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THE INFLUENCE OF FOREIGN DIRECT INVESTMENTS ON MONTENEGRO PAYMENT BALANCE

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Abstract:
In this work, with help of econometric analysis we will answer the question to which extent up to date foreign direct investments influenced Montenegro current account. Regression analysis brings to conclusion that if foreign direct investments should increase for 1%, current account deficit will increase for 0.00024% after the first quarter and 0.000227% after the second quarter. More significant effects from the direct foreign investments on Montenegrin payment balance could be seen in some period in future, if it would concentrate on new "more quality" foreign direct investments that would be export oriented. Knowing that foreign direct investments were the main source of funding current account deficit in the previous period, and that absorption possibilities for the inflow of foreign direct investments still exist, it should be continued with attracting the same mentioned, because it can help in the change of production and export structure, because with current level of domestic savings and outside debt it is unimaginable.

Keywords: foreign direct investments, *greenfield* investments, payment balance, regression analysis.

Jel Classification: F3

INTRODUCTION

One of important macroeconomic indicators of economic situation of every country is current account payment balance. It reflects movements of separate components of domestic savings and investments that imply overall economic growth.

On one hand, current account deficit can reflect economic strength of economy, because it shows resources that come into economy with goal of financing investment demands that exceed domestic savings. On the other hand, current account deficit can be a sign of dangerous and unsustainable disbalance between national savings and domestic investments, and resulting debt accumulation that cannot be timely serviced (Golubovic 2009).

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Current account deficit of payment balance is essential characteristic of Montenegrin foreign trade strategy. Due to the transition process and high rates of import growth, deficit kept deepening until 2008 reaching amounts of around 53% of GDP, and from 2009, in period of global crisis due to the decrease of domestic and foreign demand, it began dropping (IMF 2010). Problems of continuous payment balance deficit demands fast and efficient action, considering that it presents great problem in the sense of sustainability of overall economic growth. Continuous deficit must be reflected to foreign debt of the country, which attributes to enhancement of country risk and less availability to means for financing.

In this part of work we will point out that above mentioned problems cannot be effectively solved without intensifying income of foreign direct investments.

1. ANALYSIS OF INFLUENCE OF FDI TO EMPLOYMENT IN MONTENEGRO

1.1. Data

Data that will be used in econometric research of the influence of foreign direct investments to current account payment balance comprehend period 2005–2011. Income of FDI before 2005 are not included in analysis, because they are negligible. During the research there was limitation that mostly referred to collecting statistic data in terms of length of time series. Due to the shortness of periods, data on quarter level were used. Each series contains 28 observations. All data were given by Ministry of Finance, Central Bank of Montenegro and Monstat. Software E-views and SPSS were used as econometric backup.

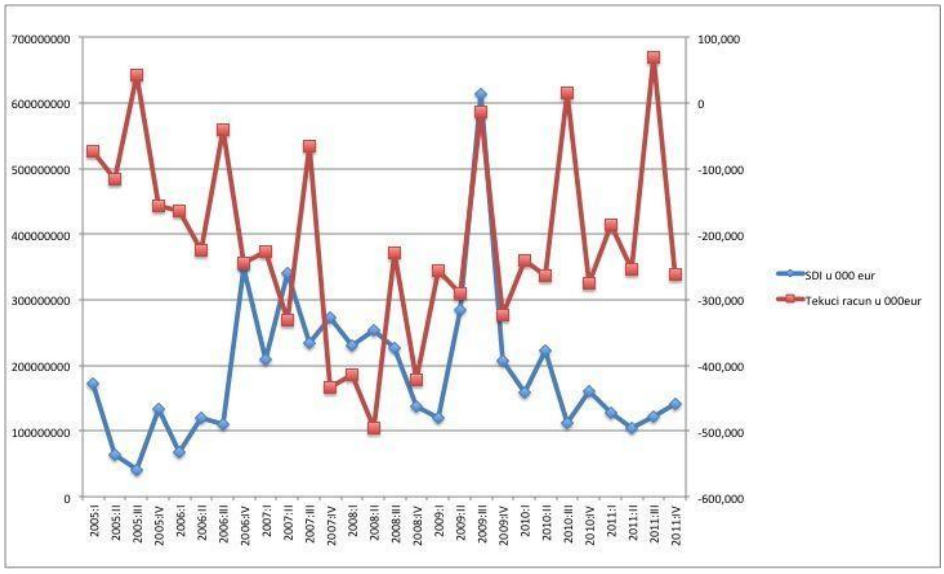


Figure 1. Movement of FDI and current account in the period 2005–2011

1.2. Methodology

In order to examine the influence of foreign direct investments on payment balance in Montenegro we will be using following techniques:

