A Work Project, presented as part of the requirements for the Award of a Masters Degree in Economics from the Nova School of Business and Economics

Determinants of Portuguese External Imbalances

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Abstract

It has been argued that real appreciation is at the root of lack of Portuguese competitiveness and consequently current account deficits. Using quarterly data from 1995q1 to 2011q4, this Work Project analyses the determinants of Portuguese's current plus capital account by constructing a VAR model and performing Granger causality tests. The results show that real exchange rate appreciation is not the cause of Portuguese external imbalances but it might have been the other way around. These findings are in accordance with the view of Campos e Cunha in his article "Is the Dutch disease pandemic in the South" (2008).

Key words: Portugal current plus capital account, real effective exchange rate, Dutch disease, Stolper-Samuelson effect

I. Introduction

The Portuguese economy is under a macroeconomic adjustment program aimed at correcting the high public debt level.

As described by Blanchard (2006), from 1995 to 2001, the drop in both nominal and real interest rates and the expectations of faster growth and real convergence, brought by the commitment of entry in the euro area, led to a decrease in savings and an increase in investment. Unemployment decreased, output boosted and current account deficit grew, though it might be have seen as *benign* due the financial market integration and adjustment convergence expectations (Blanchard and Giavazzi, 2002; Bastos, 2007; Franco, 2011; Lane and Pels, 2012). Campos e Cunha (2008) identified a resemble form of Dutch Disease phenomenon in which the main problem of the Portuguese economy was a kind of euro wealth effect which resulted in increasing levels of indebtedness, de-industrialization, and relative prices for non-tradable goods, low and decreasing levels of saving, and reduced competitiveness.[1]

Since then until 2007, the disappointment of expectations reversed the situation. With high accumulated debt and lower future prospects, private savings started to increase and investment growth came to an end. Fiscal deficits partly offset the increase in private savings but a slump was unavoidable. The low unemployment rate had pressured nominal wages, which grew above productivity, and labour cost went beyond those of the rest of euro area countries (roughly 70% of Portuguese trade), implying a loss of competitiveness, usually associated with *Stolper-Samuelson* effect (Campos e Cunha, 2008; Collignos, 2009).[2]

[1] See also Andrade (2011)

[2] See also Eichengreen (2008), Mateus (2010) and Arghyrou (2008)

Campos e Cunha (2008) develops a model in which the author challenges the prevailing explanation for Portuguese external imbalances, by arguing that Real Exchange rate appreciation is the consequence, rather than the cause, of current account deterioration. As real income and demand increases, demand for non-tradables increases and current account deteriorates. Consequently, the price of the non-tradables rise in terms of tradables and, assuming that the non-tradable sector is mostly labour intensive, by the *Stolper-Samuelson* effect so does wages. This phenomenon applies to Portugal in the case of EU structural funds transfers, decrease nominal interest rates or Government budget deficit, and explains why the real exchange rate appreciation must not be blamed for current account deficits but quite the other way around.

The purpose of this Work Project is to analyze the determinants of the Portuguese current plus capital account by constructing a VAR model and performing Granger causality tests.

The paper is organized as follow: section II reviews some literature concerning the Portuguese external imbalances. Section III presents the model and section IV describes the data. Section V addresses the estimation procedures, section VI summarizes the results and, finally, section VII discusses policy implications.

II. Related Literature

Several authors have been exploring both causes and consequences of Portuguese external imbalances. **Blanchard and Giavazzi (2002)**, by using an opened economy model, show that poor countries, the ones with higher rate of return, should run large current account deficits during financial market integration. The fall in interest rates and the welfare effects would both led to a decrease in the savings rate and increase in investment, so to a larger current account deficit. Additionally, the authors present the explanation for current account deficit based on loss of competitiveness and overvaluation. The rate at which Portugal joined the Euro, together with nominal rigidities, led to an overvalued exchange rate and to a current account deficit. However, they consider this evidence as *weak.* Firstly, because current account deficit has been mostly a reflection of high growth rates of imports rather than low growth rates of exports. And secondly, because overvaluation, which led to a lower demand for domestic goods, would be associated with lower GDP growth, which was not the case. **Fagan and Gaspar (2005)** studied the boom and bust cycle with a two-sector model with rational expectations and adjustment costs in capital. They attribute the boom to a reduction in the real long-term interest rate and the bust to the adjustment of the agents to the budget constraint. In Fagan, Gaspar e Pereira (2004) a lowering of interest rates – caused by a drop in the home country's idiosyncratic risk premium – leads to a jump in consumption (a drop in savings) and an increase in investment, thus widening the current account deficit. At the same time, the initial disturbance also causes a real exchange rate appreciation through the increase in the relative price of non-tradable goods. At the same time, the demand boom causes the relative price of non-tradable goods to increase and a shift of employment from the tradable to the non-tradable goods

