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# The Harberger-Laursen-Metzler Effect. Theory and Practice in Poland

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*The aim of the article is analyses of the Harberger-Laursen-Metzler effect in light of the theory and in practice, with particular reference to this effect in Poland in the period 1995-2009. The results of research carried out by means of the vector autoregression model (VAR) revealed that temporary improvement in terms of trade in Poland led to the current account improvement, and permanent improvement in terms of trade contributed to the current account deterioration. Thus it was confirmed prevalence of the Harberger-Laursen-Metzler effect in Poland.*

*Additionally, results of investigation confirmed relatively greater impact of temporary changes in terms of trade on the current account than in the case of permanent changes in terms of trade. Analogous interdependence was revealed with reference to clarification of the current account variability. Temporary changes in terms of trade accounted for in much more extent the current account variability in relation to permanent changes in terms of trade.*

Key words: *terms of trade, current account, economic growth*

JEL Classification: *F32*

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## I. Introduction

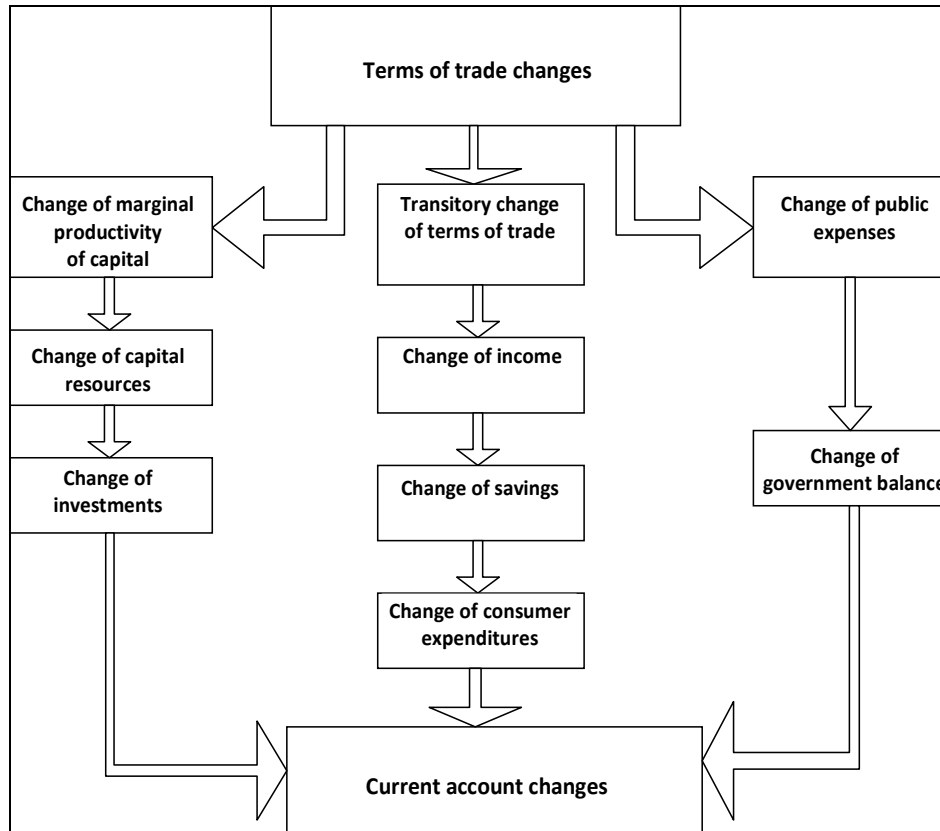
In accordance with the Harberger-Laursen-Metzler (H-B-L) effect also called as the Laursen-Metzler effect, temporary deterioration in terms of trade leads to decrease of national savings and hence to the deterioration of the current account. This situation results from the fact that the deterioration in terms of trade leads to a decrease in real income. In this situation, in order to maintain standard life at a given level consumers increase its *marginal* propensity to consume (reduce the marginal propensity to save), leading to a decline in national savings and to the deterioration of the current account (trade balance) as a result of higher growth of prices of imported goods (Turnovsky 1997: 1-520). On the other hand, temporary improvement in terms of trade leads to increase of national savings and improvement in the current account. This situation is the consequence of that national consumers treats improving terms of trade and increasing income as a temporary and they decide to reduce current consumption expenditure and increase savings, what leads to the improvement of the current account (Chowdhury 2003: 1-32). According to Laursen and Metzler, deterioration in terms of trade resulting for example from the depreciation of the domestic currency makes two mutually opposed absorption effects, i.e. income effect and substitution effects. In accordance with the first effect, price deterioration in terms of trade leads to a decrease in income, which negatively affects on national absorption. On the other hand, according to a substitution effect, the increase in prices of imported goods leads to replace an expensive import by cheaper national products what finally leads to increase of national absorption. Therefore, the final impact of changes in terms of trade on current account depends on the size of these two effects. If the income effect is greater than the substitution effect, the deterioration in terms of trade leads to deterioration of the current account. However, when substitution effect is larger than the income effect, deterioration in terms of trade leads to improve in the current account. H-B-L effect plays a particularly significant role in