- Stationarity of time series is one of the basic assumptions for successful empiric research that is based on time series data. For testing stationarity of time series we will be using augmented Dickey Fuller test (ADF) i.e. unit root test (Duckey and Fuller 1979). In ADF test we go from hypothesis that series have unit root, i.e. that it is non-stationary. This hypothesis is rejected when MacKinnon critical values are for 1%, 5% and 10% less than calculated value of t statistic for observed series.This hypothesis is rejected when MacKinnon critical values are for 1%, 5% and 10% less than calculated value of t statistic for observed series.
- Cointegration of time series — represents regression of nonstationary time series to another nonstationary time series. If the two time series are nonstationary, their linear combination is stationary, because linear combination cancels mutual nonstationary. Cointegration basically shows if the nonstationary time series form long-term balance relationship. In this work we will use Johansen test to examine cointegration of time series (Johansen 1991).
- Granger causality test — we will try to reveal with this test in which direction goes the influence of one variable to another, i.e., whether x causes y, that is, whether x variable influences on the movement of y variable. With using Granger test we will go from the assumption that variables do not influence each other we reject hypothesis when the calculated value of F statistics is bigger than theoretical value. It is said that one variable influences the other, if coefficients that stand with variable are statistically significant. It very often happens that two variables have mutual influence (Granger 1969).
- Regression analysis — it is most often used methodology in econometrics that serves for examining dependency between variables. In this work simple linear regression model will be used that describes linear connection between dependent (Y) and independent (X) variable. The goal of regression is to predict values of dependent variable (Y) for certain values of independent variable (X). To valuate results of regression, method of least squares will be used, that is based on minimizing amount of deviation from regression line. Based on t and F statistics we examine accuracy and reliability of regression model. T statistics serves for valuation of importance of regression coefficient, while F statistics serves for valuation of reliability of regression model as whole. If the calculated value of t statistic is bigger than theoretical value we can state that regression coefficients are statistically reliable with appropriate probability. If calculated value of F statistic is equal or greater than appropriate theoretical value, with appropriate probability, zero hypothesis is rejected, while alternative is accepted that goes from that one of coefficients of regression differs from zero and that independent variables in model influence movement of dependent variable (Mladenovic and Petrovic 2003).
- Autocorrelation — in order to determine the presence of autocorrelation we will be using Durbin Watson (DW) test. For this test it is necessary that the specimen is bigger than 15 observations, because Durbin-Watson test depends on the size of specimen and number of independent variables. It is a great possibility that

autocorrelation does not exist in case that value of DW coefficient is close to 2. If the DW is closer to zero (<0.5) it shows the presence of positive autocorrelation, while the value DW<1.5 inclines that testing should be made for positive autocorrelation, and if DW>2.5 for negative (Dickey and Fuller 1979).

- Heteroskedasticity of residue variance — implies variance of random error that in every observation in the sample looks like it doesn't come from the same population i.e. it is not necessary the same. For determining heteroskedasticity we will use White test. During analysis of time series we should separately treat problem of heteroskedasticity, because the existence of heteroskedasticity leads to loss of efficiency of estimation of parameters with method of least squares, because it undermines property of least variance. In case of wrong calculation of standard errors of estimated parameters, it can lead to estimation and tests about importance of regression variables are not legible anymore and can lead to wrong conclusions. Basic reasons for occurrence of heteroskedasticity are wrong specifications of models, occurrence of outlier in the sample, existence of curved distribution of independent variables etc. (White 1980).

1.3. Results of analysis

On the beginning of the analysis, considering that it can be noted that data for FDI and current account are not seasonally sorted, that is, there is presence of season in the data, it is necessary to exclude season, in order to interpret the results in the right way in the further research.

