

# DOES ECONOMIC CYCLE INFLUENCE TWIN DEFICITS IN EUROPE? A THRESHOLD MODEL.

Veronika Šulíková

**Abstract:** *The aim of the paper is to test the impact of output gap on twin deficits existence in euro-area countries and three non-euro area countries (Sweden, Denmark and United Kingdom) over the time 1995 – 2015. The idea is motivated by the fact that certain European countries succeeded to adjust their current account deficits during recession and a principal motor of this adjustment was a decrease in their domestic demand. A panel data threshold model estimated two thresholds of output gap and divided the relation between budget balance and current account into three intervals. If an output gap is slightly negative or positive, the model confirms twin deficits, whereby a “twin relation” is stronger if an output is above its potential level. If an output is importantly below its potential level during recession, we conclude to twin divergence (e.g. in Greece, Portugal and Spain): even though a country increases its budget deficit during recession, it can succeed to adjust its current account deficit. We recommend taking into account an output gap when testing twin deficits as neglecting this effect could potentially lead to spurious rejection of twin deficit hypothesis.*

**Keywords:** *Twin deficits, Twin divergence, Output gap, Current account, Budget balance, Threshold model.*

**JEL Classification:** *E32, F32, F41, H62.*

## Introduction

The origin of twin deficit hypothesis dates to 1980' when simultaneous fiscal and current account deficit has been observed in United States (Abell, 1990; Enders and Lee, 1990; Bahmani-Oskooee, 1992). Recently, the topic of twin deficits became again very actual with an increase in current account global imbalances (Gruber and Kamin, 2007; Aizenman and Sun, 2010). Current account imbalances divide Europe in surplus economies having current account surpluses (northern European countries, e.g. Germany, Netherlands, Sweden) and deficit economies with current account deficits (southern European countries, e.g. Portugal, Greece, Italy). However, according to the report of the International Monetary Fund (IMF, 2014), some southern European countries succeeded to eliminate significantly their current account deficits in times of economic recession caused by crisis from 2008-2009. IMF (2014) concluded that a principal motor of adjustment in current account deficits was a decrease in domestic demand and domestic product. Furthermore, recent empirical studies on twin deficits (e.g. Algieri, 2013) manifest that there is no positive relation between budget balance and current account, therefore twin deficits are not valid.

These stylised facts lead us to the idea that the existence of twin deficits can be determined by an economic cycle. We expect that in times of expansion, when an output gap is positive, twin deficits exist, but in times of recession, when an output gap is negative, there are no twin deficits and we can expect even a “twin divergence” (i.e. a situation when an increase in one deficit is accompanied by a decrease in second

one). Our ambition is to contribute to the empirical research on twin deficits by determination of the intervals of output gap for which we confirm the twin deficits existence and the intervals for which either we reject a twin deficit hypothesis or conclude to the “twin divergence”.

### 1 Statement of a problem

A theoretical approach to current account determinants (Krugman and Obstfeld, 2014) as well as recent empirical research (IMF, 2014) conclude that a GDP growth has a negative impact on current account balance as an increase in domestic demand supports imports and deteriorates an external balance. Consequently, an output gap, measuring the phase of the economic cycle, is also an important determinant of current account balance as an increase in output gap deteriorates a current account (confirmed e.g. by Nickel and Vansteenkiste, 2008; Angelini and Farina, 2012). Therefore, we can suppose that a positive output gap, i.e. high domestic output over its potential level in times of expansion has a negative impact on current account. On the contrary, in times of recession, a negative output gap is accompanied by current account improvement.

This idea is in accordance with the evolution of output gap (in % of potential GDP) and current account (% of GDP) in chosen southern European countries – Greece, Italy, Portugal and Spain (Fig. 1). For instance, in Greece or Spain, an increase in positive output gap in times of expansion (years 2003 - 2008) is accompanied by an increase in current account deficit (see Fig. 1). An increase in positive output gap is connected with higher national income, which supports higher domestic demand, increases domestic imports and finally leads to the deterioration in current account.