discussions on the relative importance of elasticity and absorption approach to the effects of national currency depreciation on the trade balance and balance of payments (Wang 2009: 1-432).

## **II. H-B-L effect in the light of empirical studies**

In the economics theory there is an ambiguous relationship between changes in terms of trade and current account. However, final influence of terms of trade on current account depends on many different factors, such as duration of terms of trade shock (temporary or permanent), forecasts relating to terms of trade changes (anticipated or unanticipated changes) and the type and importance of transmission channel of price shock. In the economics literature regarding H-B-L effect presented researches can be divided into three groups in terms of the type of transmission channel of price shock (Duncan 2003: 1-23). In accordance with the first group of works, changes in terms of trade lead to changes in current account by changing the size of the total savings in the country (Sachs 1981: 201-268; Obstfeld 1982: 251-270). In turn, the authors included to the second group argue that changes in terms of trade lead to changes in national savings and investments, which ambiguously affect on current account (Persson, Svensson 1985: 43-65; Sen, Turnovsky 1989: 227-250; Servén 1999: 79-101). The third group of studies concern analysis, in which authors presuppose that change in terms of trade leads to change the size of public expenditure, which alter the government budget and the current account, in accordance with so-called theory of twin deficits (Tornell, Lane 1999: 1-41).

**Figure 1**  
**Transmission channels of terms of trade to the current account**



Source. Own study.

Sachs (1981: 201-268) proved the presence and size of H-B-L effect depends on duration of price shock (terms of trade change). However, he confirmed the existence of this effect only in the case of temporary changes in terms of trade. While the occurrence of this effect in case of permanent terms of trade changes is ambiguous because permanent terms of trade changes affect only the consumption and do not cause changes in the level of national savings. Furthermore Otto (2003: 155-184) analyzing the fifteen OECD member countries and selected forty

developing countries and using vector autoregression model (VAR) confirmed that temporary improvement in terms of trade leads to improvement balance of trade in all OECD member countries, as well as in developing countries. In turn, Dornbusch (1983: 141-153) and Edwards (1989: 343-357) on the basis of empirical studies concluded that the temporary change in terms of trade have a clear impact on the size of private savings. Namely, the deterioration in terms of trade can affect the size of private savings in three ways. Firstly, terms of trade changes can contribute to reduction of the current national income in relation to the future of national income (H-L-M effect). Secondly, terms of trade changes can lead to increase of current import prices in relation to future import prices and thus contribute to postponement the date of the consumer purchases, simultaneously increasing their savings. Thirdly, the deterioration in terms of trade can lead to an increase in prices of imported goods in relation to the prices of non-*tradables* and thereby contribute to the real appreciation of the national currency. This situation finally leads to increase of interest rate, what contributes to postpone the current consumption and increase the size of national savings.

