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IS HARBERGER-LAURSEN-METZLER HYPOTHESIS VALID IN TURKEY?¹

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ABSTRACT

Purpose- In so far as financial development that supports the supply-side view as well as the country's competitiveness, a rapid increase in import price index in comparison to the export price index brings forth the deterioration regarding trade. A similar case also exists in Turkey. The aim of the study is to test the relationship between foreign trade balance and terms of trade in Turkey.

Methodology- In this study, the monthly data of terms of trade and foreign trade balance for the period 2005: M1 - 2017: M4 are analyzed for Turkey, and the validity of Harberger-Laursen-Metzler Hypothesis is tested.

Findings- The deviations in the short run converge to the long-term equilibrium in approximately 6 months period. In addition, considering the normalized long-term relationship, the 1-unit increase in the terms of trade would cause an average increase of \$ 321,335 in the estimated dependent variable, namely, the foreign trade balance.

Conclusion- There exists a long-term relationship between the variables, namely, terms of trade and foreign trade balance. Moreover, there is a short-term unilateral causality from foreign trade balance to terms of trade.

Keywords: Terms of trade, balance of trade, cointegration, Harberger-Laursen-Metzler Hypothesis.

JEL Codes: F14, F32, F41

1. INTRODUCTION

The terms of trade are the indicators that cover the long- and the short-term commercial movements of different economies, the change of the scale of goods subject to foreign trade over time and external economic dynamics in this context. In today's economic world which is affected by globalization as a whole, even in a period through which so-called openness is asserted to a large extent, the relationship between international foreign balance and terms of trade has become a matter of debate along with the increased international mobility of goods. The relationship between exchange rate / foreign trade balance / current account balance and terms of trade that can be estimated with various indicators such as exchange of goods and export/import quantity indexes are explicated using different hypotheses. Although approaches of "J and S Curves" and "Harberger Laursen Metzler-HLM Effects" are included in these hypotheses, the relationship between terms of trade and foreign trade balance in Turkey is examined within the context of HLM approach. Turkey is an emerging country so economic growth is mostly determined by export and import i.e foreign trade. If HLM hypothesis is valid in Turkey, solution will be to rearrange the terms of trade.

In the first section of the study, the theoretical background of the relationship between foreign trade balance and terms of trade is given within the framework of the approach and the second section is devoted to the literature review. In the third and the last section of the study, the validity of HLM approach in Turkish economy is tested via econometric modeling.

Terms of trade, also known as terms of international trade, define the relationship between export price and import price indexes of a country (Parasız 2013, 72), while relative prices are used instead of terms of trade to be defined as the rate of exchange of export goods with import (Seyidoğlu 2007, 55). While it is known that studies related to terms of trade started

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in the second half of the 19th century, consideration of the concept begins with the Classical economists' inquiry of "which goods would be subject to trade and which goods would be exported and which goods would be imported by the countries" (Hepaktan and Karakayali, 2009, 182). Since the calculation methods of terms of trade for the countries differ, the table below contains some variations and explanations regarding these calculations.

