Time Series Analysis of Dollarization: Impact on Public Sector Debt Instruments

ABSTRACT

In developing countries, the corporate sector and basic sector firms generally prefer foreign currencies in their borrowings in accordance with international economic agreements and contractual covenants. Borrowing by the corporate sectors through dollarisation is considered to be one of the triggers of high levels of real exchange rate increases. This is due to the negative aspects of the financial effects of borrowing in foreign currency by companies in developing countries, such as global financial shocks, sudden stops and outflows of capital flows. This situation leads to rapid depreciation of the local currency and therefore increases the risk ratios of borrowing costs and the financial effects that companies may face due to these costs. In this context, it decreases the net value of companies' balance sheets, which negatively affects the investment decisions of companies. Moreover, this situation also constitutes a risk factor for the banking sector. As a result, this risk factor, which causes negative effects for companies, has the potential to affect the national economy, which may force Central Banks to review the fixed exchange rate policy. Debt dollarisation of real sector firms in Turkey and the impact of real exchange rate changes on investments are examined using the Central Bank of the Republic of Turkey's Sector Balance Sheets inputs for firms and the Central Bank of the Republic of Turkey's Risk Center risk inputs. The determinants of firm-level debt dollarisation in Turkey and its effects on investments are investigated using twenty-five years of firm-level data from 1990-2015.

Keywords: Dollarisation Recession, Corporate Borrowing Rates, Private Sector

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INTRODUCTION

The reason for studying the period between 1990-2015 is because of the crises experienced in Turkey in 2001, 2008-2009. This period is a period of ruptures. Level fluctuations are more common in this period. Sloping fluctuations are experienced only in cyclical periods.

After 2011, a decision was made to make the Central Bank of the Republic of Turkey transparent. According to this decision, it has become impossible to predict an open crisis in Turkey. This means that crises can occur secretly.

It increases firms' borrowing costs and debt services in real terms and may negatively affect their investments by reducing the net value of their balance sheets.

The income of firms with high debt dollarization is significantly related to the real exchange rate because they are exporters. The depreciation of the Turkish Lira increases the investments of manufacturing industry firms because it provides an international competitive advantage. However, in the case of debt dollarization, the negative balance sheet effects of the depreciation of the TL suppress the positive competitive effect. If firms with high debt dollarization are not exporters or do not implement any procedures to protect themselves from exchange rate risk, they may be exposed to the negative balance sheet effects of debt dollarization when the TL depreciates and their investments may experience a recession.

In developing countries, borrowing by real sector firms through dollarization increases the borrowing costs and debt costs of firms in real terms when the national currency loses value suddenly and rapidly, and may negatively affect their investments by reducing the net value of their balance sheets.

The balance sheet vulnerabilities of the sector companies and the balance sheet effects of real exchange rate increases are also a risk factor for the banking sector from which they receive loans. Debt dollarization negatively affects the effectiveness of monetary policy due to the "floating exchange rate hesitation" and limits the ability of the Central Bank to be a credit granting authority.

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Therefore, understanding the extent, determinants and balance sheet effects of debt dollarization at the firm level constitutes the agenda of academics in terms of identifying vulnerabilities and examining the effects on exchange rate and monetary policies.

DOLLARIZATION AND EFFECTS

Debt dollarization is a significant source of vulnerability to financial shocks and rapid depreciation of the local currency for developing country economies (Calvo and Reinhart, 2002; Calvo et al., 2004; Obstfeld, 2008). The balance sheets of companies with foreign currency debt, especially those operating in sectors focused on domestic production or using high amounts of imported inputs, become vulnerable in the event of a large depreciation of the local currency, and the vulnerability of the overall economy may increase due to cross-sector interactions.

Debt ratios have been an important determinant of the vulnerabilities of the liabilities and assets in the financial balance sheets and the country's currency/foreign exchange rate against external global shocks and crises. Factors that increase financial vulnerabilities, such as the high short-term debt ratio, may cause domestic and foreign investors to reconsider their willingness to finance the relevant sectors. At the same time, the foreign exchange composition in an economy's financial balance sheet is effective in determining how effectively the country can protect itself against changes in global market conditions.

The balance sheet approach to financial crises draws particular attention to the balance sheets of the main sectors of an economy and indicates the weakness of microeconomic sectors in an economy (Krugman, 1999b; Cespedes et al., 2000; Gertler et al., 2007; Aghion et al., 2001; Allen et al., 2002). According to this approach, in financial crises, balance sheet risks such as maturity mismatch and exchange rate mismatch are important, as well as the debt ratio, which determines a country's ability to repay its debt against internal or external economic shocks (Allen et al., 2002).

