

# Treasury Auction Interest Rates and Economic Performance in Turkey

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## Abstract

This paper proposes the idea that innovations in treasury auction interest rates are informative for output and prices in Turkey. The reason for the focus on this relationship is that treasury auction interest rates measure the state of fiscal policy better than taxes, government spending or both. We show that a positive innovation in treasury auction interest rates behaves in the same way as the expansionary fiscal policy does. Importantly, this paper also demonstrates that inflation in Turkey is a fiscal rather than a monetary phenomenon.

Key words: Fiscal Policy, Interest Rates and Business Cycles.  
JEL codes: E62, E32 and H30.

# 1 Introduction

Does fiscal policy affect the economy? If so, how can we measure this effect when government spending, taxes and deficits do not represent true government purchases, receipts or deficits? This study provides new empirical evidence on both of these questions. While the second question may not be relevant for all economies, especially where government does not try to hide its spending or avoid accountability, the first question is valid for all economies.

In order to account for the effects of fiscal policy on economic performance within a dynamic framework, most studies use the U.S. data on government spending, taxes or deficit to measure government fiscal stance (for example, Blanchard and Perotti, 2003; Burnside, Eichenbaum and Fisher, 1999; Eichenbaum and Fisher, 1998; Fatas and Mihov, 2000; and Fatas and Mihov, 2001). However, these variables do not measure the fiscal stance for all countries. Polackova (1998) argues that governments' hidden financial commitments and contingent liabilities – not given explicit budget allocation nor even officially recognized – constitute a major cause of concern for fiscal and macroeconomic instability in a considerable number of countries. Alesina, Hausmann, Hommes and Stein (1999) argue that a less transparent fiscal system tends to produce more surprise liabilities which destabilize these economies. Furthermore, Easterly (1999) notes that governments seem to have an incentive to hide liabilities in off-budget items. He argues that even some of the EURO countries like Austria, France, Germany and Italy adopted economic policies, one way or another, to hide their liabilities in order to meet the Maastricht criteria. Even if this concern exists, to the best of our knowledge there is no study to assess effects of governments' total fiscal stance on economic performance. The purpose of this paper is to use an alternative measure of the fiscal stance and assess the effects of fiscal policy on economic performance, when the budget does not show all the government's spending and revenues.

Turkey provides an unique laboratory environment to assess the effects of economic policies on its economic performance. First, Turkey has had a high and volatile inflation rate since the mid-1970s without running into hyperinflation due to low price indexation. High inflation magnifies relationships among various macroeconomic variables. Moreover, the low level of indexation allows

us to capture the effect of economic policy on prices and output relatively easily compared to other developing countries where regulations like price freezes or indexation have been heavily used. Second, Turkey has highly liberalized and efficient financial markets. Treasury bill and bond markets are deep and efficient. These make interest rates for Treasury paper representative of public perceptions of future economic developments and a good measure of illiquidity in the markets.

As is the case in many countries, government spending/revenue figures do not actually represent the stance of the fiscal policy in Turkey. In order to assess the fiscal policy, this paper uses the innovations in the spread between treasury auction interest rates and interbank interest rates calculated from a Vector Autoregressive (VAR) specification as a proxy for the stance of the fiscal policy. This paper is organized as follows: Section two elaborates the available fiscal stance measures and specifies the VAR model that is used in this paper. Section three introduces the data used. Section four presents empirical evidence that the spread between the treasury auction interest rate and the Central Bank's interbank rate provide information about the future movements of macroeconomic variables by considering two different criteria. Section five presents the empirical evidence on the dynamic response of the economy to the innovation in auction interest rates. Caveats are discussed in section six and the last section offers some conclusions.

## 2 Fiscal Policy Measures

The government spending figure from the Turkish Consolidated Budget is not a good measure of the stance of fiscal policy. The consolidated budget does not include losses of state-owned enterprises, subsidies to social security system, duty losses of the publicly-owned banks, contribution to rolling-fund institutions, budgets of local governments and default payments on guaranteed investment project credits by the Treasury (see, *Report Drawn up by Special ad hoc Committee on Restructuring of Public Fiscal Management and Fiscal Transparency* for a detailed review). The consolidated budget constitutes around 60-80% of the public sector borrowing requirement (PSBR) and this ratio changes from year to year. Therefore, a stable relationship between the figures from the consolidated budget and PSBR does not exist. Moreover, PSBR figures are only available on an annual basis. Even if these figures were available in a higher frequency, transferring funds from the Treasury to finance state-owned banks (as in 1998 and 2001) would introduce large changes in the PSBR even if these losses were realized in previous years. Hence, an alternative measure of the stance of fiscal policy is in order.

If we want to measure the stance of the fiscal policy, there are two methods that could be

followed. First, one may define a new series by going backwards and incorporating excluded items. Even if defining a new variable is quite costly, this still would not guarantee that the newly created variable would continue to measure the government’s fiscal stance in the future. Second, one may use a proxy of its spending or deficit. If we can find a variable whose *innovation* could be interpreted as “policy shock” where the systematic part of the variable could be captured by lagged economic variables, and if we can assume that these measurable policy shocks are independent of contemporaneous economic disturbances, then the reduced-form responses of the specification can be used to observe the policy shocks and these measures assess the fiscal aggregate effect of a policy change.

Let’s assume that economy can be represented by the following specification

$$Y_t = B_0 Y_t + B_1 Y_{t-1} + C_0 P_t + C_1 P_{t-1} + u_t \quad (1)$$

$$P_t = D_0 Y_t + D_1 Y_{t-1} + G P_{t-1} + v_t \quad (2)$$

Where  $Y_t$  vector includes a set of non-policy variables,  $P_t$  vector includes a set of policy variables,  $u_t$  and  $v_t$  are orthogonalized residuals. Note that this system is not identified. If, on the other hand, we assume that  $D_0 = 0$  – that is, there is no feedback from the state of the economy to the current policy setting contemporaneously – the specification can be converted into a standard Vector Autoregressive (VAR, hereafter) specification by substituting equation 2 for  $P_t$  in equation 1 as can be seen in equation 4 below.<sup>1</sup>

$$P_t = D_1 Y_{t-1} + G P_{t-1} + v_t \quad (3)$$

$$Y_t = (1 - B_0)^{-1} [(B_1 + C_0 D_1) Y_{t-1} + (C_0 G + C_1) P_{t-1} + u_t + C_0 v_t] \quad (4)$$

Here, we can identify the effect of policy innovation on the non-policy variables with the impulse response functions of  $Y$  to past changes in  $v$  by using the VAR specification as stated in equations 3 and 4 where  $P_t$  precedes  $Y_t$ .

