TWO ESSAYS ON MACROECONOMICS

A Master's Thesis

by

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Department of Economics
Bilkent University
August 2003
Ankara

To My Dearest

Özge

TWO ESSAYS ON MACROECONOMICS

The Institute of Economics and Social Sciences

of

Bilkent University

by

BURAK DOĞAN

In Partial Fulfillment of the Requirements for the Degree of

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in

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Ankara

August 2003

I certify that I have read this thesis and have found that it is fully adequate, in scope and in quality, as a thesis for the degree of Master of Arts in Economics.

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ABSTRACT

TWO ESSAYS ON MACROECONOMICS

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The empirical evidence suggests that openness decreases the effect of monetary policy on output; however the effect on prices is not statistically significant. In the first chapter of this research these predictions are tested over the open economy of Turkey for quarterly data from 1987:1 to 2001:1. This chapter assesses how the openness affects the effectiveness of monetary policy on output and prices.

The purpose of the second chapter is to assess if expansionary and contractionary government spending shocks have an asymmetric effect for Turkish economy. There might be asymmetry for the effect of fiscal policy on economic outcome due to stickiness of prices, perception of changes (permanent versus transitory) and nearness to full employment. This chapter assesses this asymmetry for Turkey by using quarterly data from 1987:I to 2001:I. The empirical evidence reported here reveals that private consumption and investment decrease in the face of expansionary government spending shocks; however, they either do not change or decrease very little under contractionary government spending shocks.

Keywords: Openness, Monetary Policy, Asymmetric Effect, Fiscal Policy

ÖZET

MAKROEKONOMİ KONUNLU İKİ MAKALE

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Ampirik bulgular, dışa açıklığın, para politikasının üretim üzerindeki etkisini azalttığını, ancak fiyatlar üzerindeki etkisinin ise istatiksel olarak anlamlı olmadığını göstermektedir. Bu araştırmanın ilk kısmında, bu öngörüler, 1987:1 - 2001:1 dönemini kapsayan üç aylık veriler kullanılarak Türkiye için test edilmektedir. Bu kısım, dışa açıklığın, para politikasının üretim ve fiyatlar üzerindeki etkisini nasıl etkilediği değerlendirilmektedir.

İkinci kısmın amacı, genişletici ve daraltıcı kamu harcamalarının, Türk ekonomisi üzerinde asimetrik etkilere sahip olup olmadığı değerlendirilmektedir. Fiyat yapışkanlığı, değişiklikleri algılama (kalıcı veya geçici) ve tam istihdama yakınlığa bağlı olarak, maliye politikasının etkileri asimetrik olabilir. Bu kısımda, söz konusu asimetri, 1987:1 – 2001:1 dönemini kapsayan üç aylık veriler kullanılarak Türkiye örneği için değerlendirilmektedir. Elde edilen ampirik sonuçlara göre, genişletici kamu harcamaları şokuna tepki olarak özel tüketim ve yatırım azalmaktadır; ancak, bu değişkenler, daraltıcı kamu harcamalarına tepki olarak ya değişmemekte, ya da çok az oranda azalmaktadır.

Anahtar Kelimeler: Dışa Açıklık, Para Politikası, Asimetrik Etki, Maliye Politikası

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1.1 Introduction

In his paper Romer (1993) investigates the relationship between openness and inflation. He argues that the absence of precommitment in monetary policy leads to inefficiently high inflation. He claims that the less open economy would have a greater incentive to expand and so have a higher equilibrium of inflation rate. This relation can be explained as unanticipated monetary expansion causes real exchange rate depreciation and since more open economies are more available to be effected by the harms of real depreciation the benefits of unanticipated expansion are negatively correlated with the degree of openness. Therefore if the money authority considers openness as an important state variable for the monetary policy, monetary authorities in more open economies will on average expand money supply less and will have lower average rates of inflation. Dennis (2001) argues also that the well-known result of depreciation of domestic exchange rate is increasing inflation. But as Romer does, Dennis concludes that the money authority intervenes or does not let to absence of precommitment in monetary policy. So expansion is less and so inflation is lower in small open economies.

There is another sight of view, which says that in a more open economy, increase of money supply is expected to be more inflationary while the change in the output level would be rather smaller than it is expected or negative. Because the ability of

money to affect output is supposed to be weaker in more open economies, whereas the inflationary effects of changes in money supply increase with openness due to substitution effect. This differentiation is because of the different responses of the aggregate supplies of the both different countries by the mean of their openness levels. In an open economy the fluctuations of the exchange rates will create an expectation of depreciation of the currency. This expectation will trigger the wage demand so monetary expansion will be reflected on prices and less on output. Bryant, Henderson, Holtham and Symansky (1988), in their empirical study by more than 10 macroeconometric models, predicts that monetary expansion raise output and the price level while the contractions have the opposite effects. Papadopoulos (1993) investigates the effects of monetary policy on output and prices for an open economy in the case of Greece for the period of 1955-90. In his paper, he finds that contractionary government policy financed by domestic credit accelerated the recession with inflation declining after a two years lag. Atesoglu and Dutkowsky (1995) in their empirical study on money, output and prices in Turkey, mention that monetary expansion should not be involved with attempts to stimulate output. Karras (1999) confirms the same theory. In his paper Karras shows the expected theoretical effects of monetary policy empirically using a panel of 38 countries from the 1953-1990 periods. Karras argues that the effectiveness of the monetary policies is related to the openness of the economy such that the effect of expansionary monetary policy decreases output but increases the inflation rate. Guncavdi and Kucukcifci (2001) in their paper which is about foreign trade and factor intensity also conclude that, the

importation of intermediate goods created an employment generation and capital savings effects in 1990 in Turkey. They explain this fact by the general expectations of neoclassical theory of comparative advantage, which postulates that foreign trade induces the use of relatively abundant domestic resources as causing savings in scarce ones, such as capital.

We can sum up the expectations as follows; an unanticipated permanent monetary expansion raises aggregate demand. This is because of two reasons. First monetary expansion reduces the domestic interest rate and increases the aggregate demand. Second monetary expansion creates depreciation on domestic currency. As a result of depreciation on domestic currency, prices of domestic goods rise. In the short run output increases but in the long run following the adjustments of the monetary authority over the economy output declines backward.

This paper assess that with the increasing degree of the openness, effectiveness of the monetary policy decreases on output and prices for more open economy in the case of Turkey. Quarterly data from 1987:1 up to 2001:1 period for Turkey is used to estimate the relationship between openness and the effects of monetary policy on output and prices. Our estimated methods support the theoretical expectations: change in the money supply will lead to smaller output. Also as a parallel result of Romer's we found out that, expansionary monetary policy has an impact on inflation, which demonstrates a negative relationship with the level of openness.

The remainder of the paper consists of three sections. In section 2, we set up the specification used in this paper. Section 3 is the empirical results of the estimation and finally section 4 offers concluding remarks.

1.2 Equations that are used to estimate

In order to estimate the effect of openness on money-output relationship we estimate the following equation;

$$\Delta y_t = ß_0 + \Sigma^{3}_{i=1} ß_1 D_i + ß_2 D94_t + \Sigma^{4}_{i=1} ß_{3i}\ \Delta y_{t-i} + \Sigma^{4}_{i=0} ß_{4i}\ \Delta m_{t-i} + \Sigma^{4}_{i=0} ß_{5i}\ (open_{t-1}\Delta m_{t-i}) + u^{y}_{t} \quad (1)$$

Here; Δy_t is the output growth rate, Δm_t is the money growth rate, $open_t$ is the measure of openness at time t, *ß*s are the coefficients, u^{y}_{t} is the output residual at time t. In order to assess the effect of the openness on money-price relationship we estimate the following equation;

$$\Delta p_t = \alpha_0 + \Sigma^{3}_{i=1} \alpha_1 D_i + \alpha_2 D94_t + \Sigma^{4}_{i=1} \alpha_{3i}\ \Delta p_{t-i} + \Sigma^{4}_{i=0} \alpha_{4i}\ \Delta m_{t-i} + \Sigma^{4}_{i=0} \alpha_{5i}\ (open_{t-1}\Delta m_{t-i}) + u^{p}_{t} \quad (2)$$

Here; Δp_t is the inflation rate, Δm_t is the money growth rate, $open_t$ is the measure of openness at time t, *α*s are the coefficients, u^{p}_{t} is the output residual at time t.

