

Fiscal Theory of Price Level and Economic Crises: The Case of Turkey

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Abstract. In the fiscal theory of price level developed by Woodford, Sims and Leeper, price level is determined through the intertemporal budget valuation equation by current and future primary surpluses. Furthermore, the new theory suggests that, monetary aggregates and seignorage revenues have no effects on the deviations in price level and an independent central bank following activist policies may lead to indeterminacy in the price level and inflationary or deflationary processes. In the study, FTPL theory is analyzed for Turkey for the 1933-2004 period in accordance with the Engle-Granger (1987) cointegration method and expanded to Vector Error Correction models. Even though the hypothesis that domestic debt has inflationary impacts cannot be rejected for the 1933-2004 period, the evidence suggests that, fiscal dominance in Turkey increased especially after the 1980's, as a result of increasing costs of debt. Thus, economic crises negatively influenced the success of policies aiming at price stability in the long run.

Jel.Classification Codes: E30, E31.

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1. Introduction

In Fiscal Theory of Price Level theory (FTPL) developed by Leeper (1991), Woodford (1994, 1995) and Sims (1994), fiscal policies bear important roles in the determination of prices; thus, price level is determined by domestic

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debt. According to the FTPL theory, in economies where Ricardian equivalence does not hold, the dominance of fiscal policies causes price level to be determined by the intertemporal budget constraint.

In FTPL, the results of fiscal and monetary policies depend on which policy has dominant characteristics. Furthermore, consequences of policies differ depending on the active and passive characteristics of the policy and depending on the characteristics of the following policy. If the policy combination is such that *monetary policy is active-fiscal policy is passive*, fiscal policy accommodates monetary policies. These policies are defined as “Polar-Ricardian” by Aiyagari-Gertler (1985), “accommodative fiscal policy” by Sims (1994, 1997), “dominant monetary policy” by Sargent-Wallace (1981) and “Ricardian regime” by Woodford (1994, 1995) and Cochrane (1999, 2003). In what is known as the *monetary policy passive-fiscal policy active* combination, monetary policy accommodates fiscal policy by considering budget deficits as a constraint in the political decision process. This policy combination represents Sargent-Wallace’s “dominant fiscal policy” and Woodford’s (1994, 1995) and Cochrane’s (1999, 2005) “non-Ricardian policy” definitions.

Economies where monetary policy is under the pressure of budget deficit and fiscal policy shocks, are discussed in the literature as Non-Ricardian (Woodford 1994, Sims 1994), fiscal dominant (Sargent-Wallace 1981), Polar Ricardian or active fiscal policy (Leeper 1991). The regimes where Ricardian policies lose their validity can be seen commonly in developing markets as well as most periods in developed economies.

Leeper’s policy definitions correspond to the “Rules or Discretionary Policy” proposal suggested by Simons (1936) and Friedman (1988). On the other hand, Benhabib, Schmitt-Grohe ve Uribe (1999, 2001) discuss nominal interest rate rules under fiscal dominant regimes and conclude that Taylor rules are destabilizing and cause to multiplicity of steady-state equilibriums, hence price level stability can only be achieved by an active monetary policy that shifts towards discretionary policies in response to price level changes. The efficiency of these policies depends mainly on the passive backing by fiscal policies (Benhabib *et al.*: 1999: 2). In conclusion, an anti-inflation policy followed independently by the Central Bank could result in deflationary or inflationary spirals depending on the active and passive characteristics of fiscal policies. Loyo (1999) and Blanchard (2004) discuss Brazilian hyperinflations with analogous approaches, whereas Loyo concludes that Brazilian Economy is subject to

non-Ricardian policies combined by active monetary policy rules resulting in hyperinflations in late 1980's (Loyo, E.: 1999: 17).

Favero-Giavazzi (2002) discuss that, in economies with fiscal dominant regimes, where domestic debt is subject to indexation and speculation, active anti-inflationary monetary policies result in hyperinflation.

Cochrane (1998) and Woodford (2001) state that, inflation had progressed proportional to the changes in fiscal balance, hence as the cashless limit is reached resulting from rapid innovations in financial markets, which grounds the intertemporal budget constraint and FTPL theory to hold. Woodford (2001) points out that, the collective movement of inflation, nominal interest rates and primary surpluses also hold in Ricardian regimes as well as non-Ricardian regimes.

Canzoneri, M. *et al.* (2001) suggest a VAR based econometric model to analyze the causal relationship between primary surpluses and government debt. On the other hand, Cochrane severely criticizes the accessibility of FTPL in VAR models since there is a positive relationship between budget surpluses and debt in both regimes however, the causality occurs in opposite direction in non-Ricardian regimes. A similar approach suggested by Creel, J. *et al.* (2002), who focuses on fiscal policy rules, concludes that FTPL does not hold for France and U.S. since debt follows a decreasing and negative response to positive surplus shocks.

Sims (2002) clearly shows that both intertemporal budget constraints and the $MV=PT$ equation¹ hold in both Ricardian and Non-Ricardian regimes; both relations propose two equations and one independent variable p ; as a result, monetary and fiscal policies act according to the “who moves first” characteristics as the active and passive policy rules suggested by Leeper (1991).

¹ $MV=PT$ equation represents the mainstream theory, *Quantity Theory of Money*, where inflation is always and everywhere a monetary phenomenon. M is money supply, V is velocity, P is the price level and T is transactions. As V and T are accepted as constant, an increase in Money supply corresponds to an increase in price level.

Canzoneri *et al.* (2001) investigated the accessibility of Ricardian equivalence in accordance with the FTPL theory for the post World War II era in the United States and reached similar results to those of Bohn (1998) using VAR estimates. They conclude that, a positive shock in budget surpluses results in a decrease in current debt and an increase in future budget surpluses which is expected to be in accordance with Ricardian regimes. On the other hand, the similar results reached by Bohn (1998) are criticized in that Bohn's model fails to include an adequate amount of lags which are expected to increase the explanatory power of the model that demonstrates households with rational expectations and altruistic behavior. Erdogdu (2002), Creel *et al.* (2002) and Mikek (1999) obtained similar Ricardian results for the US economy by using VAR approaches that aim to analyze the responses of primary surpluses to domestic debt and they concluded that the dominant monetary policy had been accommodated by Ricardian policies in the U.S. On the other hand, Ersin (2005) follows a similar approach to FTPL theory followed by VEC regression methods to access short run and long run dynamics of the characteristics of fiscal policies in Turkey following the Cochrane (1998) VAR approach. To overcome the "observational equivalence" problem proposed by Cochrane (1998, 2005), off-equilibria relations between the price level and domestic debt are undertaken further by the Vector Error Correction mechanism developed by Johansen and Juselius (1991). For the 1989-2004 period, a time of financial liberalization that harbored two economic crises, Turkish political authorities were generally found to be following non-Ricardian fiscal rules.

2. Turkey and Domestic Debt

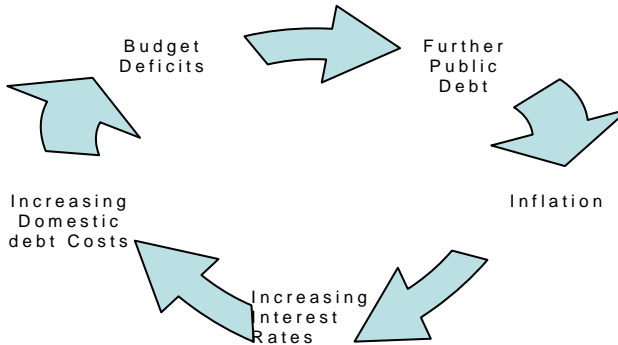
In Turkey, the first domestic debt was issued in 1933 following the increasing needs of industrialization. The main characteristic of domestic debt for the 1933-1960 period is that they had been committed for the finance of investments such as domestic railroads in order to overcome bottlenecks faced through the process of industrialization; the interest rate of domestic debt ranged between 5 and 7 percent and their maturity was 20 years combined with a good repayment program. After 1960, Turkey shifted towards a planning period and import substitution; however, the tax reforms that were required for increasing expenditures of industrial plans were not implemented (Selçuk, F., A. Rantannen: 1996: 55). Consequently, the process of continuous increases in domestic debt/GDP ratio led to higher interest rates and inflation rates, increasing domestic debt costs, which

resulted in budget deficits that led to domestic debt and the price level increases correspondingly.

After 1980, Turkey had shifted towards outward looking liberalization policies. On the other hand, domestic sector deficits followed an increasing trend and public sector borrowing requirements (PSBR) increased from a 5% level in 1980's to 10% in the 1990's, which was followed by sharp increases on interest paid for domestic debt. Hence, the share of total debt payments in tax revenues increased drastically from 11.9% in 1980 to 201% in 2003. Accordingly, budget deficit policies were financed mainly by domestic debt after 1990's and the ratio of domestic debt/GDP increased from 13.6% in 1980 to 69.2% in 2001. However, the domestic debt/PSBR ratio increased sharply from 47.7% to 114% between 1980 and 1991; in addition, this ratio reached its highest levels during economic crises, namely, 160% in 1994, 137% during the Asian crisis in 1997 and 121% in 2001.

