The Stock Market Channel Of Monetary Policy In Emerging Markets: Evidence From The Istanbul Stock Exchange

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The Stock Market Channel Of Monetary Policy In Emerging Markets: Evidence From The Istanbul Stock Exchange

Hakan Berument* and Ali M. Kutan**

Abstract
Studies on the existence of the stock market channel of monetary policy in emerging markets are scant. We examine the impact of monetary policy on stock returns in Turkey’s emerging economy during the post-1980 liberalization period. Evidence indicates that monetary policy affects returns with the strongest influence on the Financial and Services sectors. However, the impact is short lived, ranging between 9 and 24 months, depending upon the index used, suggesting that monetary policy is neutral. Overall, the results indicate that asset prices may provide an additional channel through which monetary policy affects short-run economic activity and hence business cycles. Given the increasing role of the stock market in emerging economies and the greater globalization of financial markets in general, central banks in these countries are well advised to pay close attention to the impact of stock market developments on economic activity, besides their traditional focus on the bond and foreign exchange markets.

* Bilkent University, Ankara, Turkey.
I. Introduction

Many structural economic models include asset prices as part of monetary policy transmission mechanism. For example, Modigliani (1971) and Mishkin (1977), among others, discuss channels through which monetary policy affects output via changes in stock prices. Economic theory suggests that expansionary (restrictive) monetary policy is associated with higher (lower) stock returns. Movements in interest rates, reflecting monetary policy changes, may directly affect the equity cost of capital, as well as the expectations of corporate profits, hence causing fluctuations in stock prices (Durham, 2001). Other studies point out additional reasons for the link between monetary policy and stock returns. Patellis (1997) argues that monetary policy may represent a significant source of business cycles and hence it may affect stock returns. According to Chami, et al. (1999), an increase in money supply, which raises inflationary expectations, causes a decline in the future real value of dividends paid to stockholders, making the stocks less attractive and hence reducing their prices. Gilchrist and Leahy (2002) argue that changes in asset prices may affect policy makers’ view of the outlook of the economy and hence the required policy stance. These studies indicate that the effect of monetary policy on asset prices has significant implications for portfolio managers, investors, and central banks.

Although many studies have investigated the empirical link between monetary policy and stock returns, the focus has been the United States and some other major industrial countries. While evidence from U.S. data indicates that changes in U.S. monetary policy affect both short- and long-run domestic stock market performance, evidence from non-US industrial countries is not that clear cut. Using data for the G-7 countries, Lastrapes (1998) show monetary shocks influence stock
returns, while Kaen, et. al (1997) find that changes in Bundesbank’s policy affect German bank equities. Conover et al. (1999) provide evidence from 16 industrial countries and find a significant link about the stance of monetary policy. However, Durham (2001) reports a weaker link between different indicators of monetary policy and long run stock performance.

Given scant international evidence and mixed findings from industrial countries, and the growing importance of stock markets in emerging economies, it is important to study this issue for emerging markets as well. We contribute to this line of research by examining the impact of monetary policy on stock returns in Turkey. To the best of our knowledge, this is the first study that provides evidence on this issue from an emerging market like Turkey. There are several reasons why the Turkey’s experience is not trivial. First, Turkey has been liberalizing her economy since the early 1980s. Turkey stands out from other liberalizing emerging markets in important aspects. One is that Turkey has had a persistent but moderately high inflation rate. Although Turkey never experienced hyperinflation, such as some Latin American economies, it has not been able to bring its inflation rate down. Instead, inflation has been persistent at moderately high and volatile levels for about two decades. Turkey also has faced an unstable political and social environment for the past last two decades.

Second, the importance of stock market in the overall economic activity has been steadily rising. For example, while the stock market capitalization was 12.6 percent of GDP in 1990, it increased to 34.8 percent in 2000. The number of listed companies jumped from 110 in 1990 to 310 in 2001 (World Development Indicators, Table 5.3, 2002). The dramatic increase in both the market capitalization and the number of listed companies in the last decade suggests that monetary policy
makers in Turkey need to monitor stock market developments, besides their traditional focus on the bond and foreign exchange markets. Hence, a careful examination of the effects of monetary policy on stock returns has important implications for the effective design and successful implementation of monetary policy in liberalizing emerging markets like Turkey. Thus, examining the relationship between monetary policy and stock market in Turkey provides a natural laboratory in which to test effectiveness of monetary policy in a politically unstable, liberalizing economy with a moderately high and volatile inflation rate.

