov.tr