Recent crises have highlighted the importance of "sudden stops" in international capital flows and reversals of capital inflows, as well as traditional budget deficits or current account deficits, as noted by Allen et al. (2002) and Calvo et al. (2004).

According to the transmission mechanism in the Mundell-Fleming model, the exchange rate is a variable that occurs in response to internal or external shocks. To explain the Mundell-Fleming model, the traditional approach uses the Mundell-Fleming model under Keynes to explain the positive relationship in the twin deficit hypothesis. The IS-LM model expresses macroeconomic balance in relation to the provision of internal and external balance. Studies on this model, which also includes free capital movements, have led to significant developments on different exchange rate models (Uğur and Karatay, 2009: 102-122).

The IS curve in the model represents the goods market and shows the relationship between interest rates and national income. The IS curve has a negative slope because while the money supply is determined by the Central Bank, the money demand is determined by interest rates and national income. As national income increases, the money demand decreases.

The LM curve in the model shows the relationship between interest rates in the money market and national income. The LM curve has a positive slope because while the money supply is determined by the Central Bank, the money demand is determined by interest rates and national income. As national income increases, the money demand increases, that is, there is a positive relationship. However, the money demand decreases as interest rates increase.

The BP curve in the model represents the balance of payments. The slope of the BP curve is zero and represents the sum of the current account balance and the capital balance sheet. In the assumption of perfect capital mobility, the BP curve is a line parallel to the world interest rate (i*) and the horizontal axis. In this case, the part above the curve, that is, when the domestic interest rate (i) is higher than the world interest rate, will be a capital inflow to the country. The part below the line indicates a capital outflow from the country when the domestic interest rate is lower than the world interest rate (Gök, 2006). The graph shows the implementation and results of the expansionary fiscal policy.

LITERATURE REVIEW

The research was carried out by Adanur Aklan and Nargeleçekenler (2010) and examined the effects of dollarization on investments in manufacturing industry sectors during the period of 1998-2007 using the TCMB Sector Balance Sheets database and the export data of the Undersecretariat of Foreign Trade. The main purpose of this study is to analyze the situations similar to the Asian crisis in particular by using the third generation crisis model developed by Aghion et al. (2001). This model provides an important framework for

understanding exchange rate crises and their effects on monetary policy, and this model provides an important framework for examining the situations similar to the Asian crisis in particular, by examining the situations similar to the Asian crisis, that the main source of exchange rate crises is not budget deficits under government control, but deterioration in the balance sheets of local private firms and commercial banks.

As Aghion et al. (2001) argue, economies with large foreign currency debts are at higher risk of large economic contractions and devaluations associated with currency crises. Currency crises can arise from deterioration in the balance sheets of private firms, as well as in fixed and free exchange rate regimes. Public debt can negatively affect the stability of the local currency through crowding out of private sector firms' balance sheets and access to credit. When nominal prices are rigid, a depreciation of the local currency increases the obligation to repay foreign currency debt, reducing the firm's profitability. This can reduce the firm's borrowing capacity, which in turn can reduce output and investment in credit-constrained economies.

Studies by Aguiar (2005) and Martinez and Werner (2002) show that firms in Mexico manage their foreign exchange liabilities partly as a hedge. In addition, Aguiar (2005) found that most exporting firms borrowed in foreign currency and that after the devaluation, their profits and sales increased. Benavente et al. (2003) showed that a strategy focused on exports had a positive correlation between reporting foreign exchange losses and the size of the losses in the case of Chile. They explained this situation as the tendency of firms to try to cover their liabilities with their income that is exchange rate flexible.

The study by Benavente et al. (2003) provides limited evidence that devaluation of firms with dollar-denominated debt has a positive effect on investment and sales. By analyzing the composition of dollar-denominated debt, the study finds a clear finding that larger firms have a greater advantage in borrowing in dollars. In Chilean firms, debt maturity is associated with firm size; larger firms are observed to borrow longer term.