sector. This model fits well the known facts about the adjustment of the Portuguese economy to participation in the euro area. **Campa and Gavian (2006)** use an intertemporal model, in which current account balances are used to smooth consumption and they are driven by expectations about future income and relative prices[3]. The model is not rejected for Portugal and expectations of future output changes were found to represent more than 80% of the predicted Portuguese current account. A Constant Market Share analysis of the Portuguese exports over the period 1992-2004 (see **IMF 2006**) attributes the bulk of export market loss to the deterioration of competitiveness (as opposed to other effects, such as global demand, commodity composition or market distribution). According to the analysis, the loss of market shares (in volumes) was even more pronounced before the adoption of the euro, whereas the more moderate pace of the decline afterwards resulted in a negative impact on investment and employment in the tradable sector. This may also have led to a progressive shift of the economic activity from the tradable to the non-tradable sector with an additional negative impact on productivity and further current account deficit. **Arghyrou (2008)**, using cointegrating vectors, found that the Portuguese current account deterioration experienced since 1999 was equilibrium rather than transitory. He suggests that other factors beyond income growth may explain current account position and these factors are related with inflation differentials relative to EMU average[4]. **Jaumotte and Sodsriwiboon (2010)** refer that in Portugal, like in Greece, Italy, Cyprus and Malta, declines in private saving rates were the predominant factor behind the decline in the current account.

[3] See also Ca'Zorsiand Rubaszek (2008)

[4] See also Babecký, Bulíř, and Šmídková (2009)

III. Model

The aim of this work project is to investigate the determinants of Portuguese current plus capital account balance as a percentage of GDP (**CCA**). To this end, a Vector Autoregressive model (VAR) was estimated and Granger causality tests performed.

The determinants of the Portuguese CCA were chosen by some considerations, namely economic theory, previous literature, data availability and if the model fits well in econometric terms. Hence, I specified the Portuguese CCA as a function of the log of Portuguese GDP (**Y**), foreign GDP (**Y***), real exchange rate index (**REER**) and price of oil (**OIL**). In the case of the real exchange rate, several index measures were used in order to test the robustness of the results.

Higher domestic income, as implied by higher Portuguese GDP, is expected to deteriorate CCA balance as higher purchasing power rises demand for imports and reduces exports as it diverted production to the domestic market. Conversely, higher foreign income might improve Portuguese CCA as external demand for exports increase. In terms of real exchange rate, an appreciation of REER is commonly associated with loss of competitiveness, therefore hampering Portuguese exports. Finally, the price of oil may have an ambiguous effect. On the on hand, it weighs heavily on imports value (it increase from 10.3% in 2000 to 16.8% in 2008), thus deteriorating trade balance. On the other hand, Portuguese exports of mineral fuels, lubricants and related materials is also substantial (from 6,6% in 1999 to 16% in 2011, in the total exports for Extra EU-27, compared with 2,3% to 6,5% EU-27 average[5]). In the model, it is assumed that foreign GDP and the price of oil are exogenous. The reduce form of the model is thus:

[5] Source: Eurostat

$$X_t = C + A_1 X_{t-1} + A_2 X_{t-2} + A_3 X_{t-3} + \cdots + A_p X_{t-p} + e_{it} (1)$$

Where *c* is a *k* × 1 vector of constants (intercept), A_j is a k × k matrix (for every j = 1, ..., p) and e_t is a k × 1 vector of error terms in which E(e_{it})=0, *i*=1,2 and E(e_{1t} e_{2t})=0.

Equation (1) describes the evolution of a set of k variables (called endogenous variables) over the same sample period (t = 1, ..., T) as a linear function of their past evolution.

The main advantages of a VAR model are that all variables are endogenous[6] and it allows the value of a variable to depend on more than just its own lags. Therefore, one can conduct "directional causality tests" commonly referred to as Granger causality tests.