In 1980, interest paid on domestic debt corresponded to 2% of total transfers, whereas the latter corresponded to 13.2 % during the Gulf crisis, it reached 26% during the 1994 crisis, 36.1 % in 1998 and 46.6 % in 2001 crisis. On the other hand, average maturity of debt decreased drastically compared to pre-1980 period. In 1989, average interest rate on domestic bonds corresponded to 59% and the average maturity of domestic bonds had been 233 days. Even though the average maturity had been relatively short during 1989-1993, just before 1994 crisis, interest rates followed an increasing trend and reached 89% in the 1993; 1994 and 2000 crises. The average maturity decreased to 119 days in 1994 and 148 days in 2001; interest rates increased to a yearly average of 164.4% for the former and 96.2% for the latter, respectively. The evidence suggests that, the cause of instability had not only been the continuing domestic debt but also worsening costs of debt that lead to inflationary spirals inevitably. Consequently, the inflationary spirals which had been experienced in Turkey could be explained by the Fiscal Theory of Price Level. On the other hand, the seignorage to GDP ratio followed a decreasing pattern especially after 1997; the increases in the price level cannot be explained only by the Quantity Theory of Money and by neglecting the fiscalist causes of inflation. The inflationary process followed by interest policies had been accompanied by exploding debt levels, the budget deficits caused by increasing interest payments amplified domestic debt stock. The fact that, refinancing of debt by borrowing more led the budget constraint and the Ricardian equivalence to deteriorate which resulted from the continuing Ponzi schemes in fiscal

policies. Furthermore, following the increases in domestic debt and the decreasing maturity rates, an inflationary process becomes unavoidable through the wealth effects associated with domestic bonds.



* Drawn by the Authors. Increasing domestic debt cost and refinancing through domestic debt lead to further budget deficits that result in inflationary-debt spiral in Non-Ricardian Regimes.

Figure 1. Non-Ricardian Fiscal Policy and Inflationary Spiral

As can be seen in Figure 1, deficit financing through domestic debt raises the the inflation rate; as a result, increasing nominal interest rates cause costs of domestic debt to increase. The worsening of maturity causes in budget deficits to increase even further. Therefore, the process produces even higher inflation rates resulting from the non-Ricardian fiscal and active monetary policy combinations. The increasing domestic debt costs lead to inflationary process based *on domestic debt-inflation-interest-domestic debt-inflation* spiral.

Consequently, the process of domestic debt led to higher rates of interest on debt which resulted in economic crises in the developing countries. To cope with crises, policy makers applied new stabilization programs that aimed at stabilizing economic aggregates around a nominal anchor that had been expected to be accommodated by the fulfillment of required tax and expenditure reforms. In cases where the stabilization programs failed, the process led to higher domestic debt accompanied by short maturity rates; a process in which economic crises were inevitable.

3. Data and Econometric Methodology

This study purports to analyze the applicability of the FTPL theory in accordance with the Ricardian Equivalence Theorem. The study covers the Turkish economy for the 1933-2004 period. The inflationary effects of domestic debt are analyzed within the econometric methodology covering the cointegration framework based on Johansen (1991) cointegration tests and Engle and Granger (1987) two stage cointegration processes and expanded to Vector Error Correction models. Also, the study aims to analyze the structural effects of crises and wars by including dummy variables in order to investigate if there is a net change in fiscal policy in light of Ricardian and non-Ricardian characteristics.

This work aims to analyze two regression models. First model covers inflationary effects of domestic debt by following cointegration process and expands the model into VEC models. The first model is a log-log model where *lenf* represents inflation rate and *lib* corresponds domestic debt in logarithmics. The second model investigates feedback rules between primary surplus/GDP (*s*) and domestic debt/GDP (*w*) in accordance with VEC models.

The data, which has been analyzed and used in this study, has been referenced from various sources for the two models mentioned above. In the first model, the data for inflation rates and domestic debt is obtained from the Central Bank of Turkey, Electronic Data System for 1988-2004 period. For 1948-1988 period, *Yearly Statistics Annuals*, published by State Statistics Institute (Devlet İstatistik Enstitüsü) are examined and recalculated as: *Domestic Debt = Consolidated Domestic Debt + Short-run Domestic Debt*, where Short-run Domestic Debt is the sum of short-run domestic debt by the government with a maturity of less than 1 year and repaid in the corresponding fiscal year. Since domestic debt data for 1933-1948 is not available in the statistical sources mentioned above, the relevant data was gathered from *Bütçe Gerekçesi*, an annual budget report on the fiscal year published by the Ministry of Finance. In the second model, the corresponding variables of primary surplus *s* and domestic debt *w* were gathered from the Central Bank of Turkey, Electronic Data System for 1988-2004 period. Calculations of the variables are covered in Section B below.

Starting from the first instance of domestic debt Ergani in 1933, Turkey had experienced three main structural changes. First period covered the 1933-1955 foundation years and balanced budget policies. Turkey

maintained balanced budget policies until mid-1950 when increasing budget deficits stimulated domestic debt. The second period covers the 1960-1980 period during which Turkey followed import substitution and planned development policies. The structural effects can be observed by including the years between 1955 and 1960. The reason being; open budget policies starting in mid 1950's resulted in a devaluation in 1958 and thus the pace of domestic debt slowed substantially in this period. On the other hand, increasing budget deficits led the pace of domestic debt to increase significantly after 1960. In the 1960-1980 period, maturity of debt was maintained at 10 to 20 years and the interest rate remained almost stable. The third period covers 1970-2004 and aims to access policies followed in the liberal period for investigating the fiscal reasons behind inflation after financial liberalization. During this period, maturity of government bonds decreased drastically to less than one year and interest rates reached their highest levels after 1989. As a result, the 1989-2004 period is analyzed in accordance with both inflation-debt and feedback rule models proposed in Section B.

A. Unit-Root and Cointegration Tests

The null hypotheses for Augmented Dickey Fuller (ADF) and Philips Perron (PP) tests are that the variable has a unit root, whereas the null hypothesis for Kwiatkowski, Phillips, Schmidt, Shin (KPSS) test is that the variable is trend stationary. The ADF and PP test results are given in Table 1. First part of the table covers unit root tests of model 1 and *lenf* and *lib* variables; whereas the second part covers unit root test results of the second model proposed. According to the ADF, PP and KPSS test results given in Table 1, *lenf*, *lib*, *s*, *w* variables have a unit root in levels, however they become trend stationary in their first differences, thus all variables are integrated of I(1).

Table 1. Unit Root Tests: *lenf* and *lib* Variables

<i>Ist Model</i>	<i>Sample</i>	<i>n</i>	<i>Variables:</i>	<i>ADF</i> (<i>F. Dif.</i>)	<i>PP</i> (<i>F.Dif.</i>)	<i>KPSS</i> (<i>F.Dif.</i>)*
	1933-1955	22	<i>lenf</i> (=log(inflation))	-13.37 (1)	-3.73 (1)	0.077 (2)
			<i>lib</i> (=log(domestic debt))	-3.8 (0)	-3.81 (2)	0.088 (3)
	1960-2004	44	<i>lenf</i>	-6.84 (0)	-6.89 (2)	0.151 (4)
			<i>lib</i>	-5.57 (0)	-5.57 (1)	0.126 (0)
	1970-2004	30	<i>lenf</i>	-7.75 (0)	-7.82 (5)	0.011 (3)
			<i>lib</i>	-11.38 (0)	-11.82 (2)	0.020(1)
	1989-2004	190	<i>lenf</i>	-8.5 (0)	-8.61 (11)	0.075 (0)
			<i>lib</i>	-11.37 (0)	-11.81 (7)	0.086 (7)
	1945-2004	60	<i>lenf</i>	-8.64 (0)	-8.96 (3)	0.102 (4)
			<i>lib</i>	-6.71 (0)	-6.72 (1)	0.101 (0)
	1933-2004	71	<i>lenf</i>	-7.94 (0)	-8.25 (4)	0.129 (5)
			<i>lib</i>	-6.31 (0)	-6.38 (2)	0.156 (4)
<i>2nd. Model</i>						
	1989:01-2004:12	190	<i>s</i> (<i>primary surplus/GDP</i>)	-14.97 (0)	-15.01 (0)	0.02 (0)
			<i>w</i> (<i>Domestic Debt/GDP</i>)	-4.75 (3)	-9.07 (3)	0.03 (3)

*F.Dif. is first difference. For all three tests intercept+trend added. Lag length selected by SIC information criteria and given in (). McKinnon (1996) critical values for significance levels of 1%, 5% and 10% are: 4.11, 3.48 and 3.17 for 1933-2004, 1945-2004, 1960-2004, 1970-2004 periods, respectively. For 1989:01-2004:12 period, ADF and PP test critical values are 4.01, 3.48, 3.17 for 1%, 5%, 10%; KPSS (1991) critical values are 0.216, 0.146 and 0.119 for 1%, 5% and 10% significance levels.

