Romanian Academy

"Costin C. Kiriţescu" National Institute for Economic Research "Victor Slăvescu" Centre for Financial and Monetary Research

# **Financial Studies**



# "VICTOR SLĂVESCU" CENTRE FOR FINANCIAL AND MONETARY RESEARCH

# FINANCIAL STUDIES



ROMANIAN ACADEMY "COSTIN C. KIRIŢESCU" NATIONAL INSTITUTE FOR ECONOMIC RESEARCH "VICTOR SLĂVESCU" CENTRE FOR FINANCIAL AND MONETARY RESEARCH



# FINANCIAL STUDIES

Year XXIII– New series – Issue 4 (86)/2019

The opinions expressed in the published articles belong to the authors and do not necessarily express the views of Financial Studies publisher, editors and reviewers. The authors assume all responsibility for the ideas expressed in the published materials.



#### ROMANIAN ACADEMY "COSTIN C. KIRIŢESCU" NATIONAL INSTITUTE FOR ECONOMIC RESEARCH "VICTOR SLĂVESCU" CENTRE FOR FINANCIAL AND MONETARY RESEARCH

Quarterly journal of financial and monetary studies

#### EDITORIAL BOARD

Valeriu IOAN-FRANC (*Honorary Director*), "Costin C. Kiriţescu" National Institute for Economic Research, Romanian Academy

Tudor CIUMARA (*Director*), "Victor Slăvescu" Centre for Financial and Monetary Research, Romanian Academy (<u>t.ciumara@icfm.ro</u>)

Adina CRISTE (*Editor-in-Chief*), "Victor Slăvescu" Centre for Financial and Monetary Research, Romanian Academy (<u>a.criste@icfm.ro</u>)

Ionel LEONIDA (*Editor*), "Victor Slăvescu" Centre for Financial and Monetary Research, Romanian Academy

Iulia LUPU (*Editor*), "Victor Slăvescu" Centre for Financial and Monetary Research, Romanian Academy

Sanda VRACIU (*Editorial Secretary*), "Victor Slăvescu" Centre for Financial and Monetary Research, Romanian Academy (<u>s.vraciu@icfm.ro</u>)

Alina Georgeta AILINCĂ, "Victor Slăvescu" Centre for Financial and Monetary Research, Romanian Academy

Iskra Bogdanova CHRISTOVA-BALKANSKA, Economic Research Institute, Bulgarian Academy of Sciences

Camelia BĂLTĂREŢU, "Victor Slăvescu" Centre for Financial and Monetary Research, Romanian Academy

Emilia Mioara CÂMPEANU, The Bucharest University of Economic Studies

Georgiana CHIŢIGA, "Victor Slăvescu" Centre for Financial and Monetary Research, Romanian Academy

Mihail DIMITRIU, "Victor Slăvescu" Centre for Financial and Monetary Research, Romanian Academy

Emil DINGA, "Victor Slăvescu" Centre for Financial and Monetary Research, Romanian Academy

Cătălin DRĂGOI, "Victor Slăvescu" Centre for Financial and Monetary Research, Romanian Academy

Monica DUTCAŞ, "Victor Slăvescu" Centre for Financial and Monetary Research, Romanian Academy

Barry HARRISON, Nottingham Business School, United Kingdom

Emmanuel HAVEN, University of Essex, United Kingdom

Silvia Elena ISACHI, "Victor Slăvescu" Centre for Financial and Monetary Research, Romanian Academy

Mugur Constantin ISĂRESCU, Academician, Romanian Academy

Otilia Elena MANTA, "Victor Slăvescu" Centre for Financial and Monetary Research, Romanian Academy

Constantin MARIN, "Victor Slăvescu" Centre for Financial and Monetary Research, Romanian Academy

George Daniel MATEESCU, Institute for Economic Forecasting, Romanian Academy

Nicoleta MIHĂILĂ, "Victor Slăvescu" Centre for Financial and Monetary Research, Romanian Academy

Camelia MILEA, "Victor Slăvescu" Centre for Financial and Monetary Research, Romanian Academy

Iulian PANAIT, Hyperion University, Bucharest

Elena PELINESCU, Institute for Economic Forecasting, Romanian Academy

Rodica PERCIUN, National Institute for Economic Research, Academy of Sciences of Moldova

Gabriela Cornelia PICIU "Victor Slăvescu" Centre for Financial and Monetary Research, Romanian Academy

Napoleon POP, "Costin C. Kiriţescu" National Institute for Economic Research, Romanian Academy

Corina SÂMAN, Institute for Economic Forecasting, Romanian Academy

Tihana ŠKRINJARIĆ, Faculty of Economics and Business, University of Zagreb, Croatia

Julia STEFANOVA, Economic Research Institute, Bulgarian Academy of Sciences

Andreea Maria STOIAN, The Bucharest University of Economic Studies

Alexandru STRATAN, National Institute for Economic Research, Academy of Sciences of Moldova

Angela TIMUŞ, National Institute for Economic Research, Academy of Sciences of Moldova

Feyyaz ZEREN, Department of International Trade and Finance, Yalova University, Turkey

Katharina WICK, University of Natural Resources and Applied Life Sciences, Vienna, Austria

Issue 4/2019 (86,Year XXIII)

ISSN 2066 - 6071 ISSN-L 2066 - 6071

# Contents

# CONSEQUENCES OF THE GREEK ECONOMIC CRISIS ON THE STRUCTURE OF THE GREEK BANKING SYSTEM...... 6 Simeon KARAFOLAS, PhD

## DEVELOPMENT OF A FINANCIAL MODEL IN A BUSINESS: THE CASE OF A COMPANY IN PLASTICS INDUSTRY ...... 21

Alexander JAKI, MSc Charalampos AITSIDIS, MSc Fotios PANAGIOTOPOULOS, MSc Dimitrios Maditinos, PhD

# A STUDY ON R&D EXPENDITURE AND CORPORATE

# 

# 

# 

Camelia MILEA, PhD

# CONSEQUENCES OF THE GREEK ECONOMIC CRISIS ON THE STRUCTURE OF THE GREEK BANKING SYSTEM<sup>1</sup>

### Simeon KARAFOLAS, PhD\*

#### Abstract

The Greek banking market developed considerably after the accession of Greece to the Eurozone, which was reflected on the growth of number of banks, banking network and number of employees. The application of the austerity program in Greece had serious consequences on the Greek banking market. These consequences can be witnessed in the dramatic increase of non-performing loans, the reduction of banks operating in Greece due to mergers and acquisitions, bank bankruptcy and withdrawal of foreign banks. All these resulted in Greece having the most concentrated banking market in the Eurozone. The reduction of the number of banks operating in Greece led to the closing of bank branches and dismissal of employees. Nevertheless, some aggregates seem to benefit the remaining banks in Greece. The ratios of deposits per branch and employee and in particular the ratios of loans per branch and employee have a positive impact on the productivity of the banks.

Keywords: Acquisitions, Banks, Greece, Mergers

JEL Classification: G01, G21, G33, G34

# 1. Introduction

The crisis Greece has faced for almost a decade, just after the global financial crisis, was not, initially, triggered by a banking crisis, as in the other countries, see particularly the Irish case, (Whelan, 2013). Greek banks avoided participating in high risk banking activities,

<sup>&</sup>lt;sup>1</sup> The present study has been presented at the 11th International Conference "The Economies of the Balkan and the Eastern European Countries in the Changing world", EBEEC 2019, that has been held in Bucharest, Romania 10-12 May 2019 (http://ebeec.teiemt.gr/).

<sup>\*</sup> Professor, Department of Accounting and Finance, University of Western Macedonia, Greece.

following a more conservative policy. For example, in the case of Barclays Bank, in the period 2017-2018 the derivative financial products present on average 32% of assets against 33% for loans and advances to customers. In the case of Alpha Bank, in the same period, the derivative financial products present on average only 1% of assets against 63% of loans and advances to customers, (see Karafolas, 2019). The Greek crisis was caused by the high public debt and public deficit (see Table 1), since the global financial crisis prevented the financing of the Greek debt by private investors or, if this was done, it was at a very high cost.

The Greek governments had to ask for the financial support of the European Union and the International Monetary Fund (IMF), resulting in the Greek economic adjustment program, which was part of the Memorandum of Understanding (MoU) signed between Greece and its lenders, (see Bank of Greece 2014). This program required an austerity policy with the aim of reducing deficits and hence reducing the public debt in the long run. The program was carried out under the auspices of the IMF, the European Commission and the European Central Bank.

The macroeconomic consequences of this policy appear on the Table 1. Long after the international crisis, the Greek economy suffers from a continuing economic downturn that is evident on the reduction of the Gross Domestic Product (GDP), investments and consumption and, on the other spectrum, on the rise of unemployment and nonperforming loans (Table 1). The Greek banks were adversely affected directly, through the non-paid loans, or indirectly, as a consequence of the general economic recession of the country.

Table 1

2009	2010	2011	2012	2013	2014	2015	2016	2017
-2,3	-4,2	-9,2	-7,3	-3,2	0,7	-0,4	-0,2	1,5
-1,8	-4,1	-9,9	-7,9	-2,6	0,6	-0,2	0	0,9
7,6	-9	-7	-7,2	-6,4	-1,4	1,6	-0,7	-0,4
-11,4	-17,4	-20,7	-23,4	-8,4	-4,7	0,7	4,7	9,1
9,6	12,7	17,9	24,4	27,5	26,5	24,9	23,5	21,5
	2009 -2,3 -1,8 7,6 -11,4 9,6	2009         2010           -2,3         -4,2           -1,8         -4,1           7,6         -9           -11,4         -17,4           9,6         12,7	2009         2010         2011           -2,3         -4,2         -9,2           -1,8         -4,1         -9,9           7,6         -9         -7           -11,4         -17,4         -20,7           9,6         12,7         17,9	2009201020112012-2,3-4,2-9,2-7,3-1,8-4,1-9,9-7,97,6-9-7-7,2-11,4-17,4-20,7-23,49,612,717,924,4	20092010201120122013-2,3-4,2-9,2-7,3-3,2-1,8-4,1-9,9-7,9-2,67,6-9-7-7,2-6,4-11,4-17,4-20,7-23,4-8,49,612,717,924,427,5	200920102011201220132014-2,3-4,2-9,2-7,3-3,20,7-1,8-4,1-9,9-7,9-2,60,67,6-9-7-7,2-6,4-1,4-11,4-17,4-20,7-23,4-8,4-4,79,612,717,924,427,526,5	2009201020112012201320142015-2,3-4,2-9,2-7,3-3,20,7-0,4-1,8-4,1-9,9-7,9-2,60,6-0,27,6-9-7-7,2-6,4-1,41,6-11,4-17,4-20,7-23,4-8,4-4,70,79,612,717,924,427,526,524,9	20092010201120122013201420152016-2,3-4,2-9,2-7,3-3,20,7-0,4-0,2-1,8-4,1-9,9-7,9-2,60,6-0,207,6-9-7-7,2-6,4-1,41,6-0,7-11,4-17,4-20,7-23,4-8,4-4,70,74,79,612,717,924,427,526,524,923,5

Evolution of macroeconomic indicators (rate change, %)

Financial Studies – 4/2019									
	2009	2010	2011	2012	2013	2014	2015	2016	2017
6. Non- performing to total loans	7,7	10,5	15,9	22,5	31,2	35	35,7	46,3	43,1
7. Public Debt/GDP	127	146	172	159	177	179	176	178	176
8. Public Deficit/GDP	-15,2	-11,2	-10,2	-8,8	-12,4	-3,6	-5,6	0,5	0,8

Source: Bank of Greece, 2016 and 2018 and Bank of Greece, 2017a, (author's calculations), Eurostat, 2018, Bank of Greece, 2018a

The consequences on the banking structure were immediate and multiple. They were reflected on the recapitalization needs, or even on the bankruptcy of banks, which in turn led to the shrinking of the number of banks, the banking network and employees. This study focuses on some of these issues and in particular on the evolution of the banking market by examining the acquisitions and mergers that took place before and during the crisis; most of them were the consequence of the recapitalization insufficiency, even the bankruptcy of small banks. This regression has led to the biggest concentration of the banking market in the Eurozone. After the introduction, the first section examines the course of mergers and acquisitions in the banking market; the second section discusses the evolution of the banking network and the third section the consequences of the banking restructuration, followed by the conclusions of the paper.

### 2. Evolution of banking market: mergers and acquisitions

The beginning of the 1990s was characterized by the liberalization of the Greek banking market and the set-up of new banks. During this decade, and, in particular the first half of the decade, mergers and acquisitions involve small banks; in the second half, this situation is more serious, and it involves big banks (Table 2 and Athanasoglou and Brisimis, 2004). In the first decade of 2000, another significant movement of mergers and acquisitions took place. It involves Greek and foreign banks as well and it is connected with the accession of Greece to the Eurozone and the opportunities that it creates for the financial sector. It reflects the banking policies for their development in this environment. The cases of Piraeus Bank and Eurobank are quite characteristic, as is this of Alpha Bank that acquired a major competitive bank, Ionian Bank, Table 2. Another important example is that of the acquisition of two major Greek banks by two

French ones; Credit Agricole acquired Emporiki Bank and Société Générale acquired General Bank, Table 2.

From 2011, one year after the MoU, another wave of mergers and acquisitions took place. The new one differs from the past. During this period the banking market is adversely affected by the economic recession, the non-performing loans and, as a consequence, the need of recapitalization and the bankruptcy of several small banks considered minor for the economy; see the list of significant banks for the economy at European Central Bank, (2017). In the Greek case, four banks, Alpha Bank, Eurobank, the National Bank of Greece and Piraeus Bank are considered significant for the economy; therefore, they received the support from the Hellenic Financial Stability Fund (Bank of Greece, 2012) in order to ensure their capital increase and thus achieve recapitalization. This public support was refused to the minor banks; these banks had to cover their capital needs through their own means and the private market. A lot of them did not succeed and the Bank of Greece revoked their license. The Bank of Greece decided to sell the performing loans of these banks to other banks. The consequences appear on the Table of mergers and acquisitions from 2011 to 2015, Table 2. This phenomenon particularly affected cooperative banks since 7 of them went bankrupt and their performing loans were sold to other major banks; thus, three cooperative banks were sold to Alpha Bank, four others were sold to the National Bank of Greece while the Piraeus Bank acquired the PanHellenic Bank, a stock company created by Greek cooperative banks and received the support of the German cooperative bank, DZ Bank, which possessed, since 2005, 10% of Pan Hellenic's stock capital (Karafolas, 2016). The Bank of Greece revoked the license of some other small banks but also of two state banks, the Agricultural Bank of Greece and the Post Bank; performing loans were sold to the major banks, Alpha Bank, Eurobank, National Bank of Greece and Piraeus Bank, Table 2.

# Table 2

Merges and acquisitions in the Greek banking market

ear	Acquiring bank	Acquired bank
1991	Group of investors	Piraeus Bank
1993	Hanwha First Investîmes	Bank of Athens
1996	Eurobank	Interbank
1997	National Mortgage Bank	Housing Bank
1997	Piraeus Bank	Chase Manhattan (Greek network)
1998	Piraeus Bank	Macedonia and Thrace Bank
		Crédit Lyonnais (Greek netowrk)
		Chios Bank
	Eurobank	Bank of Athens
		Bank of Crete
	Egnatia Bank	Bank of Central Greece
	National Bank of Greece	National Mortgage Bank
1999	Piraeus Bank	National Westminster ( <i>Greek netowrk</i> )
	Alpha Bank	Ionian Bank
	Telesis Finance	Doriki Bank
	Eurobank	Ergasias Bank
2001	Eurobank Ergasias	Telesis Finance
2001	Marfin Financial Group	Piraeus Prime
	First Business Bank	Nova Scotia ( <i>Greek netowrk</i> )
	Piraeus Bank	ETBA
2002	National Bank of Greece	ETEBA
2002	Asnis Bank	ABN AMRO (Greek retail network)
2003	Marfin Financial Group	Investment Bank of Greece
2003	Societe Generale	General Bank
2004	Proton Bank	Omega Bank
2000	Marfin Einangial group	Egnotic Bonk
	Credit Agricele	Egnatia Dalik Empositri Donte
2011		
2011	Post Bank	I Bank
	Piraeus Bank	Agricultural Bank of Greece
2012		General Bank
2012	National Bank of Greece	Anaiki Cooperative Bank
		Cooperative Bank of Lamia
2012		Lesvos-Limnos Cooperative Bank
2013	Alpha Bank	Emporiki Bank
	Piraeus Bank	Bank of Cyprus
		Cyprus Popular Bank
		Hellenic Bank
		Millenium Bank
	Alpha Bank	Cooperative Bank of Dodecanese
		Cooperative Bank of Evia
		Cooperative Bank of West Macedonia
	National Bank of Greece	FBBank
	Eurobank	New Proton Bank
		New Post Bank
2015	Piraeus Bank	PanHellenic Bank
	National Bank of Greece	Cooperative Bank of Pelopoppese

A main consequence of the acquisitions during the crisis period was the massive concentration of the Greek banking market. At the beginning of the crisis the Greek banking market was characterized by significant concentration, (five bigger banks controlled 70% of total assets); the acquisitions during the crisis period resulted in four big banks controlling 97% of the banking market at the end of 2017, Table 3. In the same period in the Eurozone the share of the total assets of the five largest credit institutions never surpass 50% of the market, even if a marginal increase appears this period, Table 3.

#### Table 3

# Share of total assets of five largest credit institutions

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017*
Eurozone	44	44	47	47	47	47	48	48	48	
Greece	70	69	71	72	79	94	94	95	97	97
* Only for Greece, European Central Bank, 2018										

Only for Greece, European Central Bank, 20.

Source: European Central Bank, 2017a

### 3. Consequences on the banking network and employees

The shrinking of the banking network and banking employees appears on Table 4 and it is the result of at least the following reasons: a/the recession of the economy that limited the banking activities; b/the result of the acquisitions and the necessity of a geographic restructuring of the network; c/ the bankruptcy of several banks that had to close off their branches and to lay off their employees or to have them be recruited by the acquiring banks; d/the withdrawal of foreign banks.

On the first reason, all macroeconomic aggregates have fallen dramatically during the crisis period, as it appears on the table 1. Furthermore, banks suffer from the non-performing loans that affected the banking transactions and capital needs. On the second reason, acquiring banks had to deal with the problem of the network implantation; in most cases banking branches of acquiring and acquired banks were very close in the same geographic area. The question that was raised was whether two branches of the same bank should be located in the same place. Banks decided to close one or more branches placed in the same area. Bankruptcy and withdrawal of banks appear on the number of banks, Table 4. In 2010, the first year of the MoU, the number of banks registered was 37 against 52 one

year earlier. 23 banks were in function in 2013 and since 2016 there are only 16. As a consequence, in 2010 the banking network experienced a downward trend for the first time; this trend characterized the crisis period, Table 4.