Prior estimating the VAR model, first I test for the presence of unit roots of each variable using a modified Dickey-Fuller test in which the series are transformed by a generalized least-squares regression. Elliott, Rothenberg, and Stock and later studies have shown that this test has significantly greater power than the previous versions of the augmented Dickey–Fuller test. It is important to check for non-stationarity of the variables to avoid spurious correlation and misleading regressions that might arise despite the absence of any correlation between the underlying series. Contingent on the result that all variables are stationary in first differences, I proceed with the lag length selection model using the Schwarz's Bayesian information criterion (SBIC). According

[6] The estimation procedure also allows us to specify a list of exogenous variables to be include in the VAR,

with Ivanov and Kilian (2011)[7], for persistence profiles based on quarterly VAR models, the SBIC is the most accurate criterion for all realistic sample sizes, mainly the ones smaller than 120 observations, which is the case of the sample used in this study.

IV. Data

All variables are quarterly data ranging from 1996q1 to 2011q4. CCA was computed in order to represent current plus capital account as a percentage of GDP. Current and capital account is data from Bank of Portugal while GDP is the Gross Domestic Product, at current prices, from INE. This GDP is also used to represent Portuguese output. Foreign GDP is a weighted average of the nominal GDP, taken from Eurostat, for the main Portuguese trading partners. Different real exchange rate measures are used in this study: real exchange rate by GDP deflator (source: Bank of Portugal); real exchange rate by CPI deflator (source: Bank of Portugal); real exchange rate by exports deflator (source: Eurostat and own computation) real exchange rate by overall goods price index deflator excluding services (source: Eurostat and own computation); real exchange rate by Eurostat relative unit labour costs; real exchange rate by Bank of Portugal adjusted relative unit labour costs. Price of oil is data from Bank of Portugal. More data and computation details can be found in the annex. Descriptive statistics are presented in Table 1.

[7] Ivanov, V., and L. Kilian (2001): "A Practitioner's Guide to Lag-Order Selection for Vector Autoregressions," Mimeo, Dept. of Economics, University of Michigan

V. Estimation

The tests for the presence of unit root on each variables of the VAR model are present in table 2. As I already referred, I implement this by using the DF-GLS test due to its higher power. Optimal lag lengths for DF-GLS were choosen by Schwarz's Bayesian information criterion (SBIC). The results reported indicate a unit root in the original series but stationary in the first difference in all of the series. Thus, the level variables are integrated to order one represented as I(1). Having confirmed that all variables are of stationary at first differences, I proceed on finding the appropriate lag length for the VAR model using the Schwarz's Bayesian information criterion (SBIC), as I already argued. Thus, based on this selected information criteria, the lag order was set at k= 1. This lag length also removes autocorrelation as Langrange-multipler tests were further conducted to ensure no serial correlation.

As regards real exchange rate, the problem is always to decide which is the most appropriate price deflator for nominal exchange rate. Often, one has to match what would be, conceptually, the optimal measure of REER for the economic issue at hand with data availability or even generate a real exchange rate index specific to the task under analysis. In this study I use six measures of REER, four in terms of final price deflators and two in terms of relative unit labour costs:

<u>Real Exchange rate measures in terms of final price deflators</u>

- **REER_GDP** stands for Real Effective Exchange rate (adjusted by GDP deflator – 20 trading partners) from European Central Bank (ECB);
- **REER_CPI** is the Real Effective Exchange Rate (deflator: consumer price index – 20 trading partners) from ECB;

- **REER_EXP** represents Real Effective Exchange Rate (deflator: relative exports deflator[8])
- **REER_GOODS** represents Real Effective Exchange Rate (deflator: relative consumer price index of goods excluding services[9]);

Real Exchange rate measures in terms of relative unit labour costs

- **REER_EUR** is Real Effective Exchange Rate (deflator: unit labour costs in the total economy – 16 trading partners – Euro Area) from Eurostat;
- **REER_BdP** refers to Effective Real Exchange Rate (deflator: unit labour costs in the total economy – 20 trading partners) calculated by Bank of Portugal (BdP) and ECB;

All REER series are shown in figure 1.

