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A New Perspective of Investment Modelling at the European Union Level

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The study that represents the subject of this paper follows the analysis of the investment function and the influencing factors at the European Union level. The research has, as a starting point, the hypothesis that there is a negative relationship between the European Union investments and tax rates. For verifying this hypothesis, the structural equation modeling is used (SEM), and the same technique is applied in the second part of the research, which will track the development of the investments' model at the European Union level. The results will highlight the relationships that are established between specific variables that characterize the volume of investments.

Keywords: *investment, interest rate, taxes, gross domestic product, European Union*

JEL classification: *E22*

1. Introduction

This work is a continuation of previous research regarding the modeling the investment function in in relation to specific factors. Previous research had as their starting point the elimination of the limitation according to which the investment function is a function dependent on interest rate and I introduced in the analysis the aspect related to fiscal pressure. Following these previous studies, I obtained the following results:

- a new model for determining long-term investments, but also an identification of the measures that would lead to increased investments (Opreana, 2010, pp.227-237, and Opreana, 2013, pp.4-12);
- obtaining a model in terms of investment analysis that will also allow us to identify a set of tools and measures to boost investments that can be used by countries with economies that are experiencing difficult periods in the current economic context (Opreana, 2014).

Maintaining the same direction research, in this current study which represents the object of this continued work on investment analysis and identifying the relationships that are established between investments and specific factors at the level of EU.

2. Literature Review

The analysis of investment represents the research objective of many researchers who approach, on the one hand, investments at a macroeconomic level and their relationships with consumption, and on the other hand,

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investments on financial markets. Therefore, the analysis presented in this article falls into the following research framework.

In a post-Keynesian/Kaleckian model of growth and distribution, Commendatore, Pinto, Sushko (2014: 12-28) suggested a constraint on firms' investment induced by increasing adjustment costs and/or limited financial resources.

Eslamloueyan & Jafari (2014: 209-220) used the correlated effects mean group (CCEMG) technique to a set of balanced panel error correction model and they studied the repercussions of the 1997's Asian financial crisis and of 2008's global financial crisis on the savings and investing behavior in East Asian countries. Eslamloueyan & Jafari (2014: 209-220) found that the rates of both savings and investments are highly dependent across countries of East Asia.

García-Belenguer & Santos (2013: 150-169) explored a simple version of the neoclassical growth model and studied empirically the main determinants of aggregate investment across countries. In their work, the neoclassical growth model predicts that aggregate investment may be influenced by income growth, capital income share, relative price of capital, taxes, and other market distortions (García-Belenguer & Santos, 2013: 150-169).

Using a fully general specification for the instantaneous utility function, Furlanetto & Seneca (2014: 111-126) presented that the size of the wealth effect on labor supply is largely inconsequential for macroeconomic dynamics.

Casalin & Dia (2014: 60-79) developed a simple theoretical model of investment by assuming that financial frictions generate certain adjustment costs that are different from those of industrial origin which are usually discussed in the literature.

Lim (2014: 160-177) analyzed 129 developed and developing economies in terms of their institutional and structural factors related to their investment activity. The author introduced these institutional and structural factors to a standard neoclassical investment function for open economies and found that financial development and institutional quality tend to be determinants of cross-country capital formation. Nonetheless, institutional quality seemed to show o higher level of stability in its sign and significance of its coefficient.

Rieger (2012: 239-240) developed and proved a formula for the computation of optimal financial investments in an expected utility framework with arbitrary (not necessarily concave) utility functions.

In their paper, Pirvu & Zhang (2014:142:150) approached the problem of consumption and investment in a financial market within a continuous time stochastic economy. Their results show that a change in the discount rate leads to time inconsistencies of the investor's decisions.

In another paper about optimal investment, Zeng, Wu, Lai (2013: 462-470) explored the multi-period optimal strategies for an investment-only problem and an investment–consumption problem.

Moreover, Di Corato, Moretto, Vergalli (2014: 80-89) introduced an analytical approximation of the short-run investment rule and presented how such an approximation can be used in order to derive the corresponding i) steady-state distribution of the optimal stock of capital and ii) the long-run average rate of capital accumulation.

Zhao, Shen and Wei (2014: 824-835) considered the consumption–investment problem with a general discount function and a logarithmic utility function in a non-Markovian framework. Their model's coefficients follow the assumption of adapted stochastic processes, including the coefficients of the interest rate, appreciation rate, and volatility of the stock. The work of Zhao, Shen and Wei (2014: 824-835) demonstrate that a time-consistent equilibrium consumption–investment strategy of the original problem consists of a deterministic function and the ratio of the market price of risk to the volatility. Nonetheless, the corresponding equilibrium value function can be described by the unique solution of a family of BSDEs parameterized by a time variable.