Moreover, Eicher, Schubert and Turnovsky (2008: 876-896) proved, that reaction of given economy to change in terms of trade depends primarily on whether country is a net creditor or debtor in relation to the rest of the world. At the same time, the results of these studies indicate that the deterioration in terms of trade by 20% leads to decrease of the welfare by about 10-15%.

### III. Model of the Harberger-Laursen-Metzler effect in Poland

In order to analyze the relationship between changes in terms of trade and current account in this paper were used econometric model proposed by Kent and Cashina (2003: 1-47) and presented by the following equation:

$$\Delta CA_t = \sum_{j=0}^n \alpha_j \Delta CA_{t-j} + \sum_{j=0}^n \beta_j \Delta GDP_{t-j} + \sum_{j=0}^n \gamma_j \Delta TOT_{t-j} + \mu_t \quad (1)$$

where: CA –current account;

GDP – nominal gross domestic product;

TOT- terms of trade;

t-period of time;

n – lag of variables.

It should be noted that in this work, the current account is not expressed as the difference between the export and import of goods and services, but as a ratio of the value of exports to the import of goods and services. Such approach is commonly used in many studies on similar issues and is preferred, because this index (cover ratio) does not react to a change of unit in which it is measured and can be treated as nominal current account (Bahmani-Oskooee 1991: 89-96). A key issue in VAR model was the analysis of distribution chain between variables. In this model the distribution chain was shown by the following equation:

$$TOT \rightarrow GDP \rightarrow CA \quad (2)$$

In accordance with the adopted distribution chain terms of trade changes affect national income, which makes the current account changes. This distribution chain was in line with the theoretical approach to H-L-M effect and with the results of Granger causality. Before the analysis of terms of trade impact on the current account a key issue was the distinction between permanent and temporary changes in terms of trade. In accordance with the methodology adopted by many researchers of this phenomenon, permanent change in terms of trade was measured by using a trend line obtained by means of standard Hodrick-Prescott filter. In turn, temporary change in terms of trade was measured using cyclical residuals obtained from time series after applying Hodrick-Prescott filter. Therefore, total

terms of trade changes consisted of two components, i.e. isolated trend and residual (Agénor, Aizenman 2000: 1-25; Kent, Cashin 2003: 1-47).

$$TOT = TOT_t + TOT_c \quad (3)$$

where:

TOT-total change in terms of trade;

TOT<sub>t</sub>-permanent change in terms of trade;

TOT<sub>c</sub> – temporary change in terms of trade.

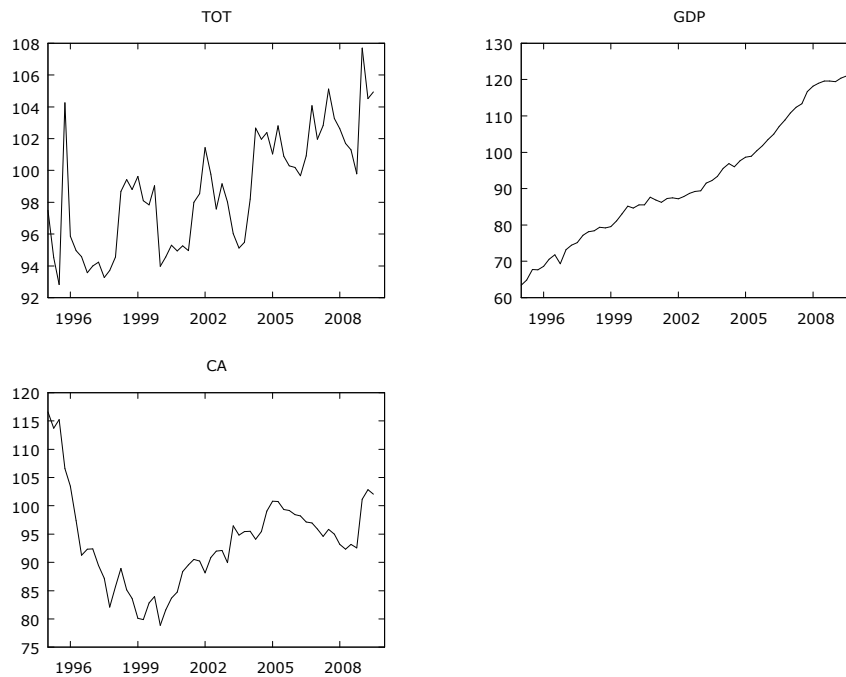
Therefore, in order to analyze the impact of permanent and temporary changes in terms of trade on the current account were created two models based on the model of Kent and Cashin (2003: 1-47). By means of the first equation was analyzed the impact of permanent terms of trade changes on the current account, and by means of the second equation was examined the impact of temporary changes in terms of trade on current account. Finally, models used to analyze H-B-L effect in Poland were as follows:

$$\Delta CA_t = \sum_{j=0}^n \alpha_j \Delta CA_{t-j} + \sum_{j=0}^n \beta_j \Delta GDP_{t-j} + \sum_{j=0}^n \gamma_j \Delta TOT_{t-j} + \mu_t \quad (4)$$

$$\Delta CA_t = \sum_{j=0}^n \alpha_j \Delta CA_{t-j} + \sum_{j=0}^n \beta_j \Delta GDP_{t-j} + \sum_{j=0}^n \gamma_j \Delta TOT_c_{t-j} + \mu_t \quad (5)$$

All the above mentioned time series had quarterly frequency and cover the period from the first quarter of 1995 to the third quarter of 2009. In order to obtain a linear relationship between the variables they were logarithm. Before the model structural parameters were estimated, it was essential to isolate a seasonal factor from time series using X12-ARIMA procedure. Finally, the indexes of analyzed variables in Poland in the period of Q1.1995-Q3.2009 were shown in the following figure.

**Figure 2**  
**Dynamics of terms of trade, gross domestic product and current account in Poland in the period 1995-2009 (seasonal adjusted)**  
**[2000 year = 100]**



Source: Own study based on data from International Financial Statistics (2010).

On the basis of above data were calculated correlation coefficient between variables of the model. It was shown that the largest, positive linear relationship was between permanent change in terms of trade and current account. Hence, we could conclude that the permanent improvement of terms of trade accompanied improvement of the current account. Almost three times less linear relationship was noted between temporary changes in terms of trade and current account.



**Table 1**  
**Correlation coefficients between the selected variables in Poland**  
**in the period 1995-2009**

	Permanent changes in terms of trade (TOT)	Temporary changes in terms of trade (TOT)	Total changes in terms of trade (TOT)
Current account (CA)	0,28	0,10	0,27
Gross domestic product (GDP)	0,98	-0,01	0,74
Permanent changes in terms of trade (TOT)	1	0,14	0,77
Temporary changes in terms of trade (TOT)	0,14	1	0,65

Source: Own study based on data from International Financial Statistics (2010).