Regarding what should be included in  $P_t$  as a representative of the government’s fiscal stance, up until now, changes in government spending, taxes or deficit have been taken as the indicator of the fiscal policy. This paper proposes using the spread between the Treasury auction interest rates and the overnight interbank interest rates as a measure of fiscal policy. The cost of government’s borrowing relative to borrowing/lending rate of banks among themselves increases as government

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<sup>1</sup>One could also assume  $C_0 = 0$  for the identification – that is, there is no feedback from the policy setting to the state of the economy contemporaneously. This specification will also be considered later in the paper.

implements its expansionary fiscal policies regardless if these spending (and revenues) are recorded on on-budget items or on off-budget items. The first reason for the Treasury’s increased borrowing cost will be that less liquidity will be available in the markets as government borrows. The second reason is that even if government spending is not recorded in the consolidated budget and performed through forcing the state owned institutes to record losses (where these losses are ultimately financed by the Treasury), the public will foresee these future liabilities and will be less willing to finance the government’s deficit. Thus the Treasury auction interest rates will increase relative to central bank’s overnight interbank interest rates. Therefore, observing the spread between the Treasury’s auction interest rate and the interbank interest rate provides an additional channel to assess the stance of the fiscal policy. In this paper, we propose the idea that the spread between the treasury auction interest rate and the interbank rate can be used as an indicator of the government’s fiscal stance. If this is the case, then the dynamic response of the economic variables to the innovation in the treasury auction interest rate and interbank rate spread will measure the effect of economic variables on fiscal policy. The empirical evidence presented here suggests that expansionary fiscal policy is associated with higher income and prices. These are parallel to the predictions of standard IS/LM models as well as to the provided empirical evidence on fiscal policy (see for example, Blanchard and Perotti, 2003; Burnside et al., 1998; Edelberg, Eichenbaum and Fisher, 1998; Fatas and Mihov, 2000 and Fatas and Mihov, 2001). However, the empirical evidence presented here suggests that the domestic currency depreciates with an expansionary fiscal policy. This is not what the Mundell-Fleming model suggests under perfect capital mobility; however, this could be due to higher default risk premium with increased deficit (see: McMillin and Koray, 1990 and Koray and Chan, 19991). In addition, expansionary fiscal policy seems to be associated with loose monetary policy. The state of the monetary policy could be explained by its low independence or, as stated at various times by the governors, by the Central Bank of the Republic of Turkey’s concern with the stability of the financial markets rather than with inflation.

### 3 Data

The treasury auction interest rate is the weighted average of each auction’s interest rate for the corresponding month.<sup>2</sup> As income measures, three variables are used: industrial production (*ip*),

<sup>2</sup>The Treasury opens auctions for various maturities each month. Here we disregarded these different maturities for each auction when we calculated the treasury auction interest rate for each month . Therefore, the auction interest rate that we used here is a mixture of several “forward rates”, which is implicit in the term structure of interest rates with different maturities. In other words, the auction interest rate variable is a pooled time series of

capacity utilization rate of the private sector ( $cu$ ), and the number of building permits given by the local authorities ( $building$ ). Prices ( $p$ ) are the wholesale price indices. The exchange rate ( $exchange$ ) is the official exchange basket that the Central Bank of the Republic of Turkey has been following in its operations: 1 USD + 1.5 DM. The depreciation rate is the logarithmic first difference of the official exchange basket, and the interbank interest rate is the Central Bank's overnight interbank interest rate. Money ( $m$ ) is M1 plus Repo volume. All data are available from the data delivery system of the Central Bank of the Republic of Turkey (CBRT).<sup>3</sup>

In this paper, the spread between the Central Bank's interbank interest rate and the depreciation rate of the basket (*Monetary Spread* hereafter) is used as an indicator of the monetary policy where the *Monetary Spread* is defined as  $Monetary\ Spread_t = \left( \frac{1+interbank_t}{1+depreciation_t} - 1 \right) * 100$ , as suggested by Berument (2001). The selection of the interbank interest rate and depreciation rate as a spread measure is not arbitrary. These two variables, simultaneously or separately, are used by the Central Bank of the Republic of Turkey to implement its economic policies. Central bankers of developing and small open economies also: (1) may be concerned with the currency substitution problem, and (2) may have an incentive to monitor their foreign exchange reserves in addition to ones that concern by central bankers of developed economies. On currency substitution, the public may have an incentive to avoid using domestic currency, preferring foreign currency to guard themselves against inflation. Agents prefer to hold more of their wealth in foreign currency rather than in domestic currency if the interest rate is lower or the depreciation of the domestic currency is higher. On the level of foreign exchange reserves, the central bank has an incentive to monitor its foreign exchange reserves, eliminating either the risk of speculative attack or the balance of payment crisis. Reserves also increase as the domestic interest rate increases (due to either capital inflow or the decreasing foreign exchange demand of domestic residents) and decrease as the return on the foreign exchange increases. In order to account for these, Berument (2001) proposes a new measure to monitor monetary policy. In particular, he argues that the extend to which interbank interest rate exceeds the depreciation rate of a local currency (*Monetary Spread*) can be used as an indicator of the stance of a central bank's monetary policy. Using the *Monetary Spread* as an

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forward rates with different maturities. Calvo and Guidotti (1992) and Missale and Blanchard (1994) argue that there is a relationship between interest rate and maturities. Empirical evidence from Turkey (not reported here) suggests that this relationship exists. Therefore, the "variable-maturity" auction interest rate variable that we used is an monotonic transformation of the "constant-maturity" auction interest rates that one might use to measure the stance of the fiscal policy, and thus, we can use the (variable-maturity) auction interest rates as an indicator of fiscal policy as suggested by the envelope theorem.