#### Table 4

	Number of banks *	Athens area	Thessaloniki area	Rest of Greece	Total Branches	Total employees
2001	59	1.182	308	1.610	3.100	59.636
2002	59	1.231	379	1.650	3.260	60.338
2003	58	1.244	339	1.686	3.269	60.531
2004	61	1.293	341	1.741	3.375	59.631
2005	61	1.430	404	1.658	3.492	60.138
2006	61	1.533	429	1.748	3.710	61.775
2007	57	1.522	392	1.806	3.720	64.350
2008	56	1.656	405	2.004	4.065	65.304
2009	52	1.684	406	2.008	4.098	64.635
2010	37	1.582	387	1.961	3.930	61.274
2011	37	1.568	390	1.942	3.900	57.737
2012	35	1.430	358	1.827	3.615	55.878
2013	23	1.213	303	1.499	3.015	51.072
2014	23	1.046	263	1.380	2.689	45.254
2015	17	993	247	1.290	2.530	45.266
2016	16	893	223	1.206	2.322	41.211
2017	16	808	210	1.143	2.161	41.441

Banking network end employees in Greece

\* Not including Bank of Greece

Source: Hellenic Bank Association, 2018, Association of Co-operative Banks of Greece, 2018, (author's calculations)

In 2010 the shrinking is related to the bankruptcy of small banks, in particular Aspis Bank and the withdrawal of foreign banks, most of which had branches in Athens; thus, the network in the area of Athens presents the bigger fall on banking branches, Table 4. On the contrary, in 2012-2013 the bankruptcy of cooperative banks provoked the shrinking of branches especially in the rest of Greece, (other than Athens and Thessaloniki area), since cooperative banks are mainly regional banks outside Athens and Thessaloniki (see Karafolas 2016).

The same trend was observed in the number of banking employees. The reduction in the number of banks caused the reduction of employees, Table 4. In 2013, 2014 and 2016 the four major banks in Greece implemented voluntary retirement schemes for the rest of the period, till 2017. The consequences are reflected on the consecutive fall in the number of employees in 2013 and 2014 and then in 2016, Table 4.

# 4. The banking restructuration, some positive results for the banks

A dynamic boost of the economy which would lead the banking market to growth rates is still absent. Nevertheless, some banking indexes have been favoured by the banking restructuration; this is quite obvious on employee productivity if we examine the course of loans and deposits per employee; it is the same for the course of the same aggregates per branch.

In Table 5 we observe the evolution of loans in the private sector and deposits in credit institutions. A decline of loans is observed since 2011, which continues for the rest of the period. A more serious fall regarding the deposits, is observed in the same period; it begun with a significant fall in 2010 and 2011, followed by another serious fall in 2015. However, a different situation is observed in terms of deposits and loans per banking branch and employee, Table 5 and figures 1, 2, 3 and 4.

# Table 5

Evolution of deposits and	loans, in tota	I and per	employee and
branch (	(millions of e	uros)	

	Deposits	Loans to private sector	Deposit/branch	Deposit/employee	Loans/ branch	Loans/ employee
2001	125.962	74.601	40,6	2,1	24,1	1,3
2002	124.240	87.177	38,1	2,1	26,7	1,4
2003	126.152	103.848	38,6	2,1	31,8	1,7
2004	137.532	123.754	40,8	2,3	36,7	2,1
2005	159.581	149.639	45,7	2,7	42,9	2,5
2006	174.937	179.158	47,2	2,8	48,3	2,9
2007	197.929	215.088	53,2	3,1	57,8	3,3
2008	227.620	249.324	56,0	3,5	61,3	3,8
2009	237.531	249.321	58,0	3,7	60,8	3,9
2010	209.604	257.474	53,3	3,4	65,5	4,2
2011	174.227	248.146	44,7	3,0	63,6	4,3
2012	161.451	227.263	44,7	2,9	62,9	4,1
2013	163.251	217.518	54,1	3,2	72,1	4,3
2014	160.285	211.637	59,6	3,5	78,7	4,7
2015	123.377	203.927	48,8	2,7	80,6	4,5
2016	121.381	194.749	52,3	2,9	83,9	4,7
2017	126.346	183.562	58,5	3,0	84,9	4,4

*Source:* Hellenic Bank Association (2018); Bank of Greece, 2018b, 2018c, (author's calculations)

The serious decline of deposits is not followed by an analogous fall of deposits per branch and per employee. A gap appears in the evolution between the total deposits and these per branch and employee in the crisis period, while the period before a very similar evolution is observed (see figures 1 and 2). Therefore, banks have benefited from the decline in the number of employees and branches. This advantage is even more obvious in the case of loans, since the gap between the two categories of aggregates, loans and loans per branch and per employee, deepens in the period of the crisis. During the crisis period, the ratios loans per branch and loans per employee are the higher during the examined period, 2001-2017 (see figures 3 and 4).



Source: Table 5



Figure 2 Evolution of deposits and deposits/banking employee (mil. EUR)

Source: Table 5



Source: Table 5



Source: Table 5

## 5. Conclusions

The global financial crisis was transformed into an economic and social crisis in Greece because of the austerity program and had a strong impact on the Greek banking market.

During the period 2001, (entry of Greece to the Eurozone), to 2009, (last year before Greece signed the MoU), more than 50 banks operated, Table 4. The year Greece signed the MoU in 2010, the banks operating in Greece were no more than 37. In the period that followed, the number of banks operating in Greece fell further, rising to 16 in 2017. Before the crisis, Greek banks followed a policy of development through mergers and acquisitions; this policy was necessary for new operating banks as Piraeus Bank and Eurobank. This policy would help to achieve the targets of better economies of scale and efficiency but also a better placement in the market. In some cases, mergers and acquisitions seemed to focus on a complementary policy; in some others it was the result of a much more aggressive policy, as in the case of the acquisition of the Ionian Bank by the Alpha Bank. The crisis changed the market's environment. The need for recapitalization, the bankruptcy especially of small banks and the withdrawal of foreign banks from the Greek market changed the characteristics of mergers and acquisitions. In most cases they seemed to have a crucial effect to the benefit of the four important for the economy banks, which received the public financial support for their recapitalization. The mergers and acquisitions created the most concentrated banking market in the Eurozone, since the four systemic banks possess 97% of the total assets of the Greek banking market. These developments are reflected on the banking network since the continuous growth of the number of branches till 2009, with 4.098 branches, was followed by a strong shrinking of the banking network, resulting in only 2.161 branches on 2017; that is a loss of 1.927, almost by half compared to 2009. The same applies to the employees, since the steady increase has been followed by a sharp decline of 23.194 banking employees since 2009 that is almost 36% of employees in 2009. This development benefited the remaining banks, which presented a bigger productivity if we compare the evolution of deposits and particularly the course of loans per branch and employee during crisis.

The huge concentration of the Greek banking market is not without risk for the national economy. In the event of difficulties, even for one of the systemic banks, the impact will be direct on the economy,

as in the case of Ireland where the Irish government that had to rescue its financial system, (O'Sullivan K.P.V. and T. Kennedy, 2010). Further, since the financing of the economy depends on four banks, these banks are able to impose their own policy on the funding of the national economy. Focusing on the consequences of Greek crisis on the banking market other issues affecting the evolution of this market did not considered; for example, technological advances, as e-banking. This is a limitation of the study. In any case, the crisis had dramatic consequences on the banking market that outweigh any technological influence during this particular period in Greece. The Greek case may be an example for other countries with similar characteristics such extended public debt and increase of non-performing loans. The Greek case can be particularly illuminating on the consequences for the banking market and should lead to fiscal, financial and regulatory policies that will prevent such problems from arising.

#### References

- 1. Association of Co-operative Banks of Greece (2018) *Quarterly financial statements*, ACBG <u>http://www.este.gr/en/news</u>
- 2. Athanasoglou, P. and Brisimis, S. (2004) The effect of mergers and acquisitions on bank efficiency in Greece,
- 3. Economic Bulletin of Bank of Greece, 22, 1, 7-32.
- 4. Bank of Greece (2012) Report on recapitalization and restructuring of the Greek banking sector, Bank of Greece, <u>http://www.bankofgreece.gr/Pages/en/Bank/News/PressRele</u> <u>ases/Displtem.aspx?Filter\_by=DT&ltem\_ID=4132&List\_ID=1</u> af869f3-57fb-4de6-b9ae-bdfd83c66c95
- Bank of Greece (2014) The chronicle of the big crisis, Bank of Greece, <u>https://www.bankofgreece.gr/BogEkdoseis/The%20Chronicle</u> %20of%20the%20Great%20Crisis.pdf
- 6. Bank of Greece (2016) Bulletin of Conjunctural Indicators, no 166, January-February 2016.
- Bank of Greece (2018) Bulletin of Conjunctural Indicators, no 182, September-October 2018.

- Bank of Greece (2018a) Report on Operational Targets for Non-Performing Exposures (NPEs), which refers to end of December 2017 data, Bank of Greece, 29/3/2018 https://www.bankofgreece.gr/Pages/en/Bank/News/PressRel eases/Displtem.aspx?ltem\_ID=6036&List\_ID=1af869f3-57fb-4de6-b9ae-bdfd83c66c95&Filter\_by=DT
- Bank of Greece (2018b) Deposits held with credit institutions, on financial institutions, Bank of Greece, https://www.bankofgreece.gr/pages/el/statistics/monetary/de posits.aspx
- Bank of Greece (2018c) Credit to domestic non-Monetary Financial Institutions (MFI) residents by domestic MFIs excluding the Bank of Greece, Bank of Greece, <u>https://www.bankofgreece.gr/Pages/en/other/AdvSearch.asp</u>
- 11. European Central Bank (2017) *Banking supervision, List of supervised banks as 1 July 2017,* ECB, <u>https://www.bankingsupervision.europa.eu/banking/list/who/h</u>tml/index.en.html
- 12. European Central Bank (2017a) Report on Financial structures, October 2017, Table 11, ECB, <u>https://www.ecb.europa.eu/pub/pdf/other/reportonfinancialstructures201710.en.pdf</u>
- 13. European Central Bank (2018) *EU structural financial indicators updated on 31-08-2018,* ECB, <u>http://sdw.ecb.europa.eu/reports.do?node=1000002869</u>
- 14. Eurostat (2018) *Government finance statistics,* Eurostat, <u>https://ec.europa.eu/eurostat/statistics-</u> <u>explained/index.php/Government\_finance\_statistics#Govern</u> <u>ment\_debt</u>
- 15. Hellenic Bank Association (2018) Greek Banking System Data, Branch network and employees, HBA, https://www.hba.gr/En
- 16. Karafolas, S. (2016) The credit cooperative system in Greece, in Karafolas, S. (ed.) *Credit cooperative institutions in European Countries*, Springer ISBN: 978-3-319-28783-6.

- 17. Karafolas, S. (2018) Banking networks, in: *Courses for the Banking Environment, Master Program on Banking-Insurance and Finance*, University of Western Macedonia University.
- 18. Karafolas, S. (2019) Investment banking, in: Courses for the Banking Environment, Master Program on Banking-Insurance and Finance, University of Western Macedonia.
- 19. O'Sullivan, K.P.V. and T. Kennedy, 2010, *What Caused the Irish Banking Crisis?* Journal of Financial Regulation and Compliance 18 July: 224-242
- 20. Whelan, K. (2013) Ireland's Economic Crisis, 2013, The Good, the Bad and the Ugly, *Bank of Greece conference on the Euro Crisis*, Athens May 24.

# DEVELOPMENT OF A FINANCIAL MODEL IN A BUSINESS: THE CASE OF A COMPANY IN PLASTICS INDUSTRY

# Alexander JAKI, MSc\* Charalampos AITSIDIS, MSc\*\* Fotios PANAGIOTOPOULOS, MSc\*\*\* Dimitrios Maditinos, PhD\*\*\*\*

#### Abstract

The purpose of this study is to analyze and explore thoroughly the economic situation of one of the leading European producers of masterbatches and agricultural films, hereafter (PK SA) and to propose various ways of development and expansion. In this paper, the operational analysis tools (PEST, SWOT and Porter) were used to analyze the company's external and internal environment. Next, a financial analysis based on the financial data of PK SA was carried out. Moreover, a financial model for the years 2012-2016 has been constructed in Excel so that by using possible future scenarios to forecast the financial future of the company for the next five years 2017-2021. The conclusions show that the company has a great potential to increase sales and profits, exploiting its potential and, above all, its extroversion, can achieve further growth over the next five years.

Keywords: PEST, SWOT, Porter, Financial analysis, WACC

JEL Classification: G17, C88

<sup>\*</sup> Special Technical Laboratory Staff, Department of Business Administration TEI of East Macedonia and Thrace, Kavala, Greece.

<sup>\*\*</sup> Special Technical Laboratory Staff, Department of Business Administration TEI of East Macedonia and Thrace, Kavala, Greece.

<sup>\*\*\*</sup> Laboratory Teaching Staff, Department of Business Administration TEI of East Macedonia and Thrace, Kavala, Greece.

<sup>\*\*\*\*</sup> Professor, Department of Business Administration TEI of East Macedonia and Thrace, Kavala, Greece.

### 1. Introduction

The aim of this study is to explore and present important and accurate steps in how to conduct a strategic analysis of the internal/external environment and how for the scenarios revealed to model and examine the proposed solutions. The company PK S.A., along with its subsidiaries in France, Romania, Poland, Russia, Turkey and China, is mainly active in the production of plastic products used in agriculture, engineering, water management, protection of the environment and raw materials in the wider plastic industry. It is one of the largest Greek manufacturers of high-tech and high-quality plastics, and is one of the largest and most important European producers of masterbatches and agricultural films. This gives it an international orientation with exports to more than 50 countries around the world.

The strategic analysis tools PEST and the Porter's five forces model - competitive analysis are used to define the external environment, the SWOT analyses both the internal and external environment.

PEST analysis attempts to identify which of the external factors of the company's macro-environment has significantly affected itself and its competitors in the past and the imminent changes that these factors will make in the future making them more or less important (Theriou, 2014). The PEST analysis covers a wide operational area and reflects aspects of the company's current state of affairs (Gouskos, 2005). SWOT analysis is a simple framework for generating strategic alternatives from analyzing the current situation. Applied either at company level or at company unit level, and often occurs in marketing plans (NetMBA, 2010). From company's strategic planning point of view, SWOT analysis is a tool for analyzing the interior in combination with that of the outside environment. The company can have the right information to make the right decisions that will lead to the achievement of its goals (Chatzikonstantinou and Goniadis, 2009). The Porter's five forces examine the external factors that directly affect the future of the company, these factors relate to its competitive environment, i.e., whether the company can cope successfully and successfully operate among its competitors and survive. Competitive environment factors directly affect the course and strategies of the business (Theriou, 2014).

We will develop prognosis in the form of scenarios that are usually based on historical data, but may also be due to changes that have been made to the business plan, even changes that affect the entire branch in which the company operates and the global economy.

Three important concepts that are distinctive and necessary for the creation of the financial model. First the Weighted Average Cost of Capital (WACC), second the Capital Asset Pricing Model (CAPM), third the valuation method Net Present Value (NPV).

To create the financial model, we use the spreadsheet program Microsoft Excel. Spreadsheet programs are widely used to manipulate and analyse advanced and complex numerical data. By entering the data into a spreadsheet, a large variety of mathematical and economical calculations can be performed even if complicate structures are involved (Chan et al., 2000). Spreadsheet modelling is recognized as the most frequently used application in the modern companies for their business decisions (Kruck, 2006).

The paper continues as follow: section 2 refers to theories on how to develop strategy and how to bring all data under modeling frame (using Excel and visual basic), section 3 deals with the presentation of the financial modeling scenarios, section 4 analyzes the methodology that is used to develop the Excel model, section 5 analysis and presents the results and section 6 concludes the paper and refers the future propositions.

## 2. Strategic Analysis

#### 2.1. PEST Analysis

Company's external environment macroeconomic factors are presented and analyzed using PEST analysis as follow:

#### 2.1.1 Political factors

Political stability is one of the most important political factors. The deep crisis is the result of the vicious circle that arose from the massive public debt and the problem created by the banking system. Government regulations and legal regulations have implications for businesses. The level of tax rates and extraordinary contributions have a significant impact on the financial performance of the agencies.

# 2.1.2 Economic factors

The financial situation of the Greeks influences their purchasing power and, to an extend companies themselves. The country's banking system, through its own crisis characterized by the lack of liquidity, is affecting the course of the economy. The low trade volume today on the Athens Stock Exchange do not allow companies to acquire new funds that would allow them to make new investments and expand their businesses. Ecology, although it is primarily a social factor, has significant economic implications because the choice of plastic products versus those considered more environmentally friendly affect the financial figures of the companies.

#### 2.1.3 Social factors

One of the most recognized social effect is the population change that has occurred due to the immigration problem. It has added cheap labor to areas where there was a deficit, such as agriculture, but it has also worsened the already inflated unemployment problem.

Ecological concerns are a cause for a new view of consumer behavior. Many types of plastic tend to be replaced by other materials, such as paper and wood. International organizations CODEX and ISO issued certifications mainly for food-grade plastics. The European Union has adopted strict regulations for the implementation of the HACCP system (Moullas and Georgiadou, 2017). Many of the materials used in agriculture, such as greenhouse leaves and pipes, are more ecological options since alternatives such as copper pipes need more energy to produce them.

The innovative solutions offered by PK S.A., mainly in the agricultural sector, have a significant impact on the standard of living of farmers by reducing working times, improve product output, and ultimately increase profit.

# 2.1.4 Technological factors

A cornerstone of technology is research and development of innovations. The export orientation of the company is based on the benefits of innovations. PK S.A. is constantly launching new and innovative products ensuring sustainability and increasing competitivity. Ensuring each patent with the corresponding credentials, allows the company to penetrate the markets and consolidate its positions.

## 2.2. SWOT Analysis

The PK S.A. as every company has strong and weak points concerning the internal environment, and opportunities and threats that arise from its external environment. Bellow some points:

# Table 1

# PK S.A. SWOT Analysis

Strengths	Weaknesses
<ul> <li>Innovations - Patents - corresponding credentials.</li> <li>Effective research and development specialization.</li> <li>Continuous investments in modern facilities.</li> <li>A wide variety of products.</li> <li>Flexibility - Collaborations.</li> <li>The company's trademark.</li> <li>Human resources.</li> <li>Inventories with a special logistics program.</li> </ul>	<ul> <li>Unstable political status.</li> <li>Influence of the international oil prices.</li> <li>Prices of raw materials.</li> <li>High transport costs.</li> <li>Growing penetration of products from low-cost countries.</li> <li>Significant capital requirements for developing international actions.</li> <li>Currency risk.</li> </ul>
Opportunities	Threats

Source: (KEMEL, 2017)

## 2.3. Porter's Five Forces model - competitive analysis

# 2.3.1 Threat of new Competitors Entry

Chemical industries have grown in Greece since 1950s and have grown considerably. According to Greek statistical authorities, 241 companies operate in Greek territory. Earnings before interest, taxes, depreciation and amortization (EBITDA) amounted in 2014 to 7.3%, from 6.6% in 2013 (inr.gr, 2016). It is obvious that the presence of new competitors in the branch is unlikely due to the already existing competition. Even the huge costs of creating a new plastic production unit with the existing expanded commercial network is another reason to discourage new units to enter, especially after the start of the financial crisis in 2009.