Dummy variables with coefficient $ß_1$ and α_1 are used for the monthly effects for the quarterly data. Dummy variable D94 is used for the self-inflicted 1994 crisis at the second quarter.

The data for all the variables are gathered from the Central Bank of the Republic of Turkey electronic data delivery system[1]. Real GDP growth rate is used for Δy_t, which is constant with 1987 prices. Logarithmic first difference of GDP deflator is used for inflation. Openness is quantified with two different fractions as being seasonally adjusted. One of the definitions of openness is the ratio of sum of the import and export with GDP both with 1987 prices [(IM+EX)/GDP]. The other definition is the ratio of import and GDP [IM/GDP]. In order to avoid simultaneity biased problem lag value of these ratios are entered into the specification. Three money aggregates; M1, M2, M2Y[2]; are used as the money indicators for Δm.

1.3 Empirical results

Table 1 reports the estimate of output equation (equation 1) and Table2 reports the estimate of price equation (equation 2) for three money measures (M1, M2, M2Y). Tables are formed in two parts as "Panel A" for the definition of openness as the ratio of sum of the import and export with GDP and "Panel B" for the definition of $open_t$ as the ratio of import with GDP.

To be consistent with the theoretical expectations the estimated $ß_{5i}$s that are the coefficients of the openness terms is expected to be negative to indicate the declining effects of money on output with openness. On the other hand, according to Karras's study estimated α_{5i}s must be positive to indicate that prices increase by the increasing level of openness while it has to be negative to show a negative

[1] http://tcmbf40.tcmb.gov.tr/cbt.html

relationship between inflation and level of openness to fit with the Romer's expectations about the policy choice of money authority.

Table1 shows that for both definitions of openness and for all of the three definitions of money, the estimated coefficients of sum of the interactive term of money with openness, which is shown as $open_{t-1}*m_{t-i}s$ are negative and statistically significant. And also, even if the signs of estimated coefficients of $m_{t-i}s$ do change, the estimated coefficients of the sums of the $m_{t-i}s$ are positive and statistically significant. This suggests that, change in the money supply declines the level of output.

Table2 shows that for both definitions of openness and for all of the three definitions of money, coefficients of the sums of the $m_{t-i}s$ are positive and statistically significant. And the coefficients of sums of the interactive terms are negative. This means that inflation decreases by the increasing level of openness. We can offer two explanations for this. First as being parallel to the view of Romer's, Turkish monetary authority injects money to system to maintain the current level of inflation (Turkey in her more than 25 years of high inflation did not experience hyper inflation) and injection of money just stimulate the output not inflation. Second, the openness measure increases due to higher imports. Higher imports, increases output and decreases prices due to substitution effect.

[2] M2Y= M2 + deposit in foreign currency denominated currency

1.4 Conclusions

In this paper it is shown that openness is an important factor for the effectiveness of monetary policy. Theoretically, using an open-economy model, openness can be shown to reduce the ability of the monetary policy to affect output, while adversely effecting inflation. Using quarterly data from 1987:1 up to 2001:1 period for Turkey, it is empirically shown that output level and prices have negative relationship with the level of openness. Turkey is in a trend to open its economy to foreign trade. This would be good for the increment of the investments and money circulation. But as a result of this empirical study, it can be said that the effectiveness of the monetary policy declines to manipulate the output so as well as the control of the economy.

In the light of the economic literature and experiences of Turkish economy, level of openness must be kept in view for the choice of monetary policy. Here we found out that, level of openness is negatively related to the average inflation rate. This means that Turkish money authority acts parallel to the predictions of Romer about the openness and monetary policy. But if money authority lets monetary expansion, it would cause Karras's predictions to come true and increase inflation. It is right that Turkey never experienced hyperinflation but also could not decreased high inflation for decades. So, Turkish money authority must be very careful when it is deciding for monetary expansion in the open economy conditions.

REFERENCES

Atesoglu, H.S. and Dutkowsky, D.H. 1995. "Money, Output and Prices in Turkey," *Applied Economics Letters* 2: 38-41.

Bryant, R., Henderson, D., Holtham, G., P., Symansky, S. 1988. *Empirical Macro Economics for Independent Economies*. Washington, D.C.: Brookings Institution.

Dennis, R. 2001. "Monetary Policy and Exchange Rates in Small Open Economies," *FRBSF Economic Letter*, 16 (May): 1-4.

Grauwe, P. "Paradigms of Macroeconomic Policy for the Open Economy," in Fratianni M.U., Salvotore D. and Jurgen von Hagen, eds., *Macroeconomic Policy in Open Economies*, vol. 5, USA: Greenwood Press.

Guncavdi, O. and Kucukcifci, S. 2001. "Foreign Trade and Factor Intensity in an Open Developing Country: An Input-Output Analysis for Turkey," *Russian and East European Finance and Trade* 37(1) (January-February): 75-88

Karras, G. 1999. "Openness and the Effects of Monetary Policy," *Journal of International Money and Finance* 18: 13-26.

Mishkin, F.S. 1995. "Symposium on the Monetary Transmission Mechanism," *Journal of Economic Perspectives*, 9(4) (Fall): 3-10

Papadopoulos, A.P. 1993. "The Effects of Monetary, Fiscal and Exchange Rate Policies on Output, Prices and the Balance of Payments in the Open Economy of Greece: 1955-90," *Applied Economics* 25: 879-890.

Romer, D. 1993. "Openness and Inflation: Theory and Evidence," *Quarterly Journal of Economics* CVIII (November): 869-903.

Table 1.1 Output, Money and Openness (+)