**Fig. 1: The evolution of output gap and current account**



Source: Own editing, data from IMF (2017)

On the other hand, a decrease in output gap from 2008 - 2009 and even a negative output gap in next period is accompanied by a decrease in current account deficit in

Greece, Spain, Portugal as well as Italy (see Fig. 1). We can therefore suppose a “mirror” evolution of output gap and current account: an increase in output gap leads to current account deterioration and a decrease in output gap leads to current account amelioration. Consequently, we can even suppose that this fact will determine the existence of twin deficits.

Twin deficits are documented when an increase in budget deficit is accompanied by an increase in current account deficit (Abell, 1990). A theoretical approach to twin deficits is supported by the Mundell-Fleming model (Mundell, 1963) and by the Keynesian theory of absorption, according to which an increase in budget deficit causes an increase in current account deficit. On the other hand, the Current Account Targeting Hypothesis (CATH) supports a reverse causality between two deficits (Summers, 1988). Thirdly, the Ricardian equivalence theory (see Barro, 1989) argues that there is no relation between budget and current account deficits. Barro (1989) offers an explanation why an expansionary fiscal policy does not positively influence a domestic demand. He explains that consumers reflect an increase in government spending and public debt into their expectations of increase in taxes in the future and therefore reduce their current consumption. A domestic demand decreases, which is connected with a decrease in imports. Finally, an increase in budget deficit is not positively linked with an increase in current account deficit and there is no twin deficit relation.

The empirical research on twin deficits tests the co-movements of budget and current account balances and the causality between them. Some authors (e.g. Piersanti, 2000; Chinn and Prasad, 2003; Salvatore, 2006; Beetsma et al., 2008; Bussière et al., 2010; or Chihi and Normandin, 2013) concluded to the twin deficit existence and confirmed the Keynesian view showing the causality running from budget deficit to current account deficit. However, the others (e.g. Kim and Kim, 2006; Marinheiro, 2008; Makin and Narayan, 2013; Sobrino, 2013) revealed a reverse causality between two balances supporting CATH hypothesis. Furthermore, some authors (e.g. Corsetti and Muller, 2006; Algieri, 2013) confirmed the Ricardian equivalence theory showing no relation between budget and current account balances. Some studies (e.g. Muller, 2008; Kim and Roubini, 2008) revealed even a “twin divergence” between budget balance and current account. Finally, recent empirical research (e.g. Nickel and Vansteenkiste, 2008; Holmes, 2011; Nickel and Tudyka, 2014) confirmed the “twin relation”, i.e. twin deficits existence, only under certain macroeconomic conditions.

As recent scientific papers on twin deficits manifest different results, we suppose that twin deficits existence is determined by several macroeconomic factors. Our ambition is to contribute to the empirical research on twin deficits by identifying the impact of the output gap on the validity of twin imbalances (i.e. twin deficits or twin surpluses). We aim to determine the intervals of output gap, for which we confirm a twin deficit hypothesis and the intervals, for which we reject twin deficits or reveal a twin divergence. In order to achieve it, we estimate a panel data threshold model, which allows identifying the threshold values of output gap dividing the estimated relationship between budget balance and current account into several output gap intervals.

The idea is following. In times of expansion, when an output gap is positive and increases in time, we suppose the existence of twin deficits, which can be explained by the Keynesian theory of absorption or the Mundell-Fleming model. An increase in budget deficit, created by an increase in government spending, supports an increase in

national income (which creates an increase in output gap) and in domestic demand, which leads to an increase in imports and current account deficit. An increase in budget deficit therefore causes an increase in current account deficit and we conclude to the existence of twin deficits. On the other hand, if an increase in budget deficit is accompanied by a decrease in national product and a decrease in / or negative output gap, domestic demand decreases, which leads to decrease in imports and therefore a decrease in current account deficit. Consequently, an increase in budget deficit is accompanied by current account amelioration, which is interpreted as so-called twin divergence (the term “twin divergence” is used e.g. by Kim and Roubini, 2008; Nickel and Tudyka, 2014). Note that a decrease in national product can be caused by a recession during a crisis period or by a decline in domestic consumption because of Ricardian equivalence existence.