For the sake of easier interpretation, FDI data will be logged.

Specification of equation

Dependent variable in the analysis is current account of payment balance, while the independent variable is FDI (foreign direct investments).

The influence of direct foreign investments on current account payment balance could be presented with regression equation in form:

$$\text{Current account}_t = C + C1*FDI_t + u_t,$$

where C is a constant, and u_t residue from regression in time period t. Results will be shown after examining stationarity and cointegration between time series.

However, before regression analysis, we must analyze properties of time series of current account payment balance and FDI. Therefore, it is necessary on the very beginning to examine the stationarity of time series. To examine stationarity of time series we use Augmented Dickey- Fuller Test.

Table 1. Augmented Dickey Fuller test

Augmented Dickey-Fuller Test	Augmented Dickey-Fuller Test
Equation	Equation
Dependent Variable: D(LOGSDISA)	Dependent Variable: D(TEKUCI _SA)
Method: Least Squares	Method: Least Squares
Date: 11/10/12 Time: 16:16	Date: 04/23/13 Time: 17:08
Sample (adjusted): 2004Q2 2011Q4	Sample (adjusted): 2005Q2 2011Q4
Included observations: 31 after adjustments	Included observations: 27 after adjustments

Table 1. (*continued*)

Null Hypothesis: LOGSDISA has a unit root Exogenous: Constant, Linear Trend Lag Length: 0 (Automatic – based on AIC, maxlag = 7)			Null Hypothesis: TEKUĆI _SA has a unit root Exogenous: Constant, Linear Trend Lag Length: 0 (Automatic – based on AIC, maxlag = 6)		
	t- Statistic	Prob′		t- Statistic	Prob′
ADF test statistic	-2.8335557	0,1916	ADF test statistic	-1,7942	0,3752
Test critical values: 1% level	-4.28458		Test critical values: 1% level	-3.69987	
5% level	-3.562882		5% level	-2.97626	
10% level	-3.215267		10% level	-2.62742	
*MacKinnon (1996) one-sided p-values.			*MacKinnon (1996) one-sided p-values.		

Based on results of ADF test in levels (Table 1) we can see that with both observed variables statistic of test |t| less than critical values for significance of 1%. That leads to conclusion that zero hypothesis on existence of unit root cannot be rejected, which means that time series of defined variables are non-stationary. Therefore, in order to solve the problem of non-stationarity it is necessary to perform differentiation of both time series. Also, it is necessary to check whether time series given in this way are stationary. Also by using Dickey-Fuller Test on the first differentiation of series. Results are shown in the Table 2.

Table 2. Augmented Dickey Fuller test

Augmented Dickey-Fuller Test Equation Dependent Variable: D(DLOGSDISA) Method: Least Squares Date: 11/10/12 Time: 16:18 Sample (adjusted): 2005Q1 2011Q4 Included observations: 28 after adjustments			Augmented Dickey-Fuller Test Equation Dependent Variable: D(TEKUĆI_SA,2) Method: Least Squares Date: 04/23/13 Time: 17:08 Sample (adjusted): 2005Q3 2011Q4 Included observations: 30 after adjustments		
Null Hypothesis: DLOGSDISA has a unit root Exogenous: Constant, Linear Trend Lag Length: 2 (Automatic – based on AIC, maxlag=7)			Null Hypothesis: D(TEKUĆI_SA) has a unit root Exogenous: Constant, Linear Trend Lag Length: 0 (Automatic – based on AIC, maxlag=6)		
	t- Statistic	Prob′		t- Statistic	Prob′
ADF test statistic	-4.721857	0,004	ADF test statistic	-4.55708	0,0013
Test critical values: 1% level	-4.323979		Test critical values: 1% level	-3.71146	
5% level	-3.580623		5% level	-2.98104	
10% level	-3.225334		10% level	-2.62991	
*MacKinnon (1996) one-sided p-values.			*MacKinnon (1996) one-sided p-values.		

According to the given results of ADF test of variable with differentiation of first order it can be clearly seen that the problem of non-stationarity is solved. Calculated test statistics is above critical values even for the level of significance of 1%, which rejects zero hypothesis about existence of unit root and confirms the fact that observed time series of FDI and GDP are integrated order 1 [I(1)].