Table 1: Variations and Explanations of the Terms of Trade

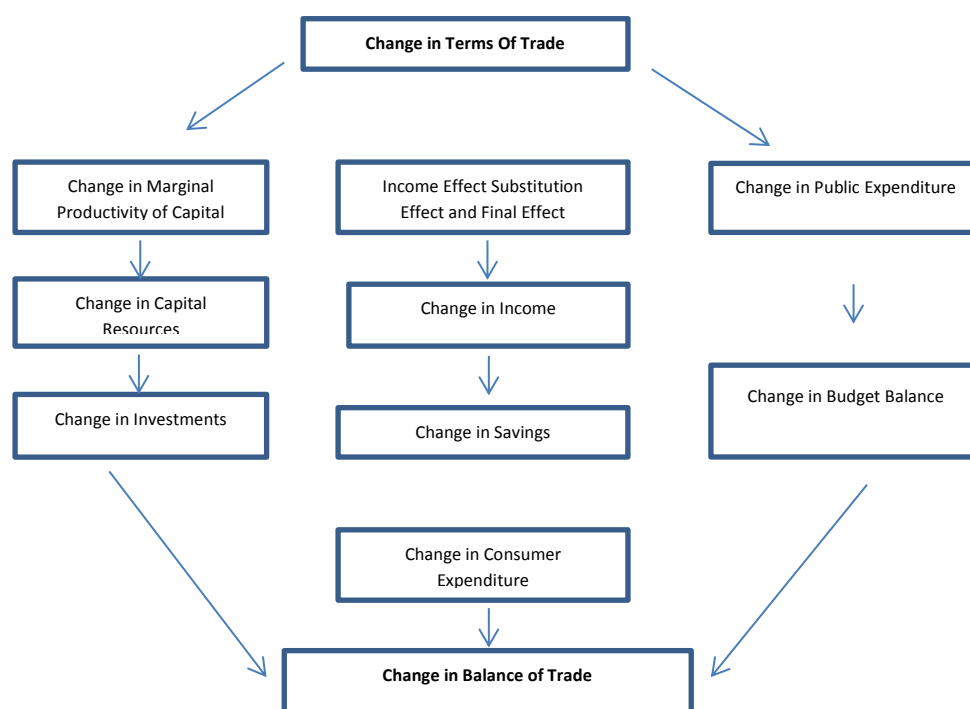
Definition of the Terms of Trade in Consideration of Barter		
Type of the Terms of Trade	Formula	Explanation
Net Barter Terms of Trade (N)	$N = P_x / P_M$ (P_x : export price index, P_M : import price index)	It is obtained by equating export prices. Since it only involves purchase & sale of goods, it may lead to deceptive results in measuring the productivity of the trading parties. Its advantage is based on the indication of the short-term changes.
Gross Barter Terms of Trade (G)	$G = Q_M / Q_x$ (Q_M : import quantity index, Q_x : export quantity index)	It is the ratio of import quantity index to export quantity index. It is used to eliminate the shortcomings of prices indexes. It faces criticism similar to Net Barter Terms of Trade.
Income Terms of Trade (I)	$I = D_x / P_x = (P_x / P_M) \cdot Q_x$ (D_x : export value index)	It indicates the purchasing power of exports since the importing capacity of the country is explained regarding exports. Therefore, it is also known as export-based import capacity index. It is criticized for not considering the change in productivity.
Definition of the Terms of Trade in Consideration of Factorial Change		
Single-Factorial Terms of Trade (S)	$S = (P_x / P_M) \cdot V_x$ V_x : productivity index in export sector	It is defined as a good economic welfare indicator in determining returns from foreign trade, while it is quite difficult to estimate the changes in productivity of resources in practice.
Double-Factorial Terms of Trade (D)	$D = (P_x / P_M) \cdot (V_x / V_M)$ V_x : productivity index in import sector	An increase in Double-Factorial Terms of Trade indicates that one unit of input used in export sector would be replaced by more foreign inputs. However, calculation of the quantity of import goods to be obtained corresponding to the change in exports involves somewhat uncertainty.
Definition of the Terms of Trade in Consideration of Utility		
Real Cost Terms of Trade (R)	$R = S \cdot E$ (R =real cost terms of trade, E = Disutility coefficient index of exports)	Disutility coefficient index of exports indicates that each unit of increasing imports leads to a rise in real costs.
Utility Terms of Trade (F)	$F = R \cdot (U_o^M / U_o^A)$ U_o^M / U_o^A : The index of the relative utility of the foregone domestic goods and the imported goods.	In the formula, the domestic goods foregone and the imported goods are denoted by A and M; respectively, while utility index is denoted by U. Since technical and utility coefficients of exports and imports are not measurable, they are not used.

Source: Prepared by the authors with reference to Aslan and Yörük (2005) and Ergin and Yetiz (2017).