Another novel feature of the paper is that it provides evidence from both sector and sub-sector indexes, in addition to employing composite indexes. Using sector indexes is useful to better understand the micro channels through which monetary policy may be at work. Monetary policy may have a stronger effect on the financial and housing sectors than those of non-financial. Hence, sectoral analysis may offer important strategical lessons for the effective implementation of monetary policy and is also useful for prediction of stock returns at the sector level.

This paper is organized as follows. In the next section, we provide an overview of monetary policy in Turkey, while the empirical methodology is presented in Section III. In Section IV, we describe the data and sample period. Section V reports the empirical evidence. Finally, Section VI elaborates on the policy implications of the findings and concludes the paper.

II. An Overview of Monetary Policy in Turkey

The developments in monetary policy in Turkey can be divided into three periods: (1) 1986-1993, (2) 1994-1999, and (3) the post-2000 period, which includes the 2000 disinflation period followed by the post-February 2001 crisis. In the first period from 1986 to 1993,
the Central Bank of the Republic of Turkey (CBRT) implemented an accommodative monetary policy (Berument and Malatyalı, 2000 and Özatay, 2000). The Bank’s close relations with the Treasury and public institutions played a major role in its daily operations as credit advances to these institutions constituted a major item in its balance sheet. The first monetary program, introduced in 1990, targeted public sector credits. At the same time, the full liberalization of the capital account and the convertibility of Turkish lira (TL) were announced. The Interbank Money Market (IMM) and Interbank Foreign Exchange (IFX) markets were introduced. The CBRT began conducting its open market operations and supervised the IMM where commercial banks could trade domestic currency using overnight and overweek options.

During the second period, after the 1994 crisis, the primary objective of the CBRT became financial market stability. This decision was partly driven by lack of political support for the disinflation program. The CBRT continued announcing daily quotations for nominal exchange rates. However, during the greater part of this period, the monthly increase in the nominal exchange rate was determined by inflationary expectations. The adjustment in the nominal exchange rate was necessary to stabilize real exchange rate movements in order to maintain trade competitiveness. The CBRT also attempted to limit the liquidity effects of the reserve increases on money supply through open market operations. To achieve stability in money markets, the CBRT started announcing daily overnight bid and ask quotations beginning on November 4, 1996 and provided funds at these rates to commercial banks. Moreover, the CBRT continued to hold repo transactions within the framework of open market operations and implemented repo and reverse repo transactions in the Istanbul Stock Exchange (ISE). Interest rate patterns in the IMM until 2000 revealed that the average interest IMM rate was close to CBRT’s bid quotations. In addition, interest
rates for repo and reverse repo transactions in the ISE were close those of the IMM, suggesting that during this time period the CBRT was able to use its daily quotations effectively.

The CBRT’s new monetary program, which was announced during the second period in 1998, initially targeted the reserve money item of its balance sheet. However, because it was hard to forecast the reserve money due to an unstable money demand function because of volatile inflation, in the second half of the year, the CBRT targeted net domestic assets (NDA) item under the IMF’s Staff Monitoring Program to enhance credibility. When both exchange rate and monetary targeting policies are taken into consideration, one might argue that the CBRT changed its quotations in order to manipulate the tightness of monetary policy. Hence, the movements in interbank interest rate are more likely to better capture the stance of monetary policy of the Turkish Central Bank during this period.

In the last period, starting from January 2, 2000 until February 22, 2001, the CBRT implemented a crawling peg exchange rate regime as part of the new disinflation program. Under this program, the adjustments in the exchange rate basket, which consisted of 1 US dollar plus 0.77 Euro, were announced, sliding 12 months. In line with this policy, the ceiling values for the NDA and floor values for net international reserves items of the CBRT balance were targeted. A band around the NDA was introduced. Funds were created in exchange for net foreign assets so that the CBRT would be able support financial institutions, given its targets and the band around NDA. This policy led IMM interest rates to fluctuate heavily compared to the previous periods.