<sup>3</sup><http://tcmbf40.tcmb.gov.tr/cbt.html>

indicator of a central bank’s monetary policy does not mean that the central bank controls both of these instruments simultaneously, but rather the central bank may control one of the two and merely watch the other. However, even in this case, the Monetary Spread might be used as an indicator of monetary policy. This measure is also robust in the case of central bank’s switching between pure exchange rate targeting and interest rate targeting. Here, the central bank may cut the liquidity provided to the public by raising interest rates at a given level of depreciation, or it may keep domestic interest rates stable and buy domestic currency from the public by selling foreign currency at a lower rate. However, following Bernanke and Blinder (1992), we also used the short term interest rates (Central Banks’s interbank interest rate) to identify the monetary policy. We observed the price, exchange rate and liquidity puzzles Kim and Roubini (2000) discuss. However, none of these puzzles was present when  $Monetary\ Spread_t$  was used to identify monetary policy.

Bernanke (1990) argues that interest rates as well as interest rate spreads can be used as predictive variables for the economy. Stock and Watson (1989) showed that the predictive power of the spread between the commercial paper rate and the T-bill rate and the spread between the 10 year T-bond rate and the 1-year T-bond out-performed the other variables considered. Bernanke (1990) also argues: “The best single predictor among interest rate variables has been found to be the spread between the commercial paper rate and the treasury bill rate.” He claims that the reason for the high predictive power is that this spread captures the default risk perceived by the market and assesses the likelihood of recession.

Similarly, we use the spread between the treasury auction interest rate and the overnight interest rate as a measure of the ease with which the Treasury can borrow from the public. If the treasury auction interest rate increases relative to the overnight interbank interest rate, we take this to indicate that the public is more hesitant to finance the government’s deficit relative to how much banks like to finance each other due to the high level of government debt. Or it could mean that the public foresees the interbank rate as an indicator of inflation and the higher spread between the auction and overnight rates may suggest a measure of higher real interest rates. Here, in order to measure fiscal policy, the auction interest rate is measured relative to the previous month’s interbank rate:<sup>4</sup>

$$Auction_t = \left( \frac{1+auction_t}{1+interbank_{t-1}} - 1 \right) * 100.$$

One of the former vice-governors of the CBRT also argues that the public takes the interbank

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<sup>4</sup>The reason that we deflated the auction interest rate with the last month’s rather than the current month’s interbank rate was to avoid simultaneity that could raise the issue that the central bank may set the interbank rate.

interest rate as a benchmark when they make their offers to the Treasury for T-bills (or bonds).<sup>5</sup> Hence, we took the spread between the treasury auction interest rate and the interbank rate as an indicator of fiscal policy. We also try different spread definitions, such as spread with lagged inflation and spread with lagged depreciations. The basic results of the paper were robust.

The estimates use data from 1986:10 to 2000:10. The selection of the beginning of the sample is dictated by the availability of the data and we end the sample in 2000:10 to avoid the series of financial crises and stress periods that started on November 19, 2000 and continued on February 22, 2001, July 7, 2001 and September 11, 2001. All these variables enter into the VAR analysis in logarithmic form except the *Auction* and the *Monetary Spread*. When the regression analysis is performed, twelve monthly dummies are included to account for the seasonality, three dummies for the 1994 financial crises (1994:03, 1994:04 and 1994:05), one dummy for the month that the Treasury did not go to auction (1999:12), one for the period for which repo data is not available (prior to 1995:11), and last one when the new money definition is introduced (after 1990:01).

## 4 The Treasury Auction Interest Rate and Other Fiscal Measures

In this section, following the method of Bernanke and Blinder (1992), we present two measures of the information content of the treasury auction interest rate compared to more standard fiscal measures: taxes and government spending. In the first sub-section, the predictive power of *Auction* interest rates will be compared with the other fiscal variables. The second sub-section deals with the relationship between the innovations in *Auction* and the general perception of the state of the fiscal policy.

### 4.1 The Information Content of The Treasury Auction Interest Rate

In this sub-section we assess the predictive power of the *Auction* interest rate. In particular, we perform a battery of Granger causality tests as reported in Table 1. In each row, we use three measures of real economic activity and report the marginal significance level of the logarithm of the lagged value of tax revenue, government spending, *Auction*, income, *prices*, *exchange*, *Monetary spread* and *Money* with one lagged order<sup>6,7</sup>. Here the predictive power of *Auction* is higher than

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<sup>5</sup>Kumcu (June 8, 2001).

<sup>6</sup>The lag order is determined to be one by the Bayesian Information Criteria.

<sup>7</sup>When the VAR equation is specified, variables appear in several forms in the specification: (i) exchange rate appears twice as the exchange rate itself and in *Monetary Spread* where the *Monetary Spread* is the difference between the interbank interest rate and the logarithmic first difference of the exchange rate and (ii) *auction* is

the predictive power of government spending and tax revenue for all three measures of income (the industrial production, the capacity utilization rate of the private sector, and the number of building permits given by the local authorities). Panel B reports the marginal significance level for prices. The predictive power of *Auction* is higher when industrial production is taken as a measure of income, but not for building or capacity utilization. This gives a strong indication that *Auction* has predictive power on income and prices.<sup>8</sup>

Table 1: Marginal Significance Levels on the Behavior of Income and Prices.

