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CONTENTS

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CONTRIBUTIONS TO BOOKS

- Sharma T., Kwatra, G. (2008) Effectiveness of Social Advertising: A Study of Selected Campaigns, Corporate Social Responsibility, Edited by David Crowther & Nicholas Capaldi, Ashgate Research Companion to Corporate Social Responsibility, Chapter 15, pp 287-303.

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- Schemenner, R.W., Huber, J.C. and Cook, R.L. (1987), "Geographic Differences and the Location of New Manufacturing Facilities," Journal of Urban Economics, Vol. 21, No. 1, pp. 83-104.

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THE EFFECT OF THE CHANGE IN SHORT-RUN FOREIGN DEBT STOCK IN TURKEY ON THE OUTPUT VOLATILITY

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ABSTRACT

In this study, the effect of the change in short-run foreign debt stock in Turkey on the output volatility is analyzed. In the analysis, the monthly data related to total short-run foreign debt stock and industrial production index following a similar course with Gross Domestic Product (GDP) were used between January 2005 and December 2013. The effect of the change in short-run foreign debt stock on the output volatility was analyzed with the GARCH Model. As the result of the analysis, an avoidant relevance was found between the short-run foreign debt stock and output volatility.

KEYWORDS
Output Volatility, Gross Domestic Product, Short-Term Foreign Debt Stock, Turkey, GARCH.

JEL CLASSIFICATION
H60, H63, O40.

INTRODUCTION

With the globalization process, the capital mobility experienced among countries has increased rapidly. In this process, countries have utilized debt as the source of financing for the governments on the one hand, and as an efficient means of fiscal policy on the other. Although the short-run debt is an important source of finance for the developing countries in particular, it has also become a significant factor which paves the way for the financial crises in these countries.

Short-run debt has also an impact on the output growth and output volatility of the countries, which is, doubtlessly, not a racket effect. When the recent studies are examined, it is discovered that there are also examples suggesting that economic growth also has an impact on the short-run debt stock. The stability and sustainability of the economic development in the countries are of great importance. The countries performing a stable output growth are also capable of pursuing sustainable debt and fiscal policies.

This study aims at making a contribution to the literature by analyzing the relationship between output volatility and short-run debt stock in Turkey. The study is organized in four sections. In the first section after the term of output volatility and its relation with other variables are explained, the recent studies about the relationship between output volatility and various macroeconomic variables are scrutinized. In the second section, the data and the methodology used in the analysis are explained. In the third section, the empirical evidence obtained as the result of the analysis is mentioned. Consequently, the concluding remarks are presented.

THEORY AND LITERATURE

Volatility is one of the important components of finance theory, being the subject of various empirical and theoretical studies, as well. "Volatility which is measured by the standard deviation or variance of returns is used as a crude measure of the total risk of the financial assets. Many asset risk models assessing the market risk require estimation or a foresight of volatility parameters" (Brooks, 2002: p. 441). In addition, the output volatility refers to the instability of the increase and decrease taking place in production, in other words, it is the increase-decrease in production following a fluctuating course. If the output volatility is low, there are low fluctuations in production. There are various measures related to output volatility. Output volatility is often calculated as the standard deviation of GDP per capita growth rates (Pitlik, 2012: p. 5). Output volatility is the source of welfare loss for both the developed and the developing countries. Moreover, the output volatility negatively affects numerous variables, such as growth, employment, poverty and public size.

In literature, there are few studies conducted on the relationship between output volatility and debt. Most of the studies performed have analyzed the relationship between economic growth and debt. In this context, one of the prominent studies was conducted by Reinhart and Rogoff (2009), where the relationship between public debt, economic growth and inflation was analyzed for 44 developing and developed countries during the period of 1946-2009. Reinhart and Rogoff's findings suggest that the growth is avoidant in the countries during the period when the rate of public debt to GDP is above 90%, whereas no relevance is found between them in the countries during the period when the rate of public debt to GDP is below 90%. Similarly, Kumar and Woo (2010), in the panel analysis study they conduct for the period of 1990–2007 in 38 developed and developing countries come to the conclusion that public debt has a negative impact on growth, which is, however, valid for those countries where the rate of public debt to GDP is over 90%. Cecchetti et al (2011) also investigate the relationship between public debt and economic growth for 18 OECD countries, and they report that the debt affects the economic growth in a negative way in the countries where the rate of debt-to-GDP rises over 85%.

