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The relationship between automobile loans and automobile production amount as a key factor for production strategy

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Abstract

The main purpose of this study is to test the relationship between automobile production quantities and the amount of automobile loans. In the study, monthly data between the period of May 2000 and June 2011 were used and these data were gathered from the Electronic Data Delivery System of the Turkish Republic Central Bank. By examining time series characteristics of the data in hand, causality relationship has been analyzed with cointegration and vector error correction models. Empirical findings point out a long-run causality from the amount of the loans to automobile production quantity. The findings also show that automobile producers should consider the automobile loans as a variable when they determine their production strategies.

Keywords: Automobile production strategy, Cointegration, VEC, Automobile loans

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1. Introduction

Even if the first impacts of the recent global crisis were experienced in the developing countries, recently, the developed countries covering the biggest economies of Europe and USA have confronted serious problems, as well. In such, Turkey has become one of the countries minimally affected from the last global crisis because it was confronted with the crisis of 2001 previously and has taken from that experience important lessons. One of these lessons was reinforcement of the banking system. Banks place the deposits they collected to the ones demanding loans through various commercial and individual loans, and by this means, they accomplish an important intermediation function in the economy. A strong banking system accomplishes an important function in order to turn the wheels of the economy.

On the other hand, current deficit is one of the issues causing Turkey to suffer lately in terms of economy. With the apprehension of the sustainability of the current deficit, the Turkish Republic Central Bank is now taking various measures, one of which is to provide increases of the loan interest and tactics such as increasing required reserves. Another goal of this tactic is to reduce domestic consumption and imports by decreasing the amount of the loans.

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Specially, very frequent usages of individual loans for financing products such as housing and automobiles can bring the productions and sales figures of these products to a relevant state with the loans. In such, it is possible to see such a circumstance in the automobile market. Having low costs and low interest for automobile loans can orientate the people who do not have automobiles to purchase one or to change existing automobiles by acquiring a loan. Since this kind of tendency has the impact to increase the demand for the automobile, it can also increase quantities of automobile production, as well. Proving such a potential relationship between automobile production quantities and automobile loans can induce automobile producers, when they determine their production strategies, to monitor vehicle loans closely, together with the developments related with the automobile loans and also the factors which may affect them. In other words, when production strategies are determined for automobile producers, automobile loans can be a variable that must be taken into consideration, together with the other factors.

In the study, starting from this motivation, by using the data of production quantities of automobiles and automobile loan amounts of deposit banks between the period of May 2000 and November 2011, the relationship between these two variables was searched empirically; it was determined whether or not there is a causality in the short- and long-run; and if there was any, an attempt was made to explain the direction of the causality.

In the second section of the study, the theoretical framework and literature review have been presented. In the third section, data and methodology were described. In the fourth section, findings were presented, and in the last section, results and policy implications were discussed.

2. Theory And Literature

The automotive industry, due to being very closely associated with other industry branches (such as iron-steel, petro chemistry) and with other sectors of the economy, is seen as the locomotive of the industry in all industrialized countries (Görener and Görener, 2008).

Starting in the last quarter of 2008, the impact of the global financial crisis on the automotive sector has been more severe when compared with the other industries, other than the housing and finance sectors. There are a few reasons for this. First of all, automobile leaders have started to encounter problems in their supply chains. Freezing of credit markets in automotive companies has caused cancellations of the purchase orders and unpaid invoices, high debt loans, and increased fixed capital, while labor costs have temporarily caused termination of production activities. Additionally, consumers faced loan restrictions during their automobile purchasing process and high costs of the automobiles have influenced consumers' automobile purchasing preferences negatively. In summary, when consumers and producers encountered loan limitations during the global crisis, this situation has caused the most serious crisis confronted in automobile sales and productions since the Great Depression (Sturgeon and Biesebroeck, 2010). In order to overcome the crisis and to stimulate the automotive sector, countries have given guaranteed loans to the automotive sector with State intervention, and in such, consumer automobile purchases were supported. According to Arbor (2010), the global economic crisis has significantly influenced debt financing by also including motor vehicle sales. Banks have limited loan amounts, even for their qualified clients, in order to protect their own additional obligations on their balance sheets. Some people have stopped their personal auto purchasing because of the limitations taking place on the loans; due to this decrease in sales, the automotive sector has reduced its costs producing fewer automobiles.