Graphic display of differentiated time series is given in the following figure.

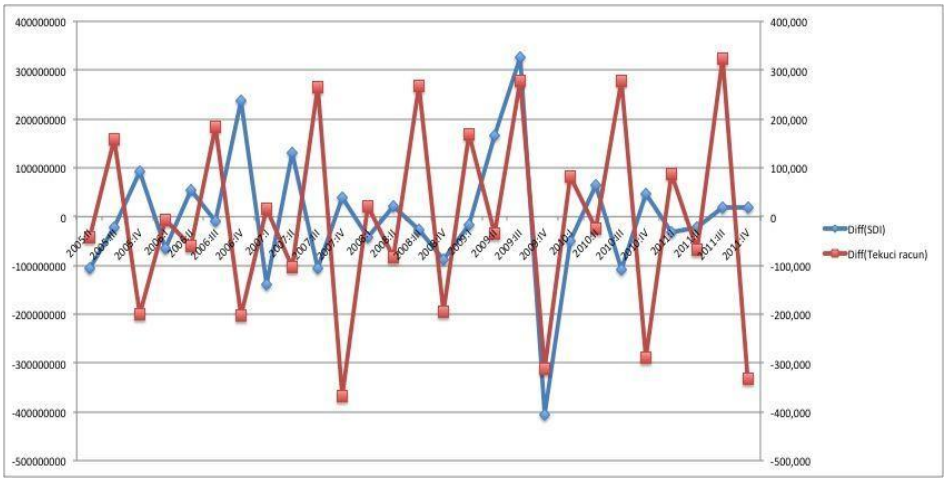


Figure 2. Differentiated time series of FDI and current account

After declaring stationarity of time series on first difference, next step in analysis is to examine the existence of cointegration between series of FDI and current account. We will examine cointegration of series using Johansen test.

Table 3. Johansen cointegration test

Date: 12/07/12 Time: 18:41				
Sample (adjusted): 2005Q3 2011Q4				
Included observations: 30 after adjustments				
Test assumption: Linear deterministic trend in the data				
Series: TEKUĆI_SA SDI				
Lag interval (in first differences): 1 to 1				
	Likelihood	5 Percent	Prob.″	
Eigenvalue	Ratio (LR)	Critical Value		
0.35684	16.5431	15.495	0.0347	None′
0.10423	3.30226	3.841	0.0692	At most 1
′ denotes rejection of the hypothesis at the 0.05 level				
″MacKinnon-Haug-Michelis (1999) p-values				

Result of Jonahsen test shows the long-term balance between observed variables. That is, the value of statistic LR are significantly bigger than critical value, which indicates rejection of hypothesis that there is no cointegration between series. We conclude that between FDI and current account payment balance there is long-term balance that is that those two variables are cointegrated.

In continuation, we will check with Granger causality test if there is causal relationship between FDI and current account, i.e. if the FDI in Montenegro affect current account or vice versa? Zero hypothesis states that there is no causality between two indicated variables.

Table 4. Granger causality test

Pairwise Granger Causality Tests		
Date: 12/07/12 Time: 18:36		
Sample: 2005Q1 2011Q4		
Lags: 5		
Null Hypothesis:	F-Statistic	Probability
SDI does not Granger Cause TEKUĆI _SA	1.83371	0.163
TEKUĆI_SA does not Granger Cause SDI	0.87236	0.5211

Results of Granger test show that calculated p value is p = 0.163, which is significantly bigger than standard value p = 0.05 and indicates to accepting zero hypothesis. That implies to the conclusion that FDI do not causally affect current account, and also, that reversed causality (p = 0.5211) in not present because the value of F statistic is significantly greater than critical value and because of that zero hypothesis that current account does not causally affect FDI cannot be rejected.

In continuing, we will interpret results of linear regression using the least squares method that is based on minimizing deviation sum from the regression line. Conditions for application of mentioned method are fullfiled considering that both series are stationary on first difference.