The impact of cyclical fluctuations of output on twin deficit hypothesis has been revealed by Kim and Roubini (2008), who concluded that divergent co-movements of fiscal and current account balances in United States are driven by output shocks - more than fiscal shocks. Florio and Ghiani (2015) applied Markov-Switching VECM for United States and concluded that “twin relation” tends to differ with the business cycle - it is stronger during expansions and weaker during recessions. Furthermore, Çatık et al. (2015) estimated two-regime threshold VAR for Turkey and concluded that twin deficits exist only if the economy operates above its potential level whereas two deficits manifest divergent movement if the economy is in the lower regime.

Consequently, we can suppose that the value of output gap will determine the “twin relation” between budget balance and current account. If an output gap is below a certain threshold, we suppose that twin deficits are not documented and a twin divergence prevails. However, if an output gap exceeds a certain threshold value; we expect the existence of twin deficits.

## 2 Methods

In order to determine the above mentioned threshold effects of output gap in the “twin relation”, we use a panel data threshold model.

### 2.1 Data

Our analysis focuses on European countries, i.e. euro area countries<sup>1</sup> and three non-euro area countries (Sweden, Denmark and United Kingdom). The annual panel data then cover 19 countries over the time 1995 - 2015. Following other panel data models, which test twin deficit relation (e.g. Salvatore, 2006; Forte and Magazzino, 2013), a current account balance is a dependent variable and a budget balance is an independent variable. As we aim to reveal the impact of economic cycle on twin deficit validity, an output gap (in percentage of potential GDP) is defined as a threshold variable, whose values will determine the relation between budget balance and current account. Furthermore, we include other control variables, which could explain the evolution of current account: GDP growth (e.g. according to Chinn and Prasad, 2003; or Forte and Magazzino, 2013), private investment (e.g. Nickel and Vansteenkiste, 2008), nominal

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<sup>1</sup> From our sample of the euro area countries, we excluded Latvia, Lithuania and Malta due to the data unavailability for output gap during the analysed period.

effective exchange rate, public debt-to-GDP ratio (e.g. Nickel and Vansteenkiste, 2008), openness (e.g. Chinn and Prasad, 2003) and inflation. Data are retrieved from IMF (WEO database, April 2017) and Eurostat database.

## 2.2 Threshold model: twin deficits and output gap

In order to test the impact of output gap on twin deficit hypothesis, we estimate a panel data threshold model, which was introduced by Hansen (1999). A threshold model is useful if regression between dependent and independent variable is not same in the whole sample. Here, a threshold model permits to estimate different regimes of the relation between budget balance and current account balance, which will depend on values of output gap (defined as a threshold variable in our case).

Hansen (1999) developed a panel data threshold model with fixed effects:

$$y_{it} = \mu_i + \beta'_1 x_{it} I(q_{it} \leq \gamma) + \beta'_2 x_{it} I(q_{it} > \gamma) + e_{it} \quad (1)$$

The index  $i$  indicates a country, the index  $t$  indicates a time,  $y_{it}$  is an explained variable (i.e. a current account in our case),  $x_{it}$  is an explicative variable, which depends on the regime of threshold variable (i.e. a budget balance),  $q_{it}$  is a threshold variable (i.e. an output gap);  $\gamma$  is the estimated threshold.

The model estimates regression coefficients  $\beta_1$ ,  $\beta_2$  and threshold  $\gamma$ . This type of model estimates two different coefficients  $\beta_1$  and  $\beta_2$  and therefore divides a panel data set in two regimes: 1) if real values of threshold variable  $q_{it}$  are smaller than estimated threshold  $\gamma$ : relation between dependent and independent variable is determined by  $\beta_1$ ; 2) if real values of threshold variable  $q_{it}$  are higher than estimated threshold  $\gamma$ : relation between dependent and independent variable is determined by  $\beta_2$ . The threshold  $\gamma$  is estimated by iteration procedure searching for the regression  $(\beta_1, \beta_2)$  with the smallest values of the sum of squared errors (Hansen, 1999).