Bleakley and Cowan (2002) conducted a study using panel data from 480 public companies in Argentina, Brazil, Chile, Colombia and Mexico for the period 1991-1999, aiming to answer the questions of "whether exporting firms hedge their risks by borrowing in foreign currency" and "whether firms with foreign currency debt suffer from devaluation". Bleakley and Cowan's (2002, 2005) findings suggest that foreign currency debt does not have a negative impact on the balance sheet. On the contrary, they find that firms with foreign currency debt benefit more from the depreciation of the domestic currency than other firms. This is due to firms' matching the foreign currency composition of their debt with the real exchange rate elasticity of their income.

It is found that the decrease in investments is more pronounced after the devaluation as the increase in debt ratios is suppressed by current and future incomes. The findings support the claim that firms with dollar debt invest less than those without dollar debt after the devaluation of the domestic currency and that exporting firms have higher foreign currency debt than non-exporting firms.

The findings of the study conducted by Bonomo and other researchers (2003) on Brazil show that large-scale companies react more to exchange rate increases than small-scale companies and reduce their foreign currency borrowing rates. They also tested how balance sheet effects affect investments, but they could not reach a statistically significant result. It was observed that firms operating in sectors that use high amounts of imported inputs, in particular, invest less in the event of a depreciation of the domestic currency.

According to Calvo and Reinhart (2000), debt dollarization, which is a common situation in developing countries, causes large real exchange rate fluctuations and the resulting sudden stops in capital inflows. Due to lack of credibility, fear of fluctuations and fluctuations in interest rates may occur even in 'normal periods' in countries that are open to international capital flows.

Carranza et al. (2003) used financial data from 163 non-financial listed companies in Peru to show that investment decisions of firms with dollar-denominated debt are negatively affected by real exchange rate losses. This study emphasizes the balance sheet effect and financial repression that create high debt dollarization and exchange rate mismatches. It also highlights the strong bank credit channel, low domestic demand, and a relatively small and undiversified export sector.

Carranza et al. (2009) conducted a study using data from more than fifty countries with different levels of dollarization and empirically examined the inflation effects of exchange rate depreciations. The results of this study support the view that countries with high dollarization experience high inflation transitions and also reveal that the exchange rate regime is effective. It was observed that countries with fixed exchange rate regimes suffer more from the balance sheet effects of exchange rate depreciations.

The findings of the study conducted by Bonomo and other researchers (2003) on Brazil show that large-scale companies respond more to exchange rate increases than small-scale companies, reducing their foreign currency borrowing rates. In addition, despite testing how balance sheet effects affect investments, it was determined that exchange rate changes did not reach a statistically significant result. It was observed that firms operating in sectors that use high amounts of imported inputs, in particular, invest less in the event of a depreciation of the domestic currency.

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The study by Carranza and others (2003), using financial data of 163 non-financial listed companies operating in Peru, shows that investment decisions of companies with dollar-denominated debt are negatively affected by real exchange rate depreciation. The study explains the main reasons for this situation by emphasizing the balance sheet effect and financial repression conditions that create high debt dollarization and exchange rate mismatch.

Carranza and others (2009) empirically examined the inflation effects of exchange rate depreciations using data from more than fifty countries with different levels of dollarization. The study concluded that countries with high dollarization experienced high inflation transitions and also revealed that the exchange rate regime was effective. It was observed that countries with fixed exchange rate regimes suffered more from the balance sheet effects of exchange rate depreciations.

Forbes (2002) examined the depreciation of the domestic currency between 1997 and 2000 in a sample of 13,500 firms from 42 countries and found that firms with higher debt ratios had lower net income growth in the year following large devaluation movements.

According to a study by Galiani et al. (2003), the widespread dollarization in all manufacturing sectors in Argentina supports the idea that the Currency Board system is perceived as a kind of implicit guarantee. The Currency Board may increase the potential destructive impact of a sudden devaluation by reducing the incentives of firms to hedge. Non-exporting producers have ignored the real exchange rate risk even in the presence of large exchange rate fluctuations. The Currency Board may delay the real exchange rate adjustment, but it does not completely insulate the economy from real shocks. The balance sheet effects of concern may be less dramatic, but can be replaced by debt deflation, which is equally damaging.

According to Harvey and Roper (1999), Asian real sector managers ignored the falling profitability and increased leverage to borrow in foreign currency and risked their firms by acting on the assumption that exchange rates would remain stable. In this case, the failure of corporate governance regarding risk management and control played an important role in the spread of the crisis.