The equation we will evaluate is:

$$Dtekućisa = c + \alpha\gamma * dummy1 + \delta * dsdisa + \delta_1 * dsdisa(-1) + \delta_2 * dsdisa(-2) + \delta_3 * dsdisa(-3) + u(t),$$

where:
dummy1 - artificial variance,
dsdisa (-1) - first lag FDI,
dsdisa (-2) - second lag FDI,
dsdisa (-3) - third lag FDI,
α - coefficient that measures the influence of the first artificial variable,
δ - coefficient that measures the influence of FDI,
δ_1 - coefficient of the influence of first lag,
δ_2 - coefficient of the influence of second lag,
δ_3 - coefficient of the influence of third lag.

As it can be seen, in the equation, for better evaluation of the model, we have included artificial variable (dummy1) in order to present variations of immeasurable factors, i.e. to measure the effect of privatization of Elektroprivreda CG (dummy1) on current account deficit movement. However, the results given show that artificial variable is depreciated with the model.

Table 5. Evaluation of regression with method of the least squares

Dependent Variable: DTEKUCI_SA
Method: Least Squares
Date: 04/23/13 Time: 18:15
Sample:2005Q4 2011Q4
Included observations: 25

Table 5. (*continued*)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CONSTANT	-3742.884	9745.036	-0.38408	0.7052
DSDI_SA	-6.29E-05	0.000118	-0.53266	0.6004
DSDI_SA(-1)	-0.000138	0.000109	-1.26296	0.2219
DSDI_SA(-2)	-0.000163	9.73E-05	-1.67516	0.1103
DSDI_SA(-3)	2.16E-05	7.97E-05	0.271523	0.7889
DUMMY_1	54922.8	69647.09	0.788587	0.4401
R-squared	0.190439	Mean dependent var		-1124.13
Adjusted R-squared	-0.022603	S.D. dependent var		46301.32
S.E. of regression	46821.68	Akaike info criterion		24.55164
Sum squared resid	4.17E+10	Schwarz criterion		24.84417
Log likelihood	-300.8955	Hannan-Quinn criter.		24.63278
Durbin-Watson stat	1.602536			

Therefore, evaluated coefficients are as follows:

Dtekućisa = - 3742,884 + 54922,8 * dummy1 - 6.29E-05 *dsdisa - 0.000138 *dsdisa(-1) - 0.000163 *dsdisa(-2) + 2.16E-05 *dsdisa(-3) + u(t).

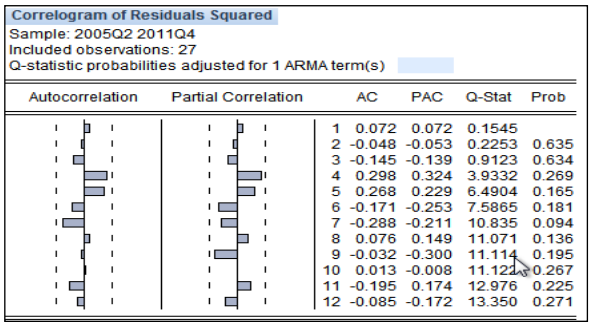
Coefficient of determination (R^2) is 19%, which shows that with model, about 19% are explained of all deviation interpreted with this regression model. Of course, because we have included greater number of variables into regression, we have calculated Adjusted R^2 which controls the number of independent variables used in the model. This coefficient equals 0.023.

The bigger the determination coefficient, the better the assumptions for predictions will be.

From the table it can be seen that coefficient with current FDI is not statistically significant, because the value of t-statistic (-0.53266) less than theoretical value. The influence of the first lag of FDI is also unimportant, to which leads us the value of t-statistic that is (-1.26296) which is less than theoretical value on 5% of significance. Also, the value of t-statistic for the influence of second lag (-1.67516) and third lag (0.271523), is less than theoretical value, which indicates to statistical insignificance of 5% significance.

Now we will examine whether autocorrelation exists between residuals of regression. Test results are shown in the following table:

Table 6. Correlogram and Q statistic



Based on correlogram it can clearly be seen that autocorrelation reaches its maximum on fifth lag, to which indicates value of Q statistic. In order for the results of regression to be valid it is necessary to evaluate regression again, taking in consideration existence of this correlation. Namely, new regression model will be:

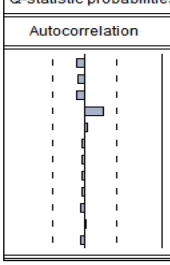
$$D(Current) = constant + coef\_1*dsdi\_sa + coef\_2*(dsdi\_sa)_{t-1} + coef\_3*(dsdi\_sa)_{t-2} + coef\_4*(dsdi\_sa)_{t-3} + dummy\_1 + u_t,$$

where $u_t = \rho u_{t-5} + \varepsilon_t$.