I decided to use these differing set of REER measures to get a robust picture of the purpose of this work project, given the relative advantages and limitations of each deflator. REER_EXP use a very suitable relative price deflator for the purpose of this study, in the sense that it reflects directly Portuguese exports competitiveness in the international trade. REER_GOODS also tries to capture the price deflator of the tradable sector, by excluding services, despite the exclusion of tourism and the growing importance of services in international trade. REER_CPI has many operational advantages, however it is affected by indirect taxes, subsidies and price controls. Moreover, it includes non-tradable goods and excludes some tradable goods, in particular intermediate goods. REER_EUR, while using unit labour costs in the total

[8] Own calculations. See annex for more details.

[9] Own calculations. See annex for more details.

economy, instead of just in manufacturing, it already points to the growing importance of services in the international trade. it does not reflect all relevant costs, such as capital costs. Furthermore, it may also denote significant problems in terms of statistical quality. As regards the second problem, REER_BdP attempts to circumvent this problem as it adjusts the compensations included in unit labour costs[10]. In what concerns the former, REER_GDP was used as a more general measure that reflects cost of capital utilization. Nevertheless, by including non-market sectors, it covers goods that are internationally not traded.

VI. Results

VAR model estimates are reported in tables 3 to 8. The main results are:

- All signs of CCA determinants come as expected except the one of REER measures, which is positive for real exchange rate in terms of price deflators and negative for those based on relative unit labour costs.
- However, only the coefficient on OIL is statistical significant in explaining CCA and it is negative.
- Using REER_GDP as the real exchange rate measure, it suggests that real appreciation is the consequence, rather than the cause, of current plus capital account deficits (table 3). This result is in accordance with Campos e Cunha (2008).

[10] In Economic Bulletin – Summer 2010, Bank of Portugal, Box 2. It is presented an adjustment correction in which Bank of Portugal adjusted compensations incorporated in unit labour costs in Portugal, by subtracting social contributions paid by general government as an employer. Based on this methodology, in the last decade there was a limited deterioration in the Portuguese economy's international competitiveness in terms of unit labour costs, which was lower than the deterioration recorded for the average of the euro area

- There is evidence that wages growth fuel output booms (tables 4 and 5), as real exchange rates appreciation based on unit labour costs Granger causes GDP growth, while GDP growth leads to relative price inflation (Y growth Granger causes REER appreciation whatever the relative price deflator consider - tables 3, 6, 7 and 8).

Table 9 compares the expected sign with the sign obtained from CCA determinants in the VAR estimates.

The nonexistence significant relation between CCA and both Portuguese and Foreign GDP may however be due to the fact that this model estimates the relation between CCA and the lags of its determinants instead of contemporaneous effects. Since GDP components, like consumption and investment, have immediate impact on current account, unlike the real exchange rate, one could expect statistically significant coefficients once such contemporaneous relation is taken into account.

Expansionary policies, capital inflows and transfers from EU structural funds, higher real income and productivity convergence during the period prior to euro area enter implied higher GDP growth. As a result of higher income and purchasing power, overall demand increased and inflation rose. Though, I note that Portuguese GDP growth does not Granger cause REER appreciation, whatever the two measures of relative unit labour costs considered in this study.

Further Granger causalities are also:

- CCA deterioration Granger causes Y growth, whatever the measure of REER considered.

CCA deterioration is usually the result of expansionary policies, higher consumption and investment, which in turn contributes to GDP growth.

- Y* growth granger causes Y growth, for any measure of REER (except using the REER_EUR).

As a small open economy, Portugal suffers the impact of shocks in the business cycle from abroad; conversely, it is not able to influence the international prices.

- Y* growth granger causes REER depreciation for any measure of REER (except REER_EUR).

This might be a change in relative prices as when Y* rises, prices and costs abroad become relatively higher due to higher demand from higher foreign income. As a result, exchange rate depreciates in relative terms, even if there was no change in prices and costs domestically.

- Increase of OIL price Granger causes REER_EXP appreciation

As already mentioned, Portugal has a higher weight on exports of refined products than its euro area peers, therefore the increase of price of oil might inflate more its exports deflator than the one of euro area average, leading to real appreciation.

- Y growth granger causes itself.

This is a common result from GDP series' autoregressive nature.

All Granger causalities are summarized in table 10.

VII. Conclusions and Policy Implication

Blanchard (2006) suggests decreasing nominal wages to re-establish Portuguese competitiveness and correct external imbalances. In this work project, I draw a robust picture using several real exchange rate indexes and show that real appreciation is not behind the Portuguese current plus capital account deficit but rather it might have been the other way around, as also pointed out by Campos e Cunha (2008).