To prove the robustness of the cointegration results, Johansen (1991) estimation procedure is carried out; this procedure uses the full information maximum likelihood framework. Table 2 shows the result of the cointegration analysis based on Johansen cointegration test. Testing the restriction of no more than r cointegration vectors against the alternative of $r+1$ such vectors, the trace statistics test restriction of no more than r cointegration vectors against the alternative of $r=0$. The hypothesis can not be rejected by both the maximum eigen value and the trace statistic values at the 95 % level. Based on the results obtained from the Johansen (1991) and the Engle-Granger (1987) two stage cointegration method, we concluded that inflation and domestic debt are cointegrated. This shows that, under the hypothesis of cointegration, the series are tied together by a long-run equilibrium relationship. Furthermore, we use the error correction model to discern a long-run relationship between inflation and domestic debt.

First of all, to analyze the long run equilibrium relations between domestic debt and price level, the following long run regression models are estimated. Thus, price level is taken as a function of domestic debt,

$$\log(enf_t) = f[\log(ib_t)] \quad (1)$$

$$\log(enf_t) = \beta_0 + \beta_1 \log(ib_t) + u_t \quad (2)$$

where, β_0 is the parameter of the intercept, β_1 is the parameter of domestic debt and u_t is the error term. Since all variables are given in logarithms, β_1 is the elasticity of domestic debt and represents the percentage point change in inflation level resulting from one percentage point change in domestic debt.

Second, to gather the short run relations between domestic debt and price level, the following short run regression is estimated following Engle-Granger two stage cointegration method,

$$\Delta \log(enf_t) = \phi_0 + \phi_1 \Delta \log(ib_t) + \phi_2 \hat{z}_{t-1} + v_t \quad (3)$$

where, Δ stands for first differences of the variables in logarithms, ϕ_0 is the intercept, ϕ_1 is the relative elasticity of debt, \hat{z}_{t-1} is the estimated residual of the long run regression. ϕ_2 represents the estimator of the error correction term, which corresponds to the degree of convergence of short run deviations to the long run equilibrium in one period.

Table 2. Johansen Cointegration Test Results (*lib* and *lenf*)

1933-1955 Eigen value 0.70 0.33				
Max-Eigen Stat: r=0 25.70 r≤1 3.02; Trace Statistic: r=0 28.73 r≤1 3.02				
<i>Trace *5 Percent CV:</i> 15.41,		3.76;		<i>1 Percent CV:</i> 20.04 6.65
<i>Max.Eig. *5Percent CV:</i> 14.07,		18.63;		<i>1 Percent CV:</i> 18.63 6.65
1933-1980 Eigen value 0.18 0.12				
Max-Eigen Stat: r=0 9.14 r≤1 5.18; Trace Statistic: r=0 15.14 r≤1 5.18				
<i>Trace *5 Percent CV:</i> 12.53,		3.84;		<i>1 Percent CV:</i> 16.31 6.51
<i>Max.Eig. *5Percent CV:</i> 11.44,		3.84;		<i>1 Percent CV:</i> 15.69 6.51
1960-2004 Eigen value 0.32 0.003				
Max-Eigen Stat: r=0 17.38 r≤1 0.0001; Trace Statistic: r=0 17.39 r≤1 0.0001				
<i>Trace *5 Percent CV:</i> 15.41,		3.76;		<i>1 Percent CV:</i> 20.04 6.65
<i>Max.Eig. *5Percent CV:</i> 14.07,		3.76;		<i>1 Percent CV:</i> 18.63 6.65
1970-2004 Eigen value 0.52 0.35				
Max-Eigen Stat: r=0 18.92 r≤1 6.90; Trace Statistic: r=0 12.02 r≤1 6.90				
<i>Trace *5 Percent CV:</i> 15.41,		3.76;		<i>1 Percent CV:</i> 20.04 6.65
<i>Max.Eig. *5Percent CV:</i> 14.07,		3.76;		<i>1 Percent CV:</i> 18.63 6.65
1989-2004 Eigen value 0.11 0.04				
Max-Eigen Stat: r=0 20.70 r≤1 8.11; Trace Statistic: r=0 28.82 r≤1 8.11				
<i>Trace *5 Percent CV:</i> 15.41,		3.76;		<i>1 Percent CV:</i> 20.04 6.65
<i>Max.Eig. *5Percent CV:</i> 14.07,		3.76;		<i>1 Percent CV:</i> 18.63 6.65
1945-2004 Eigen value 0.27 0.06				
Max-Eigen Stat: r=0 19.40 r≤1 4.97; Trace Statistic: r=0 23.48 r≤1 4.07				
<i>Trace *5 Percent CV:</i> 18.17,		3.74;		<i>1 Percent CV:</i> 23.46 6.40
<i>Max.Eig. *5Percent CV:</i> 16.87,		3.74;		<i>1 Percent CV:</i> 21.47 6.40
1933-2004 Eigen value 0.22 0.01				
Max-Eigen Stat: r=0 17.77 r≤1 0.77; Trace Statistic: r=0 18.54 r≤1 0.77				
<i>Trace *5 Percent CV:</i> 18.17,		3.74;		<i>1 Percent CV:</i> 23.46 6.40
<i>Max.Eig. 5 Percent CV :</i> 16.87,		3.74;		<i>1 Percent CV:</i> 21.47 6.40

*Test assumption is linear deterministic trend with 1-4 lag intervals.

In order to take structural effects of economic crises into account and to increase the explanatory power of the analysis, dummy variables representing periods of crises and wars are aimed to be included in the

regression test proposed above. Therefore, K01 represents the November 2000 and February 2001; whereas, K98 represents the delayed effects of Asian and Russian crises, K94 represents the April 1994 crisis, K91 represents the effects of Gulf War, K83 represents the Military rule years, K74 represents the effects of the Cyprus War and KWAR represents the effects of World War II. As a result, the short run error correction regression is estimated and equation (3) is modified as,

$$\Delta \log(enf_t) = \phi_0 + \phi_1 \Delta \log(ib_t) + \phi_2 \hat{z}_{t-1} + k_0 K01 + k_1 K98 + k_2 K94 + k_3 K91 + k_4 K83 + k_5 K74 + k_6 KWAR + v_t \quad (4)$$

where, Δ represents first differences, ϕ_0 is the intercept, ϕ_1 is the relative elasticity of debt, \hat{z}_{t-1} is the error correction mechanism; $\{k_0, k_1, k_2, k_3, k_4, k_5, k_6\}$ coefficients are estimators of corresponding crisis dummy variables and lastly, v_t is the residual term.

Furthermore, the long run and the short run regression estimation results following Engle-Granger error correction mechanism are given in Table 3. Firstly, the estimates of ϕ_1 for Turkey are empirically significant at 5 percent level, the hypothesis that domestic debt has inflationary impacts on prices cannot be rejected, thus government bonds are considered as net wealth by the households for all periods. The overall significance of regressions given in Table 3 increases according to F statistics as well as R^2 values, whereas, b_1 and ϕ_1 estimates represent that percentage point increase in inflation rate increase significantly after 1960's.

Table 3. Inflation and Domestic Debt Test Regression Estimates

<i>Long Run Regressions</i>	<i>1933-1955</i>	<i>1960-2004</i>	<i>1970-2004</i>	<i>1989-2004</i>	<i>1945-2004</i>	<i>1933-2004</i>
b_0	0.61** (2.63)	-1.05** (-10.14)	-1.30** (-11.41)	-1.23** (-3.19)	-0.46** (-4.19)	-0.19** (-2.04)
b_1	0.71** (21.72)	0.83** (132.15)	0.84** (132.21)	0.84** (47.94)	0.80** (108.37)	0.78** (112.00)
R^2	0.948	0.998	0.998	0.994	0.995	0.994
\bar{R}^2	0.946	0.997	0.998	0.993	0.995	0.994
DW	0.554	0.574	0.794	0.812	0.222	0.18
F	472	17464	17479	2298	11743	12544
<i>Engle-Granger</i>	-1.89*	-4.48**	-2.8**	-2.09**	-2.2**	-2.06**
<i>Cointegration Test (U_t)</i>						
<i>Short Run Regressions</i>						
ϕ_0	0.07** (2.13)	-	0.09** (2.05)	-	0.05* (1.83)	-
ϕ_1	0.002** (0.01)	0.67** (9.21)	0.60** (6.81)	0.87** (19.42)	0.59** (9.07)	0.59** (8.84)
<i>ECM: ϕ_2</i>	-0.31** (-2.27)	-0.33** (-4.41)	-0.21** (-2.02)	-0.40** (-3.62)	-0.09** (-1.97)	-0.09* (-1.93)
<i>KWAR</i>	-	-	-	-	-	-
<i>K74</i>	-	-	-	-	-	-
<i>K80</i>	-	0.32** (2.86)	0.33** (3.10)	-	0.36** (2.89)	0.35** (2.74)
<i>K91</i>	-	0.24** (2.22)	0.21** (2.04)	0.20** (2.29)	0.25** (2.1)	0.27** (2.05)
<i>K94</i>	-	0.28** (2.51)	0.26** (2.46)	0.17* (1.88)	0.31** (2.53)	0.32** (2.47)
<i>K98</i>	-	0.24** (2.16)	0.18* (1.75)	-	0.23** (1.85)	0.24* (1.84)
<i>K01</i>	-	-0.30** (-2.44)	-0.34** (-2.72)	-0.53** (-5.34)	-0.28** (-2.05)	-0.26* (-1.81)
R^2	0.33	0.79	0.74	0.81	0.73	0.69
\bar{R}^2	0.24	0.75	0.67	0.72	0.69	0.64
DW	0.919	1.356	1.454	1.677	1.472	1.39
F	3.7	18.972	10.765	6.572	19.801	15.07

** (*) significant at 5 (10) percent significance level. (-) denotes that dummy variable in consideration is statistically insignificant and regression is reestimated without the variable.