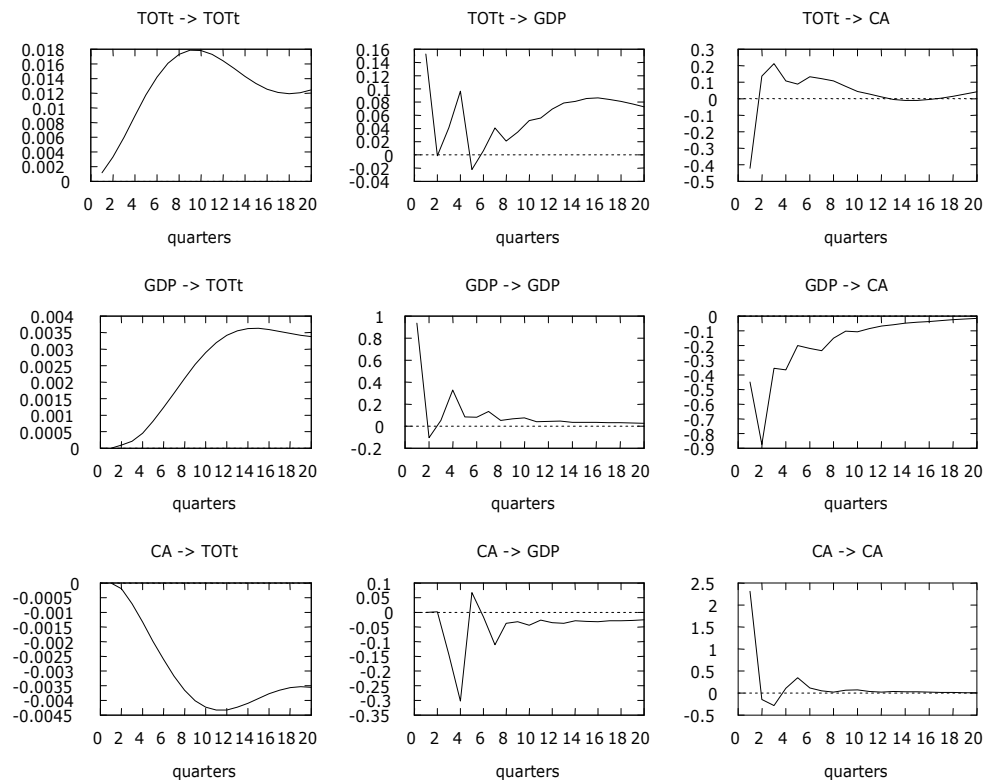
Before model estimation, it was necessary to specify stationarity of analyzed time series. To this purpose, the Augmented Dickey-Fuller Test (ADF) was used. Among the analyzed variables used in model there were time series with integration rows 0 and 1. In the majority of macroeconomics variables it was confirmed the lack of stationarity. Only in case of temporary changes in terms of trade stationarity was noted. Hence the lack of stationarity of time series forced the modification of the functional form of the model, in order to bring the stationarity of these variables. This modification was to replace the volume of variables by their first differences. For the purpose of analyses, three lag periods (three quarters) between explanatory variables were adopted. The choice of lag lengths was in line with results of the information criteria of the Akaike, Schwartz-Bayesian and Hannan-Quinn models. According to these criteria the largest information capacity had a model with three lag lengths. It should be also pointed out that due to the absence of the unit root for all the model variables and the lack of cointegration between variables, there

was no possibility to enlarge and transform the structural VAR model into Error Correction Model (ECM).

The next step was to estimate the structural parameters of VAR model. Related results of parameter estimations of models (4) and (5) were placed in the appendix. There were also shown respective graphs of the impulse response functions of permanent changes in terms of trade, changes in national income, changes in current account in Poland [fig. 3] and temporary changes in terms of trade, changes in national income, and changes in current account in Poland [fig. 4].

**Figure 3**

**Impulse response function of permanent changes in terms of trade, changes in national income, changes in current account in Poland in period 1995-2009**