In Table 1, terms of trade that can be calculated via different variations not only affect many indicators in the international economy but also give information about the level of development of the country's economy. Moreover, in the case of trade openness, especially the imbalance of payments in the country's economy is important. In this context, the approaches used in studies conducted on terms of trade and foreign trade balances do take certain criteria into account, and they are separated from each other in various aspects. Among these, the J-curve approach is based on the impacts of short-term exchange rate or terms of trade due to price and quantity delays on the foreign trade balance, while the S-curve approach indicates that the relationship between foreign trade balance and terms of trade is negative in the short-term

again. Another approach, namely, Harberger-Laursen-Metzler, states a straightforward relationship between foreign trade balance and terms of trade (Bekar and Terzi 2016, 36).

Figure 1: Transmission Mechanism for the Terms of Trade



Source: Misztal (2009).

According to Laursen-Metzler (1950), any change in terms of trade affects macroeconomic data as follows (Oktar and Dalyan 2012, 5):

- *Improvement regarding trade*: the recovery of real income growth and the current account balance
- *Deterioration in terms of trade*: increase in expenditure items in exports, decreasing savings and deterioration in the current account balance

In other words, any change in terms of trade would penetrate through the foreign trade balance and even in the same direction. The issue to be noted here is that a change in terms of trade affects the foreign trade balance basically through three channels. These are the Savings channel, the Savings-Investment Channel and the Public Expenditure channel. Figure 1 illustrates the algorithm of changes.

2. LITERATURE REVIEW

The impacts of the terms of trade on both income and growth have been extensively reviewed in the literature, and there are also some other studies in which its impacts on the foreign trade balance are also analyzed. It is foreseen that the change in terms of trade leads to the change in both national income and imports along with the savings and the investment channels, in turn, results in the change in the foreign trade balance. This theory, referred to as the 'Harberger-Laursen-Metzler- HLM (Harberger, 1950: Laursen and Metzler, 1950) in the literature, is generally tested using the time-series and panel data analysis. Turkey is among the countries with the problem of the trade deficit at high levels. In this context, the studies conducted on explaining the deterioration and improvement of the foreign trade balance are considered for testing the validity of the HLM theory for the Turkish economy.

In this regard, in Yaman and Korkmaz (2006)'s study on Turkey, this relationship is examined by the Granger Causality Test between 1991: Q4 - 2003: Q3 and it is detected that a positive shock in terms of trade may have caused deterioration in the foreign trade balance. Similarly, Oktar and Dalyan (2012) performed VAR and Cointegration analyses using monthly data for the period 2004 - 2011 and indicated that a positive shock in terms of trade would have led to an improvement in the current account balance. Küçükaksoy and Çiftçi (2014) also tested the validity of HLM Hypothesis with Johansen Cointegration Test, Granger Causality Test and VAR models using monthly data for the period 2003: M1 - 2014: M4. Their

findings include the existence of a long-term cointegration between the variables, recovery of the foreign trade balance after nine months following the deterioration in the early periods due to a shock in terms of trade and the validity of the HLM Hypothesis for Turkey. Bekar and Terzi (2016) examined the validity of the S-curve related to the relationship between the terms of trade and foreign trade balance via the Hodrick-Prescott Filter Method using monthly data between 2002: M1 - 2014: M12 for selected goods. The analysis results revealed that the S-curve is valid in trade of some goods. Lars et al. (1983) examines the effect of terms of trade changes on a small country with perfect capital mobility. In their study two periods and infinite horizon are examined. Mansoorian (1993) used the habit persistence model of Ryder and Heal to examine the Harberger Laursen Metzler effect. He found that HLM effect holds and terms of trade deterioration reduces savings. Otto (2003) investigated the existence of HLM effect on a small economy by using structural vector autoregression model. He found a strong support for the existence of HLM effect. Bouakez (2008) investigated the HLM effect on Australia, Canada and United Kingdom. His results show that terms-of-trade movements do not affect the current account in a significant way. Choi, Hur and Kang (2017) analyze the effects of terms of trade shocks in the Korean economy. They discuss that although the shock deteriorates the terms of trade (TOT), it is clearly associated with an expansionary effect on output, which is more pronounced at longer horizons. Karol et al. (2017) test the validity of HLM hypothesis for the Slovakia, Croatia and Czech Republic. The conclusions come from the structural vector autoregressive analysis of the cyclical components of **terms-of-trade**, **trade** balance, output, consumption, and investment in three post-communist countries. Brueckner and Carneiro (2017) estimates the effects that **terms of trade** volatility has on real gross domestic product (GDP) per capita growth. They find that the GDP share of domestic credit to the private sector has no significant effect on the relationship between growth and **terms of trade** volatility.