At the first column, b_1 is estimated as 0.71 for 1933-1955 period and Engle Granger test results show that there is a long run cointegration relation between the variables. According to the short run regression results, ϕ_1 is statistically insignificant, as a result, changes in domestic debt does not lead prices to increase as expected in Ricardian regimes. However, balanced budget policies and especially, increasing external debt should also be considered. On the other hand, considering the relatively low rate of domestic debt and balanced budget policies, econometric results support Ricardian policies in this period.

In the second column, the results for 1960-2004 including both planned industrialization and liberal policies followed in the period are given. Long run results suggest that, one percentage point increase in *lib* lead *lenf* to increase 0.83 percentage points. Further, according to the short run regression results, one percentage point increase in domestic debt lead inflation level to increase 0.67 percentage points. ECM estimate shows that, 33 % of short run divergence from the long run equilibrium is corrected within one period. Further, all dummy variables are estimated as positive except *KOI* and all crisis dummies are statistically significant at 5% confidence level.

Thirdly, results representing 1970-2004 are given in column 3. According to the long run regression results obtained, one percentage point increase in *lib* variable results in 0.84 percentage point increase in *lenf* variable; whereas, there is a significant cointegration relation between the variables. Hence, 20% of short run divergence is corrected in one period; whereas, one percentage point increase in domestic debt lead inflation level to increase 0.60% percentage points. Dummies representing crisis years are statistically significant and increase the overall explanatory power of the regression. Results suggest that, policies followed in 1970-2004 period represent non-Ricardian characteristics.

Fourth, test results for 1989:01-2004:12 period representing financial liberalization years are given in column 4. For the period, the inflationary effects of domestic debt cannot be rejected; one percentage point increase in *lib* results 0.84 percentage point increase in *lenf*. Further, short run regression results suggest that, ϕ_1 estimate is calculated as 0.87 which is significantly higher than other periods analyzed. Thus, 40% of short run deviations from long run equilibrium are corrected within 1 period and error correction takes 3 periods. Results suggest that, policies followed in Turkey represent non-Ricardian characteristics for the 1989-2004 period.

Results representing 1933-2004 period are given in the last column. Additionally, results corresponding to post war 1945-2004 period are given in column 5 to eliminate structural effects of war policies. On the other hand, 1945-2004 and 1933-2004 period regressions lead similar results. According to the long run regression in the last column, 1 percentage point increase in domestic debt lead inflation level to increase 0.78 percentage point for 1933-2004 period and 0.80 for 1945-2004 period. Furthermore, the short run regression estimate shows that, 1 percentage point increase in *lib* leads to a 0.59 percentage point increase in *lenf* for both 1945-2004 and 1933-2004

periods. Thus, 9% of short run deviations from long run equilibrium are corrected within 1 period and error correction lasts for 10 periods. *K98*, *K94*, *K91* and *K80* dummies are statistically significant and positive at 5 % confidence level as expected. In contrast, *K01* dummy is estimated as being negative and statistically significant at only 10 % confidence level. Consequently, domestic debt causes inflationary wealth effects and non-Ricardian policy characteristics cannot be overlooked for 1933-2004 period.

B. VAR-VEC Estimation Models

In this section, we study two VEC models in order to analyze the applicability of FTPL theory in light of econometric methodology proposed. First model covers inflation-domestic debt relations; whereas, the second model follows the analysis of primary surplus-domestic debt relations.

At the first model, the following VEC regressions are estimated to analyze the inflationary effects of domestic debt since both variables are integrated of order one I[1].

$$\Delta lenf_t = \alpha_1 + \sum_{i=1}^m \phi_{1i} \Delta lib_{t-i} + \sum_{i=1}^m \varphi_{1i} \Delta lenf_{t-i} + \gamma_1 z_{1t-1} + \varepsilon_{1t} \quad (5)$$

$$\Delta lib_t = \alpha_2 + \sum_{i=1}^m \phi_{2i} \Delta lib_{t-i} + \sum_{i=1}^m \varphi_{2i} \Delta lenf_{t-i} + \gamma_2 z_{2t-1} + \varepsilon_{2t} \quad (6)$$

where, Δ stands for first differences, α is the intercept, ϕ is the percentage increase in inflation level resulting from one percent increase in domestic debt, φ is the percentage point increase in domestic debt resulting from one percentage point increase in the price level, z_t is error terms of the cointegrating equation, γ is the estimate of error correction mechanism and ε_{1t} and ε_{2t} correspond to the residuals of VEC regression estimates.

The coefficient of domestic debt, ϕ_{1i} is expected to be statistically significant and positive. On the other hand, domestic debt should follow a decreasing path in Ricardian regimes since inflation reduces the real value of domestic debt, which results in the satisfaction of intertemporal budget valuation equation.

At the second model, following Cochrane (1998), feedback rules between primary surplus/GDP (s) and domestic debt/GDP (w) are analyzed in accordance with Ricardian equivalence theorem. Canzoneri, *et.al.* (2001),

Eroglu (2001), Mikek (1999), Creel (2002) had followed a similar approach to access FTPL theory for the U.S. economy².

Since both variables are cointegrated, the model is broadened to cointegration vectors. In the model, if fiscal policies react to domestic debt accordingly, primary surpluses are expected to increase in order to satisfy the intertemporal budget constraint. Accordingly, $s=f(w)$ represents primary surplus as a function of domestic debt/GDP and expected to follow a positive response. By simplifying the intertemporal budget constraint, following feedback rules are estimated,

$$s_j = \alpha_j w_j + \varepsilon_j \quad (7)$$

where, α_j is the estimator of w and ε_j is the error term. In Ricardian regimes, α_j is expected to range between $0 \leq \alpha_j < 1$; consequently, an increase in domestic debt ought to be financed by an increase in primary surplus. On the other hand, primary surpluses might follow a positive path in Non-Ricardian regimes as well as Ricardian regimes; however, increases in primary surpluses might fail to compensate debt shocks, hence, prices had to increase to equate intertemporal budget constraint by lowering real value of debt. As a result, empirical studies mentioned above propose a second feedback rule to be estimated,

$$w_j = \beta_j s_j + \eta_j \quad (8)$$

where, $w=f(s)$ w is a function of primary surplus s and expected to follow a decreasing path in Ricardian regimes. Hence, β_j captures the

² Both variables (s , w) are monthly and calculated as;

$$s_t = \{T_t - (G_t - IP_t)\} / \left\{ \sum_{i=1}^{12} GDP_t \right\}$$

where; s is primary budget surplus/GDP, T is the monthly tax revenue, G is the monthly government expenditure, IP represents monthly interest payment and GDP represents the net Gross Domestic Product. Further,

$$w_t = DD_t / \sum_{i=1}^{12} GDP_t$$

where, w is the domestic debt/GDP ratio and DD represents the domestic debt. Since all variables except the GDP are cumulated; GDP variable is cumulated as $\sum_{i=1}^{12} GDP_t$ to obtain the yearly rate.

response in domestic debt resulting from an innovation in primary surplus and expected to range between $-1 < \beta_j \leq 0$ (Canzoneri, *et al.*: 2001: 1225).

Following econometric methodology above, feedback rules (7) and (8) are broadened in order to gather following VEC models,

$$\Delta s_t = \alpha + \sum_{i=1}^m a_i \Delta w_{t-i} + \sum_{i=1}^m b_i \Delta s_{t-i} + c_i z_{1t-1} + \varepsilon_{1t} \quad (9)$$

$$\Delta w_t = \alpha + \sum_{i=1}^m e_i \Delta s_{t-i} + \sum_{i=1}^m f_i \Delta w_{t-i} + g_i z_{2t-1} + \varepsilon_{2t} \quad (10)$$

where, Δ is the order of integration, z_t is error correction coefficient; c_i and g_i are VECM parameter estimates, which represent the velocity of correction of short run divergences in the long run equilibrium (Hayashi, F.: 2000: 319).

4. Econometric Results

A. Inflation-Domestic Debt Model

According to the econometric methodology proposed, following regression estimations are obtained. Furthermore, inflation-domestic debt (5), (6) and feedback rule (9), (10) VEC models are given in Table 4 whereas; they had been labeled as Model I. and Model II. respectively. Consequently, both models are estimated for 1933-2004 and for 1970-2004 liberal periods, hence the models are re-estimated with crisis dummies in order to capture structural effects of 1939-1945 World War II, of 1974 lagged effects of the Cyprus War, the political shift to liberalism in 1980, 1991 Gulf War and Economic Crisis periods of 1994, 1998, and 2001, respectively.

i. VAR-VEC Results: 1933-2004

VEC estimation results for Turkey are given in Table 4. Firstly, the long run regression results obtained from VEC estimates are similar to those obtained from Engle-Granger method and Johansen test results. According to the first regression without crisis variables, one percentage point increase in domestic debt leads to 0.71 percentage point increase in inflation level in Turkey.