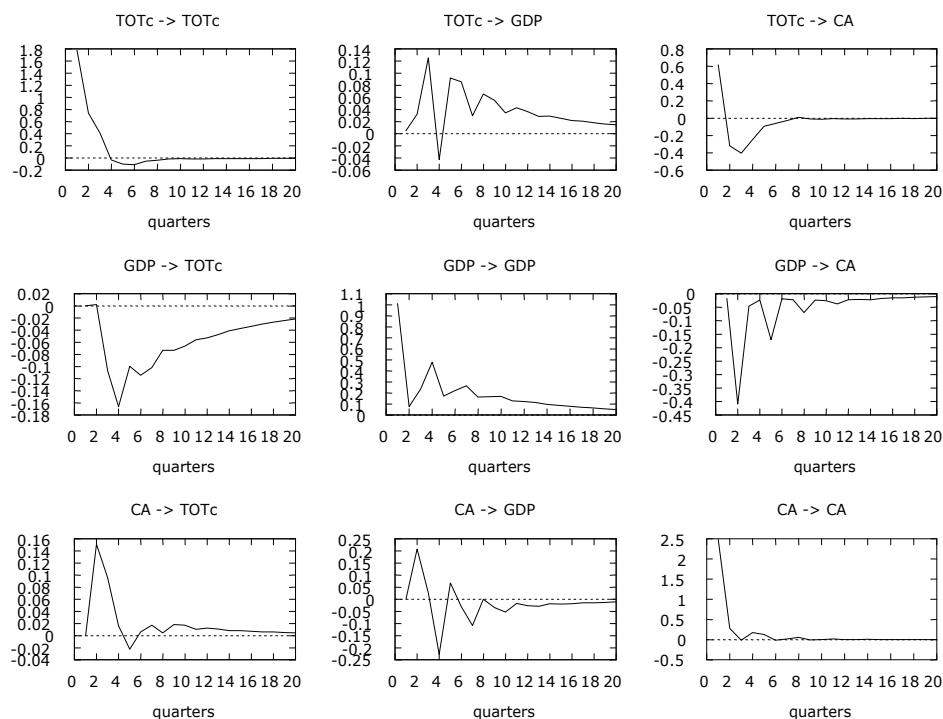


Source: Own calculations.

On the basis of above graphs it can be noted that a shock in the form of permanent improvement in terms of trade led to the gradual improvement of this index over the next ten quarters from the moment of shock, and then to stabilization after the twentieth quarter. In turn, instant improvement in terms of trade led to immediate GDP growth in Poland during the first quarter from the moment of shock, and to the stabilization of GDP after twentieth quarter. However, temporary improvement in terms of trade led to immediate worsening of the current account during two successive quarters after terms of trade changing, and then to the stabilization of the current account after the 20th quarter.

Figure 4

**Impulse response function of temporary changes in terms of trade, changes in national income, changes in current account in Poland in period 1995-2009**



Source: Own calculations.

Other than in the case of permanent changes in terms of trade were reactions of GDP and current account to temporary changes in terms of trade. However, the shock in the form of terms of trade improvement led to immediate improvement of this rate during the first quarter from the moment of shock, and then to stabilization after the tenth quarter. On the other hand, temporary improvement in terms of trade led to a gradual increase in GDP in Poland during the first three quarters from the moment of shock, and next to the stabilization of GDP after twentieth quarter. Finally, temporary improvement in terms of trade led to immediate improvement of the current account during the first quarter from the moment of shock, and then to the stabilization of the current account after twelfth quarter. The last stage of the analysis was the residual component variance decomposition of factors which determine the current account, in order to assess the impact of permanent and temporary changes in terms of trade, changes in GDP and changes in current account on current account variability in Poland.

**Table 2**  
**The error variance decomposition in the equation of permanent changes in terms of trade [%]**

The number of quarters after shock	TOT <sub>t</sub>	GDP	CA
2	3,0	14,8	82,2
4	3,6	17,7	78,7
6	3,9	18,3	77,9
8	4,2	19,1	76,7
10	4,3	19,3	76,5
12	4,3	19,4	76,3
14	4,3	19,5	76,3
16	4,3	19,5	76,3
18	4,3	19,5	76,2
20	4,3	19,5	76,2

Source: Own calculations.

As shown in table 4, permanent changes in terms of trade accounted for 3.6% of the current account variability after the fourth quarter and 4.3% after twentieth quarter. In turn, changes in GDP accounted for approximately 17,7% of the current account variability at the end of the fourth quarter as well as 19,5% after twentieth quarter. Thus, the current account variability could be explained in the most degree by previous changes in the current account.

**Table 3**  
**The error variance decomposition in the equation of temporary changes in terms of trade [%]**

The number of quarters after shock	TOT <sub>t</sub>	GDP	CA
2	7,0	2,4	90,6
4	9,9	2,4	87,7
6	10,0	2,8	87,3
8	10,0	2,8	87,2
10	10,0	2,8	87,2
12	10,0	2,9	87,1
14	10,0	2,9	87,1
16	10,0	2,9	87,1
18	10,0	2,9	87,1
20	10,0	2,9	87,1

Source: Own calculations.