Kalemli-Özcan and others (2010) examined the effects of emerging market crises on firm performance using a panel dataset of six Latin American countries. This study showed that among firms with short-term foreign currency debt, only those with local partners performed worse. Firms with foreign partners performed better in terms of sales and investments in the post-crisis period because they had easier access to global financial resources.

As noted by Krugman (1999a), investment is often limited by the wealth and leverage of firms, as discussed by Bernanke and Gertler (1989), and the level of investment is affected by the net financial condition of firms. Krugman (1999a) examines two situations when many firms borrow substantial amounts of foreign currency. First, the loss of confidence of foreign investors may lead to capital outflows, which may lead to a decline in domestic investment through balance sheet effects. Second, the normal response to a recession is money printing. In this case, the increase in the broad money supply may accelerate the depreciation of the exchange rate, which may further exacerbate the balance sheet crisis.

Studies by Krugman (1999b), Cespedes et al. (2000), Gertler et al. (2007) and Aghion et al. (2001) emphasize that large depreciations in the domestic currency will increase the real debt burden and cause contraction in investment and output if there is foreign currency borrowing.

Levy-Yeyati (2006) showed that financially dollarized countries have more unstable currency demand, suffer more from banking crises after domestic currency depreciation, and have lower and more volatile output growth without making significant gains in domestic financial depth.

Martinez and Werner (2002) stated that there was weak evidence for hedging against exchange rate risk before the Tequila Crisis. However, the flexible exchange rate system adopted in Mexico after the crisis increased firms' willingness to hedge against risk and reduced the exchange rate mismatch on firms' balance sheets. Mishkin (1999) argues that short-term borrowing in foreign currency in Mexico and East Asia helped turn the exchange rate crisis into a full-fledged financial crisis. Furthermore, the theoretical literature that Krugman calls the "Bernanke-Gertler open economy" suggests that the combination of capital market imperfections and weak balance sheets can increase the impact of negative shocks.

Pratap and others (2003) conducted a study in Mexico and found that large-scale and exporting firms are more likely to borrow in foreign currency. They stated that during periods of devaluation, borrowing in foreign currency has a strong and negative effect on investments. The existence of borrowing in foreign currency is seen as a significant risk factor during periods of devaluation. The results suggest that devaluation in Mexico has a greater competitiveness effect than a balance sheet effect.

There is also evidence that there is a negative relationship between exports and investments. The investments and incomes of exporting firms are more volatile than non-exporting firms, which causes a negative effect. While exporting firms invest less than non-exporting firms, an increase in their investments has been observed during devaluation periods.

Debt dollarization is a significant source of risk for developing country economies. This situation is sensitive to global financial shocks and sudden and large depreciations of the local currency. In countries with debt dollarization and foreign currency positions, real exchange rate increases can increase the amount of debt and the cost of servicing, leading to economic problems. It is known that financial crises are closely related to the balance sheets of the basic sectors of the economy. In these crises, the vulnerabilities in the public, real sector, finance and household sectors can affect each other and turn into a major crisis. Therefore, it should be kept in mind that these sectors are interconnected and that weakness in one sector can affect other sectors in order to ensure economic stability.

Real depreciations interacting with capital market failures can lead to economic crises. Studies by Krugman (1999b), Cespedes et al. (2000), Gertler et al. (2007) and Aghion et al. (2001) have emphasized that large depreciations in the local currency will increase the real debt burden in the case of foreign currency borrowing and cause a contraction in investment and output.

In order for real exchange rate increases to positively affect foreign trade and production, the Marshall-Lerner condition must be valid according to the trade channel, respectively, and the production increase in exporting sectors must be greater than the contraction in other sectors (Özmen and Yalçın, 2007).

As Galindo et al. (2003) noted, the data collection process may require obtaining a costly data set, accessing confidential information protected by regulatory authorities, or collecting and reviewing printed balance sheets. Firms' foreign currency borrowing may increase their sensitivity to exchange rate fluctuations, as emphasized by Bebczuk et al. (2006) and Özmen and Yalçın (2007).

In the atmosphere of financial dominance in Turkey, high and volatile inflation in financial markets is among the main factors encouraging dollarization due to the lack of effective financial measures (Başçı, 2011).

MODEL AND DATASET

This study analyzes the debts in the balance sheets of domestic and foreign companies in Turkey and reveals the relationship between dollarization and credibility in a proportional manner. Our dataset covers a 25-year period between 1990-2015. During this period, especially in the 1990-2010 period, Turkey switched from a fixed exchange rate regime to a floating exchange rate regime and also turned to liberal economic policies, which led to Turkey's globalization. During this period, Turkey became sensitive to national crises and began to be affected by international crises. With the transparency policies of the Central Bank of the Republic of Turkey in 2011, the probability of open crises decreased and the inflow of new investments to Turkey increased.