		Panel A: On Income							
		Revenue	Government	<i>Auction</i>	Income	Prices	Exchange	M. Spread	Money
<i>ip</i>		0.0114336	0.4966000	0.0003689	0.0427616	0.5516511	0.0491963	0.8636574	0.6548028
<i>cu</i>		0.1872926	0.3352616	0.0337385	0.0000000	0.5369480	0.2853272	0.3703162	0.7906804
<i>building</i>		0.6620735	0.3531675	0.0014405	0.0178577	0.4085594	0.3716365	0.6446997	0.9497575
		Panel B: On Prices							
<i>ip</i>		0.4759757	0.1636929	0.1236916	0.1419982	0.0000000	0.0004094	0.2013503	0.7505228
<i>cu</i>		0.5445320	0.1513940	0.8164293	0.0070869	0.0000000	0.000013	0.1556228	0.0566621
<i>building</i>		0.9351575	0.0895466	0.2806361	0.4684838	0.0000000	0.0007025	0.0923819	0.1432371

The Granger Causality test has drawbacks because the right hand side variables are not orthogonalized. In order to account for that, we used variance decompositions of forecast variables. This method also has its drawbacks in that the results of the estimates depend on the ordering of the explanatory variables, the forecast horizon and low level of statistical significance (see: Runkle, 1987). Therefore, Table 2 reports the variance decomposition with 6, 12, 18, 24 and 36 month horizons by using three income measures in panels A, B and C. The variables are ordered as logarithm of tax revenue, logarithm of government spending, *Auction*, Income, *prices*, *exchange*, *Monetary Spread* and *Money*. We also tried an alternative ordering method but the results were robust to this change. For almost all income measures and time horizons, *Auction* explains the variability the difference between the treasury auction interest rate and the lag value of the interbank interest rate, which is also present in the lagged values of *Monetary Spread*. These could be considered as problems. Here we impose these differences as constraints in order to identify the monetary and fiscal policies and we treat these variables as separate variables. Entering different rates along with their components and their differences along with their levels is common in the literature (see for example Bernanke, 1983; Bernanke, 1990; Bernanke and Blinder, 1992; Friedman and Kuttner, 1992 and Strongin, 1995).

<sup>8</sup>The levels of government spending and revenue may affect the economy separately. Therefore, we entered government spending and tax revenue figures separately. However, we also try various measures of deficit. We could not take the logarithm of the deficit (since it could were negative values), so we used other measures like government spending/tax revenue, government spending-tax revenue over interpolated monthly GDP figure and real deficit. Under all these alternative definitions, the predictive power of *Auction* was above the deficit measures.

Table 2: Variance Decomposition of Forecasted Income\*

	Revenue	Spending	<i>Auction</i>	Income	Prices	Exchange	M. Spread	Money
Panel A: Industrial Production as an Income measure								
6	4.94 (2.58)	4.05 (2.16)	9.74 (4.29)	75.32 (6.37)	0.27 (0.16)	1.48 (0.92)	0.28 (0.17)	0.48 (0.31)
12	4.88 (2.53)	4.11 (2.11)	9.81 (4.29)	74.35 (6.44)	0.47 (0.28)	1.91 (1.18)	0.29 (0.17)	0.54 (0.35)
18	4.88 (2.53)	4.12 (2.09)	9.82 (4.29)	74.20 (6.51)	0.56 (0.33)	2.06 (1.23)	0.29 (0.17)	0.55 (0.35)
24	4.88 (2.52)	4.11 (2.08)	9.82 (4.25)	73.95 (6.47)	0.63 (0.38)	2.14 (1.21)	0.30 (0.18)	0.57 (0.36)
36	4.85 (2.50)	4.14 (2.10)	9.90 (4.29)	73.68 (6.76)	0.67 (0.41)	2.47 (1.35)	0.31 (0.18)	0.61 (0.38)
Panel B: Capacity Utilization as an Income measure								
6	2.40 (1.13)	2.79 (1.28)	16.88 (7.54)	70.09 (11.85)	0.29 (0.15)	1.04 (0.51)	0.66 (0.32)	0.74 (0.37)
12	2.46 (1.16)	2.92 (1.31)	16.84 (7.12)	68.77 (12.14)	0.40 (0.20)	1.44 (0.70)	0.68 (0.33)	0.93 (0.45)
18	2.46 (1.16)	2.91 (1.30)	16.78 (6.95)	68.38 (12.22)	0.42 (0.21)	1.58 (0.76)	0.68 (0.33)	1.01 (0.49)
24	2.46 (1.15)	2.93 (1.31)	16.74 (6.91)	68.19 (12.21)	0.43 (0.21)	1.62 (0.78)	0.68 (0.33)	1.05 (0.51)
36	2.46 (1.15)	2.94 (1.32)	16.74 (6.91)	68.11 (12.18)	0.44 (0.21)	1.63 (0.77)	0.68 (0.33)	1.05 (0.51)
Panel C: Building as an Income measure								
6	4.41 (2.03)	3.91 (1.74)	14.25 (6.02)	70.79 (9.36)	0.31 (0.15)	1.09 (0.53)	0.39 (0.19)	0.72 (0.35)
12	4.40 (2.03)	4.12 (1.84)	14.43 (6.03)	69.98 (9.98)	0.41 (0.19)	1.30 (0.61)	0.40 (0.19)	0.80 (0.38)
18	4.40 (2.02)	4.12 (1.84)	14.45 (6.03)	69.68 (9.90)	0.45 (0.21)	1.34 (0.63)	0.40 (0.19)	0.81 (0.39)
24	4.38 (2.01)	4.13 (1.84)	14.46 (6.03)	69.61 (9.87)	0.47 (0.22)	1.35 (0.63)	0.41 (0.19)	0.82 (0.39)
36	4.37 (2.01)	4.15 (1.84)	14.46 (6.04)	69.59 (9.93)	0.51 (0.23)	1.36 (0.64)	0.41 (0.19)	0.82 (0.39)

\* The numbers in parentheses are standard error values.

of income better than revenue or spending. Table 3 repeats the same analysis for prices. A higher percentage of the variability of prices is explained by *Auction* than by government spending and taxes.<sup>9</sup> In sum, *Auction* has higher predictive power for both income and prices than conventional fiscal measures.