3. DATA AND METHODOLOGY

In this study which analyzed the relationship between the terms of trade and foreign trade balance within the context of Turkey; the terms of trade and foreign trade balance are represented by index and difference between nominal export and import values, respectively. The analysis period consists of 2005: M1 - 2017: M4 period on a basis of monthly data. The data series are obtained from the database of Turkish Statistical Institute (TSI). In the analysis of the data, EViews software is utilized. The series included in the study are tested by the Augmented Dickey-Fuller (ADF) unit root method. Time-series method is used in the study. Unit root tests are applied to determine the level of stationarity of the data. If the variables are determined to be cointegrated at the same level as a result of the stationarity test, Johansen & Juselius cointegration method would be used to investigate whether or not a long-term relationship exists. While the marriage of a couple can be regarded as a cointegration relation for two variables, the engagement period of this couple can be regarded as the short-term effect analysis, also known as error correction model. The error-correction model, as a short-term analysis, helps in determining how long would the engagement period, in other words, the short-term effect last. Following the error correction model, the causality relation between the variables is to be tested with Error Correction Model Granger causality test.

4. FINDINGS AND DISCUSSIONS

This section shows the results of tests and findings.

4.1. Augmented Dickey-Fuller (ADF) Test

The Augmented Dickey-Fuller (ADF) test analyzes whether or not the examined data contains a unit root.

In the first degree auto regressive model, using endogeneous variable, Y_t , and time index, t , $\Delta Y_t = (\rho - 1)Y_{t-1} + U_t = \delta Y_{t-1} + U_t$ function illustrates $I(1)$ operator.

Here, the hypothesis $\delta = 0$ is tested. When $\delta = 0$, since the change between periods is based on a random variable, the null hypothesis is expressed as "unit root exists". Or if;

$Y_t = \rho Y_{t-1} + U_t$, when $|\rho| \geq 0.05$, the unit root exists. However, this test does not compute t-statistics on the standard T distribution since it is applied on residual terms, but not on raw data, and compares it with the critical values in MacKinnon (1996) (Uçan 2013, 161-162).

Table 2: Unit Root Test Results

Augmented Dickey-Fuller (ADF)					
Series	Level		Series	1 st Diff.	
	ADF Value	Prob.		ADF Value	Prob.
FT_Balance	-3.161	0.096	FT_Balance	-11.696	0.0000

T_OT	-2.633	0.266	T_OT	-3.652	0.0003
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In the analysis, the series are tested using the ADF unit root technique. It is seen that the variables included in the study become stationary at the first differences level, namely, I (1). For the existence of a long-term relationship between the variables after the stationarity of the variables has been established, the optimal lag lengths in the framework of the VAR analysis are determined by the lag length criterion.