In this study, Eviews 7.1 program was used to create the data set and the data was obtained from the Central Bank of the Republic of Turkey for the period 1990-2015. Philips-Perron test will be applied to the data set because this test helps to interpret the critical values in the best way. The graphs of the tests will be shared and interpreted. 4 data were used in our study: 1 dependent variable (private sector borrowing) and 3 independent variables (GDP, M2 money supply and effective sales). Since the fragility of the data set was taken into account, seasonally adjusted data was obtained first. The data was logarithmized in order to rate and simplify. As a result, our data was made stationary at 1st differences (1st diffirence).
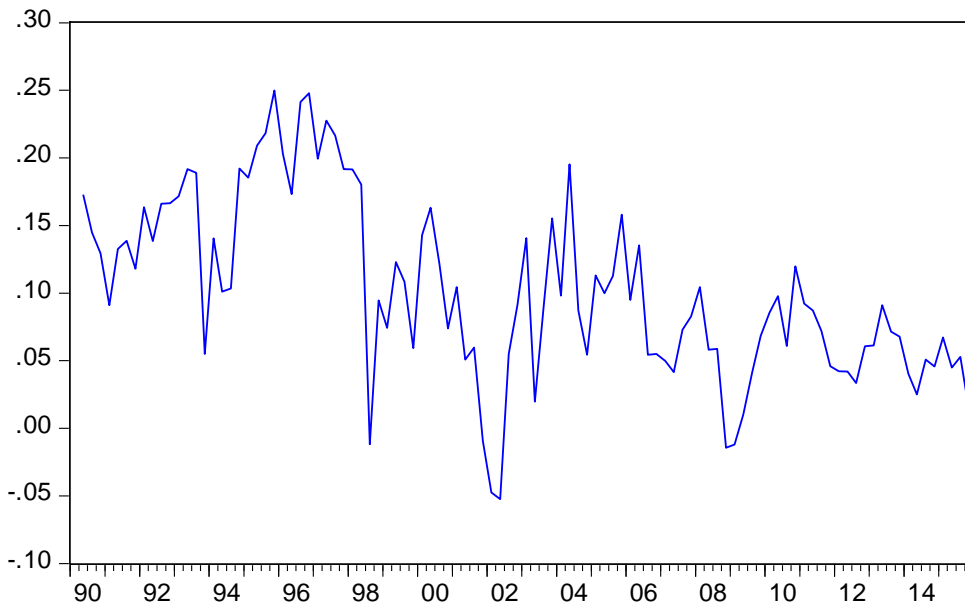
DLNOZELSEK_SA

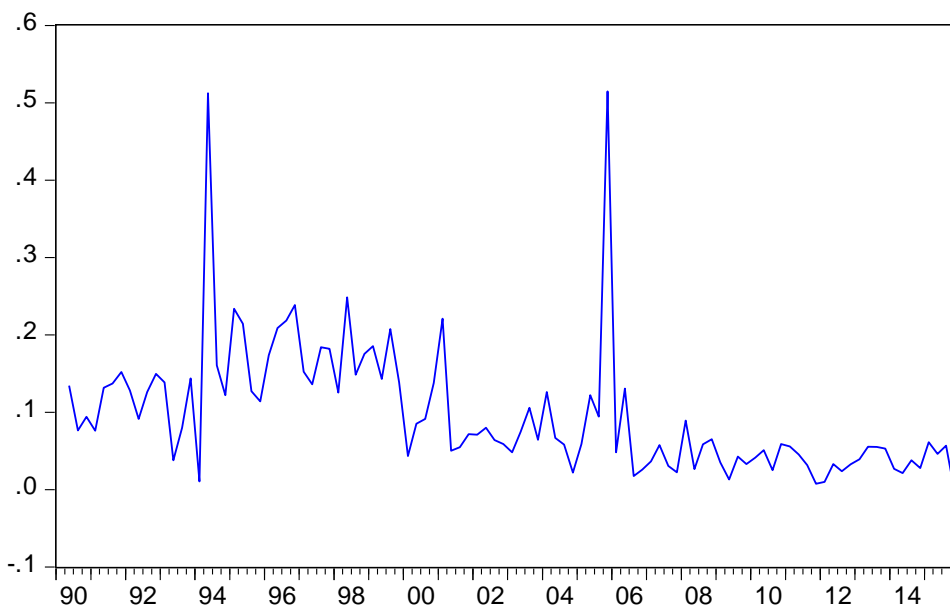Figure 1: Dependent Variable Significance Test