Data presented in table 5 clearly indicate that the impact of temporary changes in terms of trade on the current account variability in Poland in period 1995-2009 was twice higher than in the case of permanent changes in terms of trade. Temporary changes in terms of trade accounted for 10% of the current account the variability after the fourth and twentieth quarters. Significantly lesser role in accounting for the current account variability had GDP changes. Namely, changes

in GDP accounted for almost 2.4% of the current account the variability after the fourth quarter and 2,9% after the twentieth quarter. Similarly in this case, the current account variability could be explained in the most degree by previous changes in the current account.

#### **IV. Conclusions**

In the literature on the subject, it is affirmed that there is an ambiguous relationship between changes in terms of trade and current account. The final effect of changes in terms of trade on current account depends on many different factors, such as duration shock, forecasts of terms of trade changes and the type of the shock transmission channel.

The results of studies confirmed the existence of Harberger-Laursen-Metzler effect in Poland in the period 1995-2009. Using vector autoregression model (VAR) was proven, that the temporary improvement in terms of trade in Poland led to the current account improvement and permanent improvement in terms of trade contributed to the deterioration of the current account in Poland. Simultaneously, it was confirmed relatively greater impact of temporary changes in terms of trade on the current account than in the case of permanent changes in terms of trade. Similar interdependence was also found in regard to clarification of the current account variability. Namely, temporary changes in terms of trade accounted for in twice greater degree the current account variability in comparison with permanent changes in terms of trade.

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## Appendix 1

### Results of the parameter estimation of the VAR model

#### Equation : CA (permanent changes in terms of trade)

	<i>Coefficient</i>	<i>Std. Error</i>	<i>t-ratio</i>	<i>p-value</i>
TOT <sub>t-1</sub>	219,887	161,147	1,3645	0,17904
TOT <sub>t-2</sub>	-386,649	317,98	-1,2160	0,23021
TOT <sub>t-3</sub>	179,76	161,942	1,1100	0,27276
GDP <sub>1</sub>	-0,96264	0,347021	-2,7740	0,00797
GDP <sub>2</sub>	-0,61976	0,353626	-1,7526	0,08634
GDP <sub>3</sub>	-0,538243	0,350305	-1,5365	0,13127
CA <sub>1</sub>	-0,0625214	0,141922	-0,4405	0,66161
CA <sub>2</sub>	-0,106937	0,134132	-0,7973	0,42940
CA <sub>3</sub>	0,00665618	0,136706	0,0487	0,96138

Mean dependent var	-0,082847	S.D. dependent var	2,772372
Sum squared resid	315,0171	S.E. of regression	2,616906
R-squared	0,241697	Adjusted R-squared	0,109818
F(9, 46)	1,629087	P-value(F)	0,135137
rho	-0,011515	Durbin-Watson	2,012898

#### Equation : CA (temporary changes in terms of trade)

	<i>Coefficient</i>	<i>Std. Error</i>	<i>t-ratio</i>	<i>p-value</i>
TOT <sub>c-1</sub>	-0,217094	0,173016	-1,2548	0,21590
TOT <sub>c-2</sub>	-0,120317	0,183226	-0,6567	0,51467
TOT <sub>c-3</sub>	-0,0116052	0,181766	-0,0638	0,94937
GDP <sub>1</sub>	-0,402742	0,319153	-1,2619	0,21334
GDP <sub>2</sub>	0,0316224	0,30916	0,1023	0,91898

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GDP_3	0,0641589	0,318167	0,2017	0,84108
CA_1	0,113105	0,135843	0,8326	0,40936
CA_2	0,028193	0,138247	0,2039	0,83931
CA_3	0,0851476	0,14575	0,5842	0,56194
Mean dependent var	-0,082847	S.D. dependent var	2,772372	
Sum squared resid	360,9793	S.E. of regression	2,801317	
R-squared	0,131058	Adjusted R-squared	-0,020062	
F(9, 46)	0,770883	P-value(F)	0,643487	
rho	-0,016041	Durbin-Watson	2,030669	