## 4.2 Public Perception and Fiscal Policy

In order to assess whether *Auction* could be used as a measure of fiscal policy. We try to assess whether innovations in *Auction* capture the perception of public on the behavior of the fiscal policy. Figure 1 plots the cumulative sum of *Auction* innovation:  $v_t$ . The downward movement of

<sup>9</sup>Blanchard and Perotti (2003) assess the effect of shocks in government spending and taxes by using a structural VAR approach that accounts for the institutional structure of the tax and transfer systems. The timing of tax collection and spending activities are used to identify the automatic response of taxes and spending activities, and by implication, to infer deviations from the automatic response. We also used their methodology but the basic result in this sub-section was unchanged.

Table 3: Variance Decomposition of Forecasted Prices\*

Panel A: Industrial Production as an Income measure								
	Revenue	Spending	Auction	Income	Prices	Exchange	M. Spread	Money
6	3.58	1.62	8.23	6.06	59.55	13.43	0.76	0.56
	(2.37)	(0.98)	(4.96)	(3.99)	(10.85)	(6.16)	(0.52)	(0.39)
12	3.30	2.50	11.81	6.83	40.80	24.77	1.04	1.29
	(2.21)	(1.65)	(6.97)	(4.54)	(12.43)	(11.28)	(0.71)	(0.93)
18	3.28	3.16	13.17	6.83	31.88	30.68	1.16	1.58
	(2.23)	(2.13)	(7.86)	(4.62)	(12.77)	(13.90)	(0.78)	(1.15)
24	3.25	3.64	13.70	6.70	27.32	33.84	1.20	1.70
	(2.24)	(2.45)	(8.29)	(4.62)	(12.69)	(15.67)	(0.83)	(1.22)
36	3.25	4.00	14.12	6.47	22.29	36.72	1.26	1.80
	(2.27)	(2.72)	(8.59)	(4.53)	(11.39)	(17.37)	(0.87)	(1.29)
Panel B: Capacity Utilization as an Income measure								
6	1.10	1.98	14.92	6.10	49.28	16.83	0.96	1.06
	(0.52)	(0.92)	(7.00)	(3.02)	(10.79)	(6.60)	(0.48)	(0.50)
12	1.28	2.23	22.31	5.13	32.45	24.90	1.17	1.17
	(0.62)	(1.06)	(10.22)	(2.52)	(10.22)	(10.57)	(0.59)	(0.56)
18	1.26	2.40	25.00	4.72	25.10	28.95	1.25	1.32
	(0.61)	(1.15)	(11.35)	(2.32)	(9.05)	(12.83)	(0.63)	(0.64)
24	1.27	2.41	26.23	4.49	21.52	30.36	1.21	1.35
	(0.62)	(1.16)	(11.88)	(2.20)	(8.53)	(13.78)	(0.61)	(0.67)
36	1.32	2.34	26.89	4.23	18.07	32.26	1.20	1.40
	(0.65)	(1.13)	(12.08)	(2.09)	(7.75)	(15.03)	(0.60)	(0.69)
Panel C: Building as an Income measure								
6	1.57	2.15	11.36	3.39	58.39	13.14	0.87	0.79
	(0.75)	(0.99)	(5.35)	(1.66)	(11.36)	(5.43)	(0.44)	(0.38)
12	1.42	2.34	18.99	4.86	40.35	20.79	0.92	1.13
	(0.67)	(1.10)	(8.83)	(2.38)	(11.87)	(8.45)	(0.46)	(0.55)
18	1.43	2.41	21.96	5.54	31.96	24.11	0.92	1.17
	(0.68)	(1.15)	(10.07)	(2.72)	(10.95)	(10.02)	(0.46)	(0.58)
24	1.44	2.54	23.80	5.81	26.91	26.19	0.94	1.29
	(0.69)	(1.22)	(10.85)	(2.86)	(10.01)	(10.98)	(0.47)	(0.63)
36	1.43	2.53	25.74	6.00	22.36	27.84	0.91	1.43
	(0.69)	(1.23)	(11.73)	(2.97)	(9.11)	(11.78)	(0.46)	(0.71)

\* The numbers in parentheses are standard error values.

the variable indicates the fiscal tightness and upward movements are indication of fiscal looseness. Figure 1 suggests that periods between 1990:01 and 1993:04, between 1994:06 and 1996:06, and between 1999:06 and 2000:10 have tight fiscal policy.

[Insert Figure 1 here]

The first fiscal tightness is observed in 1990:01, when for the first time in its history, on January 16, 1990, the Central Bank of the Republic of Turkey announced its monetary program for the year. Since the government knew about it in advance, the announcement of the monetary policy can be assumed to be a part of a substantial stabilization program. Here we might be capturing this announced fiscal tightness. To be specific, the program was intended to limit Central Bank credit to the public sector and the real credit extended to the public and private sectors together declined by the end of year.

A loose state of fiscal policy can be observed after 1993:05. This date is associated with the death of president Turgut Özal on April 17, 1993 and the election of Prime Minister Süleyman Demirel by the Parliament as the president. After the self-inflicted crisis on April 4, 1994, it seems to have taken two months to tighten fiscal policy. In 1994:06, Turkey signed a stand-by-agreement with the IMF. The ensuing tight fiscal policy is suggested by Figure 1. With the establishment of the 54<sup>th</sup> government by the populist leader Necmettin Erbakan in April 1996, an expansionary fiscal policy is observed until 1999:06, when the government was ready to sign another stand-by agreement with the IMF. It is interesting to note that this tight fiscal policy continued to be implemented even after the August 17, 1999 earthquake in which around 18,000 lives were lost.<sup>10</sup>

## 5 Empirical Evidence

Before starting to discuss what the empirical evidence reveals regarding how the expansionary fiscal policy affects economic performance, what the economic theory suggests should be discussed. Next, the empirical evidence will be discussed. The third sub-section is on robustness statistics and the last sub-section provides empirical evidence on variance decomposition of the forecasted variables.