### 2.3.2 Threat from Substitute Products

In all branches new products come to replace the existing ones for varying reasons. Substitute products can't replace many specialized products in the branch. By targeting specific agricultural and non-agricultural products, the company managed to eliminate the risk of substitutes. Some of these products are:

- The masterbatches produced by the company worldwide.
- The sheets with more than seven layers to cover greenhouses whose price and practicality can't be reached so far by glass.
- Geomembranes for soil cover either for waterproofing or for the prevention of parasitic plants (reduction of pesticides).

In conclusion, it seems that the company is not threatened in most of its products by substitutes.

#### 2.3.3 Bargaining Power of Suppliers

Suppliers of raw materials for plastic companies have a strong bargaining power. Among their most basic raw materials are polyethylene (PE), polypropylene (PP) and polystyrenes (PS), all of which are derivatives of petroleum and are mainly imported from other countries. PK S.A., as one of the largest companies in the branch, has the advantage of making direct imports from the chemical industries in large quantities, achieving better prices.

# 2.3.4 Bargaining Power of Buyers

PK S.A. has an impressive record in research and development, with its innovative products, especially the "masterbatches", makes its negotiating power over buyers remarkable. Of course, despite all the innovative activity, it does not diminish the big competition either from industries in the branch or from importers and traders.

#### 2.3.5 Rivalry among Existing Competitors

The intense competition in the plastics market, with the exception of the pipe sector, primarily forces the largest manufacturing companies to invest in the modernization and renewal of their machinery equipment to achieve greater automation of their production

process. Also, to extend their distribution network through their representatives.

#### 3. Financial Modeling Scenarios

In order to be able to come up with safe and documented conclusions, that can be safely used by the company, we will develop forecasts in the form of scenarios. These scenarios are based on the previously mentioned analyses and on a number of factors, such as historical data, possible changes in the business plan, the branch or the global economy. When we draw up a scenario, we must plan it from the beginning so that the results that come up with it are correct and reliable. The created scenarios / forecasts will be detailed below.

#### 3.1. Scenario 1 - Stability

In the first scenario, we use the averages of the historical data from the past five years (2012-2016) analyzed using Excel. The first scenario is the realistic one. The value for market return (Rm) is the result from the sum of the returns on the market index, so we have Rm = -4.57%. For the risk free we use the 12 months treasury bills, i.e. Rf = 4.85%.

# Table 2

1 <sup>st</sup> - Scenar	rio
Increase sales rate	5,66%
Current assets / Sales	66,94%
Short-term liabilities / Sales	14,39%
Net assets / Sales	107,33%
Cost of sales / Sales	78,34%
Interest rate on borrowing	2,92%
Tax rate	29,00%
Return to Market (Rm)	-4,57%
Risk Free (Rf)	4,85%

# First scenario parameters

Source: Own development through data processing

#### 3.2. Scenario 2 - Optimistic

An optimistic scenario that is not far from a possible development is the further increase in sales. This is justified by the company's key feature of investing in innovation and making key partnerships.

# Table 3

#### Second scenario parameters

2 <sup>nd</sup> - Scenario	
Increase sales rate	<u>9,50%</u>
Current assets / Sales	55,00%
Short-term liabilities / Sales	10,00%
Net assets / Sales	88,00%
Cost of sales / Sales	63,00%
Interest rate on borrowing	4,00%
Tax rate	29,00%
Return to Market (Rm)	<u>9,20%</u>
Risk Free (Rf)	2,70%

Source: Own development through data processing

# 3.3. Scenario 3 - Crisis

The recent financial crisis has affected all branches. Political instability raises fears of a further deterioration in the economic situation. This will cause greater inconvenience to the financial figures of all companies.

#### Table 4

3 <sup>rd</sup> - Scenario				
Increase sales rate	<u>4,50%</u>			
Current assets / Sales	70,00%			
Short-term liabilities / Sales	24,00%			
Net assets / Sales	126,00%			
Cost of sales / Sales	92,00%			
Interest rate on borrowing	<u>7,00%</u>			
Tax rate	<u>32,00%</u>			
Return to Market (Rm)	9,20%			
Risk Free (Rf)	2,70%			

# Third scenario parameters

Source: Own development through data processing

# 3.4. Scenario 4 - Stable economic environment

An equally optimistic scenario is to improve the economic figures, an economic stability that will be the result of political stability. A safe environment can encourage investments, entrepreneurship and alongside the recovery of the banks giving loans.

# Table 5

#### Fourth scenario parameters

4 <sup>th</sup> - Scenario				
Increase sales rate	<u>8,50%</u>			
Current assets / Sales	60,00%			
Short-term liabilities / Sales	16,00%			
Net assets / Sales	97,00%			
Cost of sales / Sales	72,00%			
Interest rate on borrowing	<u>3,00%</u>			
Tax rate	<u>25,00%</u>			
Return to Market (Rm)	9,20%			
Risk Free (Rf)	2,70%			

Source: Own development through data processing

### 4. Methodology

We proceed with the description and analysis of the Financial Model, the value of the cash flows for the model, the calculation of the Weighted Average Cost of Capital and the Net Present Value that will lead us to the final valuation of the company.

#### 4.1. Financial Model Analysis

According to Benninga (2001), the usefulness of forecasting, that is, the projection in the future of financial statements in the financial management of a company, is undeniable. The basis in many financial analyzes for financing a company is to create a model consisting of a set of multiple variables. Based on this model, simulations can be made for specific intervals for a possible risk assessment of negative scenarios (Mendes and Leal, 2005). Financial models are used in a variety of business applications, from financial reporting to the capital budget for the valuation and structure of mergers and acquisitions (DePamphilis, 2017).

The Key Steps for Creating the Financial Model:

1. Select the Excel program.

2. Use the techniques of Excel to link spreadsheets and alternate scenarios.

3. Enter historical data.

4. Calculation of balance sheet elements.

5. Recovering the company's share price for the calculation of (beta).

6. Asset valuation using the CAPM method.

7. Calculation of weighted average cost of capital (WACC).

8. Finding Future Free Cash Flows (FCF).

9. Discount cash flow (DCF) using (WACC).

10. Calculation of residual value.

11. Valuation using the Net Present Value (NPV) method.

For the analysis of the financial model, the Excel program used the data obtained from the financial statements (the Balance Sheet and the Income Statement) of the company's annual financial reports for a five-year period 2012-2016. These data were the basis of the historical data, the averages for the five-year period as well as the percentage change were calculated. Provisions were made for the years 2017-2021 separately for the two financial statements and the relevant spreadsheets were created in Excel, immediately after the forecasts, FCF (Free Cash Flows) were calculated. Subsequently, Discounted Cash Flows (DCF) were calculated using the Weighted Average Cost of Capital (WACC). In order to arrive at a valuation of the investment we used the Net Present Value (NPV) method.

### 4.2 Free Cash Flow (FCF)

For the period we want to predict (2017-2021) we used the following data to calculate the Net Cash Flow:

- Profit after tax.
- Depreciation.
- Increase / decrease of current assets.
- Increase / decrease of short-term liabilities.
- Increase / decrease of fixed assets costs.
- Debit and credit interest.

These figures arise from the corresponding financial statements of the company that we predicted for the specific period. The formula to calculate them is given below (Maditinos, 2014).

Profit after tax

+ Depreciation

- Increase in current assets

- + Increase in short-term liabilities
- Increase in fixed costs
- + Debit interest (after tax)
- Credit interest (cash & securities)
- = Net Cash Flows (FCF)

# 4.3 Valuation method - Net Present Value (NPV)

Net Present Value (NPV) due to its unique benefits is one of the most popular valuation methods, the calculation formula is given below:

$$NPV = CF_0 + \sum_{t=1}^{N} \frac{CF_t}{(1+r)^t}$$
(1)

where

CF<sub>0</sub>: is the initial investment it refers to time 0 and is negative.

CF<sub>t</sub>: is the cash flow at time t.

- r: is the cost of capital or the discount rate.
- N: is the sum of the forecast years.

The NPV takes into account all the cash generated by the company in an investment plan, also satisfies the principle of added value. Another characteristic that makes the NPV an important criterion for the investment decisions of the company is its direct link with the wealth of the shareholders (Xanthakis and Alexakis, 2006).

# 4.4 Weighted Average Cost of Capital (WACC) - Calculation

The company's capital cost is the expected return that debt securities and its remaining portfolio can deliver. As mentioned above, we use it to discount the cash flows of a company's investment. This applies to investment at the same risk, which of course differs more than that of the total cost of the company, so the most sensible is to calculate the occasional cost separately for each investment venture (Brealey and Myers, 2003).

WACC is calculated using the following formula:

$$WACC = \frac{Equity}{Equity + Debt} * r^{E} + \left[\frac{Debt}{Equity + Debt} * r^{D} * (1 - tax \ rate)\right]$$
(2)

where

 $r^{E}$  = cost of equity.

r<sup>D</sup>= cost of debt.

For the calculation of the cost of equity  $r^{E}$  we use the widely accepted Capital Asset Pricing Model (CAPM) method. We use it to measure risk-bearing securities, that is, determine the relationship of the particular risk with the expected return on the security. The formula with which we calculate  $r^{E}$  is given below:

$$r^{E} = Rf + [\beta * (Rm - Rf)]$$
(3)

Where *Rf* (Risk free) determines the return of risk-free bonds, (Rm - Rf) determines the risk premium of the portfolio, the beta factor ( $\beta$ ) of the formula is the risk of that securities/ portfolio and *Rm* the expected market return.

For the calculation of the company's beta ( $\beta$ ) we used the daily returns of both the company's stock price and the general index, which were calculated using the function Ln (today's price / yesterday) (Maditinos, 2014).

The following Excel functions were then applied to create a regression:

- 1. With the COVAR and VARP functions
  - (beta = COVAR (Stock Market Index; Share) / VARP (Stock Market Index))
- 2. With the SLOPE function

(beta = SLOPE (Share; Stock Market Index))

The market return (Rm) was calculated using the SUM function, i.e. the sum of the daily returns in the Stock Market Index to 5 years (2012-2016). As a result of the economic crisis, the general recession and the instability that exists in Greece, the *Rm* resulting from the Stock Market Index is negative, something that, as stressed in the international literature, is not acceptable for use in modeling calculations. That is the reason why in the scenarios above only in the first one, based on historical data, we used the negative value in the other scenarios we use an Rm value of 9.20%, considering that the course of the market is smooth.

For the risk-free (Rf) investments we used the return on treasury bills issued in 2016, for 12 months "4.85%" while the quarterly is "2.70%" (Bank of Greece, 2017).

#### 4.5 Valuation

To complete valuation, we calculate the value of the investment at the end of the period i.e. the residual value of the company. After calculating it, we add it to the cash flow of the last year. For calculating the residual value, we use the Gordon Model formula:

$$Residual value = \frac{FCF_5 * (1 + growth)}{WACC - growth}$$
(4)

where

growth: increase of sales.

FCF<sub>5</sub>: cash flows in the fifth year.

We see in the model that the residual value is negative, which is not acceptable, in order to circumvent it, we make the assumption that the company is stopping to develop further from the point where the model stops.

The formula becomes:

$$Residual \ value = \frac{FCF_5}{WACC}$$
(5)

Finally, after we have discounted all the cash flows that have resulted from the appropriate model calculations, we can proceed the valuation by calculating the net present value. We use two ways to calculate it, in the first we sum up all the discounted cash flows with the help of the SUM function, in the second we use another Excel function NPV, which discounts and automatically sums up the cash flows (Maditinos, 2014).

## 5. Results

Now we present and analyze the results we obtained with the help of the Financial Model created by Excel using the alternative scenarios described in the previous chapter, i.e. stability, optimistic scenario, crisis and stable economic environment. The comparisons are based on the first scenario of "stability", the reason is that they are the company's historical data. The scenarios valuation results can be accepted only if the net present value (NPV) is positive otherwise we classify the investigation as a failure and cannot be accepted.

# 5.1 Scenario 1 - Stability

# Table 6

Free Cash Flows (FCF)					
2017	2018	2019	2020	2021	
6.191.490€	6.511.535€	6.849.018 €	7.204.910 €	7.580.238 €	
NPV (with resid	dual Value)	170.703.825 €			
NPV (without residual Value)		30.138.074 €			
WACC		4,36%			

First scenario results

Source: Own development through data processing

For this realistic scenario, we used the company's averages of the last five years historical data (2012-2016). We observe that results in an economic uncertainty and capital controls are optimistic and confirm the recovery of the branch in our country. The net cash flows are positive with increasing trend, and positive is also the valuation with the NPV. The WACC of the company is reasonable, from the annual financial reports of previous years the corresponding WACC of 2011 = 5.28%, 2012 = 5.02% and 2013 = 4.90%.

#### Table 7

# Liquidity ratios

General Liquidity Ratio							
2009	2010	2011	2012	2013	2014	2015	2016
4,07	2,71	2,56	4,28	4,48	4,21	7,05	4,15
Special Liquidity Ratio							
2009	2010	2011	2012	2013	2014	2015	2016
3,21	2,03	1,82	3,13	3,18	3,00	5,03	3,02

Source: Own development through data processing

# 5.2 Scenario 2 - Optimistic

#### Second scenario results

# Table 8

Free Cash Flows (FCF)					
2017	2018	2019	2020	2021	
17.580.136 €	19.247.918€	21.074.087 €	23.073.689 €	25.263.198€	
NPV (with residual Value)		789.624.246 €			
NPV (without residual Value)		Value) 96.424.869 €			
WACC			3,12%		

Source: Own development through data processing

Financial Studies – 4/201
---------------------------

In the optimistic scenario, the increase in sales is due to the further modernization of the production units and the expansion of the customer base. At the same time, we have a minimal increase in the borrowing rate. We see an increase of the cash flows almost 2.5 times. The excess of the NPV is due to the estimated residual value of the company. We also observe a reduction of the WACC by about one percentage point despite the increase in the borrowing rate, this is due to the almost non-existent dept of the company.

# 5.3 Scenario 3 - Crisis

# Table 9

Free Cash Flows (FCF)					
2017	2018	2019	2020	2021	
-5.436.622€	-5.752.343 €	-6.055.016€	-6.372.290€	-6.704.846€	
NPV (with resid	dual Value)	-211.915.969 €			
NPV (without residual Value)		) -27.615.224€			
WACC		3,12%			

Third scenario results

Source: Own development through data processing

In this scenario we describe the continuation of the economic crisis and the unexpected performance of extroversion. The key changes that affect the model are the decrease in sales, the increase in the tax rate as well as the borrowing rate. The results that arise in this economic environment of the national crisis give us negative cash flows which inevitably leads to a negative NPV. We also notice that WACC improvement by one percentage point remains, this is always due to the almost non-existent dept of the company.

# 5.4 Scenario 4 - Stable economic environment

Table 10

#### Forth scenario results

Free Cash Flows (FCF)					
2017	2018	2019	2020	2021	
10.681.587 €	11.577.350 €	12.548.980 €	13.602.920 €	14.746.160€	
NPV (with residual Value)		461.016.108 €			
NPV (without residual Value)		57.346.797 €			
WACC		3,13%			

Source: Own development through data processing
In the fourth scenario where there is a utopian improvement in the economic environment, it automatically leads to steadily rising sales, a favorable borrowing rate, and a reduction in the tax rate. As normal, cash flows maintain a steadily rising trend. The NPV, respectively, has a fairly significant increase, much of which is due to the residual value of the company. It is remarkable that the WACC in all three scenarios except the first remains the same.

#### 6. Conclusion

The results show that the main problem is the lack of political stability in the country. The economic environment refers to tax regulations, the limited liquidity of the banking system and the reduction in purchasing power. The social consequences are the unemployment and the migration problem. The technological environment refers to research and development to launch innovative products and the company's information system.

With the SWOT analysis we identify the company's strengths, which are the specialization in innovative products and patents, human resources, flexible partnerships and efficient inventory management. The weak points are the raw material prices and the penetration of products from low-cost countries. As opportunities we see the extroversion and green activities. The considered threats are the intense domestic market competitions.

According to the five forces Porter's model, it is unlikely that new competitors will emerge, especially after the 2009 financial crisis. About the substitute products, the company is not threatened due to its specialized agricultural and non-agricultural products. Its advantage against the supplier's negotiating power factor is to achieve better prices by directly importing large quantities from the chemical industries. The factor of buyer negotiating power is weakened from the many innovative and pioneering products. The competitive environment factor is characterized by intense competition, oversupplying with an exception, the pipe productions.

For the first realistic scenario the net cash flows are positive with increasing trend, and positive is also the valuation with the NPV. The WACC of the company is reasonable. In the "optimistic" scenario we see an increase of the cash flows almost 2.5 times. We also observe a reduction of the WACC by about one percentage this is due to the almost non-existent dept. The results that arise from the "crisis"

scenario give us negative cash flows which inevitably leads to a negative NPV. We also notice that WACC improvement by one percentage remains due to the same reason. In the fourth scenario cash flows maintain a rising trend. The NPV has a fairly significant increase, much of which is due to the residual value. It is remarkable that the WACC in all scenarios remains at the same level.

The limitations of the study are: firstly, it just explores the mother company not the whole group and secondly the luck to obtain more and not widely published financial data directly from the company. This would have made the study more accurate; we therefore propose the company to continue to outsource and create specialized products as well as trying to reduce production costs to improve its competitiveness. As for future study we recommend the use of more strategic analysis tools and develop more scenarios.