In case of double threshold model, the model estimates two thresholds and divides the relation between dependent and independent variable into three regimes:

$$y_{it} = \mu_i + \beta'_1 x_{it} I(q_{it} \leq \gamma_1) + \beta'_2 x_{it} I(\gamma_1 < q_{it} \leq \gamma_2) + \beta'_3 x_{it} I(q_{it} > \gamma_2) + e_{it} \quad (2)$$

with the estimated thresholds  $\gamma_1 < \gamma_2$  (Hansen, 1999).

As we suppose that twin deficits existence depends on the phase of economic cycle, which can be described by output gap, the relation between budget balance and current account will change with different output gap values. We expect that twin deficits should be valid only in times of expansion with higher economic growth, i.e. only if an output gap overcomes a certain threshold value. For this purpose, we define an output gap as a threshold variable. We estimate a single threshold model as well as a double threshold model. Our double threshold model is defined in following way:

$$\begin{aligned}
CA_{it} = & \mu_i + \beta_1 BB_{i,t-1} I(GAP_{i,t-1} \leq \gamma_1) + \beta_2 BB_{i,t-1} I(\gamma_1 < GAP_{i,t-1} \leq \gamma_2) \\
& + \beta_3 BB_{i,t-1} I(GAP_{i,t-1} > \gamma_2) + \theta_1 GDP_{i,t-1} + \theta_2 INV_{i,t-1} + \theta_3 NEER_{i,t-1} \\
& + \theta_4 DEBT_{i,t-1} + \theta_5 OPEN_{i,t-1} + \theta_6 INFL_{i,t-1} + e_{it}
\end{aligned} \tag{3}$$

$CA_{it}$	is current account balance (in % of GDP)
$BB_{i,t-1}$	is budget balance (in % of GDP): a regime-dependent variable
$GAP_{i,t-1}$	is output gap (in % of potential GDP): a threshold variable
$GDP_{i,t-1}$	is GDP growth (annual, %)
$INV_{i,t-1}$	is private investment (in % of GDP)
$NEER_{i,t-1}$	is nominal effective exchange rate (index, 2005=100)
$DEBT_{i,t-1}$	is public debt (in % of GDP)
$OPEN_{i,t-1}$	is trade openness (in % of GDP)
$INFL_{i,t-1}$	is inflation (annual, %)

In our model, we distinguish two types of explicative variables:

1) regime-dependent variable (i.e. budget balance), which depends on the regime of threshold variable (output gap), and for which the estimated coefficient is different in each interval of the threshold variable – i.e. coefficients  $\beta_1, \beta_2, \beta_3$ ;

2) regime-independent variables (i.e. control variables explaining current account balance: GDP growth, private investment, nominal effective exchange rate, public debt, openness and inflation), which are identical in each interval of the threshold variable – i.e. coefficients  $\theta_1, \theta_2, \theta_3, \theta_4, \theta_5, \theta_6$ .

As Baum et al. (2013) recommended, each explicative variable (including a threshold variable), is lagged by one year, which enables to avoid an endogeneity bias.

### 3 Problem solving

Tab. 1 presents the estimation results of single and double threshold models. Single threshold model estimated one threshold value of output gap: 1.024. If an output gap is higher than 1.024%, threshold model estimated a positive relation between budget balance and current account ( $\beta_2 = 0.415$ , Tab.1), i.e. confirmed the existence of twin deficits or twin surpluses. A positive relation between budget balance and current account is confirmed also if an output gap is smaller than 1.024%, however the impact of budget balance on current account is weaker in this case ( $\beta_1 = 0.117$ , Tab.1).

The estimation of single threshold model does not permit to see the impact of output gap on “twin relation” as there is a positive relation in both output gap regimes, so that we estimated a double threshold model (Tab. 1). Here, the model determined two threshold values of output gap (-4.938 and 1.024) and divided the relation between budget balance and current account in three intervals:

- 1) Output gap smaller than -4.938%;
- 2) Output gap between -4.938% and 1.024%;
- 3) Output gap higher than 1.024%.

The model estimated different relations between budget balance and current account in each of these three intervals (Tab. 1, coefficients  $\beta_1, \beta_2, \beta_3$  in double threshold model).