### 5.1 General Description of the Likely Effects of a Fiscal Expansion

Ricardian Equivalence suggests that as long as taxes are lump-sum, agents have infinite time horizons, future tax burdens are certain, capital markets perfect and expectations are rational, then there is no difference between deficits and taxes to finance spending and there is no effect on consumption, hence on income.

Even if inflation is a monetary phenomenon, governments print money to finance deficits. Hence, fiscal expansion should be inflationary (see: Fisher and Easterly, 1990). If the interest rate is flexible, increasing the government deficit will increase interest rates, while decreasing investment and consumption. Unless crowding out is complete, output increases. Therefore, economic theory suggests that expansionary fiscal policy is associated with non-decreasing output, non-decreasing prices and loose monetary policy. However, the effect of fiscal policy on money is uncertain. Even if the money supply increases, money demand decreases due to lower consumption and higher interest rates. Hence, the effect on money is not well defined.

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<sup>10</sup>It is often argued that the government used the earthquake as an excuse to tighten fiscal policy. The government raised 3,743 trillion TL as additional revenue to help earthquake victims but spent only 2,098 trillion TL for this purpose within two years of the earthquake (Dunya, 2001).

Furthermore, the Mundell-Fleming model suggests that expansionary fiscal policy increases interest rates and this appreciates the domestic currency due to an (un)covered interest rate parity condition. However, a higher deficit means higher interest rates and this may mean a higher default risk, and this may depreciate the domestic currency (see, McMillin and Koray, 1990; Koray and Chan, 1991 and *World Economic Outlook*, 1995).

## 5.2 Implication of the Specification

In this sub-section, the economic effect of a change in fiscal policy will be studied. Figure 2 displays the estimated impulse responses to an expansionary fiscal policy, depicted as a positive innovation in *Auction*, for the six macroeconomic variables considered. The impulse responses are reported for a 12 month horizon. In order to calculate the confidence bands, the Bootstrap method of 500 draws is used. The middle line shows the median of the draws and the other two lines show the confidence interval at the 80% confidence bands.<sup>11</sup>

[Insert Figure 2 here]

We will interpret the impulse responses of our baseline model where the order and the list of the variables are *Auction*, *Income*, *prices*, *exchange*, *Monetary Spread* and *Money*. First, the shock to fiscal policy persist for six months. The persistence of fiscal policy is something expected. Output tends to increase for four months and then return to its initial level. The increase in output leads to a decline in the deficit through higher tax revenue. Parallel to that, the *Auction* variable tends to decrease. The evidence on the behavior of output and *Auction* are parallel to the findings of Eichenbaum and Fisher (1998), Edelberg, Eichenbaum and Fisher (1998) Fatas and Mihov (2001). Increase in  $Auction_t$  increases prices permanently in a statistically significant fashion. This result is also robust with alternative specifications.

Next, we look at the behavior of monetary policy as measured with *Monetary Spread<sub>t</sub>*. It seems that the Central Bank adopts a loose monetary policy following a loose fiscal policy. This finding is parallel to Fisher and Easterly (1990), the statements of Central Bank Governors in the past (see, Berument, 2001) and also consistent with low degree of independence of the bank from the government (see, Berument and Neyapti, 1999). However, this is not statistically significant. The money aggregate falls with expansionary fiscal policy. This might be due to higher interest rates

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<sup>11</sup>Calculated impulse responses and their confidence bands for all six variables are available from the author upon request.

or lower consumption and investment if the expansionary policy results from higher government spending.

Concerning the behavior of the exchange rate, the effect of expansionary fiscal policy depends on the slope of the BP curve within the Mundell-Fleming model. If the slope of the BP curve is higher than the slope of the LM curve, expansionary fiscal policy would increase output but depreciate the local currency. On the other hand, if the slope of the BP curve is less than the slope of the LM curve (as it would be under perfect capital mobility), then expansionary fiscal policy appreciates the currency. Agenor, McDermott and Ucer (1997) show that expansionary fiscal policy appreciates the temporary component of the real exchange rate for Turkey.<sup>12</sup> On the other hand, Obstfeld (1991) argues that if the government cannot commit itself to a low fiscal deficit, it may depreciate the local currency. Giorgianni (1997) also argues that in countries with large fiscal deficits, expansionary fiscal policies increase the likelihood of debt consolidation and depreciate the domestic currency through its risk premium. He provides empirical evidence for this with Italian data. Moreover, Celasun, Denizer and He (1999) also note this depreciation effect for Turkey.<sup>13</sup>

One thing that needs to be highlighted here is that the effect of fiscal policy is observed faster in Turkey compared to the U.S. An expansionary fiscal policy increases output almost instantly and the output level returns to its initial level within six months. On the other hand, studies on the U.S. (such as Burnside et al., 1999) find that the effect of fiscal policy is observed after 3 quarters and lasts for 12 quarters. The relative size of the government to GDP is small in the US compare to Turkey. Furthermore, fiscal policy affects the output through relative few transmission channels in Turkey compare to the US. Therefore, observing the effect of fiscal policy during a short period of time is a reasonable. Moreover, the effect of fiscal policy on the economy does not last long possibly due to institutions and contract flexibility. It is common that wages are settled for 6 months. Lately, wages of civil servants are adjusted monthly with the realized inflation. This makes the market clear faster and the effect of policy does not last long. Lastly, Agenor and Montiel (1999) discuss two reasons for the inertia. One is that there is implicit or explicit backward looking indexation in nominal variables and the other is the lack of credibility in any program the government adopts. Turkey does not have either of these.

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<sup>12</sup>We could not replicate their findings on exchange rate possibly because we use different specifications than theirs and the real exchange rate variable that they used is calculated by IMF is not available publicly and we could not use that variable.

<sup>13</sup>One may look at *World Economic Outlook* (1995: 79-81) for the mixed results of the effect of fiscal policy on exchange rate.