In summary, the period between the introduction of IMM in April 1986 and January 2000, CBRT conducted policy by setting short-term interest rates, based on its position with respect to the public institutions
and the Treasury. To provide credibility to its implemented policies, the CBRT targeted various money aggregates, such as narrow money (M0) and NDA. However, the CBRT was not in full control of monetary aggregates for two reasons. First, money demand function was not stable because of financial innovations and alternating risk premiums. Second, there were changes in both targeted items and their content almost in each new monetary program introduced. Hence, we believe that using monetary aggregates as a policy indicator during the post-86 period may lead to the complexity and ambiguity in determining the true stance of monetary policy. Hence, developments in money markets via short-term rates, especially overnight interest rates, which had been set with respect to demand within the CBRT’s quotation corridor, may better represent the CBRT’s policy. There are two additional reasons why interest rates may be a better policy indicator than aggregates during the post-80 period. First, during this period overnight interest rates were closely related to exchange rate developments, the Treasury auction rates, and interest rates in the secondary markets of government securities. Second, the Central Bank Governor publicly announced that they paid more attention to interest rates than NDA targets in setting policy. All these reasons motivate us to use interest rates as the key policy indicator. The information about the response of stock market returns to changes in monetary aggregates may still be useful for policymakers and investors. Movements in monetary aggregates may reflect monetary policy outcomes, while interest rates changes may mirror direct policy stance. For this and comparison purposes, we also report the results using a measure of monetary aggregate, namely M1 plus repo transactions, denoted by M1R.


III. Methodological Issues

In order to capture the relationship between monetary policy and stock returns, we use a vector autoregression (VAR) model. Bernanke and Blinder (1992), Christian et al. (1994), Thorbecke (1997), Normandin and Phaneuf (2004) also employed similar VAR models. In this analysis, a vector of endogenous variables \( y_t \) by kx1 are regressed against their n lag values:

\[
y_t = \Gamma_0 + \Gamma_1 y_{t-1} + \ldots + \Gamma_n y_{t-n} + \varepsilon_t \text{ where } E(\varepsilon_t) = \Omega
\]

where \( y_t \) is assumed to be covariance stationary. Inverting Equation (1) and writing it as infinite order vector moving average representation yields:

\[
y_t = \varepsilon_t + \Pi_1 \varepsilon_{t-1} + \Pi_2 \varepsilon_{t-2} + \Pi_3 \varepsilon_{t-3} + \ldots
\]

where the variance-covariance matrix of \( \varepsilon_t \) (\( \Omega \)) is symmetric and positive definite. The Cholesky decomposition implies a lower triangular matrix \( P \) such that \( PP' = \Omega \). Therefore, Equation (2) can be rewritten as:

\[
y_t = PP^{-1} \varepsilon_t + \Pi_1 PP^{-1} \varepsilon_{t-1} + \Pi_2 PP^{-1} \varepsilon_{t-2} + \Pi_3 PP^{-1} \varepsilon_{t-3} + \ldots
\]

Similarly, Equation 3 also can be written as:

\[
y_t = \Gamma_0 v_t + \Gamma_1 v_{t-1} + \Gamma_2 v_{t-2} + \Gamma_3 v_{t-3} + \ldots
\]

where \( \Gamma_i = \Pi_i P, v_t = P^{-1} \varepsilon_t \), and \( E(v_t v_t') = I \). Equation (4), which represents the vector of \( y_t \) as a function of the orthogonalized innovations, \( v_{t-i} \), can be used both for variance decompositions as well as impulse response function analysis. One may write each component of \( y_t \) with respect to \( v_{t-i} \) to calculate the total variance of \( y_t \) and the variance of \( y_t \) attributable to each component of \( v_{t-i} \). The partial differential of each component of \( y_t \) with respect to each component of \( v_t \) gives the impulse response.
functions. We use the orthogonalized residuals to interbank interest rates to represent policy innovations to the system. More specifically, we estimate a VAR model using the following ordering: industrial production, wholesale price index, interbank interest rate, M1 plus repo, and a measure of stock market index. Thorbecke (1997) uses a similar identification strategy to construct a measure of monetary policy innovations. This ordering implies that industrial production affects all the remaining variables contemporaneously, but others affect it with a lag. Moreover, stock market index is affected by the remaining variables contemporaneously, but it does not affect them contemporaneously. Finally, each variable affects another with a lag.