#### References

- 1. Bank of Greece, 2017. *Greek Government Securities*. Retrieved on 16-11-2017 by http://www.bankofgreece.gr/Pages/el/Markets/titloi.aspx
- 2. Chatzikonstantinou, G. and Goniadis, H., 2009. Entrepreneurship and Innovation: From Foundation to Management and Survival of the New Enterprise. Gutenberg Publisher, Athens.
- 3. Benninga, S. Z., 2001. *Financial Modelling*, Second Edition. The MIT Press, Cambridge.
- 4. Brealey, R. A. και Myers, S. C., 2003. *Principles of Corporate Finance*, Seventh Edition. McGraw Hill, London.
- 5. DePamphilis, M. D., 2017. *Mergers, Acquisitions, and Other Restructuring Activities*. Academic Press, ninth edition, pp. 313-352.
- Gouskos, D., 2005. Strategic analysis: PEST analysis, SWOT analysis. Retrieved on 03-09-2017, by https://eclass.uoa.gr/modules/document/file.php/DI262/dialex eis/2 - PEST, SWOT analysis.pdf
- inr.gr, Hellenic Industry, 2016. Plastic Industry: Significant Increase in Production in 2015, Retrieved on 22-10-2017, by http://www.inr.gr/?p=a2118

- KEMEL Center for Voluntary Managers of Greece, 2017. SWOT analysis. Retrieved on 20-10-2017, by http://www.kemel.gr/sites/default/files/files/1\_swot\_pestel\_1. pdf
- 9. Maditinos, I. D., 2014. *Financial Modeling*. Disigma Publisher, Thessaloniki.
- 10. Mendes B.Vaz de Melo και Leal R. P. C., 2005. *Robust multivariate modeling in finance*. International Journal of Managerial Finance, 1 (2), pp. 95-106.
- 11. NetMBA Business Knowledge Center, 2010. *PEST Analysis*. Retrieved on 03-09-2017, by http://www.netmba.com/strategy/pest/
- 12. Theriou, N., 2014. *Strategic Business Administration*. Kritiki Publisher, Athens.
- 13. Xanthakis, M. and Alexakis Ch., 2006. *Financial Analysis of Businesses*. Stamoulis Publisher, Athens.

## A STUDY ON R&D EXPENDITURE AND CORPORATE VALUE OF CHINESE HIGH-TECH INDUSTRY

#### Guan-Chih CHEN\* Hexuan LI, PhD Student\*\* Shuling TSAO\*\*\*

#### Abstract

This paper examines the impact of research and development (R&D) expenditure, R&D capitalized expenditure and expensed expenditure on the corporate value. Through the exposition of R&D expenditure affect relevance of corporate value after the Chinese New Accounting Standards, it can be found that R&D expenditure information has a positive effect on share price. The disclosure of information on R&D expenditure has a positive relevance to corporate value means that the disclosure of R&D expenditure information. Investors give positive value to the R&D capitalized and expensed expenditure, but R&D capitalized expenditure has a greater effect on investors than R&D expenditure disclosure has a significant positive effect on the stock price, which shows that the disclosure of R&D expenditure information.

**Keywords**: Chinese High-tech industry, R&D capitalized expenditure, corporate value

JEL Classification: C33, G30, M41, O14

#### 1. Introduction

In the era of knowledge economy and a highly competitive market environment, the importance of knowledge and technology in

<sup>\*</sup> Assistant Professor, Department of Insurance and Finance, National Taichung University of Science and Technology, Taichung, Taiwan.

<sup>\*\*</sup> Social Economics, Korea Woosuk University, Korea.

<sup>\*\*\*</sup>Associate Professor, Department of International Business Administration, Wenzao Ursuline University of Languages, Kaohsiung Taiwan.

the enterprise is more and more significant. R&D expenditure is the source of technological innovation and the core competitiveness for enterprises. It is generally believed that R&D activities can improve the corporate value and the ability of enterprises to utilize existing knowledge and technology. Therefore, R&D expenditure can promote the innovation ability and absorption capacity of enterprises.

High-tech enterprises refer to the development of science and technology or scientific inventions in new areas or to innovation in the original area. On the basis of defining the scope of Chinese high-tech industry, the concept of high-tech enterprises in China can be defined from the "Measures for the Administration of High-tech Enterprises" promulgated by China in 2008. Therefore, high-tech enterprise generally refers to the state promulgated of "The fields of high-tech supported by the state," within the scope of continuous R&D and technological achievements into the core of independent intellectual property rights. As this basis to carry out the business activities are the economic entities of knowledge-intensive and technology-intensive.

Independent innovation of enterprises allows enterprises to provide better products and get a good space for development in the market. The key factor in the future prospects of high-tech enterprises is the level of scientific research and technology, and the financial condition and operating results only reflect the existing development capacity of enterprises. The R&D investment of the enterprise can reflect the importance and determination of the enterprises to improve the core competitiveness and strengthen the independent innovation. R&D activities play a pivotal position in the process of improving the level of technological innovation in high-tech enterprises. Therefore, R&D has a very important utility in corporate activities. R&D expenditure has also become one of the important criteria for evaluating and measuring the value of high-tech companies. Investors and stakeholders are more pressing to understand the details of R&D information and R&D expenditure, so as to better assess whether a company has a strong competitive edge, as well as good growth and high value.

"New Accounting Standards" were announced on February 15, 2006, and the "New Accounting Standards" began to be implemented in more than 1,400 listed companies in China on January 1, 2007. With regard to intangible assets, the New Accounting Standard and the International Financial Reporting Standards (IFRS) converge, the first one is that the intangible assets are not included in goodwill. The

second, the R&D expenditures of the intangible assets are included in the management costs, however, the R&D is divided into R&D capitalized expenditure and R&D expensed expenditure. The expenditure shall be capitalized and recognized as intangible assets when it is proved that the given five conditions exist, which are:

1. It is possible to complete the intangible asset so that it can be used or sold.

2. Have the intention to complete and use or sell the intangible asset.

3. The way in which intangible assets generate future economic benefits, includes the product which uses the intangible assets has the markets, or the intangible assets has its own market, and intangible assets will be used internally, should prove its usefulness.

4. Have sufficient technical, financial and other resources to support the completion of the development of the intangible assets and the ability to use or sell the intangible assets.

5. Expenditure which is attributable to the stage of intangible assets can be quickly measured, however, for the R&D expenditures that cannot be distinguished from the research and the development phase, they are fully expensed and included in the current profit and loss.

This paper attempts to explore the relationship between R&D expenditure and corporate value through empirical research, to assess the corporate value for investors and stakeholders.

#### 2. Literature review

With the constantly accelerating economic globalization and the rapid development of high technology, to maintain their core competitiveness, they must improve their technological innovation capability. Technological innovation can be successfully achieved largely dependent on the progress of enterprise R&D activities. The impact of R&D activities expenditure on corporate value also attracts the interest of many scholars (Toivanen et al., 2002; Eberhart et al, 2004; Anagnostopoulou, 2008). This paper describes the impact of R&D expenditure, capital expenditure, expense expenditure on corporate value to conduct a review and summarize a conclusion and suggestion.

With the increasing amount and proportion of R&D expenditures, researches on the relationship of R&D expenditure and

corporate value are more abundant and comprehensive, scholars had carried out systematic and in-depth studies (Aboody and Lev, 1998; Hu and Jefferson, 2004; Lee and Kim, 2013). These findings provided empirical evidence and valuable advice to the management and investors of the enterprise. Works of literature confirmed the positive effect of R&D expenditure on corporate value (Duqi and Torluccio, 2010; Dave et al., 2013; Yang, 2013; Ju et al., 2013) Researchers are absolutely endless after the implementation of the new guidelines, but few scholars specifically carry out the research for R&D activities and corporate value of high-tech enterprises (Tang et al., 2013; Huang and Wu, 2014; Guo and Wang, 2014).

The impact of R&D capitalized and expensed expenditure on corporate value has been controversial. Callimaci and Landry (2004) found that R&D expensed expenditure would affect investors' assessment of corporate profitability and value judgments, leading to erroneous expectations of share and net asset returns. Researches proposed that the R&D capitalized expenditure has stronger positive correlation with corporate value than R&D expensed expenditure (Lev et al., 2005; Ahmed and Falk, 2006; Zhao and Liang, 2009), but some researches pointed out that the R&D capitalized expenditure is negatively correlated with the corporate value (Cazavan-Jeny and Jeanjean, 2006; Oswahi, 2008).

Based on the above literature, this paper attempts to discuss the impact of R&D expenditure, capitalized expenditure and expense expenditure on the corporate value through the collection, collation and statistical analysis of the relevant data of high-tech enterprises in 2014-2016 for China.

#### 3. Methodology

The data in this paper is from the financial statements and notes of the enterprises of Torch High Technology Industry Development Center and Ministry of Science and Technology of China. The samples are selected on the basis of the state-approved high-tech enterprise evaluation standards, excluding the financial class and ST listed companies (Tang et al., 2013), and in accordance with the "the Guidelines for the Administration of the Recognition of Hi-tech Enterprises", select A-share listed companies of important high-tech enterprises which had been identified as Torch High Technology Industry Development Center from 2014 to 2016 as the sample. In

|--|

order to ensure the validity of the data, the selected samples are all listed A-share high-tech enterprises in 2014, and the financial information must be complete for 2014 to 2016 for three consecutive years, any missing samples are removed, a total collection of 600 companies and 1800 observations. This paper constructs the basic model of multiple linear regression analysis to test and analyze the relationship between R&D expenditure and corporate value. The definition of variables is shown in Table 1.

#### Table 1

Variable Type	Description
Dependent Variable	Tobin's Q ratio is a ratio devised by Tobin(1969), hypothesized that the combined <u>market value</u> of all the companies on the <u>stock market</u> should be about equal to their replacement costs. A low Q (between 0 and 1) implies that the stock is <u>undervalued</u> . Conversely, a high Q (greater than 1) implies that the stock is <u>overvalued</u> . TQ=total market value of firm/total asset value of firm=(equity market value + liabilities market value)/(equity book value + liabilities book value)
	Expenditure on research and development (R&D) is one of the most widely used measures of innovation inputs. RD = total R&D expenditure /total assets
Independent Variables	R&D capitalized expenditure, are funds used by a company to acquire or upgrade <u>physical assets</u> such as property, industrial buildings or equipment. It is often used to undertake new projects or investments by the firm. <i>CAPRD</i> =R&D capitalized expenditures / total assets
	R&D expensed expenditure is a type of <u>operating expense</u> and can be deducted as such on a business <u>tax return</u> . This type of expense is incurred in the process of finding and creating new products or services. <i>EXPRD</i> =R&D expensed expenditures / total assets

#### **Definition of Variables**

	Total <u>debt</u> to total <u>assets</u> is a <u>leverage ratio</u> that defines the total amount of debt relative to assets. The higher the ratio, the higher the degree of leverage, and consequently, financial risk. ALR = (short term debt + long term debt)/(total assets)
Controlled variables	Enterprise size refers to the workers, labor, labor and other factors of production and products in the concentration of enterprise. <i>SIZE</i> =LN(total assets)
	Growth refers to a positive change in size, and/or <u>maturation</u> , often over a period of time. For investors, growth rates typically represent the compounded <u>annualized rate</u> of growth of a company's revenues. OIGR = Increase of business revenue/business revenue for the previous year

*Note: Calculations are based on data from The Ministry of science and technology the torch high technology industry development center* 

Enterprises have various expenses in order to carry out R&D activities, including human resources costs and the purchase of machinery and equipment, these expenses will bring unique experience, technology, and knowledge. According to the theory of accounting information quality, the better quality and qualified accounting information will meet the specific or potential demands of investors. Capitalized the R&D expenditure which meets the criteria will improve the accounting information guality of enterprises and be conducive to investors to make the right judgment on corporate value. Lev and Sougiannis (1996) and pointed out that R&D capitalized expenditure is helpful to reduce the information asymmetry between firms and investors. Ahmed and Falk (2006) also demonstrated that R&D capitalized expenditure had an incremental ability to interpret stock prices and also supported the corporate value relevance of R&D capitalized expenditure. In the high-tech enterprises characterized by technology-intensive, high-growth and rapid development, the R&D expensed expenditure is the information that investors pay special attention to R&D activities, thus affecting the corporate value. R&D expenditure plays a role in promoting corporate value. If the R&D activities of the enterprise can be successful and bring future economic benefits to the enterprise, it will surely strengthen the confidence of investors to the invested enterprise and make the corporate value improved when they obtain the information. In summary, this paper proposes the following research assumptions:

Hypothesis 1: R&D expenditure has a positive effect on corporate value in Chinese high-tech industry.

Model 1 is constructed as follows:  $TQ_{it} = \alpha_0 + \alpha_1 RD_{it} + \alpha_2 LEV_{it} + \alpha_3 SIZE_{it} + \alpha_4 OIGR_{it} + \varepsilon_{it}$ 

Hypothesis 2: R&D capitalized expenditure has a positive effect on corporate value in Chinese high-tech industry.

Model 2 is constructed as follows:  $TQ_{it} = \beta_0 + \beta_1 CAPRD_{it} + \beta_2 LEV_{it} + \beta_3 SIZE_{it} + \beta_4 OIGR_{it} + \varepsilon_{it}$ 

# Hypothesis 3: R&D expensed expenditure has a positive effect on corporate value in Chinese high-tech industry.

Model 3 is constructed as follows:  $TQ_{it} = \gamma_0 + \gamma_1 EXPRD_{it} + \gamma_2 LEV_{it} + \gamma_3 SIZE_{it} + \gamma_4 OIGR_{it} + \varepsilon_{it}$ 

#### 4. Empirical results

In this chapter, descriptive statistics is used to understand the characteristics and development trend of all variables during the study period, including the mean, the maximum value, the minimum value and the standard deviation, and panel data regression models are used to explore the impact of R&D expenditure, R&D capitalized expenditure and R&D expensed expenditure on corporate value.

Table 2 shows that the mean of TQ is 1.8399, implies that the value of firm's stock is more expensive than the <u>replacement cost</u> of its assets in most high-tech enterprises, but the stock is <u>undervalued</u> in few enterprises, the cost to replace their assets is greater than the value of the stock. The larger range of RD indicates the larger gap in the scale of capital investment on R&D activities in Chinese high-tech listed companies, reflects the different high-tech enterprises that have different degrees of attention on R&D. The minimum of CAPRD and EXPRD are zero, which means that not every enterprise will be conditional capitalized, Fully R&D capitalized or expensed expenditure is also the situation enterprises often faced. The maximum and mean of the R&D expensed expenditure is greater than the R&D capitalized expenditure, which reflects the proportion of R&D expenditure in the

sample business is much higher than the R&D capitalized expenditure. The most appropriate asset-liability ratio should be less than 0.5 and the mean of ALR is 0.3749, indicating most high-tech enterprises in China keep the solvency up. The range of OIGR shows that the growth ability of each listed high-tech enterprise in China is different.

**Descriptive Statistics** 

#### Table 2

		•			
Variable	Min	Max	Mean	Std. Dev.	
TQ	0.6991	11.4907	1.8399	0.9830	
RD	0.0000	0.4296	0.2903	0.1094	
CAPRD	0.0000	0.0718	0.0007	0.0037	
EXPRD	0.0000	0.3574	0.2894	0.1793	
SIZE	-9.2103	27.1373	21.0403	1.7467	
ALR	0.0153	0.9441	0.3749	0.1953	
OIGR	-100.0000	2775.551	13.4111	79.0995	

Note: Calculations are based on data from The Ministry of science and technology the torch high technology industry development center. Definitions of variables are provided in Table 1.

Table 3 shows the results of Hausman test show that the three models are fixed-effect models. Asset-liability ratio and firm size have a negative impact on corporate value, and the growth of enterprises has a positive effect on corporate value, indicates that the growth of enterprises can enhance corporate value, but to expand the scale of enterprises does not necessarily achieve the promotion of corporate value. In the case of scale, asset-liability ratio and growth, the coefficient of R&D expenditure is significantly larger than 0, which proves the first hypothesis.

#### Table 3

		0	
	Model 1	Model 2	Model 3
		Coefficient (Std. Error)	
Constant	3.076***(0.282)	2.489***(0.143)	3.068***(0.284)
RD	6.597***(0.755)		
CAPRD		30.874***(3.516)	
EXPRD			6.254***(0.763)
SIZE	-0.026***(0.007)	-0.023***(0.007)	-0.087***(0.014)
ALR	-0.356*** (0.094)	-0.849***(0.046)	-0.351*** (0.091)
OIGR	0.010***(0.002)	0.011(0.001)	0.005***(0.002)

**Results of Panel Data Regression** 

	Financi	al Studies – 4/2019	
	M - J - J 1	M. 1.10	M. J.12
	Nidel 1	Coefficient (Std. Error)	Model 3
F-statistic R <sup>2</sup>	133.883 22.98%	168.958*** 27.35%	74.914*** 18.92%
Adjusted R <sup>2</sup>	22.81%	27.19%	18.68%
Hausman Test	Fixed effect	Fixed effect	Fixed effect

\*\*\*Significant at level 0.01.

Note: Calculations are based on data from The Ministry of science and technology the torch high technology industry development center. Definitions of variables are provided in Table 1.

This shows that the R&D expenditure of high-tech enterprises listed in China has delivered reasonable information on R&D activities to the market, which goes to improve the corporate value. R&D capitalized expenditure has a significant positive effect on corporate value, which is consistent with the second hypothesis, indicating that R&D activities can be successful and will bring economic benefits to enterprises in the future. When investors acquire the information about R&D successes, will be fully confident of invested enterprises, increase the initiative of investments to improve the corporate value. The results of model 3 show the R&D expensed expenditure has a significant positive effect on the corporate, which is consistent with the third hypothesis. High-tech enterprises note "management fees" and "other payment of cash related to operating activities" in the report to have a brief exposition of R&D expensed expenditure. Compared with other expenses such as "advertising expenses" and "office expenses", the information of R&D expensed expenditure passes a positive signal to investors. Although R&D expenditure is included in the period, the expenses do not mean the success of the R&D activities and the formation of technological achievements for enterprises, but the R&D expensed expenditure gives intimations to investors that companies are carrying out R&D activities. Although the R&D strategy of the enterprise will affect the profit situation in the short term, the formation and development of the independent innovation technology will enhance the core competitiveness of the enterprises, investors are more confident of the enterprises, so the R&D expensed expenditure will have a positive effect to corporate value.

#### 5. Discussion

R&D activities are the driving force for sustainable development and core competitiveness of enterprises, especially in the high-tech industry which occupies an important position in the economic activities of enterprises. For investors, R&D is very important information to evaluate the corporate value. The empirical result of this paper is more convincing for the research of high-tech enterprises in China specifically. It has a positive effect when investors assess the value of the company knowing the disclosure of the R&D expenditure information of high-tech companies. When the enterprise's emphasized on research and development activities, the greater the intensity of investment in R&D activities and the amount of R&D expenditure become, investors on the level of technological innovation and future development prospects increase in popularity, allowing them to predict higher market value of the enterprise. As a result, the R&D activities of enterprises become able to enhance the value of the company's business activities.

The main contribution of this paper is to find out that most of Chinese listed high-tech companies are developing in the researchbased stage through the empirical analysis. The R&D activities in the initial development stage are cleaver, therefore the R&D successful information obtained by investors can satisfy their judgment for the value of the technology companies. The R&D activities can enhance the corporate value, so the enterprises should strengthen the R&D activities and increase the proportion of R&D expenditure. In addition, the enterprises should expose the information of R&D expenditure timely and fully to help investors evaluate the corporate value reasonably.