The results identify a negative and statistically significant Granger relationship between current plus capital account and the price of oil. However, it misses to link the balance with domestic and foreign output, which I justify with the lack of contemporaneous regression.

Furthermore, I found that real exchange rate appreciation, in terms of price inflation, might have been driven by output growth. However, if we consider real exchange rate by relative unit labour costs, the causality reverses.

These findings challenge the prevailing explanations for Portuguese external imbalances and reveal innovative dynamics among real exchange rate, output growth and current account deficits. I consider this has relevant policy implications as one must distinguish the factors that caused transitory, reversible and necessary current account deficits, during the convergence adjustment process prior euro area enter, from those causes that made such deficit to become persistent. This means that policy measures to sustain external equilibrium need to be properly designed and its reliance on painful decreasing wages to regain competitiveness in the international trade is questionable.

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ANNEX

DATA

All time series are quarterly data.

CCA – Portuguese Current plus Capital account (source: BdP) divided by Gross Domestic Product at current prices (source: INE). Both series are seasonal adjusted. Current plus Capital account was converted from a monthly basis to quarterly data by 3-months sum.

Y –Portuguese Gross Domestic Product at current prices (source: INE); seasonal adjusted.

Y* - Foreign nominal GDP proxy by a weighted average of nominal GDP (source: Eurostat) for seven main Portuguese trading partners. Weights are export shares fixed as an average for the year of 2011 based on Walter Anatole Marques, *Cadernos Estatísticos de Economia Portuguesa - Comércio Internacional de mercadorias Janeiro a Março de 2012*: Spain (36%), Germany (20%), France (17%), UK (7%), Netherlands (6%), Italy (5%), US (5%) and Belgium (4%).

REER_GOODS - computation was obtained by adding the log of the ratio of Portuguese HCPI (2005=100) of goods - overall items excluding services over the same indicator for Euro Area from the log of Portuguese Nominal Effective Exchange Rate – 20 partners (source: BdP).

$$\log REER_{GOODS} = \log NEER^{pt} + \log \frac{HCPI^{pt}_{goods}}{HCPI^{su}_{goods}}$$

HCPI's were transformed from monthly data in quarterly, by 3-months average, and extracted from Eurostat. Base year (2005=100)

REER_EXP - Real effective exchange rate using relative exports deflator. The computation follows the same process of REER_GOODS. Exports deflators were taken from Eurostat.

REER_GDP – Real effective exchange rate using GDP deflator. Source: Bank of Portugal. Base year (1999q1=100)

REER_EUR - Real effective exchange rate deflated by relative unit labour costs against 16 partners (euro zone). Source: Eurostat. Base year (1999=100)

REER_BdP - Real effective exchange rate adjusted and deflated by relative unit labour costs against 20 partners. Source: Bank of Portugal. Base year: n.a.

REER_CPI – Real effective exchange rate deflated by relative consumer price index. Source: Bank of Portugal. Base Year (1999q1=100)

OIL –price of oil in euros (source: BdP)

Table 1 – Variables Descriptive Statistics

Variable	Mean	Std. dev.	Min	Max
CCA	-0,074	0,03	-0,129	-0,006
Y	10,469	0,195	10,027	10,680
Y*	12,962	0,156	12,613	13,17
REER_GDP	4,631	0,036	4,567	4,68
REER_EUR	4,651	0,048	4,520	4,702
REER_BdP	4,641	0,036	4,572	4,694
REER_EXP	1,996	0,014	1,973	2,020
REER_GOODS	4,592	0,026	4,535	4,632
REER_CPI	4,632	0,034	4,568	4,679
OIL	3,494	0,581	2,306	4,500