Baum et al (2012) analyze the relationship between public debt and economic growth for the period of 1990-2010 in 12 European countries through the panel data analysis method. As a result of the analysis, the short-run impact of public debt on GDP growth proves to be positively and statistically significant. However, as the rate of public debt to GDP rises up to 67% and above, such an impact diminishes, whereas it turns out to be negative when debt rises over 95%. Herndon et al. (2013) also analyze the relationship between public debt and GDP growth in 20 developed countries where the rate of public debt to GDP is over 90% in the post-war period. Contrary to the above-mentioned information, they determine that the relationship between public debt and GDP growth varies significantly according to the period of time and the country. Egert (2013a, b), however, approaches doubtfully to the threshold value in regard to the fact that the share of public debt within GDP affects the economic growth negatively when it rises over 90%, and he concludes that the so-called relation between debt and growth is not resistant to small changes in the country groups, data frequencies and model types, along with the changes in the assumptions on the minimum number of observations.

Wesselbaum (2013) investigates the relationship between the long-term output growth and public debt in the United States (U.S.) In his study where he uses the VAR model, he particularly analyzes how the relationship between output and public debt developed during the periods which he identifies as technological shocks. Consequently, he observes that the procyclical debts generate fewer fluctuations compared to countercyclical debts, as the result of which he deduces that the public debt in the U.S. creates a procyclical effect on the outcome growth. Public debt creates an additional effect in welfare due to the improvement which causes in the household incomes. It leads to the consideration that the public debt – the procyclical one-in the fluctuations is of automatic stabilizer quality. Chen (2014), similarly, investigates the relationship between public debt and real output seen since 1800s to date in 25 developed and developing countries. In his study where he uses the VAR analysis, he ascertaines that the share of the public debt within GDP affects the real output negatively in the long run in 18 out of 25 countries. Sichula (2012) analyzes, by means of the Granger Causality method, the effect of debt burden and debt relief on the economic output in 5 poverty-stricken South African countries for the period of 1970–2011. As a result of the analysis, he finds that there is a strong relationship between foreign debt and GDP in that the GDP increases as the foreign debt decreases. Moreover, Drehmann and Juselius (2012), in the study they conduct for some of the developed countries, investigate the relationship between the debt ratio borrowed by the private sector, and the financial crisis and recession. They see that the debt/service ratio is associated with the loss in the output, which is reported as a significant precursor of financial crisis.

Bezemer and Grydaki (2013) test whether or not the increase in the debts of the non-financial real sector reduce the output volatility in the U.S. for the periods of 1954–1978 and 1984–2008. They use the univariate GARCH models in order to measure the volatility of the output growth and the VAR model to assess the relationship between output volatility and the debts (the loan size was taken as the indicator of debt). They use this volatility in a VAR model along with the excessive credit growth and control variables (inflation and interest rate) over two periods of 1954-1978 (before the Great Moderation) and 1984-2008 (during the Great Moderation). Therefore, they can test whether the relation between the excessive credit growth (measure of debt in the nonfinancial sector) and GDP volatility change between these two periods. Eventually, they find out that the increase in the amount of loan, the debt of the real sector reduce the output volatility during the periods given.

Pescatori et al. (2014), in the study where they analyze the relationship between the economic growth and public debt in 19 developed countries since 1875 to date, see that there is a weak relationship between the two variables in the short run. Additionally, they determine that the relationship between the level of debt and growth is considerably influenced by the trajectory of debt: the countries with high but declining levels of debt have almost grown as equally rapidly as the countries with lower debts. In the study where they also analyze the relationship between the output volatility and debt, they come to the conclusion that the level of debt during the period when there is an output growth doesn't have an impact on the output volatility. Nevertheless, it is ascertained by them that when the sampling mean of the debt level rises above 56%, the countries comparatively shows a high level of volatility; yet, no significant impact of the output volatility on debt can be found. Catao and Kapur (2006) analyze the effects of the volatility on the public debt lapsing into default and on the optimal indebtedness in 26 developing countries for the period of 1970–2001 through the panel data analysis. As a result, they find that the risk of lapsing into default is high, while the lending limit ceiling is low in the countries where volatility is high. In other words, as the volatility increases, so does the international requirement for loan in order to improve the domestic consumption. However, due to the fact that volatility enhances the default risk, the capacity of borrowing loan is restricted. Ziemann (2012) examines the relationship between debt, output growth and macroeconomic stability in a group of OECD countries by comparing the evolution of balance sheet aggregates and economic output in high- and low debt environments. In particular, in his study where he deals with the countries with nonconsolidated annual current accounts, he finds that reverse asymmetries occurs in the distribution of the high macroeconomic volatility and the output growth during the business cycle times when there is a high level of public debt.