3. Research Methodology

To achieve the purpose of the research, the structural equation model (SEM) technique will be used to verify the hypotheses of the proposed model.

A structural equation model is a set of assumptions about how the variables in an analysis are generated and related to each other (Hu and Bentler, 1999).

This methodology will be applied by using the SPSS AMOS software on empirical data to achieve the main objective of the research and examine the hypotheses. Thus, for hypotheses testing, I used quarterly macroeconomic data, from Eurostat, related European Union, during the 2001Q1-2014Q4 timeframe.

For the empirical analysis of the investment function I will use independent variables such as interest rate and the level of fiscal pressure expressed by tax volume or tax rate.

4. Analysis and Results

4.1. Verification of the model in terms of the existence of a relationship between investment (EU28_I) and tax rate (EU28_T/Y) at the European Union level

Current research is a continuation of previous research (Opreana, 2014), in which it was observed that at EU level, there is a negative relationship is established between investments (EU28_I) and tax rate (EU28_T/Y). The main objective of this step is to verify the relationship between investment and tax rate. The hypotheses of this model are the following:

H_1: There is a relationship between investment (EU28_I) and tax rate (EU28_T/Y)

Structural equation modeling was used to test the hypotheses proposed for the model examined in this paper. The structural model was tested in accordance with the criteria established by Hu and Bentler (1999).

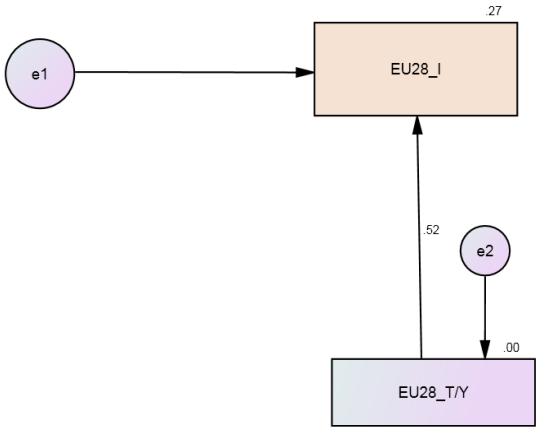

Figure 1. *Standardized results of the model*

Note: EU28_I = Investment at European Union level, EU28_T/Y = tax rate at European Union level

After applying the criteria set by Hu and Bentler (1999), the proposed model did not concur to the validation criteria in this form and needs a improvement by including more relationships between endogenous and exogenous variables.

Regarding the analysis of the hypotheses considered were obtained the following results presented in the following tables:

Table 1.1. *Regression Weights*

	Estimate	S.E.	C.R.	P
EU28_I <--- EU28_TY	16542514.109	3644604.846	4.539	***

Table 1.2. *Standardized Regression Weights*

	Estimate
EU28_I <--- EU28_TY	.522

Table 1.3. *Intercepts*

	Estimate	S.E.	C.R.	P	Label
EU28_TY	0.104	0.000	371.286	***	par_3
EU28_I	-1072116.344	377769.672	-2.838	.005	par_2

Table 1.4. *Variances*

	Estimate	S.E.	C.R.	P	Label
e2	.000	.000	5.244	***	par_4
e1	3130322122.303	596929007.181	5.244	***	par_5

Table 1.5. *Standardized Direct Effects*

	EU28_TY
EU28_I	.522

Table 1.6. *Standardized Indirect Effects*

	EU28_TY
EU28_I	.000

From the obtained results, it can be observed that there is a relationship between tax rate and investment at an EU level, but the model is not statistically valid. Thus, there is a need for developing a new conceptual model.

Also, table 1.1. shows that Hypothesis 1 is confirmed, and there is a relationship between these 2 variables.

From table 1.3 it can be observed that the result of the residual value is statistically invalid. Therefore, this shows the need for a new working model, which includes other related relationships.

4.2. Proposing a new model regarding investments at the European Union level

Next, in this upcoming paper and research, the investments' function will be achieved, and also factors determining the investments will be identified. Following the re-estimation model, it results in a new form of the model according to the type of European Economy and the influence of other factors.