In the literature, there are many studies done on the factors which influence the sales of automotive products. Sturgeon and Biesebroeck (2009) emphasize that there are a few factors influencing the sales in the automotive sector, the first of which are the significant discounts given during the recent years, which have created saturated markets by increasing the sales of the vehicles. Second, increased vehicle endurance has caused consumers to postpone new vehicle purchases or to renew their existing vehicles. Third, maintenance costs of the vehicle, increased fuel prices, and consumers confronting budget and loan limitations have decreased consumers' automobile purchases. According to Brown (1996), there are two components influencing consumers' decisions to purchase vehicles. These are preferences of the consumer and budget provisions of the consumer. If certainty is in question for the consumers in relation with their future situations, then they prefer to purchase their vehicles with bank loans having installments.

Because of increasing competition in the automotive sector and globalization during recent years, credits provided to customers for the sales of automotive products have vital importance. According to the study results of Eken and Çiçek (2009), there is a meaningful relationship between the sales of automotive products and bank loans provided to the customers.

According to Aizcorbe and Starr-mcCluer (1997), loans related to the purchasing of the vehicle are the most common way for households to go into debt. Increase occurring in automobile loans and more competitive

opportunities for the customers who demand loans influence the automobile sector positively. In their words, Aizcorbe, Starr and Hickman (2003) have addressed the changes taking place in the financing of motor vehicles between the years of 1989 and 2011 by using the Federal Reserve's Survey of Consumer Finances household data. Additionally, they have also examined alterations of the household according to the type of motor vehicle owned; what kind of financial arrangements were used in order to obtain the vehicle; and how preference of the vehicle changes according to characteristics such as income, age, wealth and credibility of the household. According to the findings of the study, people prefer to purchase the vehicle with traditional loans rather than renting motor vehicles.

In their studies, Fan and Burton (2005) have researched financing behaviors of households in automobile renting and purchasing by using the Consumer Expenditure Survey from 2001. According to the findings of the study, having a high income level among income and demographical characteristics increase consumers' likelihood of renting a vehicle instead of purchasing it.

It can be easily summarized from the above-stated theoretical framework and literature that one of the important factors influencing automobile purchasing behaviors of consumers is the conditions of automobile credit. Credit conditions influence automobile demand, and in such, give direction for producers' production strategies.

3. Data And Methodology

In the study, the monthly production number of the automobiles between the period of May 2000 and November 2011 (AUTO), and the amount of individual automobile loan given by the deposit banks between these dates were used as the data. The study has been carried out with 138 observations, in total. Data were obtained from the Electronic Data Delivery System of the Turkish Republic Central Bank. Data were seasonally adjusted with moving averages method and their natural logarithms were taken and used in the analysis. Data (LAUTO and LLOAN) used within the study are shown in Figure 1. Again, basic statistics belonging to sample are shown in Table 1.