**Tab. 1: The impact of output gap on twin deficits: threshold model estimates**

		Single threshold m. Estimated threshold: T1=1.024		Double threshold m. Estimated thresholds: T1= -4.938, T2=1.024	
		Estimate	Error	Estimate	Error
<b>Regime-dependent variables</b>					
BB <sub>t-1</sub> if (GAP <sub>t-1</sub> ≤ 1.024)	$\beta_1$	0.117 ***	(0.043)		
BB <sub>t-1</sub> if (GAP <sub>t-1</sub> > 1.024)	$\beta_2$	0.415 ***	(0.086)		
<b>Regime-dependent variables</b>					
BB <sub>t-1</sub> (if GAP <sub>t-1</sub> ≤ -4.938)	$\beta_1$			-0.254 ***	(0.081)
BB <sub>t-1</sub> (if -4.938 < GAP <sub>t-1</sub> ≤ 1.024)	$\beta_2$			0.111 ***	(0.039)
BB <sub>t-1</sub> (if GAP <sub>t-1</sub> > 1.024)	$\beta_3$			0.389 ***	(0.084)
<b>Regime-independent variables</b>					
GDP <sub>t-1</sub>	$\theta_1$	-0.031	(0.060)	-0.016	(0.060)
INV <sub>t-1</sub>	$\theta_2$	-0.719 ***	(0.070)	-0.712 ***	(0.069)
NEER <sub>t-1</sub>	$\theta_3$	-0.059 ***	(0.020)	-0.057 ***	(0.020)
DEBT <sub>t-1</sub>	$\theta_4$	-0.024 **	(0.012)	-0.036 ***	(0.012)
OPEN <sub>t-1</sub>	$\theta_5$	0.003	(0.009)	0.002	(0.009)
INFL <sub>t-1</sub>	$\theta_6$	-0.062	(0.088)	-0.050	(0.090)

Notes: Dependent variable: current account. \*\*\*=.01, \*\*=.05 indicate 1%, 5% significance level. The panel data threshold model is a panel model with fixed effects, which takes into account individual (country specific) fixed effect. Regime-dependent variable: budget balance (the estimated coefficient between budget balance and current account varies according to interval values of threshold variable). Regime-independent variables influence current account and are independent from the intervals of threshold variable. Non-existence of co-linearity between explicative variables is confirmed by correlation matrix. Errors: heteroscedasticity corrected standard errors.

*Source: Own calculations, output from R*

In double threshold model (Tab. 1), a positive relation between budget balance and current account (i.e. “twin relation” validity) is confirmed if an output gap is either between -4.938% and 1.024% ( $\beta_2 = 0.111$ ) or higher than 1.024% ( $\beta_3 = 0.389$ ). Note that the impact of budget balance on current account is stronger if an output gap exceeds 1.024% ( $\beta_3 > \beta_2$ ). However, if an output gap is smaller than -4.938%, the model estimated a negative relation between budget balance and current account (here,  $\beta_1 = -0.254$ ). The estimated relations between budget balance and current account in each of three intervals (i.e. the coefficients  $\beta_1, \beta_2, \beta_3$ ) are statistically significant (see Tab. 1).

Tab. 2 presents the robustness check for the estimated double threshold model, for which the robustness is documented in case of the estimated thresholds of output gap as well as in case of the estimated regime-dependent and regime-independent coefficients.