Virén (2005) analyzes the effect of public sector size on the output volatility. He performs the analysis in 208 countries for the period of 1960–2002. He discovers that there is no relationship between the public sector size and output volatility, and that even if there are any; it will be on a rather lower level. Gali (1994), however, analyzes the relationship between the public sector size and output volatility in 22 OECD countries for the period of 1960 -1990. Contrary to Viren, he finds that there is a strong and reverse relationship between the two variables. Similarly, Fatas and Mihov (2001) analyzes the relationship between the public sector size and output volatility in 20 OECD countries for the period of 1960 -1997, as the consequence of which they find that there was a negative relationship between the two variables. Fatas and Mihov (2003) also analyze the effect of discretionary fiscal policy on the output volatility and economic growth in 91 countries. As a result they find that countries which prefer fiscal policy face macroeconomic instabilities and high output volatility. The increase in output volatility at 1% decreases economic growth at 0,8%. Kim and Lee (2007), on the other hand, in their study where they analyze the relationship between the public size and economic uncertainty (output volatility) in 15 OECD countries for the period of 1991-1998, determine that the economic uncertainty diminishes (that the output volatility regressed) as the public size grows more.

Valev (2004), studies the maturity of loans provided by the U.S. banks to borrowers in 44 countries for the period of 1982-1996. In particular, whether noneconomic uncertainty and economic volatility in these countries are associated with shorter maturity of debt is analyzed, and it is concluded that there is a non-linear relationship between the maturity of debt and the economic volatility. It is seen that the economic volatility of a rather high degree is associated with a shorter maturity of debt. The results also show that greater non-economic uncertainty contributes to shorter maturity of international debt. Moreover, economic volatility is generally associated with longer maturity of debt rather than the shorter one. However, a very high level of economic volatility is associated with shorter maturity of debt.

Bussiére et al. (2004) analyze the interactions between currency risk, the maturity structure of debt and output volatility in 28 emerging/outward-oriented developing countries by using the annual data and the partial equilibrium model in the analysis. As the result of the analysis, they find that the high level of inconsistency in the maturity of debt – which means that the share of the short-term debts are more within the total debt- increases the output volatility. In addition, they determine that the high level of short-term debts is affected much more by financial crises and sharp fluctuating flows. The countries with a larger maturity mismatch of foreign debt have more volatile output, which promotes the hypothesis that economies with a higher share of short-term debt are more likely to suffer from the powerful boom-bust cycles and financial crises. The decrease in the short-term debts allows the capital flow to decline and the economic constriction to get better.

As is seen, there are a great number of studies which analyze the relationship between output volatility and macroeconomic variables in different countries at different periods; yet, there are a few studies analyzing this subject. In this paper, the relationship between output volatility and short -term debt stock is analyzed for Turkey. Turkey is a country, the economy of which has financial difficulties on the road to development; thus, the requirement for a short-term debt is often the top agenda of this country. Besides, Turkey is also a country with unstable growth figures, frequently experiencing economic bottleneck on the road to rapid development. For this reason, putting forth the relationship between the output volatility and short-term debts is of great importance.

DATA AND METHODOLOGY

In this study, the monthly data for short-term foreign debt stock[1] and industrial production index[2] variables are used between January 2005 and December 2013. The dataset is obtained from CBRT (The Central Bank of the Republic of Turkey) by means of Electronic Data Delivery System, converted into real values with Consumer Price Index and seasonally adjusted through the Tramo-Seats method. These variables are formed into a logarithmic exchange rate by using Equation 1 and Equation 2.

$$RIPI_t = 100.(logIPI_t - logIPI_{t-1}) \quad (1)$$

$$RDEBT_t = 100.(logDEBT_t - logDEBT_{t-1}) \quad (2)$$

In equation 1, IPI_t is industrial production index value at *t* time is given. In equation 2, $DEBT_t$ refers to short-term foreign debt stock at *t* time. The descriptive statistics of the variables are presented in Table 1.