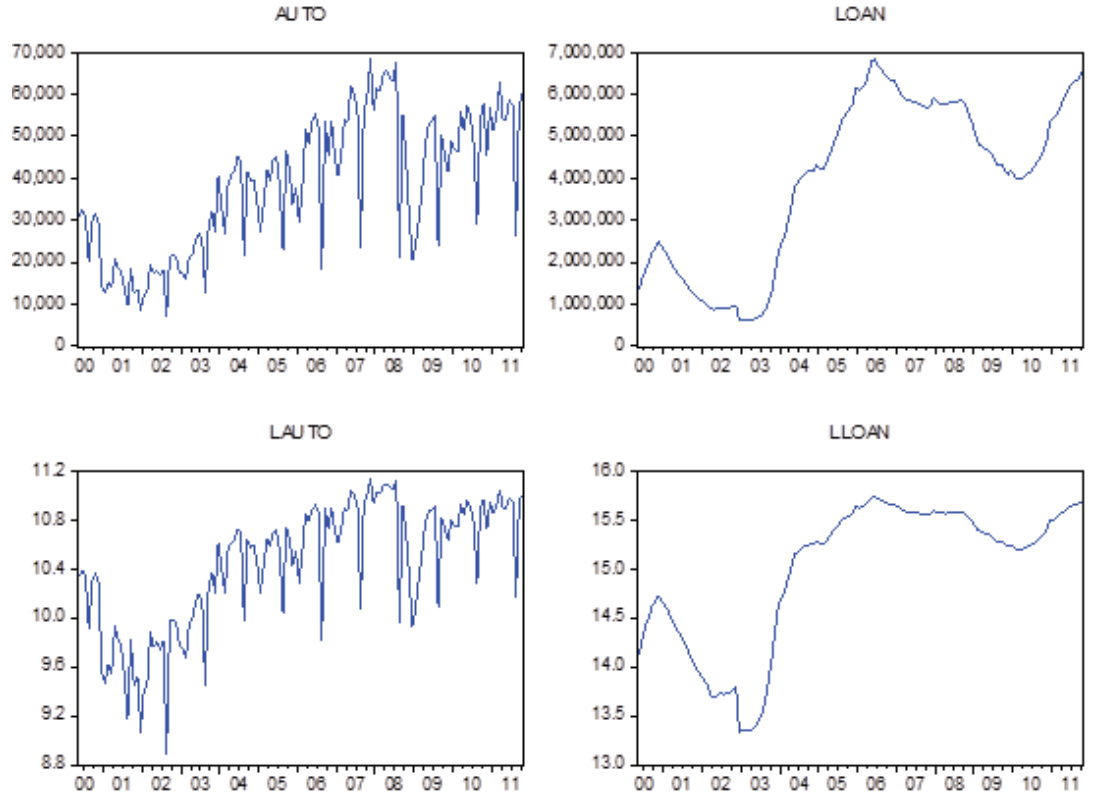

Figure 1. The Level and Logarithmic Values of Variables

Table 1. Summary Statistics

	AUTO	LOAN	LAUTO	LLOAN
Mean	38020.74	3959975	10.429	14.984
Median	39674.50	4334114	10.588	15.282
Maximum	68608	6842866	11.136	15.739
Minimum	7201	611871	8.882	13.324
Std. Dev.	16430	2011599	0.520	0.736
Observations	138	138	138	138

In order to determine the empirical methodology to be used in order to examine the relationship between the production numbers of automobiles and deposit banks' automobile loans, first the existence of the unit root in the series was used; in other words, stationarity of the series was tested. Stationarity has been tested through Augmented Dickey Fuller (ADF) and Kwiatkowski-Phillips-Schmidt-Shin (KPSS) tests. Among these tests, while ADF tests the existence of unit root in the series, KPSS tests the null hypothesis that the series is stationary. In the ADF test, rejection of the null hypothesis shows stationarity of the series, while not rejecting the same in KPSS test shows stationarity of the series.

After determining time series characteristics of the series, the Johansen (1988) cointegration test was implemented in order to test the existence of cointegration between the series. Cointegration shows that variables which are not stationary by themselves can have their linear combinations while being stationary and these variables move together in the long-run.

According to Granger (1988), if it is determined those variables are cointegrated, it is suitable to use vector error correction (VEC) models between these variables for the analysis of causality. With this purpose, the VEC models shown in equation (1) and (2) were used.

$$\Delta LAUTO_t = \alpha_{10} + \sum_{i=1}^{m} \beta_{1i} \Delta LAUTO_{t-i} + \sum_{i=1}^{n} \phi_{1i} \Delta LLOAN_{t-i} + \delta_{10} ECT_{t-1} + \varepsilon_{1t} \quad (1)$$

$$\Delta LLOAN_t = \alpha_{20} + \sum_{i=1}^{m} \beta_{2i} \Delta LLOAN_{t-i} + \sum_{i=1}^{n} \phi_{2i} \Delta LAUTO_{t-i} + \delta_{20} ECT_{t-1} + \varepsilon_{2t} \quad (2)$$

In equation (1) and (2), LAUTO automobile production quantity's logarithm and LLOAN automobile loan amount's logarithm are shown. On the other hand, ECT is named as an error correction term in the VEC models and expresses the approach to long-run balance between the variables. In VEC models, long-run and short-run causality can be examined. While ECT term shows long-run causality impacts, joint test of exploratory variables' lags analyses short-run causality (Love and Chandra, 2005).

4. Empirical Results

The empirical results of the study will be presented in this section. First, stationarity of LAUTO and LLOAN variables were analyzed with ADF and KPSS tests and the results are shown in Table 2. According to ADF results, the null hypothesis of having unit roots at the level cannot be rejected for both variables. When the same test is realized by taking the first differences of the variables, it was determined that stationarity was provided. Consequently, it is possible to say LAUTO and LLOAN variables are I(1). KPSS test results also support this finding.