#### 6. Conclusions and suggestions

From the information collated in this article, 57.343% of the enterprises in the past involved the R&D expenditure as the total cost of the other companies in which are also on the R&D expenditure conditional capitalization. This shows that Chinese listed high-tech enterprises are mostly in the basic stage of research, having just entered the development stage, where R&D activities are clearer, thus enabling investors' access to successful R&D information to make reasonable judgments of the value that would meet their high-tech standards.

The second stage of "Chinese new accounting standards" for the R&D stage had been defined, different environmental and technological activities of industry, made the results of their research not the same. It is easier to distinguish between the effectiveness of corporate financial reporting information, investors on the capitalization of R&D spending become more recognized. Capitalized expenditure on the value of Chinese listed high-tech enterprises still has a strong explanatory power which can truly reflect the value of the enterprise. At present, the successful rate of R&D of high-tech enterprises is high, and the R&D results are clear, which can meet the requirements of investors in judging whether the R&D projects are successful. Therefore, investors have a high degree of concern about capitalization.

In order to improve the probability of successful R&D, enterprises should be fully investigated before the activities of R&D. Extensive information collection, analysis of internal and external environment should be also undertaken as accurate as possible to make market forecasts and understand consumer demand changes. According to their own business to choose the best program, and then follow the R&D projects and process to complete the enterprise's innovative activities, as much as possible to achieve high input and high output. At the same time, they should improve the R&D organizational system, develop appropriate incentive system to absorb the talents to the field of R&D, as well as to take a variety of forms of business and scientific research closely linked to improve the efficiency of scientific and technological achievements into practical productivity.

And the government should give a certain economy compensation and also provide strong backing to support the development to encourage enterprises to develop innovative financial, tax incentives, loans, and other policies. At present, the Chinese tax law provides that in the calculation of corporate income tax, R&D expenses can be deducted. In the future, the government should increase the support of enterprise science and technology R&D from various aspects, to provide high-tech enterprises with self-innovation and scientific and technological progress, so that enterprises can concentrate on R&D activities and improve R&D efficiency.

#### References

- 1. Aboody, D. and Lev, B. (1998), The value relevance of intangibles: the case of software capitalization. "Journal of Accounting Research", 36, 161-191
- Ahmed, K., and Falk, H. (2006), The value relevance of management's research and development reporting choice: Evidence from Australia. Journal of Accounting and Public Policy, 25(3), 261-264.
- 3. Anagnostopoulou, S. (2008), R&D expenses and firm valuation: a literature review. International Journal of Accounting and Information Management, 16(1), 5-24.
- 4. Callimaci, A. and Landry, S. (2004), Market valuation of Research and Development Expenditure under Canadian GAAP. Canadian Accounting Perspectives, 3(1), 33-54.
- 5. Cazavan-Jeny, A. and Jeanjean, T. (2006), The negative impact of R&D capitalization: A value relevance approach. European Accounting Review, 15(1), 37-61.
- Dave, P., Wadhwa, V., Aggarwal, S., and Seetharman, A. (2013), The Impact of Research and Development on the Financial Sustainability of Information Technology (IT) Companies Listed on the S&P 500 Inde-x. Journal of Sustainable Development, 6(11), 122-138.
- 7. Duqi, A., and Torluccio, G. (2010), Can R&D expenditures affect firm market value? An empirical analysis of a panel of European listed firms. Bank performance, risk and firm financing, London, Palgrave Macmillan, 214-251.
- Guo, X. W. and Wang, X. (2014). Financial Constraints, Cash Smoothing and Firms' R&D Investment: Evidence from Chinese Listed Manufacturing Firms. *Economic Management*. *8*, 144-155.
- Hu, A. G. and Jefferson, G. H. (2004). Returns to Research and Development in Chinese Industry: Evidence from Stateowned Enterprises in Beijing. *China Economic Review*, 15, 86-107.

- 10. Huang, Z. L. and Wu, S. (2014). Can Cash Holdings Affect R&D Smoothing? *Research on Economics and Management*, *2*, 119-128.
- 11. Ju, X. S., Lu, D. and Yu, Y. (2013). Financing Constraints, Working Capital Management and the Persistence of Firm Innovation. *Economic Research Journal*, *1*, 4-16.
- 12. Lee, J. and Kim, B. (2013). The Relationship between Innovation and Market Share: Evidence from the Global LCD Industry. *Industry and Innovation*, *20(1)*, 1-21.
- 13. Lev, B., Nissim, D. and Thomas, J. K. (2005). On the informational usefulness of R&D Capitalization and Amortization. *Visualising Intangibles, 5*, 97-128.
- 14. Lev, B. and Sougiannis, T. (1996). The capitalization, amortization and value-relevance of R&D. *Journal of Accounting and Economics, 21,* 131-138.
- 15. Toivanen, O., Stoneman, P., and Bosworth, D. (2002). Innovation and the market value of UK firms, 1989-1995. *Oxford Bulletin of Economics and Statistics* 64(1), 39-61.
- Yang, Z. (2013). Related Study on Effect of R&D Investment to Enterprise Value—Empirical Testing Based on Chinese Listed Companies after New Accounting Standards. *Science* and Technology Management Research, 33(10), 42-45.
- 17. Zhao, J. and Liang, L. (2009). Analysis on impacts of the new accounting rules to enterprise's R&D investments. *New Accounting*, *1*, 55-84.

## THE CONTROL OF SMALL MEDIUM BANKS PROFITABILITY USING FINANCIAL MODELING APPROACH UNDER CERTAINTY AND UNCERTAINTY

#### Konstantinos J. LIAPIS, PhD\* Sotirios J. TRIGKAS, PhD Candidate\*\*

#### Abstract

Following a prototype economic modelling approach for Small-Medium Banks (SMBs) business plans according to structure of Additional Funds Needed (AFN) models this paper examines the volatility of banking efficiency in terms of Key Profitability Variables (KPVs) in order to determine Key Performance Indicators (KPIs). The KPVs are the size and structure of deposits, loans and their interest rates. Initially we examine the intervals in which the KPVs of the SMBs are moving. Then we conduct a sensitivity analysis under certainty. Our paper provides first evidence that business plans following AFN economic models are worthy tools for financial planning of SMBs in order to control their performance, contributing to budgeting and decision making for SMBs strategic planning. Financial planning of SMBs in order to control their performance, contributing to budgeting and decision making for SMBs strategic planning, prove to be a critical process for the overall bank efficiency. With this paper we contribute to debate regarding the introduction economic modelling approaches under certainty and uncertainty in the banking industry.

**Keywords**: Bank performance, AFN models, Operation Research

JEL Classifications: G21, M41, C44

<sup>\*</sup> Associate Professor, Faculty of Sciences of Economy and Public Administration, Panteion University of Social and Political Sciences, Athens, Greece.

<sup>\*\*</sup> Faculty of Sciences of Economy and Public Administration, Panteion University of Social and Political Sciences, Athens, Greece.

#### 1. Introduction

The efficiency of Banking Institutions has been a constant research field for many years. Especially the last decade due to the financial crises of 2008 the volatility of banking efficiency has increased substantially, leading also to an increase of the interest of the scientific research regarding the modelling and forecasting of Key Performance Indicators. Efficiency and profitability are the primary goal of any business formation. The long-term progress of a business cannot be achieved without a substantial level of efficiency and profitability. Therefore, the measurement (quantification) of current, past and future efficiency and profitability is considered imperative and to a significant extent ensures the survival of the business formation. Essentially by using these terms we refer to the ability of the company to generate profits through its activity at the lowest cost and risk.

The calculation of the revenue and expenditure figures shall be considered in respect of the income statement referred to in the course of a given year. It has an actual and budgeted character. At the budgeted level, a forecast of the usage profit status for the upcoming accounting period is formed with the probability of course deviating from the actual data (Don Hofstrand, 2009). Regardless of whether we refer to budgeted or actual efficiency and profitability, its calculation is perhaps the most important measure of success for a business.

It is a fragmentary mention that a company listed with a satisfactory level of efficiency and profitability, higher than that of similar enterprises, can attract more investment funds. This is a comparative advantage and contributes to the ever-increasing possibility of expanding the company's entrepreneurial activity. Thus, the increase in efficiency and profitability is perhaps the most important task of the financial directors. Managers are constantly looking for ways to change the operational structure of the company with the aim of improving efficiency and profitability. Tools in this effort are both the prediction of the results of use and the targeting (partial budget) of the various parts of the business activity. Targeting for example could achieve higher levels of sales or limit the costs of an activity, helping to improve the economic outturn. Efficiency and profitability and efficiency and profitability analysis through a series of indicators also contribute to early perception of problematic situations. It is important both for the control of solvency and for the principle of continuity or going concern in IFRS terminology. It concerns not only the company itself but also a

multitude of others involved and not, such as banking entities, creditors, tax authorities, institutional, supervisory mechanisms and other. Efficiency and profitability indicators are part of the financial analysis of business activity. They are indicators of importance for measuring efficiency and profitability both in terms of sales and in relation to invested capital.

#### 2. Literature review

In the context of the research developed for the banks, in terms of efficiency and profitability and its determinants, the following grouping is noted in the independent variables. Most of the studies classify the factors that study in three major categories:

- a) Macroeconomic determinants
- b) Sector determinants
- c) Internal determinants.

Both the participants in the industry and the factors of the macroeconomic environment are also known as external (external) factors. Studies examining the internal factors that impact on efficiency and profitability, use various variables to express them. Variables are used, such as the size of the business activity, capital, risk management, management of expenses etc. The variables used to express the factors influencing the internal environment vary. The size of the business activity impacts on efficiency and profitability at a statistically high level. The positive effect is formulated by the studies of Akhavein et al. (1997), Smirlock (1985), Short (1979), Bourke (1989), Molyneux and Thornton (1992) and Bikker and Hu (2002). In all the above studies the positive and statistically significant relationship between the size of the business unit and the efficiency and profitability is confirmed. In some of these, the above findings apply mainly to small and medium-sized banks.

The positive relationship between the level of concentration of the industry and efficiency and profitability as well as better quality of administration and efficiency and profitability is concluded by the work of Bourke (1989). Molyneux and Thorhton (1992) agree with these findings and they also, find a negative and statistically significant relationship between liquidity levels and efficiency and profitability. This outcome is considered reasonable because high liquidity levels mean low-risk placements and, by extension, low efficiency and profitability. In contrast, Eichengreen and Gibson (2001) in their study support the positive and statistically significant relationship between liquidity and efficiency and profitability. In their study they also formulate the positive relationship between leverage and efficiency and profitability, as well as between wage expenditures and efficiency and profitability. Miller and Noulas (1997) formulate the negative impact of financial risk on efficiency and profitability.

High-risk financing (high-risk loans) leads to higher levels of forecasting and inductively lower levels of efficiency and profitability. In this case, the following procedure was followed by Berger et al. (2000), accepting that the trend of efficiency and profitability seems to continue over time, reflecting elements of the concentration of the sector, of sensitivity to macroeconomic shocks etc. Similar results are found in their studies Davydenko (2010), Bashir (2003) and Javaid et al. (2011). Opposite results have been expressed in various studies. The negative and statistically significant relationship of capital with efficiency and profitability is supported by studies of Tregenna (2009) and of Capraru and Jhnatov (2015).

The effect of financial risk (credit risk) on efficiency and profitability appears to vary from study to study. In most of these studies, the financial risk is measured by the subprime estimate ratio to all loans. The course of this factor alters efficiency and profitability in future time. By examining the scientific literature, we see that there have been more than a few approaches regarding the measurement of bank efficiency. For example, for stress testing and credit risk models, Blaschke et al. (2001) report an example in which the nonperforming loan (NPL) ratio is regressed against the nominal interest rate, the inflation rate, the change in real GDP, and the change in the terms of trade. Van den End, Hoeberichts, and Tabbae (2006) propose an alternative method that accounts for simultaneous changes in the macro-economic variables and their interactions as typically present in the macro scenarios derived from structural macro models. Jimenez and Mencia (2007) apply a three-standard-deviation shock to the GDP and interest rate variables; similarly, Castren, Fitzpatrick, and Sydow (2008) use a five-standard-deviation shock for one macroeconomic variable of the GVAR model. Wong and Hui (2009) describe a model developed at the Hong Kong Monetary Authority to assess liquidity risk and Kapadia et al. (2012) describe the RAMSI model developed by the Bank of England.

#### 3. Data and methodology

Taking our data from the published financial statements of a small non systemic bank in Greece we construct a simplified model that provides a manageable testing approach based only on those essential variables and key performance drivers that are relevant for assessing the bank's profitability. The use of simplified IAS / IFRS structure of financial statements in accordance with Additional Funds Needed (AFN) model, is the basis for the use of sensitivity analysis.

The use of quantitative methods and analytical tools is necessary to identify and analyse the models of this research. Already in *IFRS7 - Financial Instruments: Disclosures*, reference is made to the need to use sensitivity analysis and Monte Carlo Simulation for the purposes of this standard. In addition, *IFRS 9 - Financial Instruments*, refers to the possibility of using regression analysis also for purposes of applying this standard. In this research we make use of the AFN outputs from three forecasting periods in order to conduct a sensitivity analysis as a first steps towards the implementation of Multiple Linear Regression and Monte Carlo simulation technique with the Pert distribution, which will be researched in a future research.

#### 3.1. The AFN models

The AFN banking model comprises of four main worksheets. Presentation, Financial Statements, Loans and Funding. All have a five terms period two of the last officially published annual financial statements (t-1 and t) and three of future annual projections (t+1, t+2 and t+3). As we can observe in Figure 1, all sheets are linked with Presentation interactively.

Inputs, in Presentation worksheet, are taken as calculation data from Loans and Funding worksheets, represent the historic (t-1 and t) volume and product structure of loans and deposits, their yields and nominal interests' rates accordingly, as well as their projected percentage changes in volume and structure, their yields and nominal interests' rates in time (t+1, t+2 and t+3). On the other hand, Inputs concerning Other Expenses and Other Income (not derived from loans and deposits), their historic volume (t-1 and t) and change in (t+1, t+2 and t+3) are being taken as calculation data for Financial Statements worksheet. In return Financial Statements, Loans and Funding, produce summarized data to Outputs in Presentation worksheet, where selected data from worksheet including Profit / Loss after tax from continuing operations and Additional Funds Needed are presented.

Given the structure of Figure 1 (see Appendix), our model can be analysed into categories of loans and deposits according to European Banking Authority (EBA) prototype formats and have the following indicative amounts, as observed in Tables 1 to 5.

#### Table 1

AFN Model Inputs	>	Units	t-1	t	t+1	t+2	t+3
Assets-Loans							
Increases of Gross	Loans (before write-offs)	%			2%	2%	2%
	Mortgage		13%	12%	13%	13%	13%
	Consumer		3%	3%	3%	3%	3%
	Credit cards		2%	2%	2%	2%	2%
	Other		3%	3%	3%	3%	3%
	Public sector		1%	1%	1%	1%	1%
	Large Corporate		28%	27%	28%	28%	28%
	SMEs		33%	33%	32%	32%	32%
	SBL		19%	19%	19%	19%	19%
	All Term of Gross Loans		100%	100%	100%	100%	100%
Average yield on l	Loans (on av. balances)	%					
	Mortgage		2,1%	2,1%	2,2%	2,5%	2,5%
	Consumer		3,8%	3,6%	4,0%	4,0%	4,0%
	Credit cards		3,4%	3,0%	4,0%	4,5%	5,0%
	Other		2,2%	2,0%	2,3%	2,3%	2,3%
	Public sector		4,8%	3,4%	4,5%	4,5%	4,5%
	Large Corporate		4,5%	3,6%	4,1%	4,1%	4,1%
	SMEs		4,5%	3,6%	4,5%	5,0%	5 <b>,0%</b>
	SBL		5,0%	4,2%	5,0%	5,2%	5,5%
Liabilities-Deposit	ts						
Increases of Depo	sits from Customers	%			3%	3%	3%
	Savings		22%	23%	22%	22%	22%
	Sight		26%	28%	28%	28%	28%
	Term		51%	49%	49%	49%	49%
	Other		1%	1%	1%	1%	1%
	All		100%	100%	100%	100%	100%
Nominal deposit i	nterest rates *	%					
	Savings		0,7%	0,7%	0,7%	0,5%	0,5%
	Sight		1,3%	0,8%	1,2%	1,0%	0,8%
	Term		3,0%	2,4%	2,8%	2,5%	2,5%
	Other		0,0%	0,0%	0,0%	0,0%	0,0%
AFN charges inter	est earnings		0,5%	0,5%	0,5%	0,5%	0,5%
Operating Cost		EUR mn					
Staff costs			30	30	34	35	36
Admin expenses			30	30	36	30	30
Depreciation			6	6	6	6	6
Commissions		EUR mn					
Fee & commission	i income		20	20	22	24	26
Fee & commission	n expense		4	4	4	5	6
Other operating in	ncome		5	5	6	6	6

Presentation AFN model Inputs

## Table 2

## Loan Portfolio

Loan portfolio						
Units in EUR mn (unless otherwise stated)	Unit	t-1	t	t+1	t+2	t+3
Loans to Customers - existing portfolio						
Stock						
Gross Loans (before write-offs)	EUR mn	4.000	4.400	4.497	4.596	4.697
Mortgage		500	510	562	574	587
Consumer		120	130	135	138	141
Credit cards		60	70	67	69	70
Other		120	140	135	138	141
Public sector		40	50	45	46	47
Large Corporate		1.100	1.200	1.259	1.287	1.315
SMEs		1.300	1.450	1.439	1.471	1.503
SBL		760	850	854	873	892
90+ dpd per loan category (NPEs)	EUR mn	1.000	1.000	1.022	1.044	1.067
Mortgage		50	50	51	52	53
Consumer		40	40	41	42	43
Credit cards		20	20	20	21	21
Other		40	40	41	42	43
Public sector		-	-	-	-	-
Large Corporate		150	150	153	157	160
SMEs		400	400	409	418	427
SBL		300	300	307	313	320
Stock of provisions		1.000	1.000	1.022	1.044	1.067
Provisions charge (per period)		20	20	26	28	31
Write-offs		-	-	4	6	8
Interest income on Loans	EUR mn	163	146	183	198	205
Mortgage		11	10	12	14	15
Consumer		5	5	5	5	6
Credit cards		2	2	3	3	3
Other		3	3	3	3	3
Public sector		2	2	2	2	2
Large Corporate		46	42	50	52	53
SMEs		58	50	65	73	74
SBL		36	34	43	45	49
Average yield on Loans (on av. balances)	%	4,2%	3,5%	4,1%	4,4%	4,4%
Mortgage		2,1%	2,1%	2,2%	2,5%	2,5%
Consumer		3,8%	3,6%	4,0%	4,0%	4,0%
Credit cards		3,4%	3,0%	4,0%	4,5%	5,0%
Other		2,2%	2,0%	2,3%	2,3%	2,3%
Public sector		4,8%	3,4%	4,5%	4,5%	4,5%
Large Corporate		4,5%	3,6%	4,1%	4,1%	4,1%
SMEs		4,5%	3,6%	4,5%	5,0%	5,0%
SBL		5,0%	4,2%	5,0%	5,2%	5,5%