TABLE 1: DESCRİPTİVE STATISTICS OF VARİABLES

	SUI_t	$RSUI_t$	$DEBT_t$	$DEBT_t$
Mean	100,5061	0,319	63963,38	1,279
Median	99,23461	0,435	49741,50	1,372
Maximum	120,0141	3,569	129336,0	8,712
Minimum	83,05225	-11,854	32836,00	-13,565
Standart Error	10,48663	1,690	28372,56	3,603
Skewness	0,069175	-3,478	0,903765	-0,622
Kurtosis	1,817918	26,501	2,566583	5,025
Jarque-Bera	6,374	2678,231	15,547	25,203
Number of Observations	108	107	108	107

In Table 1, there are mean values of variables, median values, maximum and minimum values, standard errors, number of observations, skewness and kurtosis of the variables. Considering the skewness of IPI_t and $DEBT_t$ it is seen that they are skewed to left since the skewness values of these series are bigger than zero. In addition, when the kurtosis values of these series are dealt with, it can be said that they are allokurtic because both series are smaller than 3. Considering the skewness of the series of $RIPI_t$ and $RDEBT_t$ it is seen that the series are skewed to right because the skewness values of both are smaller than zero. Moreover, when the kurtosis values of the series are considered, it is found out that both of the series are orthogonal because kurtosis values of the series are bigger than 3. Besides, the normality of the series is checked via the Jarque-Bera test. According to this test result, it is seen that the series don't have a normal distribution.
The volatility of the output variable is analyzed by means of the Generalized Autoregressive Conditional Heteroskedasticity (GARCH) Model, which is one of the volatility models of Conditional Heteroskedasticity (ARCH). GARCH Model was developed independently by Bollerslev (1986) and Taylor (1986). It is expressed in two parts as mean equation and conditional variance equation. The conditional variance equation is a volatility model which allows its own lags as well as the squared error residuals. With such a structure, it eliminates the obligation of adding numerous significant lags of error square in the ARCH Model. The GARCH Model (*q, p*) used in the analysis can be shown by means of the following equations. (Brooks, 2002: p. 454);[3]

$$RIPI_t = \theta_0 + u_t \quad (3)$$

$$u_t = \sigma_t \varepsilon_t \quad (4)$$

$$\sigma_t^2 = \alpha_0 + \sum_{i=1}^{q} \alpha_i u_{t-i}^2 + \sum_{j=1}^{p} \beta_j \sigma_{t-j}^2 + \gamma RDEBT_t \quad (5)$$

$RIPI_t$ and $RDEBT_t$ in Equation (3), (4) and (5) shows the logarithmic exchange rate of output and debt, respectively. While u_t refers serial uncorrelated dependent error term, θ_0 and σ_t^2 represents the conditional mean and conditional variance, respectively; whereas ε_t stands for random variable dispersing independently and identically. Lastly, q and *p* are the nonnegative integers.
This applied specification allows us to follow and understand the effect of the change in the short-term foreign debt stock on the output volatility by means of the γ parameter in the conditional variance equation.

EMPIRICAL RESULTS

The GARCH model requires the prerequisite that the variables must be stationary. For this reason, the stationarity of the variables is tested by means of the Augmented Dickey-fuller (ADF) and Phillips-Peron (P-P) unit root tests. While the unit root tests are being performed, the lag number is determined according to Akaike Information Criteria (AIC). In Table 2, the stationarity test results of the variables are shown. Based on these results, the variables have no unit root. In other words, the variables are seen to be stationary at the level.