Table 3: VAR Lag Length Result

Lag	LogL	LR	FPE	AIC	SIC	HQ
0	-2548.646	NA	6.69e+13	37.50950	37.55233	37.52690
1	-2363.036	363.0312	4.63e+12	34.83876	34.96726*	34.89098*
2	-2357.930	9.835301	4.55e+12	34.82251	35.03667	34.90954
3	-2352.959	9.430811	4.49e+12*	34.80822*	35.10805	34.93007
4	-2351.778	2.206269	4.68e+12	34.84967	35.23517	35.00633
5	-2348.858	5.366714	4.76e+12	34.86556	35.33673	35.05703
6	-2345.379	6.292966	4.80e+12	34.87322	35.43006	35.09951
7	-2341.005	7.782772	4.77e+12	34.86773	35.51023	35.12882
8	-2338.504	4.378226	4.88e+12	34.88976	35.61792	35.18567
9	-2334.361	7.127720	4.88e+12	34.88766	35.70149	35.21838
10	-2333.444	1.550396	5.11e+12	34.93300	35.83250	35.29854
11	-2331.456	3.303459	5.27e+12	34.96259	35.94776	35.36294
12	-2324.716	11.00270*	5.07e+12	34.92229	35.99312	35.35745

Note: LR: Likelihood Rate Test Statistics; FPE: Final Prediction-Error Criteria; AIC: Akaike Information Criteria; SIC: Schwarz Information Criteria; HQ: Hannan-Quinn Information Criteria.

The results of AIC and SIC criteria are generally used in the literature. In this study, since 1 lag indicated by SIC result is thought not yield statistically significant results due to monthly data, 3 lags selected by AIC result are used.

4.2. Johansen-Juselius Cointegration Test

The cointegration analysis tests the existence of a long-term relationship among stationary series of the same order. If the series are directly subjected to the least squares method whenever they are cointegrated in the same order (for example I (1)), a case of spurious regression is encountered, so that the existence of a long-term relationship would be neglected. If at least one long-term relationship is found following the cointegration analysis, the relationship between the series becomes a significant regression. In this study, the Johansen-Juselius cointegration technique, which investigated the long-term relations in terms of trade and foreign trade balance variables, is performed. The trace test and the maximum eigenvalue test are considered to determine the number of Johansen-Juselius cointegration vectors and whether or not they are significant (Esen 2012, 94).

Table 4: Johansen-Juselius Cointegration Test Results

Trace Test	5% Critical Value	P-Value**	Null Hypothesis
15.044	15.494	0.0290	None *
2.055	3.841	0.1517	At most 1
Maximum Eigenvalue Statistitcs	5% Critical Value	P-Value**	Null Hypothesis
14.989	14.264	0.0383	None *
2.055	3.841	0.1517	At most 1

* the null hypothesis is rejected at 5% significance level.

**based on MacKinnon-Haug-Michelis (1999) values.

In Table 4, the results pertaining trace and maximum eigenvalue statistics of Johansen-Juselius cointegration analysis are shown. The null hypothesis, indicating that there is no cointegration relation, is rejected according to both test results. This means that there is at least one cointegration relationship between terms of trade and foreign trade balance. It means that there is a long-term relationship between terms of trade and foreign trade balance. In the later phase of the analysis, the error-correction model is applied to examine what type of process through which this obtained long-term relationship passes in the short-term.

4.3. The Error-Correction Model (ECM)

The cointegration that shows the existence of a long-term relationship among variables indicates an interaction among the series also in the short-term. An error-correction model should be applied to determine how long the interactions, in other words, the fluctuation in the short-term would converge to the long-term equilibrium. Assuming that the two variables such as X and Y are cointegrated, the error-correction equation would be as follows:

$$\Delta Y_t = \alpha_0 + \alpha_1 \Delta X_t + \alpha_2 U_{t-1} + V_t$$

Here, ΔY_t represents the lagged value of Y_t . ΔX_t , on the other hand, represents the lagged value of X_t . α_0 , α_1 , α_2 , and U_{t-1} denote the constant term, the short-term coefficient, the balancing error term and, the lagged value of the error term that expresses the long-term equilibrium adjustments, respectively. V_t is shown as a white noise error term (Dikmen 2012, 312).