	PANEL A **(IM+EX)/GDP**			***PANEL B*** **IM/GDP**		
	M1	*M2*	*M2Y*	*M1*	*M2*	*M2Y*
Constant	-0.137**	-0.076	-0.182**	-0.122*	-0.084	-0.174**
	(-1.953)	(-1.179)	(-3.145)	(-1.892)	(-1.371)	(-3.095)
D1	-0.049	-0.152*	-0.038	-0.042	-0.108	-0.007
	(-0.570)	(-1.724)	(-0.430)	(-0.499)	(-1.236)	(-0.082)
D2	0.240*	0.130	0.311**	0.213*	0.138	0.295**
	(1.811)	(1.076)	(2.823)	(1.726)	(1.198)	(2.744)
D3	0.433**	0.411**	0.492**	0.390**	0.379**	0.447**
	(4.0174)	(4.569)	(5.737)	(3.956)	(4.33)	(5.273)
D94	-0.085**	-0.105**	-0.104**	-0.099**	-0.106	-0.102**
	(-2.139)	(-3.158)	(-3.063)	(-2.431)	(-2.976)	(-2.897)
y_{t-1}	-0.265*	-0.414**	-0.230	-0.258	-0.350	-0.186
	(-1.652)	(-2.571)	(-1.424)	(-1.630)	(-2.156)	(-1.143)
y_{t-2}	-0.145	-0.141	-0.047	-0.191	-0.196	-0.108
	(-0.831)	(-0.965)	(-0.328)	(-1.149)	(-1.319)	(-0.733)
y_{t-3}	-0.092	-0.111	-0.199	-0.116	-0.141	-0.213
	(-0.540)	(-0.755)	(-1.377)	(-0.704)	(-0.941)	(-1.441)
y_{t-4}	-0.109	-0.112	-0.183	-0.053	-0.047	-0.116
	(-0.615)	(-0.758)	(-1.206)	(-0.309)	(-0.313)	(-0.745)
m_t	0.774**	1.018**	1.153**	0.668**	0.732**	0.935**
	(2.19)	(3.133)	(2.925)	(2.283)	(2.683)	(2.639)
m_{t-1}	0.576*	0.513	0.053	0.494	0.258	-0.081
	(1.666)	(1.508)	(0.127)	(1.6)	(0.89)	(-0.22)
m_{t-2}	0.274	-0.316	-0.572	0.439	-0.126	-0.284
	(0.711)	(-0.934)	(-1.360)	(1.327)	(-0.432)	(-0.725)
m_{t-3}	-0.073	0.373	0.455	0.039	0.378	0.389
	(-0.214)	(1.096)	(1.091)	(0.126)	(1.233)	(0.994)
m_{t-4}	0.618*	0.750**	0.849**	0.510*	0.577*	0.661*
	(1.890)	(2.061)	(2.015)	(1.833)	(1.844)	(1.66)
$open_{t-1}*m_t$	-1.267*	-2.335**	-2.259**	-1.926*	-3.304**	-3.352**
	(-1.835)	(-3.444)	(-2.735)	(-1.78)	(-2.1)	(-2.392)
$open_{t-1}*m_{t-1}$	-1.006	-1.126	-0.092	-1.578	-1.136	0.213
	(-1.579)	(-1.579)	(-0.112)	(-1.469)	(-0.978)	(0.155)
$open_{t-1}*m_{t-2}$	-0.428	0.827	1.254	-1.356	0.878	1.225
	(-0.61)	(1.186)	(1.474)	(-1.214)	(0.765)	(0.83)
$open_{t-1}*m_{t-3}$	0.332	-0.310	-0.294	0.328	-0.591	-0.302
	(0.513)	(-0.439)	(-0.348)	(0.302)	(-0.486)	(-0.203)
$open_{t-1}*m_{t-4}$	-1.327**	-1.316*	-1.619*	-2.054**	-1.888	-2.363
	(-2.122)	(-1.732)	(-1.896)	(-2.039)	(-1.489)	(-1.55)
R^2	0.985	0.988	0.987	0.984	0.986	0.986
DW	2.051	2.245	2.163	2.154	2.312	2.197
$\Sigma^4_{i=0}\, m_{t-i}$	2.169	2.338	1.938	2.150	1.819	1.620
	(2.337)	(3.378)	(2.4)	(2.455)	(2.7)	(1.96)
$Open_{t-1}*\Sigma^4_{i=0}\, m_{t-i}$	-3.697	-4.259	-3.011	-6.587	-6.041	-4.580
	(-2.31)	(-3.3)	(-2.185)	(-2.41)	(-2.68)	(-1.78)

(+) The t-statistics are reported in parenthesis; * Significant at 10%; ** significant at 5%

Table 1.2 Prices, Money and Openness(+)

	PANEL A **(IM+EX)/GDP**			***PANEL B*** **IM/GDP**		
	M1	*M2*	*M2Y*	*M1*	*M2*	*M2Y*
Constant	0.112**	0.048	0.059**	0.108**	0.049	0.062**
	(3.245)	(1.362)	(2.171)	(2.922)	(1.362)	(2.301)
D1	0.037**	0.054**	0.040**	0.038**	0.053**	0.036*
	(2.123)	(2.08)	(2.123)	(1.967)	(1.99)	(1.938)
D2	-0.007	0.011	0.008	-0.003	0.012	0.004
	(-0.333)	(0.362)	(0.353)	(-0.138)	(0.395)	(0.163)
D3	-0.054**	-0.040	-0.015	-0.052**	-0.036	-0.017
	(-2.733)	(-1.38)	(-0.634)	(-2.461)	(-1.25)	(-0.728)
D94	0.188**	0.203**	0.167**	0.182**	0.200**	0.169**
	(5.713)	(5.912)	(5.854)	(5.372)	(5.795)	(6.02)
p_{t-1}	0.065	0.310*	0.444**	0.050	0.335**	0.480**
	(0.481)	(1.895)	(2.716)	(0.338)	(2.049)	(2.944)
p_{t-2}	0.210	-0.101	-0.287	0.172	-0.155	-0.308
	(1.555)	(-0.501)	(-1.452)	(1.147)	(-0.787)	(-1.555)
p_{t-3}	0.168	0.509	0.418**	0.152	0.491**	0.404**
	(1.219)	(2.48)	(2.233)	(1.061)	(2.518)	(2.152)
p_{t-4}	-0.248*	-0.143	-0.044	-0.171	-0.107	-0.048
	(-1.872)	(-0.83)	(-0.313)	(-1.346)	(-0.642)	(-0.347)
m_t	-0.121	-0.703	-1.230**	-0.193	-0.652**	-1.232**
	(-0.413)	(-2.136)	(-3.804)	(-0.732)	(-2.401)	(-4.231)
m_{t-1}	0.267	0.073	0.891**	0.203	0.139	0.889**
	(0.909)	(0.242)	(2.522)	(0.735)	(0.539)	(2.774)
m_{t-2}	0.826**	0.489	-0.221	0.666**	0.329	-0.276
	(2.886)	(1.405)	(-0.453)	(2.427)	(1.123)	(-0.603)
m_{t-3}	0.229	0.165**	0.509	0.183	0.185	0.440
	(0.808)	(0.422)	(1.194)	(0.633)	(0.556)	(1.108)
m_{t-4}	-0.262	-0.242	0.032	-0.092	-0.163	0.077
	(-0.94)	(-0.613)	(0.082)	(-0.34)	(-0.493)	(0.215)
$open_{t-1}*m_t$	-0.277	0.679**	1.131*	-0.272	1.029	2.153**
	(-0.505)	(0.983)	(1.769)	(-0.294)	(0.968)	(2.06)
$open_{t-1}*m_{t-1}$	-0.344	0.426	-0.591	-0.385	0.681	-1.042
	(-0.637)	(0.724)	(-1.05)	(-0.404)	(0.714)	(-1.129)
$open_{t-1}*m_{t-2}$	-1.658**	-1.462**	-0.482	-2.530**	-2.234**	-0.735
	(-3.234)	(-2.32)	(-0.656)	(-2.798)	(-2.253)	(-0.592)
$open_{t-1}*m_{t-3}$	-0.363	0.046	-0.417	-0.539	0.001	-0.486
	(-0.681)	(0.065)	(-0.60-5)	(-0.528)	(0.0007)	(-0.414)
$open_{t-1}*m_{t-4}$	0.235	0.296	-0.406	-0.086	0.318	-0.967
	(0.445)	(0.372)	(-0.562)	(-0.089)	(0.245)	(-0.785)
R^2	0.902	0.873	0.912	0.896	0.873	0.914
DW	2.022	2.012	1.302	1.868	2.020	1.290
$\Sigma^4_{i=0}\, m_{t-I}$	0.940	-0.217	-0.019	0.768	-0.162	-0.101
	(1.09)	(-0.28)	1.31	(0.84)	(-0.22)	(-0.147)
$Open_{t-1}*\Sigma^4_{i=0}\, m_{t-I}$	-2.406	-0.014	-0.766	-3.810	-0.206	-1.077
	(-1.5)	(-0.01)	(-0.63)	(-1.22)	(-0.082)	(0.5)

(+) The t-statistics are reported in parenthesis; * significant at 10%; ** significant at 5

CHAPTER 2: The Asymmetric Effects of Government Spending Shocks: Empirical Evidence from Turkey