DLNM2_SA

Figure 2: Independent Variable Significance Test

DLNEFEKSATIS_SA
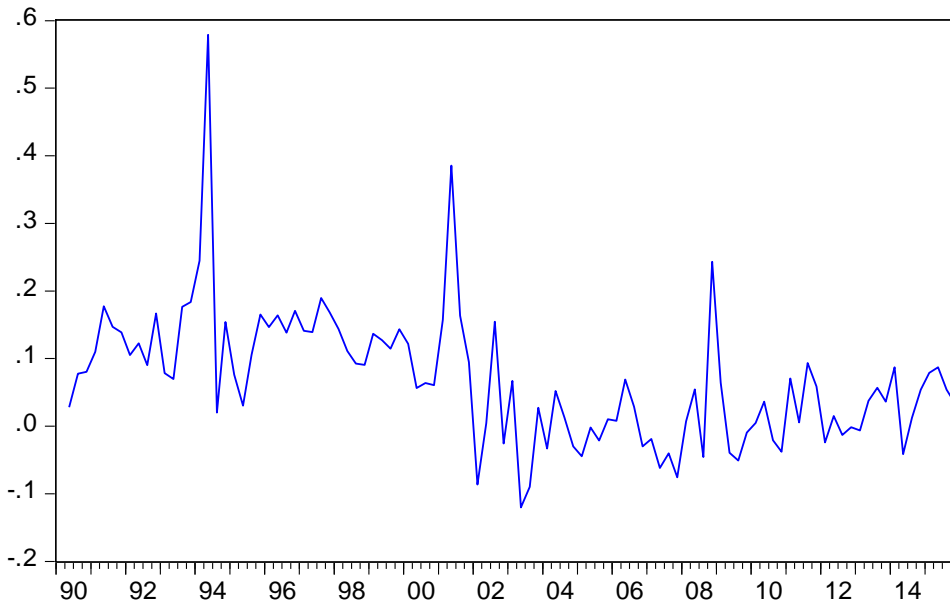
Figure 3: Independent Variable Significance Test

DLNGSYIH_SA
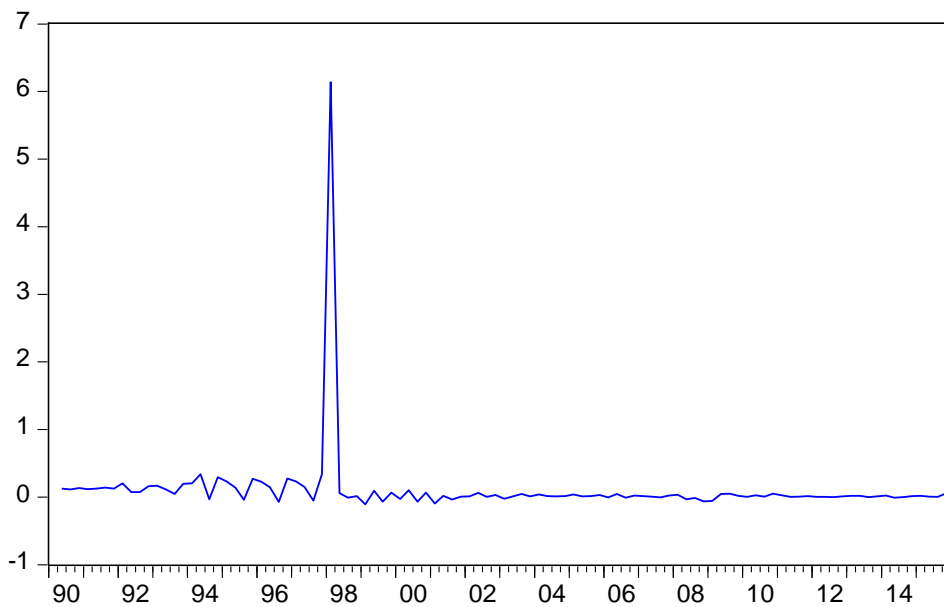
Figure 4: Independent Variable Significance Test