Considering that in previous regression model we have seen that there is autocorrelation of fifth lag, in the new model we have corrected residuals u_t and assumed that new residuals ε_t are not autocorrelated. This assumption will be checked with overview of correlogram after evaluation of new regression model. Results are shown in the following table:

Table 7. Correlogram and Q statistic

Correlogram of Residuals Squared
Sample: 2006Q3 2011Q4
Included observations: 22
Q-statistic probabilities adjusted for 1 ARMA term(s)



Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	-0.100	-0.100	0.2493	
		2	-0.082	-0.093	0.4288	0.513
		3	-0.112	-0.132	0.7750	0.679
		4	0.258	0.231	2.7257	0.436
		5	0.030	0.065	2.7545	0.600
		6	-0.038	-0.000	2.8017	0.731
		7	-0.048	0.008	2.8828	0.823
		8	-0.029	-0.096	2.9145	0.893
		9	-0.039	-0.091	2.9764	0.936
		10	-0.055	-0.082	3.1085	0.960
		11	0.019	-0.003	3.1256	0.978
		12	-0.065	-0.054	3.3459	0.985

Based on correlogram and Q statistic it is clear that autocorrelation is removed. Therefore, the results of new regression are valid and shown in Table 8.

Table 8. Evaluation of new (corrected) regression with method of the least squares

Dependent Variable: DTEKUCI_SA
Method: Least Squares
Date: 04/23/13 Time: 18:36
Sample (adjusted): 2006Q3 2011Q4
Included observations: 22 after adjustments
Convergence achieved after 16 iterations

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CONSTANT	-6445.953	6651.963	-0.96903	0.3479
DSDI_SA	-0.000183	9.99E-05	-1.83308	0.0867
DSDI_SA(-1)	-0.00024	8.64E-05	-2.77594	0.0141
DSDI_SA(-2)	-0.000227	8.20E-05	-2.76101	0.0146
DSDI_SA(-3)	5.92E-05	7.16E-05	0.826098	0.4217
DUMMY_1	108985.8	57787	1.885992	0.0788
AR(5)	-0.557304	0.218963	-2.54519	0.0224
R-squared	0.354908	Mean dependentvar		-308.574
Adjusted R-squared	0.096871	S.D. dependent var		46954.44
S.E. of regression	44622.25	Akaike infcriterion		24.50322

Table 8. (*continued*)

Sum squared resid	2.99E+10	Schwarz criterion	24.85037
Log likelihood	-262.5355	Hannan-Quincriter.	24.585
Durbin-Watson stat	1.928401		

Namely, evaluated coefficients in new regression model are as follows:

Dtekućisa = - 6445.953 + 54922.8 * dummy1 - 0.000183 *dsdisa - 0.00024 *dFDIsa(-1) - 0.000227 *dsdisa(-2) + 5.92E-05 *dsdisa(-3) + u(t).

Coefficient of determination (R^2) is 0.354908 or 35.5%, which shows that with the model about 35.5% of variations of dependent variable or current account is explained. Adjusted R^2 that controls the number of independent variables used in the model is 0.09.

From the table it can be seen that coefficient with current FDI is not statistically significant, because the value of t-statistic (-1.83308) less than theoretical value. The influence of the first (-2.77594) and second lag (-2.76101) of foreign direct investments is statistically significant, to which leads us the value of t-statistic that is less than theoretical value on 5% of significance, while the influence of the third lag of foreign direct investments statistically insignificant. Result imposes the conclusion that the slight influence of foreign direct investments will reflect on current account after certain time period (1 or 2 quarters).

The next important test for evaluation of observed regression model is to determine the existence of heteroskedasticity. To test heteroskedasticity we will use White test. With this test, it is necessary to estimate if the used variables of regression model have unequal variance. Starting hypothesis is that there is problem of heteroskedasticity i.e. that observed variables are not homoscedastic.