2.1 Introduction

Budget deficit and its sustainability have a prime importance in the establishment of economic policies in Turkey. Keynesian theory suggests that increased government spending stimulates aggregate demand and increases output. However, due to the increase in interest rates, government spending crowds out private consumption and private investment. Barro (1987) argues that, if the increase in the government spending is taken as permanent, then an increase in output will be realized without increasing interest rates. The purpose of this paper is to assess whether expansionary and contractionary government spending shocks have asymmetric effects on economic performance. The assessment of this asymmetric effect is important because it is often argued that decreasing prices and providing stability in the market will be followed by a decrease in government spending. There might be various reasons for this. First, if wages and prices are sticky downward, a contractionary government spending shock decreases output more than expansionary government spending shock increases it. Price response will tend more to an increase than a decrease in government spending. Second, when prices and wages are perfectly flexible and output is equal to near full employment level, then an increase in government spending does not increase output but a decrease in government spending decreases output. Third, interest rates increase in the face of expansionary

government spending shocks while there is no evidence of a reduction in the face of contractionary government spending shocks. The reason for this is that the response of private agents to an increase and a reduction in interest rates would be different; that is, the response of interest rates and private agents would be different to the expansionary and contractionary shocks (see, Kandil, 2001). Lastly, the economic outcome might be affected and changed by the perceptions and expectations of the public. If it is perceived to be permanent by the public, then the expansionary shock will increase aggregate demand, but if it is perceived to be temporary by the public, then the expansionary government spending shock will not effect aggregate demand very much. Thus, if the government the spending increase is perceived as permanent but the government the spending decrease is perceived as transitory, the effect of expansionary and contractionary fiscal policy on economic outcome will be asymmetric.

Cover (1992) illustrates the asymmetric effects in the face of expansionary and contractionary economic policy shocks using the quarterly data of real output in the United States. He finds that contractionary economic policy shocks affect output while expansionary economic policy shocks do not affect output. Kandil (2001), using quarterly data for the United States, demonstrates the asymmetric effects of expansionary and contractionary shocks to government spending around an anticipated steady-state trend over time. She finds that while interest rates increase in the face of expansionary government spending shocks, there did not seem to be any evidence of a reduction in the face of contractionary shocks. Consequently, in the

face of an expansionary government spending shock, increased government spending crowds out private investment. Moreover, there is evidence of a reduction in private consumption. As a result, output growth and price inflation decrease despite expansionary government spending shocks, on average, over time.

Studying the asymmetric effects of government spending shocks for the Turkish economy is interesting because Turkey has high persistent inflation without running into hyperinflation and this is a vital problem for the fiscal policies of the Turkish economy. Moreover, Turkish government spending is volatile, which can frequently create possible asymmetric effects. Thus, Turkey produces a laboratory environment to assess the effect of fiscal policy on economic performance. In the last two decades, the Turkish economy has performed unstable macro economic development. Growth during a period was followed by contraction in the next period. Every time that the government tried to compensate for the budget deficit, it affected the balance of the financial markets in the face of unstable interest rates. Therefore, explaining the asymmetric effects of Turkish government spending is an important macroeconomic topic to be worked on.

In order to investigate unanticipated government spending shocks, we studied the effects of expansionary and contractionary government spending shocks on *aggregate demand*, *prices*, *total private consumption* and *total private investment*. Moreover, in order to carry out a more detailed investigation we also took into account the subcomponents of *total private consumption* and *total private investment*. We found that unanticipated government spending shocks have asymmetric effects on

the subcomponents of both *total private consumption* and *total private investment*. The empirical evidence reported here reveals that *total private consumption* and *total private investment* decrease in the face of expansionary government spending shocks; however, they do not change or decrease very little under contractionary government spending shocks. The analysis reveals that the private sector responds to the government spending shocks asymmetrically but there is no evidence as to the asymmetry in *prices* and *output* in the face of government spending shocks in Turkey.

This paper is structured as follows. Section 2 describes the methodological framework. Section 3 gives the empirical evidence and interprets the estimates. Finally, section 4 concludes the paper.

2.2 Methodology

In order to investigate the possible asymmetric effects, we employ the following empirical model:

$$\begin{bmatrix} 1 & b_{12} \\ b_{21} & 1 \end{bmatrix} \begin{bmatrix} g_t \\ z_t \end{bmatrix} = \begin{bmatrix} b_{10} \\ b_{20} \end{bmatrix} + \begin{bmatrix} \gamma_{11} & \gamma_{12} \\ \gamma_{21} & \gamma_{22} \end{bmatrix} \begin{bmatrix} g_{t-1} \\ z_{t-1} \end{bmatrix} + \begin{bmatrix} \varepsilon_{gt} \\ \varepsilon_{zt} \end{bmatrix} \qquad (1)$$

where g_t is for percentage change of real government spending, z_t is a vector of other economic variables of interest, and ε_{gt} and ε_{zt} are orthogonalized disturbances.

In this model, the set of relevant explanatory variables (z_t) includes logarithmic first difference of the real GDP, logarithmic first differences of the wholesale price index, logarithmic first differences of real total private consumption, logarithmic first differences of real total private investment, the logarithmic first difference of

government spending and the 3-month treasury bill rate. Furthermore, for a more specific investigation of the asymmetric effect of government spending shocks over consumption and investment; we have used some components of consumption and investment instead of *total private consumption* and *total private investment* themselves[3]. During the estimation process, if one of the components of total consumption was used instead of *total private consumption* itself, *total private investment* itself was used rather than its components and vice versa. When the estimation is performed, various dummy variables are also included. In order to account for seasonality, three dummy variables, which are denoted as D_{it}, are used for the seasonality effects over the quarterly data. $D94_t$ stands for the self-inflicted 1994 crisis in the second quarter. Similarly, $D00_t$ stands for the crisis in the Turkish economy in the last quarter of 2000. The data for all the variables are gathered from the Central Bank of the Republic of Turkey electronic data delivery system[4].

In order to assess the positive and negative government spending shocks to fiscal policy, we define two variables, pos_t and neg_t, which stand for the expansionary and contractionary government shocks, respectively. We measured the positive and negative government spending shocks in a similar way to Cover (1992) and Kandil (2001), as follows:

$$pos_t = 0.5 * (\varepsilon_{gov_t} + |\varepsilon_{gov_t}|) \qquad (2)$$

[3] Logarithmic first differences of durable goods, *semi-durable goods*, public sector consumption, public construction expenditures, *private sector consumption*, private sector machinery expenditures and private sector construction expenditures are taken as the components of total private consumption. Moreover, logarithmic first differences of mining and quarrying, manufacturing, total industrial and wholesale/ retail productions are taken as the components of *total private investment*.

$neg_t = -1 * (\varepsilon_{gov_t} - pos_t)$ (3)

Here, shock terms, which are denoted as ε_{gov_t}, are the residual terms created by regressing the logarithmic first difference of government spending over the same explanatory variables of our model. pos_t stands for the expansionary government spending shocks while neg_t stands for the contractionary government spending shocks. We include pos_t and neg_t in the models to observe the asymmetric effects of unanticipated government spending shocks to assess their effect on *aggregate demand, price level, total private consumption* and *total private investment*. Therefore, we model the macroeconomic variable, which is claimed to be affected by government spending shocks asymmetrically. Then we include positive and negative shocks in the model as follows:

$$Y_t = \Gamma_0 + \Gamma_1 X_t + \Gamma_2 POS_t + \Gamma_3 NEG_t + \eta_t$$

Where Y_t is the variable under concern, Γ_0 stands for the constant terms and dummy variables, X_t is the set of explanatory variables, Γ_2 and Γ_3 are the coefficients of the lagged effects of the positive and negative unanticipated government spending shocks on the concerned variables and η_t is the error term (see Appendix for details).

Aggregate demand, prices, total private consumption and *total private investment* are expected to react to the fluctuations in government spending shocks. The estimates Γ_2 and Γ_3 will allow us to examine the asymmetry on the dependent

[4] http://tcmbf40.tcmb.gov.tr/cbt.html

variables created by the government expansionary and contractionary spending shocks.