**Tab. 2: The robustness check of the estimated double threshold model**

	Model 1	Model 2	Model 3	Model 4	Model 5
<b>Estimated thresholds</b>	T1 = -4.938 T2 = 1.024	T1 = -4.938 T2 = 1.024	T1 = -4.938 T2 = 1.024	T1 = -4.938 T2 = 1.488	T1 = -4.938 T2 = 1.488
<b>Regime dependent var.</b>					
BB <sub>t-1</sub> (GAP <sub>t-1</sub> ≤ T1)	-0.254 ***	-0.255 ***	-0.265 ***	-0.283 ***	-0.286 ***
BB <sub>t-1</sub> (T1 < GAP <sub>t-1</sub> ≤ T2)	0.111 ***	0.111 ***	0.107 ***	0.090 **	0.090 **
BB <sub>t-1</sub> (GAP <sub>t-1</sub> > T2)	0.389 ***	0.391 ***	0.393 ***	0.428 ***	0.428 ***
<b>Regime-independent var.</b>					
GDP <sub>t-1</sub>	-0.016	-0.015	-0.013	0.023	0.023
INV <sub>t-1</sub>	-0.712 ***	-0.714 ***	-0.714 ***	-0.703 ***	-0.701 ***
NEER <sub>t-1</sub>	-0.057 ***	-0.056 ***	-0.051 **		
REER <sub>t-1</sub>				-0.013	-0.010
DEBT <sub>t-1</sub>	-0.036 ***	-0.036 ***	-0.036 ***	-0.036 ***	-0.035 ***
OPEN <sub>t-1</sub>	0.002			-0.001	
INFL <sub>t-1</sub>	-0.050	-0.049		-0.026	

Notes: Dependent variable: current account. \*\*\*=.01, \*\*=.05 indicate 1%, 5% significance level.

Source: Own calculations, output from R

## 4 Discussion

A double threshold model (see Tab. 1) reveals a significant impact of cyclical fluctuations on “twin relation” between budget balance and current account as an output gap in % of potential GDP (i.e. a threshold variable) determines three different relations between these two balances.

If an output gap is smaller than -4.938%, the model estimates a significant negative relation between budget balance and current account ( $\beta_1 = -0.254$  for double threshold model in Tab. 1). In other words, if an output is below its potential level in times of recession, twin deficits do not exist as a positive co-movement between budget balance and current account is not confirmed. In this case, a negative coefficient even concludes to the twin divergence between budget balance and current account, i.e. an increase in budget deficit is accompanied by a decrease in current account deficit. In the period of recession, when an output gap is negative and a national product decreases, an increase in budget deficits leads to current account amelioration. According to the traditional Keynesian view of twin deficits, an increase in public expenses (i.e. an increase in budget deficit) stimulates a domestic demand, increases imports and leads to increase in current account deficit. However, a decrease in national product below its potential level during recession (i.e. if an output gap is smaller than -4.938% in our case), causes a decrease in domestic demand and imports and it leads to the adjustment of current account deficit. Our results show that this is a case of southern European countries (e.g. Greece, Spain, Portugal, Cyprus) over the time period 2013 - 2015, as they had a negative output gap smaller than -4.938% and are situated in the first estimated interval (see Tab. 3). Note that the results of the IMF report (IMF, 2014) concluded that these countries succeeded to adjust their current account deficits “thanks to” a decrease in domestic demand, which is in accordance with our results of the twin divergence existence.



**Tab. 3: Percentage of countries in three estimated intervals of output gap**

Output gap	Percentage of countries in 3 intervals		
	$\leq -4.938\%$	$-4.938\%$ to $1.024\%$	$> 1.024\%$
<b>Relation between BB and CA</b>	Negative ( $\beta_1 = -0.254$ ) twin divergence	Positive ( $\beta_2 = 0.111$ ) twin deficit twin surplus	Positive ( $\beta_3 = 0.389$ ) twin deficit twin surplus
<b>Year</b>			
1996	5% (IE)	89%	5% (CY)
1997	0%	100%	0%
1998	0%	95%	5% (EE)
1999	0%	89%	11% (EE, FI)
2000	0%	84%	16% (DK, NL, PT)
2001	0%	47%	53%
2002	0%	53%	47%
2003	0%	95%	5% (ES)
2004	0%	84%	16% (EL, IE, ES)
2005	0%	68%	32%
2006	0%	58%	42%
2007	0%	42%	58%
2008	0%	5% (SK)	95%
2009	5% (SK)	16% (FR, PT, UK)	79%
2010	11% (EE, SE)	74%	16% (CY, EL, SK)
2011	5% (EE)	84%	11% (CY, EL)
2012	0%	95%	5% (CY)
2013	21% (EL, IE, PT, ES)	74%	5% (CY)
2014	32% (CY, EL, IE, PT, SI, ES)	68%	0%
2015	21% (CY, EL, PT, ES)	79%	0%

Notes: Output gap is lagged by one period, i.e. year 1996 (2015) correspond to the output gap from year 1995 (2014). BB = budget balance, CA = current account, CY = Cyprus, DK = Denmark, EE = Estonia, EL = Greece, ES = Spain, FI = Finland, FR = France, IE = Ireland, NL = Netherlands, PT = Portugal, SE = Sweden, SI = Slovenia, SK = Slovakia, UK = United Kingdom.