Table 5: Error-Correction Model

	FT_Balance
Error Correction coefficient	-0.173*
Standard deviation	(0.062)
Estimated T value	[-2.787]
<i>Normalized Equation</i>	
	$FT_Balance(-1) = 38766747 + 321335 T_OT(-1)$
Estimated T value	[-3.579]

It is expected that the error correction coefficient obtained from the error correction equation is negative and that statistically significant value is obtained between zero and minus one. In Table 5, the error-correction coefficient is found as -0.173. The error-correction coefficient is statistically significant according to the obtained *t*-value. Accordingly, -0.173 of the short-term deviations which occur in relation to foreign trade balance and the terms of trade disappear per annum. That is, these deviations would converge to the long-term equilibrium in approximately 6 ($1 / |-0.173| = 5.78$) months period. In addition, considering the normalized long-term relationship, the 1-unit increase in the terms of trade would cause an average increase of \$ 321,335 in the estimated dependent variable, namely, the foreign trade balance.

4.4. Granger Causality Test

The Granger causality test is a method of investigating whether or not a mutual interaction exists between the series. A possible bilateral causality would be expected between the series with cointegration relationship, while a unilateral or no relationship would also be encountered. Essentially, Granger (1969), while defining causality, stated that "X is said to Granger-cause Y if Y can be better predicted using the histories of both X and Y than it can by using the history of Y alone" (Granger, 1988: 554).

Table 6: HDM Granger Causality Test Results

H₀ (No Granger Causality)	Chi-square	Prob.	Decision
D(T_OT) \neq D(FT_Balance)	1.075	0.584	Accept H ₀
D(FT_Balance) \neq D(T_OT)	9.457	0.008	Reject H ₀

The equations of the statement are as follows:

$$Y_t = \sum \alpha_i n_i = 1 Y_t - i + \sum \beta_i n_i = 1 X_t - i + \epsilon 1_t$$

$$X_t = \sum \lambda_i n_i = 1 X_t - i + \sum \delta_i n_i = 1 Y_t - i + \epsilon 2_t$$

Here; for $i = 1, 2, \dots, n$, α_i , β_i and δ_i represent the lag coefficients. Also $\epsilon 1_t$ and $\epsilon 2_t$ refer to error terms with white-noise characteristics. Therefore, the causality relationship between the series can be explained by these equations. Also, if the probability value is less than 0.05 at the 5% level of significance, the null hypothesis is rejected and it is understood that the series Granger cause each other.

According to the results of the ECM Granger causality, the existence of a unilateral causality relation from FT_Balance to T_OT is determined in the short-term under the constraint of the period covered.

Econometric results indicate that HLM Hypothesis is valid in Turkey. That means, positive changes in terms of trade, *ceteris paribus*, would also cause positive changes in the economy's balance of foreign trade. So aggregate demand increases resulting in rise in economic growth.

5. CONCLUSION

The relationship between terms of trade and the current accounts in a broad sense and the relationship between terms of trade in a narrow sense is a matter of considerable research in the economics literature.

The fact that macroeconomic indicators are not so important in both developed and developing countries' economies is seen as the result of globalized world trade and the transfer of competitiveness along with growth rates across the countries.

More precisely, liberalized financial and real markets have led to the differentiation of import and export items which have changed the size of merchandise trade between countries. Thanks to the countries with different macroeconomic structures and trade flows with dynamic frameworks, the relationship between terms of trade and the balance of foreign trade preserves its vitality. Here, on the other hand, the discussion of the extent to which different theories and approaches are appropriate for the country's economic structure is analyzed by various econometric tests and theoretical explanations. While Harberger-Laursen-Metzler (HLM) hypothesis is one of the approaches on terms of trade and balance of foreign trade, it is argued that the positive (negative) changes in terms of trade, *ceteris paribus*, would also cause positive (negative) changes in the economy's balance of foreign trade. The keypoint here is inquiring the validity of such theory in the macroeconomic structure of each country. In this study, the applicability of HLM for Turkey is explicated by utilizing theoretical background as well as econometric methods. With a clearer statement, the impact of terms of trade on balance of foreign trade is analyzed for Turkish economy pertaining HLM. According to the obtained findings, there is a long-term relationship between and whereas a short-term causality relationship from the foreign trade balance toward terms of trade is found.

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