If the expansionary and contractionary government spending shocks are perceived as permanent by the public, then the expansionary shock will increase aggregate demand, but if it is perceived as temporary by the public, then the expansionary government spending shock will affect the aggregate demand at a smaller magnitude. It is also possible that the government's expansionary spending shock might be taken as permanent while the government contractionary spending shock is perceived as temporary. This suggests that the effect of unanticipated expansionary government spending would be greater than the effect of unanticipated contractionary government spending. Moreover, the way chosen by the government to finance the deficit would be important for the response of aggregate spending to expansionary and contractionary shocks. If the government borrows from the public to finance the gap which is induced by the expansionary spending shock, the public might see it as the increase of future wealth. This would trigger aggregate consumption and demand. But in order to capture the asymmetry, the level of the response of the aggregate demand to expansionary and contractionary shocks must not be balanced. In other words, an increase in the aggregate demand because of expansionary government shocks must be different from that of a decrease in the aggregate demand. It is expected that the expansionary effects of government spending shocks may exceed the contractionary effects on aggregate demand.

Consistent to the discussion about aggregate demand, private consumption would be determined with respect to the expectations of the public (expectations concerning the persistence of a shock), as well as the way of financing the spending shock by the government. It is expected that the expansionary effects of government spending will exceed the contractionary effects on private consumption.

Kandil (2001) also suggests that interest rates increase in the face of an increase in government spending. This fact causes a decrease in private investment. In addition, a decrease in government spending would decrease interest rates and increase investment demand. The rates of increase and decrease in private investment in response to government spending shocks will not be equal. That is why we are looking for asymmetry.

To sum up, the effect of unanticipated government shocks would be greater if they are accepted as permanent rather than temporary. The way chosen by the government to finance the deficit which is created by the government spending shock affects the amount of consumption and investment by the private sector. Likewise, interest rates, which will increase or decrease separately in the face of expansionary or contractionary government spending shocks, would affect private sector consumption and investment to create asymmetry.

2.3 Empirical evidence

The estimation process determines the asymmetric effect of government spending shocks on the dependent variables of our models. The models are estimated

with four lags. We used two methods for the estimation: least square (LS) and three stage least square (3SLS). First, we used LS to assess the asymmetric effect of fiscal policy on the economy. For the LS estimates, we used a two step procedure. In the first step, using Equations (1), (2) and (3), we constructed the pos_t and neg_t terms to indicate the expansionary and contractionary government spending shocks. Then we regressed our four dependent variables (logarithmic first differences of aggregate demand -*real GDP-,* prices -*WPI-, total private consumption* and *total private investment*) over the explanatory variables. However, one may calculate pos_t and neg_t incorporating the reduced form setting. Hence, 3SLS will be in order. In 3SLS, we used 6 lagged logarithmic first differences of all the dependent variables, as well as the explanatory variables themselves as instrumental variables in addition to the ordinary models.

Table 1 reports the estimations of the lag values for pos_t and neg_t terms. Panel A shows the results of the LS estimation, while Panel B shows the results of the 3SLS process. In both of the panels, the first two columns present the sums of the coefficients of the pos_t and neg_t terms (in order to account for their long tem effects), respectively. Column 3 for each panel presents the total effect generated by both expansionary and contractionary government spending shocks. Asymmetry in the effects of government spending shocks on unanticipated growth in the various explanatory variables of our model can be identified. Columns 4, 5 and 6 report the *p*-values of the Wald test statistics: column 4 reports the results of the hypothesis that the sum of the coefficients of pos_t terms is equal to zero; column 5 tests the

hypothesis that the sum of the coefficients of neg_t terms is equal to zero; the last column of each panel tests the hypothesis that the sum of the coefficients of the pos_t terms is equal to the negative signed sum of the coefficients of neg_t terms.

Specifically, we concentrate on the sum of the coefficients for positive and negative government spending shocks on various explanatory variables. In Table 1 and Panel A, by using LS for the estimation, the cumulative effect of expansionary government spending shocks on *total private consumption* is negative but statistically insignificant[5]. This suggests that *total private consumption* decreases as the amount of government spending increases. This fact can be related to the public's opinion about the government's policy of financing the spending shock. The public may decide that the gap created by the spending shock will be financed by the future taxes; *total private consumption* decreases. The cumulative effect of contractionary government spending shocks on *total private consumption* is negative and statistically insignificant. The difference between the cumulative effects of positive and negative spending shocks is the key factor for the identification of the asymmetry. For *total private consumption*, this difference is positive and statistically insignificant. But this result does not help us to capture the asymmetric effect of a government spending shock. Furthermore, we find parallel results to the LS when we do the estimation by 3SLS to explain the effects of an unanticipated government spending shock on *total private consumption*.

[5] The level of significance is 5% unless otherwise stated.

Alternatively, we can use subcomponents of *total private consumption*, instead of using *total private consumption* itself. Keep in mind that, if one of the components of *total private consumption* was used instead of *total private consumption* itself, *total private investment* itself was used rather than its components. When we examined the subcomponents of *total private consumption*, we found more supporting evidence. Explaining unanticipated growth in *durable goods* consumption, the cumulative effects of positive and negative government spending shocks are negative. The results are statistically significant for positive government spending shocks, although insignificant for the negative ones. Parallel to the discussion about *total private consumption*, the asymmetric effect can be identified in the 3rd column. The difference between the cumulative effects of positive and negative shocks is negative and statistically significant. When we do the same examination for *semi-durable goods* consumption to see the effects of government spending shocks, we find that the test results for asymmetry are statistically insignificant, although the cumulative effect of contractionary government spending shocks is negative and statistically significant.

Explaining the effects of unanticipated government spending shocks on *private sector* consumption as being another subcomponent of *total private consumption*, the cumulative effect of expansionary government spending shocks is negative and statistically significant. In the same way, the cumulative effect of contractionary government shocks is also negative and statistically significant. As the core point, the difference between the cumulative effects of expansionary and

contractionary shocks is negative and statistically significant, showing asymmetry. So we can say that observing the asymmetric effects of unanticipated government spending shocks, a contractionary spending shock decreases *private sector* consumption, and *private sector* consumption decreases even more under an expansionary spending shock. The results gathered from the 3SLS estimation are mostly parallel to the ones of LS, but empirical evidence is weaker.

In Table 1, the cumulative effect of expansionary government shocks on prices (*WPI*) is negative, although statistically insignificant. We can say that the reduction in private spending, along with the increase in the government spending, decreases prices over time. The cumulative effect of contractionary government spending is also negative and statistically insignificant. Finally, the difference between the cumulative effects of expansionary and contractionary government shocks is negative and statistically insignificant. Thus, once more, we could not capture the asymmetric effect at a meaningful significancy level. With the 3SLS estimation method, the cumulative effect of expansionary government spending shock on prices is positive, although insignificant. This can be explained by the positive effect of government spending shock on aggregate demand in the 3SLS method. Increasing demand increases prices. The cumulative effect of contractionary government spending shocks is negative and insignificant. Finally, in the 3SLS method, to determine the asymmetry, we examine the 3rd column; the difference between the cumulative effects of expansionary and contractionary government spending shocks is positive, although statistically insignificant.

Although economic theory suggests an indirect relationship between unanticipated government shocks and *total private investment*, our empirical study indicates the opposite situation with high *p*-values for both LS and 3SLS and also for some of the subcomponents of *total private investment*.