### 5.3 Robustness Statistics

One item that affects *Auction* interest rates in Turkey is the foreign capital inflow. Although Celasun et al. (1999) find that the capital inflow is associated with neither public consumption nor public investment, both Celasun et al. (1999) and Alper (2002) argue that the capital inflow is associated with the performance of the private sector (private consumption, private investment and total output). Hence, the capital inflow setting is entered into the VAR as the first variable.<sup>14</sup> Figure 3 suggests that the results on the effect of *Auction* innovation on all six variables that are used in the benchmark specification are parallel to Figure 2. However, capital inflow tends to decrease for 2 months. This is on a parallel with the increased risk premium hypothesis discussed in the previous section. After 1997, there has been a decrease in capital inflow (see: Celasun et al., 1999), which accounts for why the sample ends in 1997:12. The results were parallel to the benchmark specification again.<sup>15</sup>

Next, lag length was increased up to 6 lags. The level of significance decreases in the impulse response analysis for the effect of *Auction* on other variables, but the results were similar.

It is possible that there is a structural change in the model. Celasun et al. (1999) argue that after 1997 there was a change in the capital inflow and that borrowing by the Treasury was more difficult than in the pre-1997 period. Therefore, the sample is ended in 1998:08 with the Russian financial crisis and the analysis is performed again. Turkey also experienced a self-inflicted financial crisis in April of 1994. As a second stability test we start to sample from 1995:01. When the impulse responses are calculated for the post- 1995 period, the results are parallel to the benchmark specification for the behavior of output, prices, the exchange rate and money. However, when we start to sample after 1994 we observe that expansionary fiscal policy is associated with tight monetary policy. When the sample includes pre-1994 and excludes post-1997, we find that expansionary fiscal policy is associated with loose monetary policy.

Different definitions of *Auction* are also used to measure the fiscal policy. The auction interest rate is first denominated with lagged inflation:  $\left(\frac{1+auction_t}{1+inflation_{t-1}} - 1\right) * 100$ , then denominated with lagged value of depreciation:  $\left(\frac{1+auction_t}{1+depreciation_{t-1}} - 1\right) * 100$ . Results using each of these measures are parallel to the benchmark specification; but when the auction interest rate is denominated with depreciation, there is an increase in money variable rather than a decrease when we introduce one standard deviation shock to  $Auction_t$ . This may mean that when the auction interest rate relative to the foreign exchange rate increases, agents switch from foreign currency to local currency, and

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<sup>14</sup>For normalization, the capital inflow figure is divided by the lag value of imports.

<sup>15</sup>Other impulse responses are available from the author upon request.

this increases the money variable.

One of the crucial items in the determination of the auction interest rate is the deepness of the financial market. If financial markets are not deep, then expansionary fiscal policy would increase the interest rate more than if the financial markets are deep. In order to capture changing financial deepness, we include the time trend, the logarithm of time trend, the square of the time trend and the lag value of financial deepness measured as a Real M2Y-Industrial product ratio. When all these four variables are included individually in the VAR specification as additional regressors, the basic inferences of the benchmark model are found to be robust.

Agents may like to see the response of the monetary authority to the state of the economy before they make their offer to the Treasury on an auction. In order to incorporate this, *Auction* was entered after *Monetary Spread*. Impulse responses are also parallel to our benchmark specification. Observing similar results with two different orderings further strengthen the conclusion of the paper.

The effect of fiscal policy on income can also be estimated by using other income measures. Here we used the logarithm of the number of building permits given by the local authorities and the private sector capacity utilization rate. The impulse responses gathered from these are also parallel to the benchmark specifications.

#### 5.4 Evidence from Variance Decompositions of Forecasted Variables

Impulse response functions reported here assess the dynamic effect of fiscal shocks. In order to understand how fiscal policy shocks contribute to the volatility of various economic agents, it is necessary to use forecast error variance decomposition analysis. There are two reasons why this question is important. First, this question helps to assess whether fiscal policy shocks have been an important independent source of impulses to the business cycles. Second, this aids the identification strategy, which assumes that fiscal policy is mostly exogenous.

[Insert Table 4 here]

Table 4 reports the percentage of variation in the first 6, 12, 18, 24 and 36 step-ahead forecast error variance for all six variables in each panel where the industrial production is used as a income measure. The first thing that strikes attention is that the biggest variation of *Auction* is explained by *Auction*. This supports the proposition that, as identified, *Auction* is an exogenous variable and this supports the identification strategy adopted in this paper.

Second, at least 10% of the variation in output is explained by *Auction* and this is statistically significant at the 5% level. At most, 0.32% of the variation is explained by monetary policy as

identified with *Monetary Spread*, this suggests that the *Auction* variable is not something that policy makers can ignore in Turkey. The low explanatory power of the variation of output by the variation of monetary policy is parallel to Berument (2001), Kim (1999) and Kim and Roubini (2000). Except for *Auction* and income itself, none of the other four variables can explain the variation of income in a statistically significant fashion. The highest percentage of the variation of prices is explained by price itself. The variation in the exchange rate also explains the variation in prices. Importantly *Auction* explains the variation in prices after step 12. This supports the proposition that inflation is a fiscal phenomena in Turkey.

## 6 Caveats

Using *innovation* in the treasury auction interest rate as a measure of fiscal policy does present some problems. First, our model implicitly assumes that, as long as they are equal to each other, increasing government spending or decreasing government receipts have the same effect on the economy. The Keynesian IS/LM framework claims otherwise with the implied positive balanced budget multiplier. Moreover, decreasing taxes may have an additional expansionary effect through the supply side. Lastly, not only the level, but also the composition of the government spending may have an effect on the economy (see: Ramey and Shapiro, 1998).

## 7 Conclusion

This paper argues that the spread between Treasury auction interest rates and Central Bank interbank rates (*Auction*) is an indicator of fiscal policy. In order to demonstrate this, we showed that the auction interest rate can be used as an information variable for output and prices, and found that the *Auction* spread has higher information content for the economy than do government spending and taxes. This might be due to the fact that variables from the consolidated budget are not good indicators of the government's fiscal stance in Turkey. These variables may not measure the fiscal stance as well as the auction interest rate. Finally, this paper shows that when expansionary fiscal policy is identified with positive innovations in auction interest rates, output and prices increase and local currency depreciates.