IV. Data and Sample Period

Three composite market indexes (ISE-100, ISE-50, and ISE-30), three sector indexes (industrials, financials, and services), and a variety of subsector indexes are employed. Table 1 summarizes all the indexes used in this paper. ISE National-100 composite index, which is the main indicator of the market, is available since January 1986. Data for the other two composite indexes, as well as the financials and industrials sectors are available since January 1991. Services and all subsector indexes are published since January 1997. For all the indexes, the sample period ends prior the financial crisis in October 2001, with a minimum (maximum) of 58 (191) monthly observations.

Seasonal dummies are included in the VARs to remove seasonality in the industrial production and the wholesale price indexes. To capture the impact of the three recent domestic financial crises in April 1994, November 2000, and February 2001, a (0,1) dummy variable for each is included separately. Finally, two dummy variables are added to account for the recent changes in the definitions of M1 and repo. Repo data are not available prior to 1995:12; hence an intercept term
is included. There was also a change the definition of M1 in 1989:12, which is also captured by a dummy variable. The latter should not impact the inferences because the repo transactions were small at the beginning of the sample period, but increased overtime and became popular after 1997s. All estimations utilize a lag order of 1, which was chosen based on the Bayesian information selection criteria. Using a different lag order did not significantly change the inferences, however.

Table 1 reports the descriptive statistics for stock returns. It is evident that returns have different mean and variances. Because they are not directly comparable due to different sample periods employed, we conducted an ANOVA analysis to test the null hypothesis that returns are the same for a common time span and the results indicated rejection of the null hypothesis. In Table 1, Regional index has the highest returns, while Tourism sector returns have the highest variance. Table 1 also reports the Johansen cointegration test results for searching a long run relationship between a given stock index and the corresponding macroeconomic variables. The last two columns of Table 1 present the $\lambda_{\text{max}}$ and $\lambda_{\text{trace}}$ cointegration tests. Both tests indicate at least one cointegrating vector. Therefore, following Sims, Stock and Watson (1990), we use the level of variables in estimations. All data are in logs, except the interest rate. Running a system in levels is asymptotically equivalent to employing a vector error correction system, where variables are expressed in their first-differenced form plus an error correction term.

V. Effects of Monetary Policy on Stock Returns

A. Impulse Responses

Figure 1 reports a set of impulse response functions of main (ISE 100, ISE 50, ISE 30) and sector (industry, financials and services) indexes with respect to one standard error shock to the interbank interest rate. The middle line shows the median impulses, while the other two lines
indicate the confidence bands at the 10% level. The standard errors are calculated by bootstrapping with 500 draws. Returns respond statistically to monetary policy shocks at the initial level. In all cases, tight monetary policy is associated with a decline in index returns in response to a given policy shock. Monetary policy has the most persistent effect on the ISE-100, while it has the biggest (smallest) quantitative impact on the financial sector (ISE-30 index). Interest rates constitute the biggest part of the cost of borrowing for Turkish financial firms. Thus, finding that policy shocks have the largest effect on finance sector returns is not unexpected. Overall, monetary policy shocks have important wealth effects in that they affect these stock indexes significantly.

Figure 2 plots the impulse responses for all the other sub-sector and the regional market indexes. In all cases, a tight policy is associated with lower returns, at least at the initial periods. The biggest impact is on Forestry and Finance (excluding banking) returns, while the smallest decrease is observed for Merchandise. The response of the Chemical, Metal (main), Textile, Merchandise, and Transportation sectors to policy shocks is not statistically significant. Overall, monetary policy shocks do not have as much significant impact on these sub-sector and the regional market indexes as those main (ISE 100, ISE 50, ISE 30) and sector (industry, financials and services) indexes.

For comparison purposes, we next assess the impact of changes in monetary aggregates on returns. Figure 3 plots the impulse response functions for the three main-ISE indexes, following a one standard error shock to the M1R. A loose monetary policy first causes a decline in ISE-30 and ISE-50 returns but then an increase. The impact of aggregate shocks on services sector is not statistically significant,
while the biggest impact is observed for the Finance sector (which is also consistent with earlier results). Figure 4 repeats the same analysis for the sub-sectors. Negative initial impact on returns is common in the sub-sectors. Returns increase in most cases, but they are statistically insignificant for many sectors, including Finance (excluding banking), Housing, Insurance, Metal (main), Metal (home items), Forestry, Investment Partnerships, Stone, and Textile. Overall, the results based on returns are consistent with the evidence based on the level of indexes.