The hypotheses considered in terms of obtaining this model are:

H_2: Taxes affect investments in the European Union

H_3: GDP influences the amount of taxes in the European Union

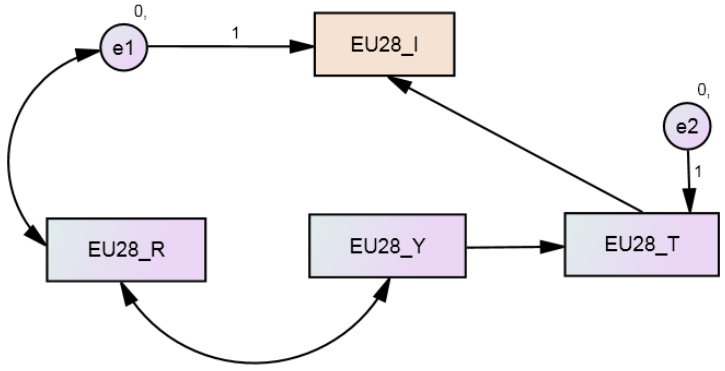

Figure 2. *The New Investment Model*

Note: EU28_R = Interest Rate at the EU level, EU28_Y = EU Gross Domestic Product, EU28_T = Taxes at the EU level, EU28_I = Investment at the EU level

Again, structural equation modeling was used to test the hypotheses proposed for the model examined in this section. The structural model was tested in accordance with the criteria established by Hu and Bentler (1999) and developed in Table 2.

Table 2.1. *Model accuracy*

Measurement	*Measurement model result*	*Recommended values*
χ^2	8.373 (p=0.015, 2df)	$p \leq 0.05$
χ^2 /df	4.187	≤5
NFI	0.975	≥0.90
RFI	0.925	≥0.90
CFI	0.981	≥0.90
RMSEA	0.241	≤0.10

Note: χ^2 =Chi-square, χ^2 /df = ratio of Chi-square and degrees of freedom, GFI = Goodness of fit index, NFI = Normed fit index, RFI = Relative fit index, CFI = Comparative fit index, RMSEA = Root mean square error of approximation.

To analyze the new investment model using the structural equation modeling technique, I analyzed the path coefficients of the hypothetical relationships between variables.

The following tables reflect information regarding the unstandardized and standardized coefficients estimates, statistical significance, and standard error of each relationship.

Table 2.2. *Regression Weights*

			Estimate	S.E.	C.R.	P	Label
EU28_T	<---	EU28_Y	.111	.003	44.340	***	par_2
EU28_I	<---	EU28_T	1.553	.144	10.769	***	par_1

Table 2.3. *Standardized Regression Weights*

			Estimate
EU28_T	<---	EU28_Y	.986
EU28_I	<---	EU28_T	.820

Table 2.4. *Intercepts*

	Estimate	S.E.	C.R.	P
EU28_T	-23299.594	7683.829	-3.032	.002
EU28_I	152005.080	45816.036	3.318	***

Table 2.5. *Covariances*

			Estimate	S.E.	C.R.	P
e1	<-->	EU28_R	16079.333	3695.867	4.351	***
EU28_R	<-->	EU28_Y	-142194.580	36248.761	-3.923	***

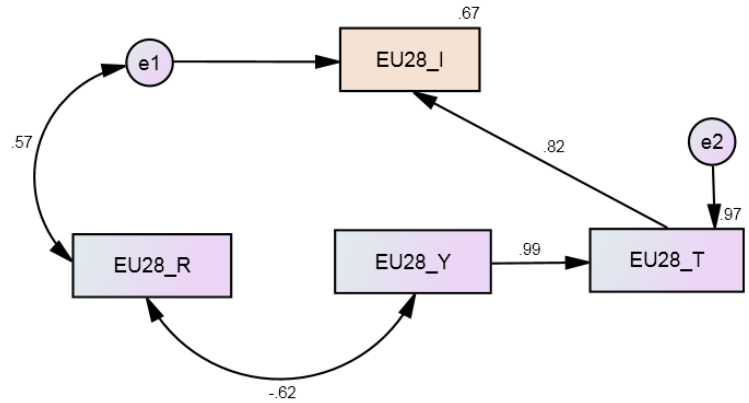

Figure 3. *Standardized results of the new investment model*

Table 3. *Estimates of hypotheses testing*

Hypotheses	*Significance*	*Hypothesis Result*
H_2. EU28_T→EU28_I	***	Confirmed
H_3. EU28_Y →EU28_T	***	Confirmed

**** Significant at a 0.001 level (Two-tailed)*
*** Significant at a 0.005 level (Two-tailed)*
** Significant at a 0.010 level (Two-tailed)*

5. Conclusions

Following this present research, a new model regarding the investment function was identified. The results obtained confirm the three proposed hypotheses, namely:

H1: There is a relationship between investment and tax rates.

H2: Taxes affect investment in the European Union

H3: GDP influences the amount of taxes in the European Union

Regarding the limits of this research it should be mentioned that the RMSEA value in Table 2.1. shows that the new model of investments needs a development and it is necessary to identify specific variables that influence the behavior of variables at the level of the European Union's economies.

However, the results from this research will enable us to achieve and identify a new set of specific measures for each country, which will lead to boosted investments in the current economic context.

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