After determining that the series are I(1), the Johansen Cointegration test was performed and results are shown in Table 3. According to Cointegration test results, the null hypothesis of two variables that are not cointegrated is rejected. Then, it can be said that two variables are cointegrated. After normalization of the cointegration vector, the long-run relationship between two variables can be shown as $LAUTO = 0.560\ LLOAN$.

Estimated results of the VEC models formed for the analysis of causality between two variables and expressed in equation (1) and (2) are presented in Table 4. Lag length in the model was selected by the mediation of Schwarz Information Criterion (SIC) and Hannan-Quinn Information Criterion (HQ). According to estimated results obtained from the VEC models, Granger causality was examined. Results in the orientation of short- and long-run causality can be observed in Table 4. According to the results of the joint test of lagged exploratory variables, there was no finding about the existence of short-run causality between the variables. On the other hand, in order to examine long-run causality, the significance and sign of ECT terms' coefficient were examined and the result of this is that there was evidence obtained in the orientation of having significant long-run causality from the loan amount to automobile production quantity.

Table 2. Unit Root Tests

	LAUTO			LLOAN		
	None	C	C&T	None	C	C&T
ADF(Level)	0.942	-1.624	-2.509	0.415	-1.166	-2.184
ADF (Difference)	-3.185*	-3.334**	-3.323	-4.343*	-4.349*	-4.329*
KPSS (Level)	-	1.076*	0.188**	-	0.926*	0.176**
KPSS (Difference)	-	0.254	0.102	-	0.089	0.084

None: No constant and trend C: with constant C&T: with constant & trend
ADF: Augmented Dickey Fuller KPSS: Kwiatkowski-Phillips-Schmidt-Shin
* Significant at%1 ** significant at %5

Table 3. Johansen Cointegration Test Results

Hypothesis	**Eigen value**	**Max. Eigen Statistics**	**Trace Test Statistics**
$r = 0$	0.214	32.641*	38.068*
$r \leq 1$	0.039	5.426	5.426

*Significant at 1%

Table 4. Error Correction Model Estimation Results

	Dependent Variables	
	$\Delta LAUTO_t$	$\Delta LLOAN_t$
Constant	-0.0008 (-0.030)	0.003 (0.616)
ECT_{t-1}	-0.418 (-3.726)	0.046 (1.233)
$\Delta LAUTO_{t-1}$	-0.261 (-2.356)	-0.026 (-1.301)
$\Delta LAUTO_{t-2}$	-0.103 (-1.116)	-0.010 (-0.579)
$\Delta LLOAN_{t-1}$	0.832 (1.825)	0.347 (4.143)
$\Delta LLOAN_{t-2}$	-0.148 (-0.330)	0.255 (3.104)
	Short Run Granger Causality (χ^2 Statistics)	
$AUTO \rightarrow LOAN$	1,749 [0.417]	
$LOAN \rightarrow AUTO$	3,844 [0.146]	

(.): t values [.]: significance levels

5. Conclusion and Policy Implications

Together with globalization, buyer-supplier relations in the automotive sector are becoming apparent between long distances. Additionally, because of global integration, it is possible to use much more varied financial tools in the purchasing of automobiles. Automobile renting and the utilization of automobile loans by the banks can be given as the examples of these. Consumers prefer to purchase new cars especially by using automobile loans provided by the banks, because consumers see the automobile as a durable consumer good and they are able to obtain loans in the financial sector with competitive prices. At the same time, vehicles purchased with these bank loans can lead to an increase of the production in the automotive sector.

In this study, the causality relationship between automobile production quantities and automobile loan amount of deposit banks was analyzed with the assistance of cointegration and VEC Models by using the data from the 2000-2011 periods, taken from the Electronic Data Delivery System of the Turkish Republic Central Bank. According to empirical results, there is long-run causality from the amount of the loan to production quantity.

In literature, despite the presence of studies relating to the economic structure of consumer decisions in automobile purchasing and dealing with the factors influencing the sales of automotive products, studies dealing with the relationship of automotive products' sales with the loans are rather limited. For this reason, this study has the ability to direct future studies. On the other hand, when determining production strategies of automobile producers, this study supplies evidence about the requirement of having the examination of loan conditions and loan amounts. In addition, results show that loan amounts will be a leading indicator in the estimation of future sales. Following studies can also consider loan amounts as an important variable in the mathematical models used by them by focusing on the forecasting of automobile sales quantities.

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