Table 4. Regression Test Results for Inflation and Feedback Rule Models

<i>Model I.</i>	<i>Inflationary Effects of Domestic Debt</i>		
1933-2004		$lenf_t = -0.22 + 0.71lib_t + e_t$	
	<i>1st. VEC</i>	$\Delta lenf_t = \alpha_1 + \sum_{i=1}^1 \phi_{1i} \Delta lib_{t-i} + \sum_{i=1}^1 \phi_{1i} \Delta lenf_{t-i} - 0.14(lenf_{t-1} - 0.71lib_{t-1} + 0.22) + \varepsilon_{1t}$	$R^2 : 0.79, \bar{R}^2 : 0.77,$ F:29.22,LL:62.54, AIC: -1.57
	<i>2nd. VEC</i>	$\Delta lib_t = \alpha_2 + \sum_{i=1}^1 \phi_{2i} \Delta lib_{t-i} + \sum_{i=1}^1 \phi_{2i} \Delta lenf_{t-i} - 0.32(lenf_{t-1} - 0.71lib_{t-1} + 0.22) + \varepsilon_{2t}$	$R^2 : 0.57, \bar{R}^2 : 0.51,$ F:3.74,LL:62.54, AIC: -0.42
1933-2004 with Crisis Dummies		$lenf_t = 0.99 + 0.82lib_t + KWAR + K74 + K80 + K91 + K94 + K98 + K01 + e_t$	
	<i>1st. VEC</i>	$\Delta lenf_t = \alpha_1 + \sum_{i=1}^1 \phi_{1i} \Delta lib_{t-i} + \sum_{i=1}^1 \phi_{1i} \Delta lenf_{t-i} - 0.017(lenf_{t-1} - 0.82lib_{t-1} - 0.99) + KWAR + K74 + K80 + K91 + K94 + K98 + K01 + \varepsilon_{1t}$	$R^2 : 0.84, \bar{R}^2 : 0.79,$ F:18.50,LL:70.86, AIC: -1.61.
	<i>2nd. VEC</i>	$\Delta lib_t = \alpha_2 + \sum_{i=1}^1 \phi_{2i} \Delta lib_{t-i} + \sum_{i=1}^1 \phi_{2i} \Delta lenf_{t-i} - 0.073(lenf_{t-1} - 0.82lib_{t-1} - 0.99) + KWAR + K74 + K80 + K91 + K94 + K98 + K01 + \varepsilon_{2t}$	$R^2 : 0.63, \bar{R}^2 : 0.53,$ F:6.06,LL:28.94, AIC: -0.38.
1970-2004		$lenf_t = -14.005 + 0.856lib_t + e_t$	
	<i>1st. VEC</i>	$\Delta lenf_t = \alpha_1 + \sum_{i=1}^8 \phi_{1i} \Delta lib_{t-i} + \sum_{i=1}^8 \phi_{1i} \Delta lenf_{t-i} - 0.371(lenf_{t-1} - 0.856lib_{t-1} + 14.005) + \varepsilon_{1t}$	$R^2 : 0.75, \bar{R}^2 : 0.54,$ F: 3.51,LL:34.91, AIC:-1.02.
	<i>2nd. VEC</i>	$\Delta lib_t = \alpha_2 + \sum_{i=1}^8 \phi_{2i} \Delta lib_{t-i} + \sum_{i=1}^8 \phi_{2i} \Delta lenf_{t-i} - 0.806(lenf_{t-1} - 0.856lib_{t-1} + 14.005) + \varepsilon_{2t}$	$R^2 : 0.76, \bar{R}^2 : 0.56,$ F: 3.74, LL: 23.71, AIC: -0.38
1970-2004 with Crisis Dummies		$lenf_t = -12.431 + 0.796lib_t + KWAR + K74 + K80 + K91 + K94 + K98 + K01 + e_t$	
	<i>1st. VEC</i>	$\Delta lenf_t = \alpha_1 + \sum_{i=1}^8 \phi_{1i} \Delta lib_{t-i} + \sum_{i=1}^8 \phi_{1i} \Delta lenf_{t-i} - 0.23(lenf_{t-1} - 0.796lib_{t-1} + 12.43) + KWAR + K74 + K80 + K91 + K94 + K98 + K01 + \varepsilon_{1t}$	$R^2 : 0.91, \bar{R}^2 : 0.68,$ F:4.00,LL:53.72, AIC:-1.58
	<i>2nd. VEC</i>	$\Delta lib_t = \alpha_2 + \sum_{i=1}^8 \phi_{2i} \Delta lib_{t-i} + \sum_{i=1}^8 \phi_{2i} \Delta lenf_{t-i} - 0.57(lenf_{t-1} - 0.796lib_{t-1} + 12.43) + KWAR + K74 + K80 + K91 + K94 + K98 + K01 + \varepsilon_{2t}$	$R^2 : 0.94, \bar{R}^2 : 0.78,$ F:5.94,LL:48.17, AIC: -1.26.

Model II		Primary Surplus Feedback Rule	
1989:01-2004:12			
	$s_t = 0.0056 + 0.159w_t + e_t$		
1st. VEC	$\Delta s_t = \alpha + \sum_{i=1}^{16} a_i \Delta w_{t-i} + \sum_{i=1}^{16} b_i \Delta s_{t-i} - 0.28(s_{t-1} - 0.159w_{t-1} - 0.006) + K2000 + K98 + K94 + k91 + \varepsilon_{1t}$		$R^2: 0.52, \bar{R}^2: 0.38,$ F: 3.76, LL: 501.01, AIC: -5.69
2nd. VEC	$\Delta w_t = \alpha + \sum_{i=1}^{16} e_i \Delta s_{t-i} + \sum_{i=1}^{16} f_i \Delta w_{t-i} + 0.25(s_{t-1} - 0.159w_{t-1} - 0.006) + K2000 + K98 + K94 + k91 + \varepsilon_{2t}$		$R^2: 0.55, \bar{R}^2: 0.42,$ F: 4.27, LL: 487.57, AIC: -5.52
		Domestic Debt Feedback Rule	
1989:01-2004:12			
	$w_t = -0.03 + 6.33s_t + e_t$		
1st. VEC	$\Delta w_t = \alpha + \sum_{i=1}^{16} e_i \Delta s_{t-i} + \sum_{i=1}^{16} f_i \Delta w_{t-i} - 0.03(w_{t-1} - 6.33s_{t-1} + 0.03) + K2000 + K98 + K94 + k91 + \varepsilon_{2t}$		$R^2: 0.55, \bar{R}^2: 0.41,$ F: 4.13, LL: 487.63, AIC: -5.51
2nd. VEC	$\Delta s_t = \alpha + \sum_{i=1}^{16} a_i \Delta w_{t-i} + \sum_{i=1}^{16} b_i \Delta s_{t-i} + 0.04(s_{t-1} - 0.159 - 0.006) + K2000 + K98 + K94 + k91 + \varepsilon_{1t}$		$R^2: 0.51, \bar{R}^2: 0.38,$ F: 4.13, LL: 501, AIC: -5.68

* Lag length selection criteria were LR, AIC, SIC and HQ. Given in the Appendix.

The second long run regression includes structural effects of economic crises and war years. One point is the fact that, by comparing the first and the second long run regression given at the fourth row, the inflationary effect of domestic debt increases since one percentage point increase in domestic debt leads inflation to increase 0.81 percentage points.

For VEC regression estimates, various lag length criteria are employed. In the first period, *LOGL, LR, FPE, AIC, SC, HQ* information criteria are calculated and lag length is selected as 1 (Appendix: Table 1). Cointegration equation estimates suggest that 14% of deviations from the long run equilibrium are corrected within one period, whereas disequilibrium is corrected in 8 periods. At the second VEC estimates, 32% of short run divergence is corrected within 1 period and convergence to the long run equilibrium takes 3 periods.

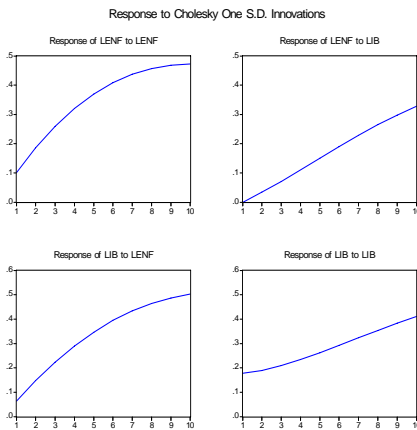


Figure 2.

Impulse response functions, 1933-2004

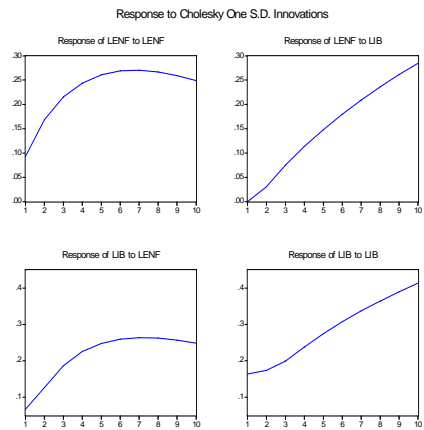


Figure 3.