Table 4: Variance Decomposition of Forecast Variables

		<i>Auction</i>				
Steps	<i>Auction</i>	Income	Prices	Exchange	M. Spread	Money
6	91.08	2.45	0.28	3.37	0.60	2.23
	(4.19)	(2.41)	(0.37)	(2.70)	(0.70)	(1.95)
12	86.82	2.55	0.70	6.50	0.64	2.78
	(6.40)	(2.50)	(0.86)	(4.80)	(0.72)	(2.41)
18	84.30	2.59	1.02	8.51	0.65	2.93
	(8.21)	(2.53)	(1.26)	(6.36)	(0.72)	(2.54)
24	82.72	2.62	1.23	9.77	0.66	3.01
	(9.61)	(2.55)	(1.57)	(7.50)	(0.73)	(2.62)
36	80.95	2.64	1.49	11.16	0.67	3.09
	(11.53)	(2.58)	(2.02)	(9.04)	(0.73)	(2.72)
		<i>Income</i>				
Steps	<i>Auction</i>	Income	Prices	Exchange	M. Spread	Money
6	10.71	86.31	0.43	1.37	0.30	0.88
	(4.96)	(5.12)	(0.45)	(1.44)	(0.38)	(0.98)
12	10.73	85.31	0.75	1.97	0.31	0.94
	(4.96)	(5.24)	(0.69)	(2.03)	(0.38)	(1.03)
18	10.74	84.85	0.92	2.22	0.31	0.96
	(4.96)	(5.42)	(0.83)	(2.31)	(0.38)	(1.03)
24	10.76	84.57	1.02	2.36	0.32	0.97
	(4.99)	(5.61)	(0.91)	(2.46)	(0.38)	(1.03)
36	10.81	84.04	1.14	2.70	0.32	0.99
	(5.06)	(6.01)	(1.02)	(2.65)	(0.38)	(1.03)
		<i>Price</i>				
Steps	<i>Auction</i>	Income	Prices	Exchange	M. Spread	Money
6	8.03	8.17	67.50	14.29	1.26	0.75
	(5.50)	(5.00)	(8.69)	(5.64)	(1.12)	(0.87)
12	14.64	9.08	40.22	32.35	1.67	2.03
	(7.95)	(5.39)	(10.95)	(9.85)	(1.34)	(1.99)
18	17.54	8.76	25.46	43.50	1.76	2.98
	(8.85)	(5.46)	(10.44)	(11.49)	(1.40)	(2.73)
24	18.82	8.29	17.68	49.86	1.76	3.59
	(9.30)	(5.47)	(9.39)	(12.12)	(1.42)	(3.21)
36	19.69	7.59	10.78	55.95	1.72	4.27
	(9.73)	(5.43)	(7.71)	(12.57)	(1.45)	(3.77)
		<i>Exchange</i>				
Steps	<i>Auction</i>	Income	Prices	Exchange	M. Spread	Money
6	12.73	6.77	5.60	71.70	1.52	1.68
	(7.00)	(4.58)	(3.87)	(8.38)	(1.18)	(1.48)
12	17.39	7.16	4.56	66.07	1.67	3.15
	(8.92)	(5.04)	(3.97)	(10.39)	(1.37)	(2.75)
18	18.81	7.07	3.96	64.62	1.68	3.86
	(9.53)	(5.16)	(3.99)	(11.22)	(1.42)	(3.37)
24	19.37	6.94	3.62	64.15	1.67	4.25
	(9.81)	(5.20)	(3.98)	(11.66)	(1.44)	(3.72)
36	19.75	6.70	3.36	63.88	1.65	4.65
	(10.05)	(5.23)	(4.02)	(12.12)	(1.46)	(4.09)
		<i>M. Spread</i>				
Steps	<i>Auction</i>	Income	Prices	Exchange	M. Spread	Money
6	3.51	2.00	1.06	41.42	51.72	0.30
	(2.73)	(1.75)	(1.02)	(5.73)	(5.76)	(0.38)
12	3.63	2.02	1.20	41.81	51.01	0.34
	(2.75)	(1.75)	(1.04)	(5.68)	(5.68)	(0.39)
18	3.73	2.03	1.25	41.98	50.62	0.37
	(2.78)	(1.75)	(1.05)	(5.66)	(5.65)	(0.40)
24	3.80	2.05	1.29	42.08	50.39	0.40
	(2.82)	(1.76)	(1.05)	(5.65)	(5.64)	(0.41)
36	3.90	2.06	1.33	42.19	50.11	0.43
	(2.93)	(1.77)	(1.06)	(5.64)	(5.70)	(0.43)
		<i>Money</i>				
Steps	<i>Auction</i>	Income	Prices	Exchange	M. Spread	Money
6	5.40	1.77	9.71	6.40	0.92	75.80
	(4.16)	(1.86)	(3.78)	(4.07)	(1.15)	(7.22)
12	5.53	2.16	19.98	7.94	0.89	63.50
	(4.28)	(2.03)	(5.35)	(5.15)	(1.03)	(8.93)
18	6.05	2.85	24.79	8.82	0.96	56.53
	(3.86)	(2.20)	(5.83)	(4.59)	(0.96)	(8.22)
24	7.65	3.70	25.27	13.07	1.09	49.22
	(4.11)	(2.38)	(6.32)	(5.21)	(0.91)	(7.35)
36	11.74	5.05	20.19	26.80	1.33	34.88
	(6.00)	(2.95)	(7.03)	(9.06)	(0.92)	(7.34)

The numbers in parentheses are standard errors.

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## Supplement: Treasury Auction Interest Rate and Economic Performance in Turkey

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This document provides additional figures to *Treasury Auction Interest Rate and Economic Performance for Turkey* not reported in the original paper

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