## Table 3

Funding Sources						
Units in EUR m (unless otherwise stated)	Unit	t-1	t	t+1	t+2	t+3
Deposits from Customers						
Total deposits (Volume)	EUR mn	2.720	2.870	2.956	3.045	3.136
of which:						
Savings	EUR mn	600	650	650	670	690
Sight	EUR mn	700	800	828	853	878
Term	EUR mn	1.400	1.400	1.448	1.492	1.537
Other	EUR mn	20	20	30	30	31
Interest expense on deposits	EUR mn	63	43	54	<b>48</b>	48
of which:						
Savings	EUR mn	3	4	5	3	3
Sight	EUR mn	6	6	10	8	7
Term	EUR mn	54	33	40	37	38
Other	EUR mn	0	0	0	0	0
Nominal deposit interest rates *	%	2,3%	1,5%	<b>1,9%</b>	<b>1,6%</b>	1,6%
Savings	%	0,7%	0,7%	0,7%	0,5%	0,5%
Sight	%	1,3%	0,8%	1,2%	1,0%	0,8%
Term	%	3,0%	2,4%	2,8%	2,5%	2,5%
Other	%	0,0%	0,0%	0,0%	0,0%	0,0%
*effective nominal rates for each deposit category						
Eurosystem funding						
Total Eurosystem funding	EUR mn	210	407	352	294	212
AFN charges		1	2	2	1	1

## **Funding Sources**

### Table 4

## Projected financial statements of BS and PnL

Projecte	d financial statements of AFN model					
Units in	EUR mn (unless otherwise stated)	t-1	t	t+1	t+2	t+3
	Balance Sheet					
Assets						
	Cash & balances with Central Bank	50	55	50	50	50
	Due from banks	10	6	5	5	5
	Loans & advances to customers	3.000	3.400	3.483	3.563	3.645
	Gross Loans (en. Balance)	4.000	4.400	4.501	4.602	4.705
	Accumulated Provisions (en. balance)	1.000	1.000	1.018	1.038	1.059
	Derivative financial instruments	10	10	10	10	10
	Securities portfolio	80	60	50	50	50
	Investment in subsidiaries & associates	0	0	0	0	0
	Property & equipment	100	100	100	100	100
	Goodwill, software & other intangibles	40	40	40	40	40
	Deferred tax asset	100	90	80	65	44
_	Other assets	100	100	100	100	100
Total As	sets	3.490	3.861	3.917	3.984	4.045
AFN De	oosits(+) Placemnets (-) from/to banks	210	407	352	294	212
Liabilitie	25					
	Deposits from customers	2.720	2.870	2.956	3.045	3.136
	Other borrowed funds	10	10	10	10	10
	Provision for empl. Benef. & conting. Liab.	30	30	30	30	30
Other liabilities		20	20	20	20	20
Total Lia	bilities	2.780	2.930	3.016	3.105	3.196
Total Eq	uity	500	524	550	585	637
Total Lia	bilities & Equity	3.280	3.454	3.566	3.689	3.833
Total Lia	bilities & Equity &AFN	3.490	3.861	3.917	3.984	4.045
	Income Statement					
	[+] Interest & similar income	163	146	183	198	205
	[-] Interest expense & similar charges	64	45	56	50	49
	[=] Net interest income	99	101	127	148	156
	[+] Fee & commission income	20	20	22	24	26
	[-] Fee & commission expense	4	4	4	5	6
	[=] Net fee income	115	117	145	167	176
	[+] Other operating income	5	5	6	6	6
	Total operating income	120	122	151	173	182
	[-] Staff costs	30	30	34	35	36
	[-] Admin expenses	30	30	36	30	30
	[-] Depreciation	6	6	6	6	6
	Pre Provision Profit	54	56	75	102	110
	[-] Loan loss impairment	20	20	26	28	31
	Profit / Loss before tax	34	36	49	73	79
	[-] Tax	10	10	14	21	23
Profit /	oss after tax from continuing operations	24	26	35	52	56

#### Table 5

#### Presentation AFN model Outputs

AFN Model Outputs	(EUR mn)	t-1	t	t+1	t+Z	t+3
Loans & advances to customers		3.000	3.400	3.483	3.563	3.645
Gross Loans (en. Balance)		4.000	4.400	4.501	4.602	4.705
Accumulated Provisions (en. balar	nce)	1.000	1.000	1.018	1.038	1.059
Total Assets		3.490	3.861	3.917	3.984	4.045
Deposits from customers		2.720	2.870	2.956	3.045	3.136
AFN Deposits(+) Placements (-) fr	om/to banks	210	407	352	294	212
Total Equity		500	524	550	585	637
Net Interest Income		99	101	127	148	156
Net Fee & commission income of	her Income	29	29	32	35	38
Operating expenses		66	66	76	71	72
Pre Provision Profit		54	56	75	102	110
Provisions		20	20	26	28	31
Profit / Loss before tax		34	36	49	73	79
Profit / Loss after tax from contir	nuing operations	24	26	35	52	56

Source: Authors work

For Inputs, the percentage of change in volume for Gross Loans and Deposits is required to be fulfilled for the five periods. Also, the average yield on Loans (on average balances) and the nominal deposits from Customers also need to be fulfilled respectively. The main categories of loans and deposits according to EBA specifications are Mortgage, Consumer, Credit Cards, Other, Public Sector, Large Corporate, SMEs and SBL while for deposits these are Savings, Sight, Term and Other. Operating Cost including Staff costs, Admin expenses, Depreciation and Commissions including Fees & commissions income, Fees & commissions expense and Other operating income must be also stated, as they are not products of volume and rates of loans and deposits.

For Outputs, the AFN model, based on the Inputs and the formed data of the other worksheets (Loans, Funding Sources, BS and PnL) is calculating the amounts for the categories as stated below and

for five periods. Loans & advances to customers, Gross Loans (en. Balance), Accumulated Provisions (en. balance), Total Assets, Deposits from customers, AFN Deposits (+) Placements (-) from/to banks, Total Equity, Net interest income, Net Fee & commission income & other income, Operating expenses, Pre- Provision Profit, Provisions, Profit / Loss before tax, Profit / Loss after tax from continuing operations.

# 3.2. Sensitivity analysis of Profit / Loss after tax from continuing operations

Based on the AFN model and using Palisade econometric software suite we conduct a sensitivity analysis in order to observe the factors and size magnitude of impact that influence Profit / Loss after tax from continuing operations for the forecasting periods of t+1, t+2 and t+3.

#### 4. Findings

We run sensitivity analysis on Profit / Loss after tax from continuing operations for t+1, t+2 and t+3 periods that were forecasted using the AFN bank specific model. As shown below on Table 6 What-If Analysis Summary for Output Profit / Loss after tax from continuing operations / t+1, t+2, t+3 (P/L AT of t+1, t+2, t+3) there are 96 main Inputs Ranked by Percentage Change that influence substantial the output P/L After Tax of t+1, t+2, t+3. Using Palisade TopRank, we run 1 simulation with 1.515 recalculations (iterations) examined three outputs and 303 Auto Vary inputs.

#### Table 6

# What-If Analysis Summary for Output Profit / Loss after tax from continuing operations

TopRank - Summary	
Performed By: Liapis Konstantinos	
Model: AFN FOR BANKS.xlsx	
Run: 1 of 1	
What-If Analysis Summary Information	Value
Runs (Simulation s)	1
Recalculations (Iterations)	1.515
Total Outputs	3
Outputs Selected	3
Outputs without Reports (Variation below thresh old)	0
Total Inputs	303
Standard Inputs	0
Auto-Vary Inputs	303
Multi-Way Recalculation s	0
Maximum Number of Inputs	32
Threshold of Inputs	0

Source: Authors work

The results were 3 independent groups (one for each term) of the 32 most influencing variables for each term with tornado graph for each group which helped as visualize the magnitude of influence. For the need of this research paper we present the results in a minimum base, beginning from the tornado graph of t+1 in Figure 2 and its interpretation of What if analysis results.

### Figure 2

TopRank - Tornado Graph of What-If Analysis for Output Profit / Loss after tax (t+1) period



Source: Authors work

Interpreting the results of sensitivity analysis for the first year of projections (t+1) for a+/- 10% change of inputs, we notice the following: In terms of impact to the Profit / Loss after tax, 1st comes the

input NPEs \_ SMEs of Period t+1 from Worksheet Loans with a +/-80,88% change of output. 2nd comes the input NPEs\_ SBL of Period t+1 from Worksheet Loans with a +/-60,66% change. 3rd comes the input NPEs\_Large Corporate of Period t+1 from Worksheet Loans with a +/-30,33% change. 4th comes the input All Term G. Loans of Period t+1 from Worksheet Presentation with a +/-14,16% change. 5th comes the input Average yield on SMEs of Period t+1 from Worksheet Presentation with a +/-13,2% change. 6th comes the input Gross Loans SMEs of Period t from Worksheet Loans with a +/-11,3% change. 7th comes the input Average yield on Large Corporate of Period t+1 from Worksheet Presentation with a +/-10,24% change. 8th comes the input NPEs\_Mortgage of Period t+1 from Worksheet Loans with a +/-10,11% change. 9th comes the input Gross Loans Large Corporate of Period t from Worksheet Loans with a +/-8,86% change. 10th comes the input Average vield on SBL of Period t+1 from Worksheet Presentation with a +/-8,65% change. 11th comes the input Nominal IR on Term deposit of Period t+1 from Worksheet Presentation with a +/-8,1% change. 12th comes the input NPEs\_Consumer of Period t+1 from Worksheet Loans with a +/-8,08% change. 13th comes the input NPEs Other of Period t+1 from Worksheet Loans with a +/- 8,08% change. 14th comes the input Admin expenses of Period t+1 from Worksheet Presentation with a +/-7,31% change. 15th comes the input Gross Loans SBL of Period t from Worksheet Loans with a +/- 7,05% change. 16th comes the input Staff costs of Period t+1 from Worksheet Presentation with a +/- 6,9% change. 17th comes the input All Deposits from Customers (Term) of Period t+1 from Worksheet Presentation with a +/-5,4% change. 18th comes the input Term Deposits from Customers of Period t from Worksheet Funding with a +/-5,23% change. 19th comes the input Gross Loans SMEs of Period t+1 from Worksheet Loans with a +/-5% change. 20th comes the input Fee & commission income of Period t+1 from Worksheet Presentation with a +/-4,47% change. 21st comes the input % Increase of Gross Loans of Period t+1 from Worksheet Presentation with a +/-4,14% change. 22nd comes the input Income Tax of Period t+1 from Worksheet FS with a +/-4,08% change. 23rd comes the input NPEs Credit cards of Period t+1 from Worksheet Loans with a +/-4,04% change. 24th comes the input Gross Loans Large Corporate of Period t+1 from Worksheet Loans with a +/-3,88% change. 25th comes the input Gross Loans SBL of Period t+1 from Worksheet Loans with a +/-3,39% change. 26th comes the input Gross Loans Mortgage of Period t from Worksheet Loans with a +/-2,78% change. 27th comes the input Term Deposits from Customers of Period t+1 from Worksheet Funding with a +/-2,57% change. 28th comes the input Average yield on Mortgage of Period t+1 from Worksheet Presentation with a +/-2,39% change. 29th comes the input Nominal IR on Sight deposit of Period t+1 from Worksheet Presentation with a +/- 1,98% change. 30th comes the input Sight Deposits from Customers of Period t from Worksheet Funding with a +/-1,69% change. 31st comes the input % of Savings to total Deposits of Period t+1 from Worksheet Presentation with a +/-1,38% change. 32nd comes the input NPEs\_SMEs of Period t from Worksheet Loans with a +/-1,37% change.

Continuing with tornado graph of t+2 in Figure 3 and its interpretation of What if analysis results.

Figure 3 TopRank - Tornado Graph of What-If Analysis for Output Profit / Loss after tax (t+2) period



Source: Authors work

Interpreting the results of sensitivity analysis for the first year of projections (t+2) for a+/- 10% change of inputs, we notice the following:

In terms of impact to the Profit / Loss after tax, 1st comes the input NPEs \_ SMEs of Period t+2 from Worksheet Loans with a +/- 55,45% change of output. 2nd comes the input NPEs\_ SBL of Period t+2 from Worksheet Loans with a +/- 41,59% change. 3rd comes the input All Term G. Loans of Period t+1 from Worksheet Presentation with a +/- 23,1% change. 4th comes the input NPEs\_Large Corporate of Period t+2 from Worksheet Loans with a +/- 20,79% change. 5th comes the input Average yield on SMEs of Period t+2 from Worksheet Presentation with a +/- 9,91% change. 6th comes the input All Term G. Loans of Period t+2 from Worksheet Presentation with a +/- 9,91% change. 6th comes the input All Term G. Loans of Period t+2 from Worksheet Presentation with a +/- 9,71% change. 7th comes the input Gross Loans SMEs of Period t+1 from Worksheet Loans with a +/- 7,88%

change. 9th comes the input Average yield on Large Corporate of Period t+2 from Worksheet Presentation with a +/- 7,11% change. 10th comes the input NPEs\_Mortgage of Period t+2 from Worksheet Loans with a +/- 6,93% change. 11th comes the input Gross Loans Large Corporate of Period t from Worksheet Loans with a +/- 6,52% change. 12th comes the input All Deposits from Customers (Term) of Period t+1 from Worksheet Presentation with a

+/- 6,33% change. 13th comes the input Gross Loans Large Corporate of Period t+1 from Worksheet Loans with a +/- 6,33% change. 14th comes the input Average yield on SBL of Period t+2 from Worksheet Presentation with a +/- 6,12% change. 15th comes the input NPEs\_Consumer of Period t+2 from Worksheet Loans with a +/- 5,54% change. 16th comes the input NPEs\_Other of Period t+2 from Worksheet Loans with a +/- 5,54% change. 17th comes the input Nominal IR on Term deposit of Period t+2 from Worksheet Presentation with a +/- 5,01% change. 18th comes the input Gross Loans SBL of Period t+1 from Worksheet Loans with a +/- 4,92% change. 19th comes the input Staff costs of Period t+2 from Worksheet Presentation with a +/- 4,77% change. 20th comes the input Gross Loans SBL of Period t from Worksheet Loans with a +/- 4.62% change. 21st comes the input Admin expenses of Period t+2 from Worksheet Presentation with a +/- 4,08% change. 22nd comes the input Income Tax of Period t+2 from Worksheet FS with a +/- 4,08% change. 23rd comes the input Gross Loans SMEs of Period t+2 from Worksheet Loans with a +/- 3,92% change. 24th comes the input Fee & commission income of Period t+2 from Worksheet Presentation with a +/- 3,27% change. 25th comes the input All Deposits from Customers (Term) of Period t+2 from Worksheet Presentation with a +/- 3,11% change. "26th comes the input Term Deposits from Customers of Period t+1 from Worksheet FUNDING with a +/- 3,01% change. 27th comes the input % Increase of Gross Loans of Period t+2 from Worksheet Presentation with a +/- 2,82% change. 28th comes the input NPEs Credit cards of Period t+2 from Worksheet Loans with a +/-2,77% change. 29th comes the input Gross Loans Mortgage of Period t from Worksheet Loans with a +/- 2,76% change. 30th comes the input Gross Loans Large Corporate of Period t+2 from Worksheet Loans with a +/- 2,66% change. 31st comes the input Gross Loans SBL of Period t+2 from Worksheet Loans with a +/- 2,44% change. 32nd comes the input Gross Loans Mortgage of Period t+1 from Worksheet Loans with a +/- 2,22% change.

Finally, we proceed with tornado graph of t+2 in Figure 4 and its interpretation of What if analysis results.

#### Figure 4 TopRank - Tornado Graph of What-If Analysis for Output Profit / Loss after tax (t+3) period



Source: Authors work

Interpreting the results of sensitivity analysis for the first year of projections (t+3) for a+/- 10% change of inputs, we notice the following: In terms of impact to the Profit / Loss after tax, 1st comes the input NPEs \_ SMEs of Period t+3 from Worksheet Loans with a +/- 52,69% change of output. 2nd comes the input NPEs\_ SBL of Period t+3 from Worksheet Loans with a +/- 39,51% change. 3rd comes the input All Term G. Loans of Period t+1 from Worksheet Presentation with a +/- 23,17% change. 4th comes the input All Term G. Loans of Period t+2 from Worksheet Presentation with a +/- 22,15% change. 5th comes the input NPEs\_Large Corporate of Period t+3 from Worksheet Loans with a +/- 19,75% change. 6th comes the input Average yield on SMEs of Period t+3 from Worksheet Presentation with a +/- 9,42% change. 7th comes the input All Term

G. Loans of Period t+3 from Worksheet Presentation with a +/-9,22% change. 8th comes the input Gross Loans SMEs of Period t+2 from Worksheet Loans with a +/- 7,76% change. 9th comes the input Gross Loans SMEs of Period t from Worksheet Loans with a +/- 7,65% change. 10th comes the input Gross Loans SMEs of Period t+1 from Worksheet Loans with a +/- 7,26% change. 11th comes the input Average yield on Large Corporate of Period t+3 from Worksheet Presentation with a +/- 6,76% change.

12th comes the input NPEs\_Mortgage of Period t+3 from Worksheet Loans with a +/- 6,58% change.13th comes the input Gross Loans Large Corporate of Period t+1 from Worksheet Loans with a +/-6,34% change. 14th comes the input Gross Loans Large Corporate of Period t from Worksheet Loans with a +/- 6,33% change. 15th comes the input Average yield on SBL of Period t+3 from Worksheet Presentation with a +/- 6,15% change. 16th comes the input Gross Loans Large Corporate of Period t+2 from Worksheet Loans with a +/-6,06% change. 17th comes the input All Deposits from Customers (Term) of Period t+2 from Worksheet Presentation with a +/- 5.94% change. 18th comes the input NPEs\_Consumer of Period t+3 from Worksheet Loans with a +/- 5,26% change. 19th comes the input NPEs Other of Period t+3 from Worksheet Loans with a +/- 5,26% change. 20th comes the input Gross Loans SBL of Period t+2 from Worksheet Loans with a +/- 4,87% change. 21st comes the input Nominal IR on Term deposit of Period t+3 from Worksheet Presentation with a +/- 4,79% change. 22nd comes the input Staff costs of Period t+3 from Worksheet Presentation with a +/- 4,56% change. 23rd comes the input Gross Loans SBL of Period t from Worksheet Loans with a +/- 4,48% change. 24th comes the input Gross Loans SBL of Period t+1 from Worksheet Loans with a +/- 4.31% change. 25th comes the input All Deposits from Customers (Term) of Period t+1 from Worksheet Presentation with a +/- 4,16% change. 26th comes the input Income Tax of Period t+3 from Worksheet FS with a +/- 4,08% change.