B. Variance Decompositions

The impulse response functions indicate how stock returns are affected by unanticipated monetary policy changes, while the forecast error variance error decompositions show the proportion of variations in returns explained by innovations in monetary policy. Table 2 reports the percent of 12-month forecast error variance decompositions (FEVD) of stock returns that is accounted by shocks to monetary policy, as measured by innovations in the overnight interbank interest rate and money (M1R). For the purposes of this paper, we report the results only with respect to these two variables. The complete matrix of results is available from the authors upon request.

Looking at the results for the composite and sector indexes first in Table 2 indicate that interest rate innovations influence all composite and sector returns, while money shocks explain variations only in ISE 30 and Financials returns. Interest rate innovations have the biggest influence on Services, explaining about 17 percent of the FEVD of Services returns, while money shocks have the largest influence on Financials, contributing to about 10 percent variation in returns in this sector. Interest rate shocks have a similar impact on Financials returns, explaining 11.3 percent of variation in returns in this sector. Overall, interest rate innovations are found to be more statistically
significant than monetary aggregates, accounting about 5 to 17 percent of the variation in returns. The results are consistent with U.S. evidence. For example, Thorbecke (1997) finds that about 4 percent of the FEVD of stock returns is explained by federal funds rate shocks while nonborrowed reserves innovations account for about 16 percent of the FEVD of stock returns.

Turning to the results for the subsectors in Table 2, we observe that interest rate and money shocks are statistically significant in 8 and 5 cases out of 16 subsectors, respectively. Interest rate shocks have the biggest impact on Finance (excluding banking) and Forestry returns, which is about 14 percent contribution to each sector’s returns. For other subsectors, shocks to interbank interest rates contribute to variation of returns by more than 5 percent. Money shocks have the biggest impact on Finance (excluding banking), Holdings, Forestry, and Regional market returns. Overall, the findings suggest that both interest rate shocks seems to better explain movements in subsector stock returns than money supply shocks.

VI. Policy Implications and Conclusion

We examine the impact of monetary policy on stock returns in Turkey’s emerging economy. We find that positive innovations in short run interest rates are associated with lower returns. This impact seems to be short lived, however, ranging from 9 to 24 months, depending upon the index used. This finding suggests that monetary policy shocks have short-lived effects and monetary policy is therefore neutral in Turkey. We find that monetary policy has the strongest influence on the sectors of Financial and Services, indicating that monetary authorities can increase the effectiveness of monetary policy by focusing on these sectors.
The findings also indicate that monetary policy is a significant predictor of stock returns at the composite, sector and subsector levels. Overall, our results indicate that asset prices may provide an additional channel through which monetary policy may affect short-run economic activity and thus business cycles in Turkey, as suggested by Patellis (1997). As the stock market capitalization is expected to further increase over time in emerging markets, the stock market is likely to play a larger role in economic activity. As result, central bankers in emerging markets are advised to pay close attention to stock market developments, along with their traditional focus on the bond and foreign exchange markets.
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Table 1: Descriptive Statistics and Cointegration Tests