For aggregate demand, if we examine the effect of an unanticipated government spending shock on the *real GDP*, in Panel A, by intersecting the last row and the first column, we see that the cumulative effect of expansionary government spending shocks is negative, although statistically insignificant. The cumulative effect of contractionary government spending shocks on aggregate demand is negative and statistically significant. Asymmetry in aggregate demand shifts is captured by the difference between the expansionary and contractionary government shocks, which is positive and significant. When we do the estimation with 3SLS, we see that the cumulative effect of expansionary government spending shocks is positive, although statistically insignificant. The cumulative effect of contractionary government spending shocks on aggregate demand is positive and statistically significant. Finally, in the 3SLS method, to determine the asymmetry, we examine the 3rd column; the difference between the cumulative effects of expansionary and contractionary government spending shocks is negative and statistically significant. That is, demand contraction is evident in the face of expansionary and contractionary government spending shocks.

It can be seen in Table 1 that using total government spending does not support what the economic theory suggests. When we used the total government

spending variable to capture the unanticipated government spending shocks on various explanatory variables, we could not reach statistically significant results except for r*eal GDP*, *durable goods* and *semi-durable goods* when investigated with LS and 3SLS and for *private sector consumption* when investigated with LS only. Since the results were insignificant when we used total government spending during the estimation process of government spending, we used the difference between the treasury auction interest rate and the previous quarter's interbank interest rate (so called *auction* in our work) alternatively to the total government spending variable. The reason for using treasury *auction* interest rates rather than the government spending variable should be explained. Total government spending includes figures from the consolidated budget; and in the very relaxed supervision of this consolidated budget system of Turkey, some public institutions (particularly local administrations) invoice their own spending to the government. Conversely, sometimes governments show their expenditures as if they were the expenditures of public institutions and avoid reporting these expenditures in the government budget[6]. Such budgetary movements are called hidden liabilities (Esfahani and Kim, 2002). This problem is not peculiar to Turkish economy. Most governments have financial commitments and contingent liabilities that do not receive explicit budgetary operations or even official recognition. Less transparent fiscal systems tend to produce more liabilities. Conditioning the fiscal transparency to attain fiscal discipline is also emphasized in various international pacts and multilateral arrangements as in the European Union's

[6] See Atiyas, Gunduz, Emil, Erdem and Ozgun (1999).

Maastricht Treaty and the IMF conditionality. In fact, since Turkey is a candidate country for entry to the European Union and has close relations with IMF, one of the main planning reforms of the ongoing economic program of the Turkish economy concerns the restructuring of public fiscal management and fiscal transparency.[7] Thus, some non-government spending is included in the total government spending in the budget and independent of the unanticipated government spending shocks. However, the borrowing cost of the government, treasury auction interest rates, reflects the true value of government spending, which is done purely by the treasury. Berument (2002) suggests using the spread between the treasury auction interest rate and the lagged value of the interbank interest rate to account for fiscal policy.

In Table 2, we can see the effects of unanticipated expansionary government shocks when we take treasury auction interest rates as government spending. This time the shock term, ε_{gov}, is generated by regressing treasury auction interest rates on the various explanatory variables. Table 2 is constructed the same as Table 1.

In Panel A of Table 2, by using LS for the estimation, the cumulative effect of expansionary government spending shocks on *total private consumption* is positive and statistically significant. This means that an increase in government spending increases *total private consumption*. The increase in *total private consumption* in the face of an expansionary government shock can be explained in such a way that the income effect dominates the substitution effect. On the other hand, the cumulative

[7] See the report drawn up by *Special Ad Hoc Committee on Restructuring of Public Fiscal Management and Fiscal Transparency*, March 2000, http://ekutup.dpt.gov.tr/kamumali/oik8/pubfinan.doc.

effect of contractionary government spending shocks on *total private consumption* is positive but statistically insignificant. The difference between the cumulative effects of positive and negative shocks is positive and statistically significant. Therefore, we can capture the asymmetry in the effects of unanticipated expansionary and contractionary government shocks on *total private consumption*. Moreover, when we do the estimation with 3SLS, we find results similar to those reported in Panel B of Table 2 with higher levels of significance.

When we examined the lower components of *total private consumption* to see if they are affected by unanticipated expansionary and contractionary government shocks, measured with treasury auction interest rates, we found more evidence to support asymmetric effects. Explaining unanticipated growth in *durable goods* consumption, after the 3SLS estimation (presented in Panel B of Table 2), the cumulative effect of expansionary government shocks is positive and statistically significant. This means that the consumption of *durable goods* increases in the face of an increase in government spending. On the other hand, the cumulative effect of contractionary government shocks on *durable goods* consumption is positive but statistically significant at the 10% level. The difference between the cumulative effects of positive and negative shocks is positive and statistically significant, which indicates asymmetry.

Explaining the unanticipated expansionary and contractionary government shocks measured with treasury auction interest rates on *private sector* consumption as

being another lower component of *total private consumption* like we did before, in Panel A, the cumulative effect of expansionary government shocks is positive and statistically significant at the 10% level. The cumulative effect of contractionary government shocks is also positive and statistically significant. The difference between the cumulative effects of expansionary and contractionary shocks is positive and statistically significant, thus indicating asymmetry. As a result, by observing the asymmetric effects of unanticipated government shocks, we can argue that *private sector* consumption increases with both expansionary and contractionary shocks. The 3SLS estimation method also indicates an asymmetric effect of government spending on *private sector* consumption. The results that are reported in Panel B of Table 2 are statistically significant and this time results are statistically significant also for the contractionary government spending shocks.

When we investigated the asymmetric effects of expansionary and contractionary government shocks on machinery consumption, we found supporting evidence with 3SLS. As reported in Panel B of Table 2, machinery consumption is decreased by the effect of expansionary government shock. This result is statistically significant. It can be seen in the same panel that contractionary government shocks decrease the machinery spending more than expansionary shocks do, and this is statistically significant. The difference between the cumulative effects of expansionary and contractionary shocks is positive and statistically significant, indicating asymmetry.

Identifying the effects of government shocks on *private construction* consumption with LS estimation, we find results similar to those for *private sector* consumption. The cumulative effect of expansionary government shocks is positive and statistically significant 5.7% level. The cumulative effect of contractionary government shocks is also positive and statistically significant. The difference between the cumulative effects of expansionary and contractionary shocks is positive and statistically significant, showing asymmetry. Thus, observing the asymmetric effects of unanticipated government shocks, we can say that private construction consumption increases for both expansionary and contractionary shocks. When we do the estimation with 3SLS, the expansionary and contractionary government shocks and the difference between the cumulative effects of expansionary and contractionary shocks is positive and statistically significant, indicating asymmetry.

The estimates from *total private investment* do not reflect asymmetric effects in the face of unanticipated government shocks. However, if we use the lower components of *total private investment* instead of itself, we find supporting evidence with 3SLS estimation. The effect of expansionary government shocks on *manufacturing* is negative and statistically significant. In other words, manufacturing investment decreases in the face of expansionary government shocks. Contractionary government shocks also affect manufacturing negatively and the results are statistically significant. As the core point, the difference between the cumulative effects of expansionary and contractionary shocks is negative and statistically

significant, showing asymmetry. We reach the same results with total industrial and wholesale/retail investments.

Compared with the results of the asymmetric effects of government spending shocks in Table 1, we find more supporting results in Table 2. In fact, this supports our hypothesis that treasury auction interest rates are more suitable for representing government spending. As reported in Table 2, using treasury auction interest rates, there is evidence that unanticipated government spending has asymmetric effects on total private consumption and on the lower components of *total private consumption* and *total private investment*. Although supported weakly with LS estimation, with 3SLS there is greater supporting evidence for our hypothesis. In Panel B of Table 2, the results for *total private consumption, durable goods* consumption*, private sector* consumption*, machinery* consumption*,* and *private construction* consumption are statistically significant. In addition, the results for the subcomponents of *total private investment*, specifically for *manufacturing, total industrial* production and *wholesale/retail* production are statistically significant, capturing the asymmetric effects of expansionary and contractionary government spending shocks.