Tablo 1: Dependent and Independent Variable Significance Test Result

Values	Coefficient Values	T Account Values	Possibility
DLNM2_SA	0.491852	4.368082	0,0000
DLNGSYİH_SA	0.011944	0.838120	0.4040
DLNOZELSEK_SA	0.184180	1,259897	0.2107
C	0.000733	0.045563	0.9638

Tablo 2: Significance Test

Variables	Values
R^2	0.261786
Corrected R^2	0.239416
F Value	11,70248
Probability F Value	0.000001

When the model established model is significant at a rate of 26%. In the model, the distribution rates of errors on variables were investigated and for this, VAR analysis test was applied. (External variables were not taken into account.) According to the result of the normal distribution test of errors,

Tablo 3: Normality Test

Maximum	0.350499
Minimum	-0.272995
Standard deviation	0.0844167
Median	-0.004053

Tablo 4: Jarque-Bera Test Results

Jarque-Bera	92.07746
Possibility	0,000000

Since the Jarque-Bera value is greater than the 0.05 limit, our errors are normally distributed. In other words, the H0 hypothesis is accepted.

Autocorrelation	Partial Correlation		HUNGRY	PAC	Q-Stat	Probe
.|** |	.|** |	1	0.348	0.348	12,813	0.000
.|** |	.|* |	2	0.218	0.110	17,892	0.000
.|. |	.|. |	3	0.069	-0.042	18,414	0.000
.|. |	*|. |	4	-0.053	-0.101	18,724	0.001
.|* |	.|** |	5	0.175	0.255	22,091	0.001
.|* |	.|. |	6	0.151	0.067	24,634	0.000
.|* |	.|. |	7	0.139	0.003	26,822	0.000
.|* |	.|. |	8	0.086	-0.019	27,663	0.001
.|* |	.|* |	9	0.132	0.169	29,665	0.001
.|* |	.|. |	10	0.117	0.025	31,244	0.001
.|* |	.|. |	11	0.131	0.024	33,269	0.000
.|. |	*|. |	12	0.042	-0.082	33,475	0.001
.|. |	.|. |	13	-0.034	-0.033	33,612	0.001
.|. |	.|* |	14	0.062	0.088	34,073	0.002
.|. |	.|. |	15	0.041	-0.005	34,281	0.003
.|. |	**|. |	16	-0.060	-0.213	34,733	0.004
.|. |	.|. |	17	-0.064	-0.049	35,251	0.006
*|. |	.|. |	18	-0.109	0.009	36,760	0.006
.|. |	.|. |	19	-0.024	0.043	36,832	0.008
.|* |	.|. |	20	0.104	0.048	38,235	0.008
.|. |	.|. |	21	0.049	-0.022	38,550	0.011
.|. |	*|. |	22	-0.038	-0.072	38,747	0.015

.|. |	.|* |	23	0.010	0.141	38,760	0.021
*|. |	*|. |	24	-0.155	-0.158	42,055	0.013
.|. |	.|. |	25	-0.050	-0.016	42,397	0.016
.|. |	.|. |	26	-0.029	0.009	42,513	0.022
.|. |	.|. |	27	-0.060	0.069	43,028	0.026
.|* |	.|** |	28	0.181	0.222	47,767	0.011
.|* |	.|. |	29	0.146	0.066	50,897	0.007
.|** |	.|* |	30	0.224	0.108	58,334	0.001
.|. |	*|. |	31	0.032	-0.126	58,489	0.002
*|. |	*|. |	32	-0.098	-0.081	59,961	0.002
*|. |	.|. |	33	-0.080	0.002	60,945	0.002
.|. |	.|. |	34	-0.006	0.018	60,952	0.003
.|. |	*|. |	35	0.032	-0.121	61,115	0.004
.|. |	.|. |	36	0.004	-0.030	61,118	0.006

Figure 5: Q Test

According to this test (Q test), there is no break in errors.

Tablo 5: Heteroskedasticity Test: White

Variables	Values
F-statistic	6.630319
Obs.R^2	40.25801
Scaled explained	115.9385
Prob. F(9.93)	0,000000
Prob.Chi-squared(9)	0,000000
Prob. Chi-squared(9)	0,000000

According to the result of this test; there is no variable variance. It is possible to say that there is constant variance.