<table>
<thead>
<tr>
<th>Return</th>
<th>Beginning sample period</th>
<th>Mean</th>
<th>Variance</th>
<th>$\lambda_{\text{max}}$</th>
<th>$\lambda_{\text{trace}}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISE 100</td>
<td>1986:02</td>
<td>0.04905</td>
<td>0.02392</td>
<td>195.2</td>
<td>273.98</td>
</tr>
<tr>
<td>ISE 50</td>
<td>1997:02</td>
<td>0.03328</td>
<td>0.032881</td>
<td>154.58</td>
<td>257.33</td>
</tr>
<tr>
<td>ISE 30</td>
<td>1997:02</td>
<td>0.0368</td>
<td>0.036027</td>
<td>154.35</td>
<td>258.24</td>
</tr>
<tr>
<td>Industry</td>
<td>1991:02</td>
<td>0.042689</td>
<td>0.019534</td>
<td>165.95</td>
<td>265.08</td>
</tr>
<tr>
<td>Finance (all)</td>
<td>1991:02</td>
<td>0.046853</td>
<td>0.025075</td>
<td>163.78</td>
<td>260.99</td>
</tr>
<tr>
<td>Service</td>
<td>1997:02</td>
<td>0.02965</td>
<td>0.023088</td>
<td>144.83</td>
<td>232.25</td>
</tr>
<tr>
<td>Banking</td>
<td>1997:02</td>
<td>0.043337</td>
<td>0.042018</td>
<td>153.56</td>
<td>259.27</td>
</tr>
<tr>
<td>Finance (excl. banking)</td>
<td>1997:02</td>
<td>0.012999</td>
<td>0.042037</td>
<td>144.62</td>
<td>242.86</td>
</tr>
<tr>
<td>Insurance</td>
<td>1997:02</td>
<td>0.040472</td>
<td>0.043514</td>
<td>153.56</td>
<td>259.27</td>
</tr>
<tr>
<td>Food</td>
<td>1997:02</td>
<td>0.037309</td>
<td>0.026823</td>
<td>150.87</td>
<td>251.87</td>
</tr>
<tr>
<td>Holdings</td>
<td>1997:02</td>
<td>0.035617</td>
<td>0.044204</td>
<td>151.47</td>
<td>252.2</td>
</tr>
<tr>
<td>Investment Partner</td>
<td>1997:02</td>
<td>0.028236</td>
<td>0.048183</td>
<td>144.5</td>
<td>244.97</td>
</tr>
<tr>
<td>Chemical</td>
<td>1997:02</td>
<td>0.026197</td>
<td>0.033261</td>
<td>143.25</td>
<td>238.85</td>
</tr>
<tr>
<td>Metal (main)</td>
<td>1997:02</td>
<td>0.018015</td>
<td>0.037707</td>
<td>145.71</td>
<td>250.66</td>
</tr>
<tr>
<td>Metal (home items)</td>
<td>1997:02</td>
<td>0.033768</td>
<td>0.040894</td>
<td>149.65</td>
<td>249.6</td>
</tr>
<tr>
<td>Forestry</td>
<td>1997:02</td>
<td>0.0313</td>
<td>0.039923</td>
<td>149.23</td>
<td>247.96</td>
</tr>
<tr>
<td>Stone</td>
<td>1997:02</td>
<td>0.034033</td>
<td>0.0238</td>
<td>149.38</td>
<td>247.5</td>
</tr>
<tr>
<td>Textile</td>
<td>1997:02</td>
<td>0.018775</td>
<td>0.034005</td>
<td>136.9</td>
<td>238.58</td>
</tr>
<tr>
<td>Merchandise</td>
<td>1997:02</td>
<td>0.035623</td>
<td>0.028289</td>
<td>136.53</td>
<td>232.1</td>
</tr>
<tr>
<td>Tourism</td>
<td>1997:02</td>
<td>0.01267</td>
<td>0.073178</td>
<td>136.42</td>
<td>247.54</td>
</tr>
<tr>
<td>Transportation</td>
<td>1997:02</td>
<td>0.029784</td>
<td>0.044418</td>
<td>134.12</td>
<td>235.38</td>
</tr>
<tr>
<td>Regional</td>
<td>1997:02</td>
<td>0.045704</td>
<td>0.033842</td>
<td>132.98</td>
<td>227.03</td>
</tr>
</tbody>
</table>

Note: All data end in 2001:10. Italics indicate subsectors.
Table 2: Percent of 12-month Forecast Error Variance of Stock Returns Explained by Innovations in Interest Rate and Monetary Aggregate

<table>
<thead>
<tr>
<th>Returns</th>
<th>Interest Rate (Std. Error)</th>
<th>Monetary Aggregate (Std. Error)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Composite and Sector Indexes</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ISE 100</td>
<td>10.94 (5.44)**</td>
<td>6.59 (4.80)</td>
</tr>
<tr>
<td>ISE 50</td>
<td>5.81 (3.16)*</td>
<td>6.09 (3.92)</td>
</tr>
<tr>
<td>ISE 30</td>
<td>4.97 (2.83)*</td>
<td>6.56 (3.71)*</td>
</tr>
<tr>
<td>Industrials</td>
<td>9.97 (4.99)**</td>
<td>3.17 (3.04)</td>
</tr>
<tr>
<td>Financials</td>
<td>11.30 (6.42)*</td>
<td>10.22 (5.99)*</td>
</tr>
<tr>
<td>Services</td>
<td>16.69 (8.59)*</td>
<td>0.48 (3.31)</td>
</tr>
</tbody>
</table>