27th comes the input Admin expenses of Period t+3 from Worksheet Presentation with a +/- 3,8% change. 28th comes the input Gross Loans SMEs of Period t+3 from Worksheet Loans with a +/- 3,72% change. 29th comes the input Fee & commission income of

|--|

Period t+3 from Worksheet Presentation with a +/- 3,29% change. 30th comes the input All Deposits from Customers (Term) of Period t+3 from Worksheet Presentation with a +/- 2,98% change. 31st comes the input Term Deposits from Customers of Period t+2 from Worksheet Funding with a +/- 2,83% change. 32nd comes the input Gross Loans Mortgage of Period t+1 from Worksheet Loans with a +/- 2,82% change.

In order to summarize our findings, we have constructed a table comparing all 96 significant inputs of all 3 periods respectively to find if there are any inputs of previous terms that influence the output of current terms. The results are as shown below in Table 7.

#### Table 7

	t+1		t+2		t+3			
Worksheet	Name	Period	Worksheet	Name	Period	Worksheet	Name	Period
Loans	NPEs _ SMEs	t+1	Loans	NPEs _ SMEs	t+2	Loans	NPEs _ SMEs	t+3
Loans	NPEs _ SBL	t+1	Loans	NPEs_SBL	t+2	Loans	NPEs_SBL	t+3
Loans	NPEs _ Large Corporate	t+1	Presentation	All Term G. Loans	t+1	Presentation	All Term G. Loans	t+1
Presentation	All Term G. Loans	t+1	Loans	NPEs _Large Corporate	t+2	Presentation	All Term G. Loans	t+2
Presentation	Average yield on SMEs	t+1	Presentation	Average yield on SMEs	t+2	Loans	NPEs _ Large Corporate	t+3
Loans	Gross Loans SMEs	t	Presentation	All Term G. Loans	t+2	Presentation	Average yield on SMEs	t+3
Presentation	Average yield on Large Corporate	t+1	Loans	Gross Loans SMEs	t+1	Presentation	All Term G. Loans	t+3
Loans	NPEs _ Mortgage	t+1	Loans	Gross Loans SMEs	t	Loans	Gross Loans SMEs	t+2
Loans	Gross Loans Large Corporate	t	Presentation	Average yield on Large Corporate	t+2	Loans	Gross Loans SMEs	t
Presentation	Average yield on SBL	t+1	Loans	NPEs _ Mortgage	t+2	Loans	Gross Loans SMEs	t+1
Presentation	Nominal ir on Term deposit	t+1	Loans	Gros s Loans Large Corporate	t	Presentation	Average yield on Large Corporate	t+3
Loans	NPEs _ Consumer	t+1	Presentation	Customers (Term)	t+1	Loans	NPEs _ Mortgage	t+3
Loans	NPEs _ Other	t+1	Loans	Gross Loans Large Corporate	t+1	Loans	Gross Loans Large Corporate	t+1
Presentation	Admin expenses	t+1	Presentation	Average yield on SBL	t+2	Loans	Gross Loans Large Corporate	t
Loans	Gross Loans SBL	t	Loans	NPEs _ Consumer	t+2	Presentation	Average yield on SBL	t+3
Presentation	Staff costs	t+1	Loans	NPEs _ Other	t+2	Loans	Gross Loans Large Corporate	t+2
Presentation	All Deposits from Customers (Term)	t+1	Presentation	Nominal ir on Term deposit	t+2	Presentation	All Deposits from Customers (Term)	t+2
Funding	Term Deposits from Customers	t	Loans	Gross Loans SBL	t+1	Loans	NPEs _ Consumer	t+3
Loans	Gross Loans SMEs	t+1	Presentation	Staff costs	t+2	Loans	NPEs _ Other	t+3
Presentation	Fee & commission income	t+1	Loans	Gross Loans SBL	t	Loans	Gross Loans SBL	t+2
Presentation	% Increase of Gross Loans	t+1	Presentation	Admin expenses	t+2	Presentation	Nominal IR on Term deposit	t+3
FS	Income Tax	t+1	FS	Income Tax	t+2	Presentation	Staff costs	t+3
Loans	cards	t+1	Loans	SMEs	t+2	Loans	Gross Loans SBL	t

Comparison of each periods' 32 Inputs

	£11			t 1 2			t   3	
Worksheet	Name	Period	Worksheet	Name	Period	Worksheet	Name	Period
Loans Loans	NPEs _ SMEs NPEs _ SBL	t+1 t+1	Loans Loans	NPEs _ SMEs NPEs _ SBL	t+2 t+2	Loans Loans	NPEs _ SMEs NPEs _ SBL	t+3 t+3
Loans	Gross Loans Large Corporate	t+1	Presentation	Fee & commission income	t+2	Loans	Gross Loans SBL	t+1
Loans	Gross Loans SBL	t+1	Presentation	All Deposits from Customers (Term)	t+2	Presentation	All Deposits from Customers (Term)	t+1
Loans	Gross Loans Mortgage	t	Funding	Term Deposits from Customers	t+1	FS	Income Tax	t+3
FUNDING	Term Deposits from Customers	t+1	Presentation	% Increase of Gros s Loa ns	t+2	Presentation	Admin expenses	t+3
Presentation	Average yield on Mortgage	t+1	Loans	NPEs _ Credit cards	t+2	Loans	Gross Loans SMEs	t+3
Presentation	Nominal ir on Sight deposit	t+1	Loans	Gross Loans Mortgage	t	Presentation	Fee & commission income	t+3
FUNDING	Sight Deposits from Customers	t	Loans	Gross Loans Large Corporate	t+2	Presentation	All Deposits from Customers (Term)	t+3
Presentation	% of Savings to total Deposits	t+1	Loans	Gross Loans SBL	t+2	Funding	Term Depos its from Customers	t+2
Loans	NPEs _ SMEs	t	Loans	Gross Loans Mortgage	t+1	Loans	Gross Loans Mortgage	t+1

Source: Authors work

What we observe in Table 7 is that the first most significant determinants are NPEs of SMEs and SBLs of every current period in all three terms respectively. Moreover, the most interesting findings have to do with inputs – determinants of past periods, that influence significantly future periods, in particular:

a) All segments of Gross Loans as well as Term deposits of t period, affect significantly Profit / Loss after tax from continuing operations of t+1 period. Also, all segments of Gross Loans of t period and Term deposits with all deposits of t+1 period, affect significantly Profit / Loss after tax from continuing operations of t+2 period. Finally, again, all segments of Gross Loans of t period and all deposits of t+1 period and Term deposits of t+2 period, affect significantly Profit / Loss after tax from continuing operations of t+3 period.

The next step is to interpret the results of the Spider graph for each of the three periods which gives a summarized illustration of all linear relations from AFN model variables given a minus five percentage change (-5%) and their positive or negative influences on Profit / Loss after tax from continuing operations of t+1.
Figure 5





Source: Authors work

We observe that:

% Increase of Gross Loans in period t+1 has a negative relation to earnings of t+1 as for a -0,05 negative change we have a 0,0207 positive change of earnings.

All Term G. Loans in period t+1 has a positive relation to earnings of t+1 as for a -0,05 negative change we have a -0,0708negative change of earnings.

Average yield on Mortgage in period t+1 has a positive relation to earnings of t+1 as for a -0,05 negative change we have a -0,012negative change of earnings.

Average yield on Large Corporate in period t+1 has a positive relation to earnings of t+1 as for a -0,05 negative change we have a - 0,0512negative change of earnings.

Average yield on SMEs in period t+1 has a positive relation to earnings of t+1 as for a -0,05 negative change we have a -0,066 negative change of earnings.

Average yield on SBL in period t+1 has a positive relation to earnings of t+1 as for a -0,05 negative change we have a -0,0433negative change of earnings.

% of Savings to total Deposits in period t+1 has a positive relation to earnings of t+1 as for a -0,05 negative change we have a -0,0069negative change of earnings.

All Deposits from Customers (Term) in period t+1 has a negative relation to earnings of t+1 as for a - 0,05 negative change we have a 0,027 positive change of earnings.

Nominal ir on Sight deposit in period t+1 has a negative relation to earnings of t+1 as for a -0,05 negative change we have a 0,0099 positive change of earnings.

Nominal ir on Term deposit in period t+1 has a negative relation to earnings of t+1 as for a -0,05 negative change we have a 0,0405 positive change of earnings.

Staff costs in period t+1 has a negative relation to earnings of t+1 as for a -0,05 negative change we have a 0,0345 positive change of earnings.

Admin expenses in period t+1 has a negative relation to earnings of t+1 as for a -0,05 negative change we have a 0,0366 positive change of earnings.

Fee & commission income in period t+1 has a positive relation to earnings of t+1 as for a -0,05 negative change we have a -0,0224negative change of earnings.

Income Tax in period t+1 has a negative relation to earnings of t+1 as for a -0,05 negative change we have a 0,0204 positive change of earnings.

Gross Loans Mortgage in period t has a positive relation to earnings of t+1 as for a -0,05 negative change we have a -0,0139negative change of earnings.

Gross Loans Large Corporate in period t has a positive relation to earnings of t+1 as for a -0,05 negative change we have a -0,0443negative change of earnings.

Gross Loans Large Corporate in period t+1 has a positive relation to earnings of t+1 as for a -0,05 negative change we have a -0,0194negative change of earnings.

Gross Loans SMEs in period t has a positive relation to earnings of t+1 as for a -0,05 negative change we have a -0,0565negative change of earnings. Gross Loans SMEs in period t+1 has a positive relation to earnings of t+1 as for a -0,05 negative change we have a -0,025 negative change of earnings.

Gross Loans SBL in period t has a positive relation to earnings of t+1 as for a -0,05 negative change we have a -0,0353negative change of earnings.

Gross Loans SBL in period t+1 has a positive relation to earnings of t+1 as for a -0,05 negative change we have a -0,017negative change of earnings.

NPEs\_Mortgage in period t+1 has a negative relation to earnings of t+1 as for a -0,05 negative change we have a 0,0506 positive change of earnings.

NPEs\_Consumer in period t+1 has a negative relation to earnings of t+1 as for a -0,05 negative change we have a 0,0404 positive change of earnings.

NPEs\_Credit cards in period t+1 has a negative relation to earnings of t+1 as for a -0,05 negative change we have a 0,0202 positive change of earnings.

NPEs\_Other in period t+1 has a negative relation to earnings of t+1 as for a -0,05 negative change we have a 0,0404 positive change of earnings.

NPEs\_Large Corporate in period t+1 has a negative relation to earnings of t+1 as for a -0,05 negative change we have a 0,1517 positive change of earnings.

NPEs\_SMEs in period t has a negative relation to earnings of t+1 as for a -0,05 negative change we have a 0,0069 positive change of earnings.

NPEs \_ SMEs in period t+1 has a negative relation to earnings of t+1 as for a -0,05 negative change we have a 0,4044 positive change of earnings.

NPEs\_ SBL in period t+1 has a negative relation to earnings of t+1 as for a -0,05 negative change we have a 0,3033 positive change of earnings.

Sight Deposits from Customers in period t has a negative relation to earnings of t+1 as for a -0,05 negative change we have a 0,0085 positive change of earnings.

Term Deposits from Customers in period t has a negative relation to earnings of t+1 as for a -0,05 negative change we have a 0,0262 positive change of earnings.

Term Deposits from Customers in period t+1 has a negative relation to earnings of t+1 as for a -0,05 negative change we have a 0,0129 positive change of earnings.

Accordingly, we are going to interpret the results of the Spider graph for Profit / Loss after tax from continuing operations of t+2 as represented on figure 2 Spider graph of t+2.





Source: Authors work

We observe that:

Income Tax in period t+2 has a negative relation to earnings of t+2 as for a -0,05 negative change we have a 0,0204 positive change of earnings.

"Term Deposits from Customers in period t+1 has a negative relation to earnings of t+2 as for a -0,05 negative change we have a 0,0151 positive change of earnings."

"Term Deposits from Customers in period t+1 has a positive relation to earnings of t+2 as for a -0,05 negative change we have a 0,0151 negative change of earnings."

"Gross Loans Large Corporate in period t has a positive relation to earnings of t+2 as for a -0,05 negative change we have a -0,0326 negative change of earnings. "

Gross Loans SMEs in period t has a positive relation to earnings of t+2 as for a -0,05 negative change we have a -0,0394 negative change of earnings.

"Gross Loans SBL in period t has a positive relation to earnings of t+2 as for a -0,05 negative change we have a -0,0231 negative change of earnings. "

"Gross Loans Mortgage in period t has a positive relation to earnings of t+2 as for a -0,05 negative change we have a -0,0138 negative change of earnings."

"Gross Loans Large Corporate in period t+1 has a positive relation to earnings of t+2 as for a -0,05 negative change we have a -0,0317 negative change of earnings."

Gross Loans SMEs in period t+1 has a positive relation to earnings of t+2 as for a -0,05 negative change we have a -0,0405 negative change of earnings.

"Gross Loans SBL in period t+1 has a positive relation to earnings of t+2 as for a -0,05 negative change we have a -0,0246 negative change of earnings."

"Gross Loans Mortgage in period t+1 has a positive relation to earnings of t+2 as for a -0,05 negative change we have a -0,0111 negative change of earnings."

"Gross Loans Large Corporate in period t+2 has a positive relation to earnings of t+2 as for a -0,05 negative change we have a -0,0133 negative change of earnings."

"Gross Loans SMEs in period t+2 has a positive relation to earnings of t+2 as for a -0,05 negative change we have a -0,0196 negative change of earnings. "

"NPEs\_Mortgage in period t+2 has a negative relation to earnings of t+2 as for a -0,05 negative change we have a 0,0347 positive change of earnings."

"NPEs\_Consumer in period t+2 has a negative relation to earnings of t+2 as for a -0,05 negative change we have a 0,0277 positive change of earnings." "NPEs\_Credit cards in period t+2 has a negative relation to earnings of t+2 as for a -0,05 negative change we have a 0,0139 positive change of earnings."

"NPEs\_Other in period t+2 has a negative relation to earnings of t+2 as for a -0,05 negative change we have a 0,0277 positive change of earnings."

NPEs\_Large Corporate in period t+2 has a negative relation to earnings of t+2 as for a -0,05 negative change we have a 0,104 positive change of earnings.

NPEs \_ SMEs in period t+2 has a negative relation to earnings of t+2 as for a -0,05 negative change we have a 0,2773 positive change of earnings.

NPEs\_ SBL in period t+2 has a negative relation to earnings of t+2 as for a -0,05 negative change we have a 0,208 positive change of earnings.

NPEs\_ SBL in period t+2 has a positive relation to earnings of t+2 as for a -0,05 negative change we have a 0,208 negative change of earnings.

"All Deposits from Customers (Term) in period t+1 has a negative relation to earnings of t+2 as for a - 0,05 negative change we have a 0,0317 positive change of earnings."

"All Deposits from Customers (Term) in period t+1 has a positive relation to earnings of t+2 as for a - 0,05 negative change we have a 0,0317 negative change of earnings."

All Term G. Loans in period t+2 has a positive relation to earnings of t+2 as for a -0,05 negative change we have a -0,0486 negative change of earnings.

"Average yield on Large Corporate in period t+2 has a positive relation to earnings of t+2 as for a -0,05 negative change we have a -0,0356 negative change of earnings."

"Average yield on SMEs in period t+2 has a positive relation to earnings of t+2 as for a -0,05 negative change we have a -0,0496 negative change of earnings. "

"All Deposits from Customers (Term) in period t+2 has a negative relation to earnings of t+2 as for a - 0,05 negative change we have a 0,0156 positive change of earnings."

% Increase of Gross Loans in period t+2 has a negative relation to earnings of t+2 as for a -0,05 negative change we have a 0,0141 positive change of earnings. Nominal ir on Term deposit in period t+2 has a negative relation to earnings of t+2 as for a -0,05 negative change we have a 0,0251 positive change of earnings.

Staff costs in period t+2 has a negative relation to earnings of t+2 as for a -0,05 negative change we have a 0,0239 positive change of earnings.

Admin expenses in period t+2 has a negative relation to earnings of t+2 as for a -0,05 negative change we have a 0,0204 positive change of earnings.

Admin expenses in period t+2 has a positive relation to earnings of t+2 as for a -0,05 negative change we have a 0,0204 negative change of earnings.

Finally, we are going to interpret the results of the Spider graph for Profit / Loss after tax from continuing operations of t+3 as represented on figure 3 Spider graph of t+3.

Figure 7





Source: Authors work

We observe that:

Income Tax in period t+3 has a negative relation to earnings of t+3 as for a -0,05 negative change we have a 0,0204 positive change of earnings.

Term Deposits from Customers in period t+2 has a negative relation to earnings of t+3 as for a -0,05 negative change we have a 0,0142 positive change of earnings.

Gross Loans Large Corporate in period t has a positive relation to earnings of t+3 as for a -0,05 negative change we have a -0,0317 positive change of earnings.

Gross Loans SMEs in period t has a positive relation to earnings of t+3 as for a -0,05 negative change we have a -0,0383 positive change of earnings.

Gross Loans SBL in period t has a positive relation to earnings of t+3 as for a -0,05 negative change we have a -0,0224 positive change of earnings.

Gross Loans Large Corporate in period t+1 has a positive relation to earnings of t+3 as for a -0,05 negative change we have a -0,0317 positive change of earnings.

Gross Loans SMEs in period t+1 has a positive relation to earnings of t+3 as for a -0,05 negative change we have a -0,0363 positive change of earnings.

Gross Loans SBL in period t+1 has a positive relation to earnings of t+3 as for a -0,05 negative change we have a -0,0216 positive change of earnings.

Gross Loans Mortgage in period t+1 has a positive relation to earnings of t+3 as for a -0,05 negative change we have a -0,0141 positive change of earnings.

Gross Loans Large Corporate in period t+2 has a positive relation to earnings of t+3 as for a -0,05 negative change we have a -0,0303 positive change of earnings.

Gross Loans SMEs in period t+2 has a positive relation to earnings of t+3 as for a -0,05 negative change we have a -0,0388 positive change of earnings.

Gross Loans SBL in period t+2 has a positive relation to earnings of t+3 as for a -0,05 negative change we have a -0,0244 positive change of earnings.

Gross Loans SMEs in period t+3 has a positive relation to earnings of t+3 as for a -0,05 negative change we have a -0,0186 positive change of earnings.

NPEs\_Mortgage in period t+3 has a negative relation to earnings of t+3 as for a -0,05 negative change we have a 0,0329 positive change of earnings.

NPEs\_Consumer in period t+3 has a negative relation to earnings of t+3 as for a -0,05 negative change we have a 0,0263 positive change of earnings.

NPEs\_Other in period t+3 has a negative relation to earnings of t+3 as for a -0,05 negative change we have a 0,0263 positive change of earnings.