2.4 Summary and conclusions:

Government spending and its effects is an imported topic to be worked on, especially for the countries, like Turkey, which have chronic budget deficits. There has been considerable discussion and many studies regarding government spending in Turkey. Government spending has some direct and indirect impacts on the various

macroeconomic variables. An increase in government spending would cause aggregate demand to increase. Correspondingly, increasing demand stimulates output growth and price inflation, so this situation affects private consumption and investment although we do not observe that the decrease in government spending affects the economy.

However, the relationship between government spending and the variables affected by the government spending is asymmetric, such that the effect of an increase in government spending may be different from that of a decrease in government spending. One reason for the asymmetry is the capacity constraints in the credit market. A positive shock to government spending above an anticipated steady-state trend increases the demand for loanable funds and raises the interest rate. The increasing interest rate crowds out the expansionary government spending shocks. However, the interest rate does not decrease in the face of contractionary government spending shocks. Of course, private investment does not increase in the face of contractionary government spending shocks.

Another source of asymmetry may the response of *private consumption* to government spending shocks. The perception of the government spending shock by private agents is important in clarifying the effect of government spending shocks. Specifically, agents decrease consumption in anticipation of future tax liability in the face of expansionary government spending shocks.

In this paper, it is shown that asymmetry in the effects of government spending shocks can be best captured when treasury auction interest rates were used

to indicate the government's fiscal stance. Moreover, when we used subcomponents of *private consumption* and *private investment,* the results of estimation results became more supportive.

The effects of expansionary government spending are closely related to the economy's ongoing state. Asymmetry in the face of government spending shocks indicates that the stabilizing effects of fiscal policies are dependent on the state of the business cycle. During recessions, the expansionary effects of an increase in government spending are likely to be pronounced, speeding up recovery towards full-equilibrium. In contrast, a decline in government spending during boom periods is likely to stimulate a fast increase in private spending, hindering the success of contractionary fiscal policy in moderating excess demand.

REFERENCES:

Aiyagari, Rao, Lawrence J. Chritiano, and Martin Eichenbaum.1992. "The output, employment, and interest rate effects of government spending," *Journal of Monetary Economics* 30: 73-86.

Atiyas, Izak, Emil Ferhat, C.M. Erdem, D.B. Ozgun. 1999. "Fiscal adjustment in Turkey: the role of quasi fiscal activities and institutional reform." *Working Paper, Turkish Treasury*.

Barro, R.J. 1987. "The Economic Effects of Budget Deficits and Government Spending: Introduction," *Journal of Monetary Economics*, 20(2): 191-193.

Barro, R.J. 1989. "The Neoclassical Approach to Fiscal Policy." In.*Modern Business Cycle Theory.* R.J. Barro (ed.). Cambridge: Harvard University Press.

Barro, R.J. 1990. "Government spending in a simple model of endogenous growth," *Journal of Political Economy* 98: 103-125.

Berument, Hakan M. 2002. "Treasury Auction Interest Rates and Economic Performance for Turkey." Mineo.

Cover, J.P. 1992. "Asymmetric Effects of Positive and Negative Money Supply Shocks," *Quarterly Journal of Economics* 107 (4): 1261-1282.

Devereux, M.B., D.R.F, Love. 1995. "The Dynamic Effects of Government Spending Policies in a Two-Sector Endogenous Growth Model," *Journal of Money, Credit, and Banking,* 27(1): 232-256.

Esfahani, H.S., H.,Kim. 2002. "On Hiding and Revealing Public Debt." Working Paper. University of Illinois, Urban-Champaign.

Haug, A. 1990. "Ricardian Equivalence, Rational Expectations, and the Permanent Income Hypothesis," *Journal of Money, Credit, and Banking* 22: 305-326.

Kandil, M. 1995. "Asymmetric Nominal Flexibility and Economic Fluctuations." *Southern Economic Journal* 61(3): 674-95.

Kandil, M. 2000. "Asymmetry in Economic Fluctuations in the US Economy: The Pre-war and the 1946-1991 Periods Compared." Working Paper. Department of Economics, University of Wisconsin- Milwaukee.

Kandil, M. 2001. "Asymmetry in the Effects of US Government Spending Shocks: Evidence and Implications," *The Quarterly Review of Economics and Finance* 41: 137-165.

Kandil, M. 2002. "Asymmetry in the Effects of Monetary and Government Spending Shocks: Contrasting Evidence and Implications," *Economic Inquiry* 40(2): 288-313.

Karras, G. 1996a. "Are the Output Effects of Monetary Policy Asymmetric? Evidence from a Sample of European Countries," *Oxford Bulletin of Economics and Statistics* 58: 267-278.

Karras, G. 1996b. "Why are the Effects of Money Supply Shocks Asymmetric? Convex Aggregate Supply or Pushing on a String?," *Journal of Macroeconomics* 20: 605-620.

King, R.G., Sergio Rebelo 1990. "Public Policy and Economic Growth: Developing Neoclassical Implications," *Journal of Political Economy* 98: 126-150.

Appendix:

The particular model we estimated in this paper is:

$$\Delta \ln Y = \alpha_0 + \sum_{i=1}^{3} \alpha_1 D_{it} + \alpha_2 D94_t + \alpha_3 D00_t + \sum_{i=1}^{4} \alpha_{4i} R_{t-i} + \sum_{i=1}^{4} \alpha_{5i} Y_{t-i} + \sum_{i=1}^{4} \alpha_{6i} P_{t-i} + \quad \text{(A1)}$$
$$+ \sum_{i=1}^{4} \alpha_{7i} C_{t-i} + \sum_{i=1}^{4} \alpha_{8i} I_{t-i} + \sum_{i=1}^{4} \alpha_{9i} G_{t-i} + \sum_{i=1}^{4} \alpha_{10i} pos_{t-i} + \sum_{i=1}^{4} \alpha_{11i} neg_{t-i} + \varepsilon_{yt}$$

$$\Delta \ln P = \beta_0 + \sum_{i=1}^{3} \beta_1 D_{it} + \beta_2 D94_t + \beta_3 D00_t + \sum_{i=1}^{4} \beta_{4i} R_{t-i} + \sum_{i=1}^{4} \beta_{5i} Y_{t-i} + \sum_{i=1}^{4} \beta_{6i} P_{t-i} + \text{(A2)}$$
$$+ \sum_{i=1}^{4} \beta_{7i} C_{t-i} + \sum_{i=1}^{4} \beta_{8i} I_{t-i} + \sum_{i=1}^{4} \beta_{9i} G_{t-i} + \sum_{i=1}^{4} \beta_{10i} pos_{t-i} + \sum_{i=1}^{4} \beta_{11i} neg_{t-i} + \varepsilon_{pt}$$

$$\Delta \ln C = \gamma_0 + \sum_{i=1}^{3} \gamma_1 D_{it} + \gamma_2 D94_t + \gamma_3 D00_t + \sum_{i=1}^{4} \gamma_{4i} R_{t-i} + \sum_{i=1}^{4} \gamma_{5i} Y_{t-i} + \sum_{i=1}^{4} \gamma_{6i} P_{t-i} + \quad \text{(A3)}$$
$$+ \sum_{i=1}^{4} \gamma_{7i} C_{t-i} + \sum_{i=1}^{4} \gamma_{8i} I_{t-i} + \sum_{i=1}^{4} \gamma_{9i} G_{t-i} + \sum_{i=1}^{4} \gamma_{10i} pos_{t-i} + \sum_{i=1}^{4} \gamma_{11i} neg_{t-i} + \varepsilon_{ct}$$

$$\Delta \ln I = \theta_0 + \sum_{i=1}^{3} \theta_1 D_{it} + \theta_2 D94_t + \theta_3 D00_t + \sum_{i=1}^{4} \theta_{4i} R_{t-i} + \sum_{i=1}^{4} \theta_{5i} Y_{t-i} + \sum_{i=1}^{4} \theta_{6i} P_{t-i} + \quad \text{(A4)}$$
$$+ \sum_{i=1}^{4} \theta_{7i} C_{t-i} + \sum_{i=1}^{4} \theta_{8i} I_{t-i} + \sum_{i=1}^{4} \theta_{9i} G_{t-i} + \sum_{i=1}^{4} \theta_{10i} pos_{t-i} + \sum_{i=1}^{4} \theta_{11i} neg_{t-i} + \varepsilon_{it}$$

$\Delta \ln Y_t$: Logarithmic first difference of real GDP.