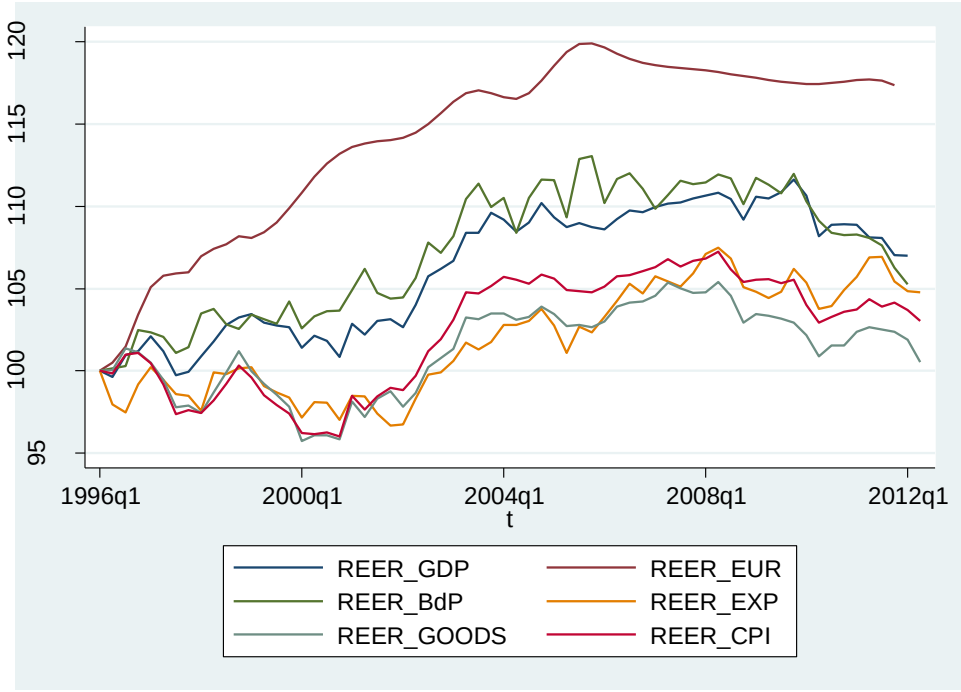
NOTE: All variables are in logarithm form. CCA is in percentage of GDP

Table 2 – Unit Root tests

	Dickey Fuller – GLS unit-root test H_0 hypothesis: unit root	
	Level	First Difference
CCA	-1,379 (1)	-6,670*** (1)
Log Y	0,188 (1)	-3,503** (2)
Log Y*	-1,047 (1)	-4,342*** (1)
Log OIL	-3,006* (2)	-4.148*** (2)
Log REER_GDP	-0;731 (1)	-5,353*** (1)
Log REER_EUR	0,161 (3)	-6,997*** (2)
Log REER_BdP	-0,528 (1)	-7,976*** (1)
Log REER_EXP	-2,012 (1)	-4,543*** (1)
Log REER_GOODS	-1,339 (1)	-4.812*** (1)
Log REER_CPI	-1.331 (2)	-4.193*** (1)

NOTE: Number of lags in parenthesis

Figure 1 – Real Exchange rate indexes



NOTE: All series were transformed such that the base year is (1996q1=100). Data sources and more computation details can be found in the annex.

Table 3 – VAR model using REER_GDP

Dep. Var.	Indep. Var.					
	Δ CCA_Y$_{t-1}$	**Δ log Y$_{t-1}$**	**Δ log REER_GDP$_{t-1}$**	**Δ log Y*$_t$**	**Δ log OIL$_t$**	**const**
Δ CCA_Y$_t$	-0,123 (0,122)	-0,316 (0,197)	0,15 (0,244)	0,035 (0,150)	-0,023* (0,014)	0,003
Δ log Y$_t$	-0,16** (0,069)	0,338*** (0,111)	0,133 (0,137)	0,160* (0,084)	-0,0002 (0,008)	0,005
Δ log REER_GDP$_t$	-0,1** (0,05)	0,145** (0,074)	-0,08 (0,091)	-0,4*** (0,056)	-0,006 (0,005)	0,003

Table 4 - VAR model using REER_EUR

	Δ CCA_Y$_{t-1}$	**Δ log Y$_{t-1}$**	**Δ log REER_EUR$_{t-1}$**	**Δ log Y*$_t$**	**Δ log OIL$_t$**	**const**
Δ CCA_Yt	-0,091 (0,13)	-0,324 (0,214)	-0,433 (0,485)	0,085 (0,155)	-0,023* (0,014)	0,005
Δ log Y$_t$	-0,179*** (0,07)	0,348*** (0,115)	0,603** (0,261)	0,084 (0,084)	0,0007 (0,007)	0,004
Δ log REER_EUR$_t$	0,004 (0,023)	0,033 (0,037)	0,793*** (0,084)	-0,023 (0,027)	0,003 (0,002)	0,0002