Impulse response functions, with crises variables 1933-2004

The first part of Figure 2 represents the response followed by *lenf* resulting from an innovation in *lib*. As can be seen in the figure, an expansionary domestic debt shock leads inflation level to rise steadily in Turkey in the long run. At the bottom of figure 2, the response of domestic debt is positive as a result of an impulse in the inflation level. The policies followed in Turkey have shown that, increasing domestic debt combined with the expectations regarding that increases in debt will not be financed by

increases in primary surpluses in the future resulted in wealth effects. As a result, prices had to increase to lower the real value of domestic debt until the net wealth of the households is equated to the future primary surpluses.

ii. VAR-VEC Results with Crises Variables: 1933-2004

According to the results given in Table 4, one percentage point increase in domestic debt increases inflation rate by 0.82 percentage point and wealth effects of domestic debt cannot be rejected. It is observed that inclusion of structural effects of economic crises led the coefficient estimate of *lib* variable to increase from 0.71 to 0.82 percentage points. Thus, lag length is selected as 1 by *LogL*, *LR*, *FPE*, *HQ*, *AIC* and *SC* information criteria.

According to the results obtained after the inclusion of the structural effects of wars and economic crises, our VEC models point out two important findings. Firstly, the inclusion of crises variables increase the overall significance of both VEC estimations as the \bar{R}^2 , *F* statistics and *LogL* and *AIC* criteria suggest. Secondly, the error correction estimates are significantly lower than previous results. The evidence suggests that economic crises increase the degree of divergence from the long run equilibrium; whereas, 1.7% and 7.3% of short run disequilibria are corrected within one period in the first VEC and second VEC models estimated, respectively.

Impulse response functions are given in Figure 3. In the first part of the IRF's, an innovation in domestic debt (*lib*) results in an increasing and positive path in the inflation level; in the second part of the figure, domestic debt responds positively to increases in inflation. The evidence suggests that increases in the prices resulting from domestic debt constitute a strong sign of non-Ricardian policies, economic crises and instability increase positive inflationary impacts of domestic debt; hence government bonds cause wealth effects that lead inflation to rise in the long run in Turkey.

iii. 1970-2004 VAR-VEC Results

The long run regression results obtained from VEC estimates are similar to those obtained from Engle-Granger method and Johansen test results. As can be seen, one percentage point increase in domestic debt leads to 0.86 percent increase in the inflation rate, which is the highest estimate compared to previous results. VAR lag length order is selected as 8 by AIC information criteria.

In the first VEC estimation, 37 percent of the disequilibrium is corrected in one period whereas, the convergence towards the equilibrium takes 3 periods. On the other hand, 80.6 percent of the deviations are corrected within one period at the second VEC estimation. The R^2 is calculated as 0.75 and 0.76 for the first and second VEC. According to the results given in Table 4, 75 percent of the deviations in the dependent variables are explained by the explanatory variables, and calculated F statistics are above the critical value at 5% significance level. Further, the impulse response functions gathered for Turkey are given in Figure 4.

The first part of the figure represents the response followed by *lenf* resulting from an innovation in *lib*. As can be seen in the figure, an expansionary domestic debt shock leads inflation level to rise steadily in Turkey in the long run. At the bottom, the response of domestic debt is positive as a result of an impulse in the inflation level.

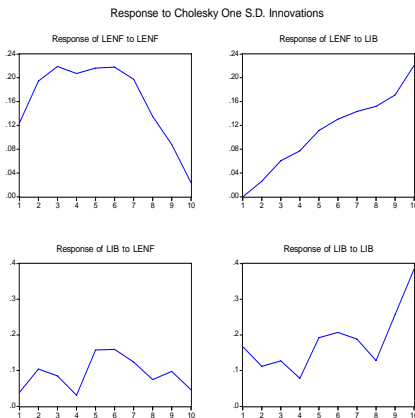


Figure 4.

Impulse response functions, 1970-2004 with crises variables

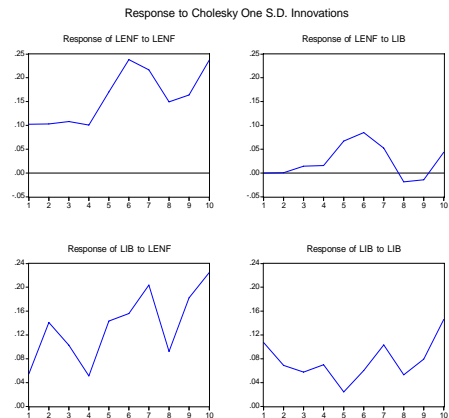


Figure 5.

Impulse response functions, 1970-2004 with crises variables

iv. 1970-2004 VEC Results with Structural Effects of Economic Crises

According to the regression results, one percentage point increase in the domestic debt causes price level to increase 0.79 percentage points. On the other hand, the inclusion of the dummy variables integrated the structural effects of crises to the model in Turkish economy. As can be seen in Table 4,

after the inclusion of dummy variables the overall explanatory power of the model had been increased. At the first VEC, 23% of the deviations converge to the equilibrium in one period, as a result, the correction of short run divergence occur in 5 periods. According to the second VEC regression results, 57% of the deviations from the equilibrium is corrected in one period thus, the correction of the short run deviations last two periods.

Furthermore, following the VEC estimates, the impulse response functions are given in figure 5. In the figure, the first part demonstrates the response of inflation level to domestic debt shocks whereas; the second part includes the response of domestic debt resulting from a shock in inflation level. As can be seen in Figure 7, an innovation in the domestic debt (*lib*) leads prices unchanged in the first period, however, *lenf* follows an increasing path between the second and the eighth periods, and after the ninth period it becomes positive. After a positive innovation in the inflation level *lenf*, domestic debt increases and follows the same pattern in the long run.

B. Econometric Results Of Primary Surplus-Domestic Debt Models

The model proposed investigates primary surplus-domestic debt variables in accordance with the econometric models proposed. Further, feedback rules given in equation (7) and (8) are aimed to be analyzed by estimating VEC models (9) and (10).

i. VEC Model Estimation for Estimating Primary Surplus Feedback Rule

Since both variables are integrated of I(1), the following Johansen test results are obtained to investigate the long run cointegration between *s* and *w* series. According to the trace and maximum eigen value statistics, the hypothesis that there is one cointegration relation is accepted.

Table 7. Johansen Cointegration Test

<i>1989-2004 Eigen value 0.1733 0.0001</i>				
<i>Max-Eigen Stat: r=0 35.01 r≤1 0.02; Trace Statistic: r=0 35.04 r≤1 0.02</i>				
<i>Trace *5 Percent CV:</i>	<i>15.41,</i>	<i>3.76;</i>	<i>1 Percent CV:</i>	<i>20.04 6.65</i>
<i>Max.Eig. *5Percent CV:</i>	<i>14.07,</i>	<i>3.76;</i>	<i>1 Percent CV:</i>	<i>18.63 6.65</i>

**Test assumption is linear deterministic trend with 1-4 lag intervals.*

Results suggest that, one percent increase in domestic debt/GDP lead primary surplus/GDP to increase by 0.16 percent. On the other hand, since a positive relationship might occur even in non-Ricardian regimes, increasing budget surpluses fail to satisfy continuing increase in domestic debt especially in economies, where cost of debt increases accordingly; leading intertemporal budget constraint to be satisfied through increases in the price level. Lag length is calculated as 16 by AIC and FPE information criteria. At the first VEC, 28% of the short run deviations are corrected in one period, hence, the correction of disequilibrium occurs in 4 periods. According to the second VEC regression results, 25% of the divergence from the equilibrium is corrected in one period; the correction of the short run deviations lasts 4 periods.

The impulse response functions obtained from primary surplus feedback rule are given in Figure 6. In Figure 6, first part constitutes the response of primary surplus/GDP (s) to an innovation in domestic debt/GDP (w). As can be seen, primary surpluses follow a positive path after a shock in domestic debt as expected in both Ricardian and Non-Ricardian regimes. On the other hand, as can be seen at the second part of the figure, after an innovation in s , w follows a positive response. The results suggest that, increases in primary surpluses fail to satisfy increases in domestic debt as expected in Non-Ricardian regimes.

ii. VEC Model Estimation for Estimating Domestic Debt Feedback Rule

According to the long run regression results, one percent increase in primary surplus/GDP lead domestic debt/GDP to increase by 6.33 percent. As the empirical studies mentioned above suggests, a positive response is expected in Non-Ricardian regimes. In the first VEC, where Δw_t is the dependent variable, 3 percent of short run divergence from the equilibrium is corrected in one period; the error correction takes 34 periods. On the other hand, the second VEC results suggest that, a 4 percent disequilibrium is corrected within one period and convergence to the long run equilibrium lasts 25 periods.