Results of heteroskedasticity and values of White test are shown in the following table.

Table 9. White's heteroskedasticity test

F-statistic	1.374549	Prob. F(15,9)	0.3212
Obs*R-squared	17.40333	Prob. Chi-Square(15)	0.2953
Scaled explained SS	12.10448	Prob. Chi-Square(15)	0.6711

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 04/23/13 Time: 18:41
Sample: 2005Q4 2011Q4
Included observations: 25
Collinear test regressors dropped from specification

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.93E+09	6.50E+08	2.963174	0.0159
CONSTANT*DSDI_SA	-0.23438	13.22466	-0.017723	0.9862
CONSTANT*DSDI_SA(-1)	-17.1607	10.90625	-1.573477	0.1501
CONSTANT*DSDI_SA(-2)	-7.9353	16.90298	-0.469462	0.6499
CONSTANT*DSDI_SA(-3)	-22.0506	10.89155	-2.024559	0.0736
CONSTANT*DUMMY_1	-6.18E+09	1.23E+10	-0.502556	0.6273
DSDI_SA^2	8.24E-08	6.38E-08	1.290783	0.2289
DSDI_SA*DSDI_SA(-1)	5.50E-08	2.53E-07	0.217398	0.8327
DSDI_SA*DSDI_SA(-2)	1.71E-07	2.61E-07	0.65461	0.5291

Table 9. (*continued*)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DSDI_SA*DSDI_SA(-3)	1.44E-07	1.93E-07	0.743398	0.4762
DSDI_SA(-1)^2	6.67E-08	9.50E-08	0.702441	0.5002
DSDI_SA(-1)*DSDI_SA(-2)	-1.57E-07	2.37E-07	-0.659995	0.5258
DSDI_SA(-1)*DSDI_SA(-3)	4.70E-07	1.98E-07	2.369074	0.042
DSDI_SA(-2)^2	-1.11E-07	1.25E-07	-0.887323	0.398
DSDI_SA(-2)*DSDI_SA(-3)	-2.31E-07	1.67E-07	-1.384543	0.1996
DSDI_SA(-3)^2	-1.27E-07	6.71E-08	-1.895052	0.0906
R-squared	0.696133	Mean dependent var		1.67E+09
Adjusted R-squared	0.189688	S.D. dependent var		2.64E+09
S.E. of regression	2.38E+09	Akaike info criterion		46.27318
Sum squared resid	5.08E+19	Schwarz criterion		47.05326
Log likelihood	-562.415	Hannan-Quinn criter.		46.48954
F-statistic	1.374549	Durbin-Watson stat		2.217864
Prob(F-statistic)	0.321236			

Results of White test (Obs*R-squared = 17.40333) indicate that the problem of heteroskedasticity does not exist.

Regression analysis imposes the conclusion that if the foreign direct investments increase for 1%, current account deficit will increase for 0.00024% after the first quarter and 0.000227% after the second quarter.

CONCLUSION

The results of analysis were expected, if we bear in mind the fact that foreign investors in initial phase invest through import and that they are oriented on domestic markets, in a way that they perform additional investments to enterprises they bought, in order to increase their level of competitiveness, and all of that affect increase of current account deficit. The experiences of countries in transition tell us that later import flux based on development of investments are growing weak, and export to foreign markets is strengthening. According to Jože Mencinger, that supports thesis that there is strong correlation between income of FDI and enormous current account deficits, great amount of foreign direct investments in European countries in transition was a bargain of property in privatization, and those assets didn't go to fixed investments, but to spending and import. The case of Montenegro testifies that current structure of foreign direct investments led to slight increase of current account payment balance deficit. More significant effects from foreign direct investments to payment balance could be felt in Montenegro in some future period, if it would be oriented to new "more quality" foreign direct investments to which it would be export oriented. Considering that foreign direct investments were the main source of current account deficit financing in the previous period, and that absorption possibilities for income of foreign direct investments still exist, it should be continued with attracting them, because it can help in changing production and export structure, because on the up-to-date level of domestic savings and foreign debt that is unimaginable.

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