Source: Own calculations, output from R

If an output gap is between  $-4.938\%$  and  $1.024\%$ , a double threshold model estimates a significant positive relation between budget balance and current account (Tab. 1,  $\beta_2 = 0.111$ ) and confirms a twin deficit relation. It should be pointed out that majority of countries from our sample are situated in this output gap interval (Tab. 3). However, in 2008, it was only a case of Slovakia and majority of countries are found in the third interval with an output gap over  $1.024\%$  (Tab. 3).

If an output gap is higher than  $1.024\%$ , a double threshold model also concludes to the twin deficit relation showing a significant positive relation between budget balance and current account. Here, an increase in budget deficit is accompanied by an increase in output over its potential level by more than  $1.024\%$  and an increase in domestic demand during the period of expansion, which leads to increase in current account deficit. It should be noted that the estimated coefficient  $\beta_3 = 0.389$  in this output gap

interval is higher than  $\beta_2 = 0.111$  in the second interval (see Tab. 1). It means that in times of expansion, when an output is above its potential level (i.e. an output gap is superior to 1.024%), a positive impact of budget balance on current account is more important and we conclude to “stronger” twin deficit relation. However, in our sample, we can find also countries having twin surpluses in certain years, i.e. budget surpluses accompanied by current account surpluses. Let us take an example of Denmark and Netherlands, which are situated in the third interval with an output gap higher than 1.024% (see Tab. 3, year 2000). These countries recorded simultaneous budget and current account surpluses accompanied by a positive output gap.

Our results for European countries are consistent with previous studies researching the impact of cyclical fluctuations on twin deficits in United States (Kim and Roubini, 2008; Florio and Ghiani, 2015) or in Turkey (Çatık et al., 2015), which concluded that a twin relation varies with the business cycle and twin deficits are confirmed only if output is above its potential level. On the other hand, if an output is below its potential level (i.e. an output gap smaller than -4.938% in our case, Tab. 1), a co-movement of budget balance and current account is divergent. Even though a country increases a budget deficit during recession, it succeeds to adjust its current account deficit.

## Conclusion

The paper aimed to contribute to the existing empirical research on twin deficits by estimating the impact of cyclical fluctuations on twin relation existence for European countries over the time 1995 - 2015. We supposed that an output gap determines whether we confirm a twin deficit relation or a twin divergence. The idea was motivated by the fact that certain European countries succeeded to adjust their current account deficits during the period of recession and by the research of the IMF (2014), which concluded a significant impact of domestic demand decrease on current account adjustment.

A double threshold model, used for panel data, estimated two thresholds of output gap (-4.938% and 1.024%) and therefore divided the relation between budget balance and current account into three intervals, whereby the relation is different in each one. If an output gap is smaller than -4.938% (i.e. an output is below its potential level in times of recession), the model concludes to negative relation between budget balance and current account, i.e. a twin divergence. If an output gap is between -4.938% and 1.024%, the model confirms a twin deficit hypothesis. Moreover, a “twin relation” is confirmed if an output gap is over its potential level during the period of expansion (i.e. an output gap is higher than 1.024%), whereby the twin deficit relation in this output gap interval is stronger as in the second one. Consequently, we can conclude that the phase of economic cycle determines a “twin relation” and therefore neglecting the effects of output gap could lead to spurious rejection of twin deficit hypothesis.

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## Contact Address

**Ing. Veronika Šuliková, PhD.**

Technical University of Košice, Faculty of Economics, Department of Finance

Němcovej 32, 040 01, Košice, Slovakia

Email: veronika.sulikova@tuke.sk

Phone number: +421 55 602 26 65

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