| **Subsectors**                 |                            |                                |
| Banking                        | 7.13 (3.92)*               | 7.60 (4.81)                    |
| Finance (exc. Banking)         | 14.22 (7.50)**             | 11.02 (4.62)**                 |
| Insurance                      | 4.45 (3.28)                | 5.71 (4.60)                    |
| Food                           | 7.90 (4.49)*               | 1.53 (0.39)                    |
| Holdings                       | 5.38 (3.03)*               | 15.31 (4.42)**                 |
| Investment Partnerships        | 7.23 (4.02)*               | 2.99 (3.33)                    |
| Chemical                       | 3.60 (3.06)                | 1.91 (3.20)                    |
| Metal (main)                   | 3.06 (2.19)                | 3.41 (4.19)                    |
| Metal (home items)             | 6.63 (3.94)                | 4.14 (4.54)                    |
| Forestry                       | 14.25 (7.20)**             | 15.33 (4.52)**                 |
| Stone                          | 6.18 (3.63)*               | 2.30 (6.16)                    |
| Textile                        | 1.81 (1.71)                | 2.03 (4.37)                    |
| Merchandise                    | 0.55 (1.45)                | 6.27 (4.33)                    |
| Tourism                        | 4.71 (2.93)                | 11.20 (5.52)**                 |
| Transportation                 | 1.34 (2.49)                | 1.31 (3.95)                    |
| Regional                       | 7.72 (3.98)*               | 13.87 (4.98)**                 |

Note: **(*) indicates the level of significance at the 5% (10) level.
Figure 1: Impulse Responses of Composite and Sector Indexes to Interest Rate Shocks
Figure 2: Impulse Responses of Sub-Indexes to Interest Rates Shocks
Figure 2 (Continued): Impulse Responses of Sub-Indexes to Interest Rate Shocks
Figure 2 (Continued): Impulse Responses of Sub-Indexes to Interest Rate Shocks

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Figure 3: Impulse Responses of Composite and Sector Indexes to Monetary Aggregate Shocks
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(Footnotes)


2. Empirical studies on Turkish stock market are limited. Influential studies include Başçi, Özyıldırım, and Aydoğan (1996), Bildik (2001), Kutan and Aksoy (2003), and Muradoğlu and Metin (1996).

3. As stated, between January 2000 and February 2001, the CBRT adopted a crawling peg exchange rate regime, making the exchange rate as the policy instrument, while market forces determined interest rates. Despite this, interest rates, namely interbank rate, are viewed as the policy tool in this paper, because (1) the period is too short to capture the effects of exchange rate rates, (2) excluding this period did not change the basic conclusions of the paper, and (3) the interbank rate measures the cost of short term borrowing and studying how such changes in the borrowing cost affects stock market activity is useful for portfolio allocation decisions.

4. This section draws on Thorbecke (1997).

5. The variance-covariance matrix of the p period ahead forecast error can be calculated as

\[ \text{Var}[y_{t+p} - E(y_{t+p} | y_t, y_{t-1}, y_{t-2}, \ldots)] = \Gamma_0' \Gamma_0 + \Gamma_1' \Gamma_1 + \Gamma_2' \Gamma_2 + \ldots + \Gamma_{p-1}' \Gamma_{p-1} \]

One may calculate the contribution of the jth orthogonalized innovation to the p-period-ahead FEV is:

\[ \Gamma_{0,j} \Gamma_0' + \Gamma_{1,j} \Gamma_1' + \ldots + \Gamma_{p-1,j} \Gamma_{p-1}' \]

Here \( \Gamma_{0,j} \) represents the jth column of the matrix \( \Gamma_0 \).

\[ \Sigma \sum_{s=0}^{p-1} \sum_{i,j} \Gamma_{s,i,j}^2 / \left( \Sigma \sum_{j=1}^{n} \Sigma \sum_{s=0}^{p-1} \Gamma_{s,i,j}^2 \right) \]

is used to calculate the contribution of an innovation in the jth variable to the p period ahead FEV where \( \Gamma_{s,i,j} \) is the ijth element of the matrix \( \Gamma \).

6. Using first differenced data did not change the findings qualitatively, except some decline in the statistical significance of interest rates and monetary aggregate, M1R.

7. Due to higher capital adequacy ratio for the banking sector, it is expected that non-bank financial sectors are more sensitive to interest rate changes than banking sector.

8. A 10% level of significance is used, unless otherwise noted.