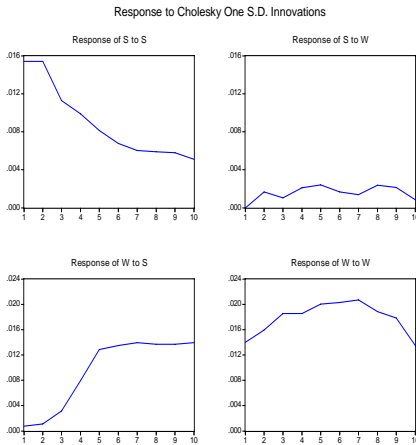


Figure 6.
Impulse response functions of the primary surplus feedback rule

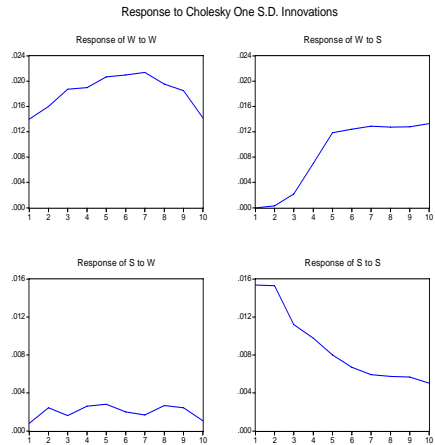


Figure 7.
Impulse response functions of the domestic debt feedback rule

Further, IRF figure for the domestic debt feedback rule is given in Figure 7. The first part of Figure 7 represents the response followed by the primary surplus (s) resulting from an innovation in the domestic debt (w). As can be seen in the figure, an expansionary primary surplus shock leads domestic debt to rise steadily in Turkey in the long run. At the bottom of the figure 7, the response of s is positive as a result of an impulse in w , as expected. The policies followed in Turkey have shown that, increases in primary surpluses failed to satisfy increases in domestic debt. Results suggest that, prices had to increase to lower the real value of domestic debt until the net wealth of the households is equated to the future primary surpluses. The evidence suggests that price stability is seriously weakened by Non-Ricardian characteristics of policies followed in the period.

5. Conclusion

In the study, the accessibility of FTPL theory has been analyzed in accordance with Ricardian equivalence theorem based on cointegration and Vector Error Correction mechanism to investigate the short run and long run dynamics of domestic debt on the price level and feedback rules followed by fiscal authorities in Turkey. The evidence shows that, considering the increasing costs of debt without responsible debt policies especially after the 1980's led to deficit-debt-inflation spirals, which resulted in economic

crises. According to the regression results and IRF figures obtained in accordance with the first model, there is strong evidence that Ricardian equivalence theorem does not hold for the Turkish economy, increasing government bonds lead to wealth effects causing price level to increase. Accordingly, continuing economic crises and mismanagement of domestic debt endangers the sustainability of price stability. The efficiency of monetary policy in achieving price stability is under the pressures of fiscal dominance hence, active monetary policies such as inflation targets may result in inflationary processes unless credible fiscal discipline is undertaken. The results obtained by the econometric models suggested in the study show that inflationary episodes in Turkey are highly influenced by fiscal dominance, where the impact of the high cost domestic debt on the price level cannot be disregarded. On the other hand, Non-Ricardian policies affect the results of anti-inflationary policies and accessibility of price stability is seriously damaged unless stability policies are backed by fiscal commitment.

References

- Aiyagari, S. Rao, and Mark Gertler (1985), "The Backing of Government Bonds and Monetarism," *Journal of Monetary Economics*, vol. 16, pp. 19-44.
- Barro, Robert J. (1974), "Are Government Bonds Net Wealth?" *Journal of Political Economy* LXXXII, pp. 1095-1117.
- Benhabib, Jess; Stephanie Schmitt-Grohe; Martin Uribe (1999), "Monetary Policy and Multiple Equilibria," *Departmental Working Papers 199914*, Rutgers University, Department of Economics.
- Benhabib, Jess; Stephanie Schmitt-Grohe; Martin Uribe (2001), "The Perils of Taylor Rules," *Journal of Economic Theory* 96, 40-69.
- Bildirici, Melike, Ozgur Omer Ersin (2005), "Fiscal Theory of Price Level and Economic Crises: Brazil, Mexico, Turkey, England, Australia, Spain, France and Germany," forthcoming in *Yapı Kredi Economic Review (YKER)*. bildiri@yildiz.edu.tr
- Blanchard, Oliver (2004), "Fiscal Dominance and Inflation Targeting: Lessons from Brazil," *NBER Working Paper No. 10389*.
- Bohn, Henning (1998), "The Behaviour of U.S. Public Debt and Deficits," *Quarterly Journal of Economics* 113, pp. 949-64.
- Buchanan, James (1967), "Fiscal Policy and Fiscal Choice: The Effects of Unbalanced Budgets," *University of North Carolina, Public Finance in Democratic Process* 67 (1), pp. 98-112.
- _____ (1986), "The Economic Consequences of Deficit." *Journal of Public Finance and Public Choice*, Vol. 3, pp. 149-156.
- Canzoneri, Matthew B., Robert E. Cumby, Behzad Diba (2001), "Is the Price Level Determined by the Needs of Fiscal Solvency?" *The American Economic View* 91-5.
- Carlo A. Favero & Francesco Giavazzi (2002), "Inflation Targeting and Debt: Lessons from Brazil," *NBER Working Papers 10390*, National Bureau of Economic Research, Inc.

- Cochrane, John H. (1998), "A Frictionless View of Inflation," Graduate School of Business, University of Chicago. [www.gsb.uchicago.edu/fac/john.cochrane/] (12.09.2007).
- _____ (1999), "Long Term Debt and Optimal Policy in the Fiscal Theory of the Price Level," Graduate School of Business, University of Chicago.[www.gsb.uchicago.edu/fac/john.cochrane/] 12.09.2007).
- _____ (2005), "Money as Stock," *Journal of Monetary Economics*, Vol. 52, pp. 501-528.
- _____ (2003), "Fiscal Foundations of Monetary Regimes," Neemrana Conference Series, Graduate School of Business, University of Chicago.
- Dickey, D.A., W.A. Fuller (1979). "Distribution of the Estimators for Autoregressive Time Series with a Unit Root," *Journal of the American Statistical Association*, 74, pp. 427–431.
- Dickey, D. A., W. A. Fuller (1981), "Likelihood Ratio Statistics for Autoregressive Time Series with a Unit Root," *Econometrica*, Vol. 49-4, pp. 1057-1072.
- Engle, R.F, C.W.J. Granger (1987), "Cointegration and Error Correction: Representation, Estimation and Testing," *Econometrica*, Vol. 55 (2), pp. 251-76.
- Erdoğan, Oya S. (2002). Price Level Determination: Ricardian vs. Non-Ricardian Policies, Iowa State University, Ph.D. Thesis.
- Ersin, Ozgur Omer (2005). Fiscal Theory of Price Level. Yildiz Technical University, Institute of Social Sciences, Department of Economics, M.A. Thesis.
- Friedman, Benjamin M (1988), "Lessons on Monetary Policy from the 1980's," *Journal of Economic Perspectives* 2, pp. 51-72. [http://ideas.repec.org/a/aea/jecper/v2y1988i3p51-72.html] (19.09.2007).

- Hayashi, Fumio (2000). *Econometrics*. Princeton University Press: New Jersey.
- Jerome Creel & Henri Sterdyniak (2002), "The fiscal theory of the price level and sluggish inflation: how important shall the wealth effect be?," Documents de Travail de l'OFCE 2002-01, Observatoire Francais des Conjonctures Economiques (OFCE).
- Johansen, Søren (1991), "Estimation and Hypothesis Testing of Cointegration Vectors in Gaussian Vector Autoregressive Models," *Econometrica*, 59, pp. 1551–1580.
- Kwiatkowski, D., Peter C. B. Phillips, P. Schmidt, Y. Shin (1992), "Testing the null hypothesis of stationarity against the alternative of a unit root: How sure are we that economic time series have a unit root?" *Journal of Econometrics*, Elsevier, vol. 54(1-3), pp. 159-178.
- Leeper, Eric M.(1991), "Equilibria under 'Active' and 'Passive' Monetary and Fiscal Policies," *Journal of Monetary Economics* 27.
- Loyo, Eduardo (1999), "Tight Money Paradox: Fiscalist Hyperinflation," Kennedy School of Business, Harvard University.
- Lucas, Robert E., Jr., and Nancy L. Stokey (1987), "Money and Interest in a Cash-in Advance Economy," *Econometrica* 55, pp. 491-513.
- _____(2000), "Demand-Pull Stagflation," Kennedy School of Business, Harvard University.
- McKinnon, J. G. (1991), "Critical Values for Cointegration Tests," R. F. Engle C. W. J. Granger Ed., *Long Run Economic Relations*, Oxford University Press.
- Mikek, Peter (1999). *Interactions Between Monetary and Fiscal Policy in an Open Economy*. University of Indiana, Department of Economics, PH.D. Thesis.
- Modigliani, Franco (1985), "Life Cycle, Individual Thrift and the Wealth of Nations," Nobel Price Lecture.