Tablo 6: Breusch-Godfrey Serial Correlation LM Test

Variables	Values
F-statistic	4.097891
Obs.R^2	15.15672
Prob. F(4.95)	0.0042
Prob. Chi-squared(4)	0.0044

According to the result of this test, there is no autocorrelation since the F-statistic value is less than the 0.10 limit value. While the H0 hypothesis is rejected, the H1 hypothesis is accepted. VAR analysis was applied to the data sets.
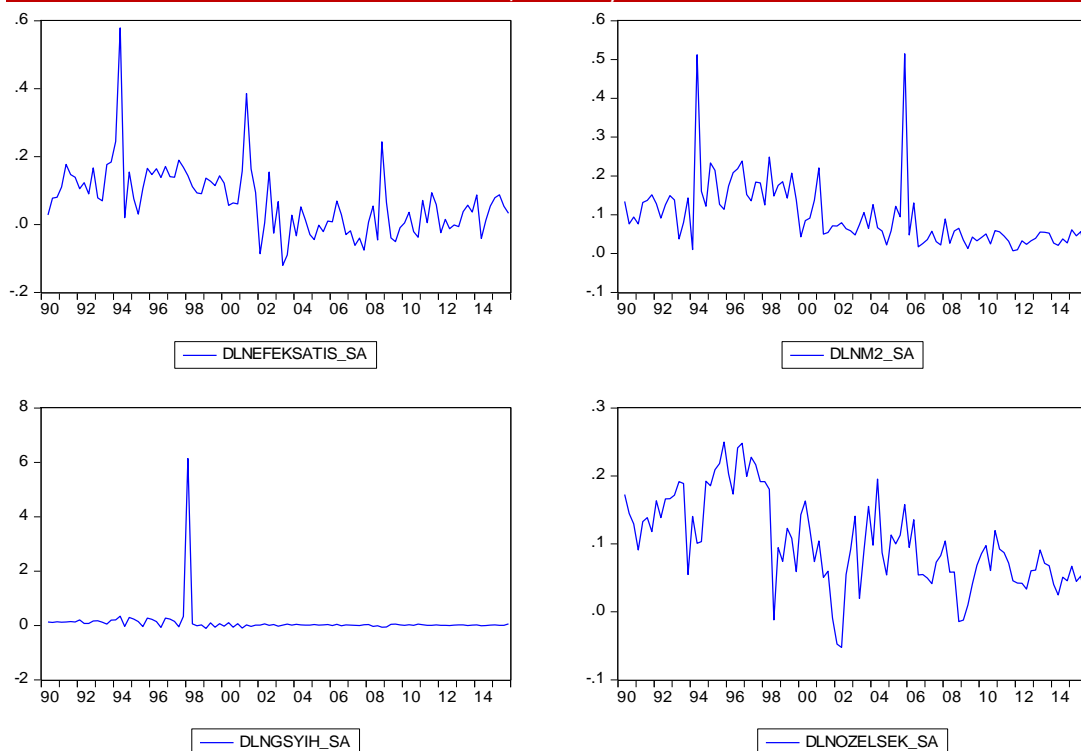
Figure 6: VAR Aanalyses Test Graph

Tablo 6: VAR Aanalyses Test Result

	T Prob.	Coefficient	Standart Deviation
PRIVATE SECTOR DEBT	1.25	0.18	0.014
M2 MONEY SUPPLY	4.36	0.49	0.112
GDP	0.83	0.01	0.146

CONCLUSION AND RECOMMENDATIONS

Industrialization, which is an important factor in economic growth, is usually realized through borrowing due to the cost of investments. However, especially in the period 1990-2015, governments in Turkey have followed various economic policies. In addition to these economic policies, there have also been changes in financial policies. One of the most obvious and important changes has been the transition to a liberal foreign economy in economic terms, and Turkey has become more active in the international economic arena. Investments have increased rapidly, especially in the transition to a floating exchange rate regime. However, this rapid increase has significantly affected the cash reserves of companies, which has reduced the need for companies to hold cash. In this case, due to developments in the financial sector, companies have generally invested by borrowing.

Due to the effect of inflation in Turkey, the Turkish Lira has experienced a rapid depreciation, especially due to the tunnelless snake theory between Europe and the USA. This situation has caused a significant depreciation in the local currencies of countries outside the European Union and the USA. In this context, companies have tried to minimize their losses by borrowing in foreign currencies (through dollarization). However, the risk rate, especially due to the floating exchange rate regime, has caused a high level of risk among the debts arising from the investments of the companies.

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