Table 5 - VAR model using REER_BdP

Dep. Var.	Indep. Var.					
	Δ CCA_Y$_{t-1}$	**Δ log Y$_{t-1}$**	**Δ log REER_BdP$_{t-1}$**	**Δ log Y*$_t$**	**Δ log OIL$_t$**	**const**
Δ CCA_Y$_t$	-0,129 (0,124)	-0,310 (0,198)	-0,06 (0,176)	0,029 (0,15)	-0,023* (0,014)	0,004
Δ log Y$_t$	-0,132* (0,067)	0,394*** (0,107)	0,221** (0,095)	0,136* (0,081)	0,003 (0,007)	0,004
Δ log REER_BdP$_t$	-0,094 (0,085)	0,221 (0,135)	-0,125 (0,112)	-0,301*** (0,102)	0,007 (0,009)	0,001

Table 6 - VAR model using REER_GOODS

	Indep. Var.					
Dep. Var.	**Δ CCA_Y$_{t-1}$**	**Δ log Y$_{t-1}$**	**Δ log REER_GOODS$_{t-1}$**	**Δ log Y*$_t$**	**Δ log OIL$_t$**	**const**
Δ CCA_Y$_t$	-0,126 (0,123)	-0,298 (0,195)	0,1 (0,23)	0,032 (0,15)	-0,023* (0,014)	0,003
Δ log Y$_t$	-0,162** (0,069)	0,352*** (0,11)	0,085 (0,129)	0,157* (0,085)	0,0001 (0,008)	0,005
Δ log REER_GOODS$_t$	-0,034 (0,049)	0,195** (0,078)	0,039 (0,092)	-0,434*** (0,06)	-0,004 (0,005)	0,002

Table 7 - VAR model using REER_EXP

	Indep. Var.					
Dep. Var.	**Δ CCA_Y$_{t-1}$**	**Δ log Y$_{t-1}$**	**Δ log REER_EXP$_{t-1}$**	**Δ log Y*$_t$**	**Δ log OIL$_t$**	**const**
Δ CCA_Y$_t$	-0,108 (0,124)	-0,294 (0,195)	0,331 (0,464)	0,026 (0,15)	-0,023* (0,014)	0,003
Δ log Y$_t$	-0,158** (0,070)	0,353*** (0,110)	0,014 (0,263)	0,151* (0,085)	0,00004 (0,008)	0,005
Δ log REER_EXP$_t$	-0,043 (0,027)	0,088** (0,042)	0,054 (0,100)	-0,176*** (0,032)	0,005* (0,003)	0,001

Table 8 - VAR model using REER_CPI

	Indep. Var.					
Dep. Var.	**Δ CCA_Y$_{t-1}$**	**Δ log Y$_{t-1}$**	**Δ log REER_CPI$_{t-1}$**	**Δ log Y*$_t$**	**Δ log OIL$_t$**	**const**
Δ CCA_Y$_t$	-0.123 (0,123)	-0,297 (0,196)	0,047 (0,254)	0,028 (0,150)	-0,023* (0,014)	0,003
Δ log Y$_t$	-0,162** (0,069)	0,36*** (0,109)	0,156 (0,142)	0,161* (0,084)	0,00003 (0,008)	0,005
Δ log REER_CPI$_t$	0,011 (0,04)	0,185*** (0,0631)	0,141* (0,082)	-0,404*** (0,049)	-0,007 (0,004)	0,002

NOTE: Standard errors in parenthesis. *, ** and *** denotes significance at the 10 percent, 5 percent, and 1 percent, respectively. One lag length

Table 9 – Expected versus obtained signs of CCA determinants

Determinant	Expected sign	Obtained sign
Y	Negative	Negative
REER_GDP	Negative	Positive
REER_EUR	Negative	Negative
REER_BdP	Negative	Negative
REER_EXP	Negative	Positive
REER_GOODS	Negative	Positive
REER_CPI	Negative	Positive
Y*	Positive	Positive
OIL	Ambiguous	Negative

Table 10 –Granger causality tests – summary table

Granger causalities		
Oil	⇒ (-)	CCA
CCA	⇒ (-)	Y REER_GDP
REER_EUR REER_BdP	⇒ (+)	Y
Y	⇒ (+)	Y REER_GDP REER_GOODS REER_CPI
Y* (1)	⇒ (+)	Y
Y*	⇒ (-)	REER_GDP REER_BdP REER_GOODS REER_CPI
OIL	⇒ (+)	REER_EXP