- _____, “Long Run Implications of Alternative Fiscal Policies and the Burden of the National Debt”, *Economic Journal*, LXXI, s.730-755.
- Obsfeld, Maurice ve Kenneth Rogoff (1983), “Speculative Hyperinflations in Maximizing Models: Can We Rule Them Out?” *Journal of Political Economy* 91, pp. 675-87.
- Phillips, P.C.B. and P. Perron (1988), “Testing for a Unit Root in Time Series Regression,” *Biometrika*, 75, pp. 335–346.
- Sargent, Thomas (1982), “The Ends of Four Big Inflations,” *Inflation*, Chicago University: R. E. Hall.
- Sargent, Thomas and Neil Wallace (1981), “Some Unpleasant Monetarist Arithmetic,” *Federal Reserve Bank of Minneapolis Quarterly Review*, Vol. 5 No.3.
- Selçuk, F. and Rantanen, A. (1996), *Türkiye’de Kamu Harcamaları ve İç Borç Stoku Üzerine Gözlemler ve Mali Disiplin Üzerine Öneriler*, İstanbul: TUSIAD Publications.
- Simons, H.C. (1936), "Rules versus Authorities in Monetary Policy," *Journal of Political Economy*, 44, 1, 1-30.
- Sims, Christopher A. (1994), “A Simple Model for the Study of the Determination of the Price Level and the Interaction of Monetary and Fiscal Policy,” *Economic Theory* 4, pp. 381-399.
- _____(1997), “Fiscal Foundations of Price Level in Open Economies,” Yale University, [<http://www.princeton.edu/~sims/>] (12.09.2007).
- _____(2002), “Limits to Inflation Targeting,” Princeton University, [<http://www.princeton.edu/~sims/>] (12.09.2007).
- Taylor, John B. (1993), “Discretion vs. Policy Rules in Practice,” *Carnegie-Rochester Conference Series on Public Policy* 39, pp. 195-214.

Uygur, Ercan (2001), "Enflasyon, Para ve Mali Baskı: İktisat Politikasında Geri Kalmışlık," İktisat, İşletme ve Finans Yıl 16, Sayı 189.

Woodford, Michael (1994), "Monetary Policy and Price Level Determinacy in a Cash-in-Advance Economy," *Economic Theory* 4, pp. 345-380.

_____ (1995), "Price Level Determinacy Without Control of a Monetary Aggregate," *Carnegie-Rochester Conference Series on Public Policy* 43, pp. 1-46.

_____ (1998), "Doing Without Money: Controlling Inflation in a Post-Monetary World," *Review of Economic Dynamics* 1, pp. 173-219.

_____ (1998), "Public Debt and Price Level," Princeton University.
[<http://www.princeton.edu/~woodford>] (12.09.2007)

_____ (2001), "Fiscal Requirements for Price Stability," *Journal of Money, Credit and Banking* Vol. 33, No.3.

_____ (1998), "Doing Without Money: Controlling Inflation in a Post-Monetary World," *Review of Economic Dynamics* 1, pp. 173-219.

Appendix

Table 1. VAR Lag Length Criteria for Model I.: 1933-2004 Period

Lag	LogL	LR	FPE	AIC	SC	HQ
0	25.29089	NA	0.001674	-0.716643	-0.649739	-0.690245
1	73.75694	92.45831*	0.000426*	-2.084829*	-1.884116*	-2.005635*
2	76.74579	5.517866	0.000440	-2.053717	-1.719195	-1.921726
3	77.57989	1.488553	0.000485	-1.956304	-1.487975	-1.771518

* indicates lag order selected by the criterion LR: sequential modified LR test statistic (each test at 5% level), FPE: Final prediction error, AIC: Akaike information criterion, SC: Schwarz information criterion, HQ: Hannan-Quinn information criterion.

Table 2. VAR Lag Length Selection for Model I. with Crises: 1933-2004 Period

Lag	LogL	LR	FPE	AIC	SC	HQ
0	49.55277	NA	0.001388	-0.90932	-0.24027	-0.64534
1	94.37364	73.09249*	0.000397*	-2.16534	-	-
2	98.48812	6.456563	0.000397	-	1.362492*	1.848567*
				2.168865*	-1.23221	-1.79929

* indicates lag order selected by the criterion LR: sequential modified LR test statistic (each test at 5% level), FPE: Final prediction error, AIC: Akaike information criterion, SC: Schwarz information criterion, HQ: Hannan-Quinn information criterion.

Table 3. VAR Lag Length Selection for Model I.: 1970-2004 Period

Lag	LogL	LR	FPE	AIC	SC	HQ
0	43.50490	NA	0.000925	-1.343137	-0.454367	-1.036334
1	60.92154	22.89044*	0.000440*	-2.109802	-1.043278*	-1.741638
2	63.74352	3.386374	0.000489	-2.042487	-0.798208	-1.612962
3	65.23289	1.617032	0.000594	-1.899022	-0.476990	-1.408137
4	71.77544	6.355619	0.000551	-2.044311	-0.444524	-1.492065
5	78.01145	5.345150	0.000534	-2.172083	-0.394542	-1.558476
6	87.12956	6.773457	0.000454	-2.464546	-0.509252	-1.789579
7	90.91317	2.378269	0.000547	-2.452181	-0.319132	-1.715853
8	99.32755	4.327396	0.000540	-2.704432*	-0.393629	-1.906743*

* indicates lag order selected by the criterion LR: sequential modified LR test statistic (each test at 5% level), FPE: Final prediction error, AIC: Akaike information criteria, SC: Schwarz information criterion, HQ: Hannan-Quinn information criterion.

Table 4. Lag Length Criteria Selection-Feedback Rules VAR Model

Sample: 1989:01 2004:12

n: 180

Lag	LogL	LR	FPE	AIC	SC	HQ
0	875.0611	NA	8.42E-08	-10.61425	-10.42445*	-10.53719
1	881.8453	12.98582	8.14E-08	-10.64841	-10.38269	-10.54053
2	887.9864	11.60406	7.93E-08	-10.67468	-10.33304	-10.53598
3	892.6131	8.628802	7.87E-08	-10.68237	-10.26481	-10.51284
4	897.2653	8.562393	7.81E-08	-10.69037	-10.19689	-10.49002
5	899.3605	3.804759	8.00E-08	-10.66700	-10.09760	-10.43583
6	901.1974	3.290686	8.22E-08	-10.64046	-9.995137	-10.37847
7	904.2229	5.345623	8.32E-08	-10.62850	-9.907259	-10.33569
8	906.0988	3.268408	8.55E-08	-10.60244	-9.805276	-10.27880
9	916.2079	17.36544	7.94E-08	-10.67740	-9.804315	-10.32294
10	927.7105	19.47670	7.25E-08	-10.76945	-9.820451	-10.38417
11	951.8653	40.30747	5.67E-08	-11.01675	-9.991829	-10.60064*
12	954.6549	4.586528	5.76E-08	-11.00190	-9.901057	-10.55497
13	962.2036	12.22615	5.52E-08	-11.04544	-9.868679	-10.56769
14	971.0694	14.14168*	5.21E-08	-11.10515	-9.852461	-10.59657
15	975.5366	7.016053	5.19E-08	-11.11088	-9.782274	-10.57148
16	980.7889	8.120149	5.13E-08*	-11.12624*	-9.721720	-10.55602

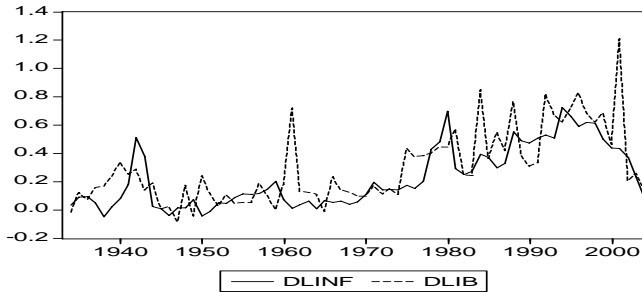
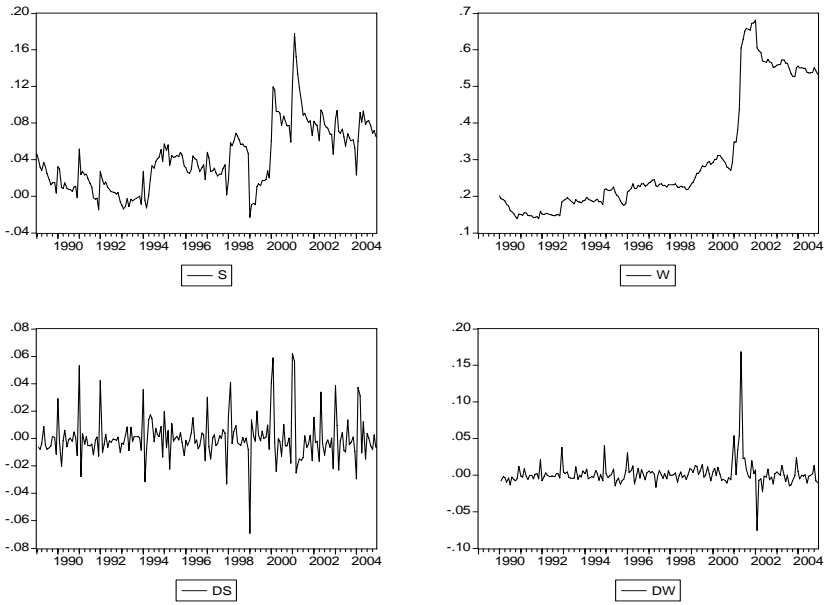


Figure 1.
Inflation Level (dlinf) and Domestic Debt (dlib), Logarithmic and First Differences: 1933-2004 Period



s : Primary Surplus/GDP, w : Domestic Debt/GDP, $d(*)$ are first differences.

Figure 2.
Feedback Rules in Primary Surplus and Domestic Debt Test Variables: 1989-2004 Period