$\Delta \ln P_t$: Logarithmic first difference of wholesale price index.

$\Delta \ln C_t$: Logarithmic first difference of real total private consumption.

$\Delta \ln I_t$: Logarithmic first difference of real *total private investment*.

$\Delta \ln G_t$: Logarithmic first difference of government spending.

R_t: 3-month treasury bill rate

D_{it}: Dummy variable for seasonal effects.

$D94_t$: Dummy variable for 1994 crisis occurred in the second quarter.

$D00_t$: Dummy variable for 2000 crisis occurred in the fourth quarter.

pos_t: Positive government shocks.

neg_t: Negative government shocks.

TABLE 2.1: The Asymmetric Effects of Government Spending Innovations

	Panel A: Least Square Estimates						Panel B: 3 Stage Least Square Estimates					
	The sum of the coefficients of the pos_t terms, with lag values 1 to 4	The sum of the coefficients of the neg_t terms, with lag values 1 to 4	The diffrence of sums	Wald test of pos_t terms	Wald test of neg_t terms	Wald test of the model	The sum of the coefficients of the pos_t terms, with lag values 1 to 4	The sum of the coefficients of the neg_t terms, with lag values 1 to 4	The diffrence of sums	Wald test of pos_t terms	Wald test of neg_t terms	Wald test of the model
TOTAL PRIVATE CONSUMPTION	-14.621	-50.400	35.779	0.607	0.128	0.187	-26.312	-38.043	11.732	0.511	0.219	0.323
Durable goods	-307.427(**)	-188.340	-119.087(**)	0.019	0.169	0.043	-380.705	-513.131(*)	132.426(*)	0.152	0.088	0.088
Semi-durable goods	-16.703	-265.791(*)	249.088	0.911	0.085	0.224	369.039(**)	-214.803	583.842	0.041	0.208	0.570
Public sector	-73.082	-170.846	97.764	0.704	0.379	0.428	-229.628	-19.623	-210.005	0.217	0.934	0.490
Public construction	-174.862	-106.831	-68.031	0.229	0.677	0.386	-381.975	35.392	-417.368	0.279	0.946	0.468
Private sector	-385.454(**)	-203.043(*)	-182.410(**)	0.020	0.071	0.011	-168.345	79.596	-247.941	0.631	0.853	0.895
Machinery	-414.978	-25.325	-389.653	0.112	0.895	0.122	-2102.093	734.167	-2836.260	0.440	0.559	0.475
Private construction	23.845	27.349	-3.504	0.567	0.650	0.553	23.622	46.755	-23.133	0.586	0.696	0.655
TOTAL PRIVATE INVESTMENT	266.238	-81.194	347.432	0.117	0.682	0.530	444.726(*)	-150.606	595.333	0.063	0.416	0.450
Mining and quarrying	16.408	55.239	-38.831	0.827	0.533	0.604	-27.861	-139.665	111.804	0.864	0.748	0.764
Manufacturing	-30.969	-34.204	3.235	0.379	0.435	0.367	1.107	34.947	-33.840	0.967	0.327	0.531
Industrial total	-40.718	-18.616	-22.101	0.420	0.754	0.545	-61.596	221.498	-283.094	0.914	0.615	0.845
Construction industry	30.734	-19.387	50.120	0.434	0.695	0.880	69.505	38.520	30.985	0.359	0.655	0.473
Wholesale, retail	2.915	72.605	-69.690	0.939	0.491	0.561	10.647	136.183	-125.536	0.847	0.354	0.454
WPI	-53.165	-47.191	-5.974	0.148	0.270	0.115	4.006	-13.270	17.276	0.943	0.759	0.919
Real GDP	-33.202	-57.849(*)	24.646(**)	0.193	0.052	0.039	3.295	38.834(**)	-35.539(*)	0.140	0.030	0.052

* Indicates significance at the 10% level.

** Indicates significance at the 5% level.

Note: The first column of both of the panels is multiplied by 100 for simplicity.

TABLE 2.2: The Asymmetric Effects of Treasury Interest Rate Innovations

	Panel A: Least Square Estimates						Panel B: 3 Stage Least Square Estimates					
	The sum of the coefficients of the pos_t terms, with lag values 1 to 4	The sum of the coefficients of the neg_t terms, with lag values 1 to 4	The difference of sums	Wald test of pos_t terms	Wald test of neg_t terms	Wald test of the model	The sum of the coefficients of the pos_t terms, with lag values 1 to 4	The sum of the coefficients of the neg_t terms, with lag values 1 to 4	The difference of sums	Wald test of pos_t terms	Wald test of neg_t terms	Wald test of the model
TOTAL PRIVATE CONSUMPTION	5.446(**)	3.180	2.266(**)	0.028	0.101	0.047	4.281(**)	1.708(*)	2.574(**)	0.000	0.088	0.003
Durable goods	3.957	2.666	1.292	0.307	0.239	0.162	7.367(**)	2.010(*)	5.357(**)	0.001	0.084	0.000
Semi-durable goods	2.038	1.022	1.016	0.934	0.913	0.927	6.950	2.509	4.441	0.167	0.223	0.176
Public sector	-2.483	-1.170	-1.313	0.732	0.853	0.706	-10.598(*)	12.797(*)	-23.396	0.074	0.090	0.744
Public construction	-2.177	-0.046	-2.131	0.876	0.996	0.901	-1.246	8.516(*)	-9.762	0.786	0.052	0.287
Private sector	8.853(*)	6.821(**)	2.032(**)	0.069	0.032	0.043	8.685(**)	7.163(**)	1.523(**)	0.000	0.000	0.000
Machinery	-8.262	-9.995	1.733	0.629	0.610	0.615	-14.226(**)	-16.348(**)	2.122(**)	0.021	0.018	0.019
Private construction	4.193(*)	3.122(**)	1.071(**)	0.057	0.009	0.021	6.186(**)	3.727(**)	2.460(**)	0.000	0.000	0.000
TOTAL PRIVATE INVESTMENT	-40.053	-37.204	-2.849	0.199	0.127	0.158	-17.654	-8.875	-8.779	0.316	0.586	0.426
Mining and quarrying	-4.174	-2.442	-1.732	0.410	0.604	0.413	-5.620(*)	-1.748	-3.871(**)	0.078	0.372	0.009
Manufacturing	-2.387	-0.036	-2.351	0.185	0.984	0.442	-3.585(**)	-2.371(**)	-1.214(**)	0.000	0.026	0.001
Industrial total	0.235	-0.090	0.325	0.325	0.386	0.597	-1.035(**)	-0.018(**)	-1.018(**)	0.000	0.015	0.023
Construction industry	-0.085	0.720	-0.805	0.976	0.645	0.871	0.770	0.798(*)	-0.028	0.389	0.092	0.196
Wholesale, retail	-1.889	0.701	-2.590	0.325	0.386	0.597	-2.139(**)	0.592(**)	-2.730(**)	0.000	0.015	0.023
WPI	-0.939	-0.538	-0.401	0.823	0.869	0.841	0.416	1.175	-0.760	0.790	0.416	0.590
Real GDP	1.262	0.659	0.604	0.606	0.731	0.654	0.627	-0.144	0.772	0.464	0.856	0.766

* Indicates significance at the 10% level.

** Indicates significance at the 5% level.

Note: The first column of both of the panels is multiplied by 100 for simplicity.