TABLE 2: STATIONARY AND UNIT ROOT TEST RESULTS

	$RDEBT_t$			$RIPI_t$		
	N	**I**	**I and T**	**N**	**I**	**I and T**
ADF (Level)	-3,574*	-4,133*	-4,203*	-4,236*	-9.807*	-9,761*
P–P(Level)	-9,178*	-9,765*	-9,748*	-9,791*	-9,995*	-9,956*

*is significant by 1%, ** is significant by % 5 , N: None I: Intercept IT: Intercept and Trend

In order to determine the lag length of GARCH model error squares in the analysis, the sample estimation of σ_t^2 and the partial autocorrelation function of $\hat{u}_t^2$ are examined. To determine the lag rank of conditional variance itself, trials are performed in application, mostly in the way that it is utilized, starting from the shorter lags, while, in the meantime, the effect of ARCH is tried to be removed from the conditional variance equation. Following all these procedures, it is determined that the most convenient model is GARCH (1, 1). As the GARCH (1, 1) model is estimated through the maximum likelihood method, the model identification tests are performed and the results are presented in Table 3.

TABLE 3: ESTIMATION RESULTS

	Mean Equation
θ_0	0,595 (0,000)*
	Conditional Variance Equation
α_0	0,138 (0,000)*
α_1	-0,037 (0,000)*
β_1	1,040 (0,000)*
γ	-0,086(0,000)*
	Diagnostic Tests
Log Probability	-182,389
Ljung- Box Q(3)	2,865
Ljung- Box Q(6)	10,919
Ljung- Box Q^2(3)	0,497
Ljung- Box Q^2(6)	1,077
ARCH-LM(3)	0,435
ARCH-LM(6)	1,029

( ): P-values are in parenthesis, indicating the significance level. * significant by 1%.

The statistical insignificance of Ljung Box and ARCH-LM tests shown in Table 3 proves that the specifications of mean equation and conditional variance equation are sufficient. The error term of mean equation is cleared of the serial correlation. The results of ARCH-LM test also show that the effect of ARCH is removed from the variance equation.

When the estimation results are analyzed, all the parameters are seen to be significant. Here, the most important parameter which needs to be interpreted at most is γ. Indicating the effect of the rate of exchange in the short-term foreign debt stock on the output volatility; this parameter is a significant negative value. Therefore, while the positive changes in the amount of debt lead to a decrease in the output volatility, the negative changes give rise to an increase. In other words, the output volatility decreases as the short-term debt stock increases, and vice versa. In brief, there is a negative (counter-related) relationship between output volatility and short run foreign debt stock.

CONCLUSION

Turkey is the country prominently experiencing the challenges of being a developing country. Rapid growth and industrialization are of great importance on the road to development. Thus, the industrial production requires be enhancing and consistently implementing. Yet, in this process, a significant problem shows up. The savings necessary for industrialization and development remain inadequate, as a result of which the alternative of borrowing debt becomes inevitable. At this point, another problem is the matter of being destitute of a long-term debt in particular. Since there is no stable and sustainable growth, the country becomes subjected to the short-term indebtedness. This is the method of financing, the sustainability of which is doubtful beyond being a high cost source of finance. In this regard, the relationship between short-term debt and national output volatility –in particular, the industrial production volatility- is of great importance.

According to the results of the study, there is a negative relationship between the change in the short-term foreign debt stock and the industrial output volatility in Turkey in the given period. Hence, the rise in the short-term debt stock is of significance for the stable growth of industrial production. But, the decrease in the short-term debt stock enhances the output volatility, which is an unsustainable situation, or a difficult one to carry on and something costly. It is necessary that alternative sources of finance be found in order to minimize the output volatility and grow consistently. In this context, new policies should be devised. Turkey should promptly look for ways of surviving from short-term debts. Such short-term dependency must be overcome by devising and developing alternative policies regarding the matter.

NOTES

[1] The short-term foreign debt stock is the current balance of unconditional liabilities, the use/process of which has been completed by any given date and that through which the residents of a given place are indebted to non-residents and that which necessitates a principal and/or interest repayment(s) within a year from the date of access/application. (www.tcmb.gov.tr).

[2] In such studies, although the Gross Domestic Product (GDP) data are more commonly used, no monthly data of the GDP is available. Hence, in this study, the Industrial Production Index with monthly data has been used, instead of the GDP. As a sample study in this matter, see Yaylalı and Lebe (2012), Öcal (2013), Bal and Demiral (2102).

[3] Even though the conditional mean in GARCH models is usually expressed via the structure of ARIMA, it is modelled merely with a constant term for convenience provided that the error term is serial uncorrelated.

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