NPEs\_Large Corporate in period t+3 has a negative relation to earnings of t+3 as for a -0,05 negative change we have a 0,0988 positive change of earnings.

NPEs \_ SMEs in period t+3 has a negative relation to earnings of t+3 as for a -0,05 negative change we have a 0,2635 positive change of earnings.

NPEs\_ SBL in period t+3 has a negative relation to earnings of t+3 as for a -0,05 negative change we have a 0,1976 positive change of earnings.

All Term G. Loans in period t+1 has a positive relation to earnings of t+3 as for a -0,05 negative change we have a -0,1159 positive change of earnings.

All Deposits from Customers (Term) in period t+1 has a negative relation to earnings of t+3 as for a - 0,05 negative change we have a 0,0208 positive change of earnings.

All Term G. Loans in period t+2 has a positive relation to earnings of t+3 as for a -0,05 negative change we have a -0,1108 positive change of earnings.

All Deposits from Customers (Term) in period t+2 has a negative relation to earnings of t+3 as for a - 0,05 negative change we have a 0,0297 positive change of earnings.

All Term G. Loans in period t+3 has a positive relation to earnings of t+3 as for a -0,05 negative change we have a -0,0461 positive change of earnings.

Average yield on Large Corporate in period t+3 has a positive relation to earnings of t+3 as for a -0,05 negative change we have a -0,0338 positive change of earnings.

Average yield on SMEs in period t+3 has a positive relation to earnings of t+3 as for a -0,05 negative change we have a -0,0471 positive change of earnings. Average yield on SBL in period t+3 has a positive relation to earnings of t+3 as for a -0,05 negative change we have a -0,0308 positive change of earnings.

All Deposits from Customers (Term) in period t+3 has a negative relation to earnings of t+3 as for a - 0,05 negative change we have a 0,0149 positive change of earnings.

Nominal IR on Term deposit in period t+3 has a negative relation to earnings of t+3 as for a -0,05 negative change we have a 0,024 positive change of earnings.

Staff costs in period t+3 has a negative relation to earnings of t+3 as for a -0,05 negative change we have a 0,0228 positive change of earnings.

Admin expenses in period t+3 has a negative relation to earnings of t+3 as for a -0,05 negative change we have a 0,019-positive change of earnings.

Fee & commission income in period t+3 has a positive relation to earnings of t+3 as for a -0,05 negative change we have a -0,0165 positive change of earnings.

The above examination of the positive or negative influence of the top 96 variables influencing Profit

/ Loss after tax from continuing operations, is of a main importance as it examines the relations of our deterministic AFN model and we can have a comparison analysis with the variables of our multiple linear regression model which will follow in our research.

## 5. Conclusions

From the above initial examination of AFN banking model and its sensitivity analysis for the three annual future periods, we can observe ninety-six main inputs taken from a pool of 303 inputs from all five time periods of AFN model, which have a significant impact in determining the main output of Profit / Loss after tax from continuing operations, in every future time period (t+1, t+2, t+3). The most interesting inputs are those of past terms that are already realized. Given this relationship, there is strong evidence that an econometric model can significantly assist the proforma budget financial statements for a 3-year programming period, which is also required at the level of administrative accounting and supervisory authorities in Greece (BoG) and EU (EBA). The use of administrative accounting information by combining the AFN methodology to construct a static model is the first step in order to access banking efficiency. Because AFN model as a static model is influenced by exogenous factors, mainly macroeconomic variables of economic circumstances like economic crisis therefor a selected group of internal bank performance variables, is examined here and can be forecasted using econometric methodology together with exogenous factors like GDP growth rate, Inflation rate, Euribor, and dummy variance of economic crises.

We believe and are researching to prove that, AFN for banks methodology coupled with the econometric approach through multiple linear regression and the control of uncertainty through Monte Carlo simulation can form a compact and solid framework to access the effectiveness and control of a banking non-systemic institution. To further control and reinforce our findings, the model should be tested in other domestic and multinational bank configurations as well as the possibilities of using methodologies of genetic algorithms and artificial intelligence.

#### References

- Akhavein, J. D., Berger, A. N., & Humphrey, D. B. (1997). The effects of megamergers on efficiency and prices: Evidence from a bank profit function. Review of industrial Organization, 12(1), 95-139.
- 2. Bashir, A. H. M. (2003). Determinants of profitability in Islamic banks: Some evidence from the Middle East.
- Berger, A. N., DeYoung, R., Genay, H., & Udell, G. F. (2000). Globalization of financial institutions: Evidence from crossborder banking performance. Brookings-Wharton papers on financial services, 2000(1), 23-120.
- 4. Bikker, J. A., & Hu, H. (2002). Cyclical patterns in profits, provisioning and lending of banks and procyclicality of the new Basel capital requirements. PSL Quarterly Review, 55(221).
- Blaschke, W., M. T. Jones, G. Majnoni, and M. S. Martinez Peria.2001. "Stress Testing of Financial Systems: An Overview of Issues, Methodologies, and FSAP Experiences." IMF Working Paper No. 88.

- Bourke, P. (1989). Concentration and other determinants of bank profitability in Europe, North America and Australia. Journal of Banking & Finance, 13(1), 65-79.
- 7. Capraru, J. (2015). Determinants of bank's Profitability in EU15. De Gruyetr open doi 10.1515/AICUE- 2015-0007.
- Castren, O., T. Fitzpatrick, and M. Sydow. 2008. "Assessing Portfolio Credit Risk Changes in a Sample of EU Large and Complex Banking Groups in Reaction to Macroeconomic Shocks." Mimeo.
- 9. Davydenko, A. (2010). Determinants of bank profitability in Ukraine. Undergraduate Economic Review, 7(1), 2.
- 10. Eichengreen, B., & Gibson, H. D. (2001). Greek banking at the dawn of the new millennium.
- 11. Hofstrand, D. (2009). Understanding profitability. Ag Decisions Makers, 2, C3-24.
- 12. Javaid, S., Anwar, J., Zaman, K., & Gafoor, A. (2011). Determinants of bank profitability in Pakistan: Internal factor analysis. Mediterranean Journal of Social Sciences, 2(1).
- 13. Jimenez, G., and J. Mencia. 2007. "Modelling the Distribution of Credit Losses with Observable and Latent Factors." Banco de Espana Working Paper No. 0709.
- 14. Kapadia, Sujit, Drehmann, Mathias, Elliott, John, Sterne, Gabriel, 2012. Liquidity Risk, Cash Flow Constraints, and Systemic Feedbacks. Bank of England Working Paper #456. June 21, 2012.
- 15. Miller, S. M., & Noulas, A. G. (1997). Portfolio mix and largebank profitability in the USA. Applied Economics, 29(4), 505-512.
- Molyneux, P., & Thornton, J. (1992). Determinants of European bank profitability: A note. Journal of banking & Finance, 16(6), 1173-1178.
- 17. Short, B. K. (1979). The relation between commercial bank profit rates and banking concentration in Canada, Western Europe, and Japan. Journal of Banking & Finance, 3(3), 209-219.

- Smirlock, M. (1985). Evidence on the (non) relationship between concentration and profitability in banking. Journal of money, credit and Banking, 17(1), 69-83.
- 19. Tregenna, F. (2009). The fat years: the structure and profitability of the US banking sector in the pre- crisis period. Cambridge Journal of Economics, 33(4), 609-632.
- Van den End, J. W., M. Hoeberichts, and M. Tabbae. 2006. "Modelling Scenario Analysis and Macro Stress-Testing." De Nederlandsche Bank Working Paper No. 119.
- 21. Wong, Eric, Hui, Cho-Hoi, 2009. A Liquidity Risk Stress-Testing Framework with Interactions Between Market and Credit Risks. Hong Kong Monetary Authority Working Paper 06/2009.

## APPENDIX



Source: Authors work

Figure 1

# WAYS OF INVOLVING CENTRAL BANK IN SUPPORTING ECONOMIC GROWTH

### Adina CRISTE, PhD<sup>\*</sup>

### Abstract

Addressing the relationship between the policy of a central bank and economic growth in the post-crisis stage, the article aims to identify essential tools that the monetary authority has theoretically available to support a sustainable economic growth, in the future. In the context of the global economy developments and the challenges that it is subject to, on the one hand, and considering certain attributes of a central bank, on the other hand, there are highlighted some elements that lead us to clarify the proposed objective.

**Keywords:** central bank policy, communication tool, postcrisis time, financial stability

## JEL Classification: E44, E58, F43

#### 1. Introduction

The financial crisis occurrence and the post-crisis period have brought major challenges, and one of them refers to the role that a central bank can play in supporting economic growth, especially as one of the serious effects of the crisis is the deep and prolonged recession.

The central bank's policy was the main instrument for the economic recovery, after the global financial crisis, compensating for the lack or inadequacy of the structural and fiscal policies. Although the central banks are often accused of overstepping their duties during this period, their actions were still needed to cover the lack or poor action in other areas. After all, the pursuit of achieving a sustainable economic growth implies an adequate macroeconomic policy mix. Moreover, in the following period, the recovery of the economic activity required a greater emphasis on appropriate structural and fiscal policies.

<sup>\*</sup> Senior Researcher II, "Victor Slävescu" Centre for Financial and Monetary Research, Romanian Academy, Bucharest.

The concerted efforts of the major central banks and their loosen monetary policy conduit represented an essential support for the recovery of the global economic activity in the post-crisis period, but at the same time their interventions have resulted in very low, even negative, levels of interest rates, as well as significant increases in the balance sheets of central banks of global importance. Thus, the monetary policy has lost its available room for intervention.

In a low inflation environment and given the narrow space of monetary policy actions, it is necessary to identify a trade-off between inflation and financial development, maintaining a balance between reaching inflation goals, on the one hand, and avoiding the risk for further encouraging the development of longer-term financial vulnerabilities, on the other hand. To this end, flexibility is needed both in pursuit of the inflation target and in the reaction to volatility episodes on the financial market, avoiding overly aggressive reactions in the event of short-term volatility episodes.

Theoretically, the central bank's policy should fall within the area of the more general objective, pursued also by other macroeconomic policies, namely, that of reaching the optimal level of the financial frontier (Beck & Feyen, 2013; Barajas et al., 2013). In this regard, the central bank's intervention means applying measures to activate the market to reach its financial potential, while also aiming to direct the market to ensure that the economy is within the limit of its potential financial capacity. In the first case, the central bank has at its disposal the monetary policy, aimed at ensuring price stability, as well as specific measures to regulate the functioning of the banking system. In the second case, the central bank is called upon to ensure, within its limits of responsibility, the financial stability by macro-prudential and supervision policies, and also by financial education measures (as for example: informing the public about the risks of excessive debt, saving methods, etc.).

Starting from describing the responsibility of a central bank and its room of manoeuvre, but also based on the observations from the literature, certain elements that make the connection between the economic growth and the activity of a central bank are highlighted. They are, in fact, important benchmarks for identifying tools that a central bank has available to support future economic growth.

# 2. Central bank landmarks in supporting economic growth - experiences and explorations in literature

One of the permanent concerns for decision-makers, including the central bank, is to identify risks to financial stability. The latter is an important factor in influencing the sustainability of economic growth, assuming that the long-term economic growth can only be sustained under the conditions of a stable financial system. In this context, the level and dynamics of financial conditions are guidelines elements for identifying the risks regarding the economic growth, the financial indicators included in the financial conditions index providing the authorities with an analysis base in this direction.

Financial conditions are an important factor influencing economic growth, a fact confirmed by the recent episode, after the global financial crisis, when the easing of financial conditions contributed to the economic recovery in many countries. However, the longer-term experience shows that during the times when the financial conditions are favourable, there is a tendency of building up of financial vulnerabilities. This observation, more clearly highlighted with the onset of the global financial crisis, is at the basis of conceiving new methods for measuring the financial stability, based on the *growth-atrisk* indicator, that links financial conditions to the distribution of future GDP growth. Based on this model, it can be evaluated the intertemporal balance between supporting short-term economic growth and increasing the medium-term risk regarding financial stability and economic growth.<sup>1</sup>

Changes in the risk level in the internal market may signal the presence of factors with negative influence on the economic growth, During the post-crisis period, the high levels of the financial leverage may signal the slowdown in medium-term economic activity, although in the short-term such risk is mitigated by favourable indicators of financial markets (low risk margins, low market volatility, positive risk perception). Nevertheless, a rapid decompression of margins in the financial market and an increase in its volatility can add to the risks regarding the financial leverage, amplifying the adverse effects on the economic growth. Therefore, monetary authorities can use this information by integrating it into a broader framework to identify imminent risks and to act quickly to counteract them by adapting their

<sup>&</sup>lt;sup>1</sup> The methodology of calculated the growth-at-risk indicator (GaR) is described in Financial Stability Report (IMF, 2017).

behaviour and using a wide range of measures both for managing crisis and for preventing it. The calibration of the central bank interventions to financial conditions is as important as the calibration of the monetary policy based on the information on inflation and economic activity reflected by the Taylor rule. Moreover, Adrian et al (2019) confirm that financial conditions have become a common element for the monetary policy framework, an idea also emphasized by Peek et al. (2016).

Another important factor of influence of economic growth refers to the characteristics and trends in the housing market imprinted by the process of global financial integration. Thus, the "financialization" of real estate assets and also the greater synchronization of house prices, as effects of the global financial integration, contribute to increasing the degree of connection both between the local real estate markets, and between the prices of these assets, enhancing the risk of contagion in times of crisis. Contagion is a particular feature of the financial markets, but in the real estate sector it has wide and major implications on the real economy, considering the multiple connections with the other sectors of the economy (the private sector balance sheet has a structure that is based on real estate assets and mortgages, and financial institutions are largely exposed to the dynamics of housing prices). Therefore, decision makers should develop a "strategy" for monitoring the housing market aimed at: analysing developments, identifying major factors of influence, and their potential effects, estimating trends, developing scenarios, identifying risks, etc. All these elements require not only access to data, but also a permanent update of these data. In addition, a higher degree of particularization and coverage of information on housing prices can help to obtain more representative control indicators. In this way, one can identify the sphere of influence of both the global financial conditions, and the global investors on the dynamics of the prices in the housing market. More detailed information on the participation of global investors in the housing markets could strengthen surveillance and control efforts. Monitoring the synchronization of prices in these markets can help decision-makers understand the issues related to transactions associated with the broader links on the global housing market.

In order to support the economic activity, from this perspective, the central bank can contribute by carrying out risk analysis and assessments, but also by applying broader measures aimed at financial stability. It is emphasized that the implementation of macroprudential measures maintains a certain capacity to influence the evolution of housing prices at the local level, even in countries with highly synchronized markets (IMF, 2018a).

The exchange rate flexibility can play an important role as concerns the housing prices, providing a higher capacity for monetary policy to influence domestic conditions. Based on the premise that there is an inverse relationship between exchange rate flexibility and the importance of global financial conditions for the local economy<sup>2</sup>, in economies that have flexible currency regime, the central bank can more easily manage liquidity, especially if it has a high and adequate level of foreign exchange reserves. In addition, if lending in local currency prevails in the economy, then central bank can have a greater influence on short-term interest rates and thus on financial conditions.

The involvement of the central bank in supporting economic growth is also achieved through the macro-prudential policy, considering both its relationship with the economic growth, a widely debated topic in the literature, and the fact that the macro-prudential policy is found in the activity of central banks worldwide. Moreover, macro-prudential instruments, aimed at reducing either the tendency of financial crises to occur or their severity, have greater or lesser influence on economic growth. They usually have the role of increasing the resilience of the financial system, thereby reducing the systemic risks arising from financial intermediation.

There is the opinion that macro-prudential measures can contribute to macroeconomic stabilization, but at the cost of affecting economic activity and long-term economic growth, through the influence exerted on lending and investments.

On the other hand, efforts to ensure the financial stability (through macro-prudential measures) are considered to contribute to enhancing its capacity to support and stimulate economic growth. Basically, macro-prudential measures are intended to improve the resilience of the financial system and to alleviate the financial cycle, especially because of establishing and consolidating capital buffers. To the extent that macro-financial volatility reduces economic growth, and macro-prudential policy reduces such volatility, then macro-prudential policy should be positively related to long-term economic growth. Recent studies (e.g. Ueberfeldt and Duprey, 2018) show a higher efficiency of applying the macro-prudential policy compared to the

<sup>&</sup>lt;sup>2</sup> The greater the flexibility of the exchange rate, the less the importance of global liquidity for the domestic economy.

monetary policy regarding reducing the risks of slowing the future economic activity. Although older research has identified a negative relationship between macroeconomic stability and economic growth (Kormendi and Meguire, 1985), it is more recently stated that volatility itself does not affect economic growth, but rather that politically induced (Fatás and Mihov, 2012), based on the idea that a lower volatility in the longer term can induce political decision makers a false safety sentiment, leaving room for financial imbalances accumulation. The Great Moderation confirms such a situation - a period of low volatility for a long time, in which there were built-up imbalances that ultimately led to the outbreak of the global financial crisis.

Analysing the relationship between macro-prudential measures and long-term macroeconomic outcomes, Boar et al. (2017) show that countries that frequently use macro-prudential tools have both higher growth rates for GDP/capita and more stable GDP growth. However, the benefit of applying these measures to economic growth (in terms of level and stability) depends on the degree of openness and financial development of that economy. Thus, economies that either have a greater degree of openness, or are more financially developed, have better results following the application of these macro-prudential measures. In contrast, it is noted that non-systematic macro-prudential interventions affect economic growth.

Anchoring long-term inflation expectations is a common goal of central banks around the world, both in developed and emerging economies, being a support for achieving the monetary policy objective. The experience of the post-crisis period shows that this problem goes beyond the monetary policy spectrum, proving to be useful for sustaining the economic growth. The preconditions for anchoring the long-term inflation expectations refer to the high levels of credibility and independence of the central bank, attributes that allow it to clearly and timely communicate its intentions to the public and to the market.

Inflation in emerging economies is on average higher than in developed economies, but with some differences between countries, rather reflecting the degree of long-term inflation expectations anchored and less external conditions (Criste, 2017). Anchoring for inflation expectations gives the central bank a certain profile of its reporting on economic activity. If these expectations are not well anchored in the long run, they will tend to increase with the spread of price shocks, affecting economic activity. Thus, the central bank is in a dilemma - between correcting expectations by adopting a restrictive monetary policy, which would reduce economic activity and implicitly generate risk of recession, or supporting economic growth through an easing monetary policy., which would have an adverse effect on inflation expectations.

A recent study (IMF, 2018b) shows that the pass-through of exchange rate depreciation was lower in economies with better anchored expectations than in other economies. These observations confirm the results of earlier (Taylor, 2000) or more recent (Carričre-Swallow et al., 2016) studies that underline the influence of inflation expectations on the degree of the exchange rate pass-through in the economy.

For central banks in emerging economies that have large financial and trade openness, reflected by the importance of the foreign exchange factor in the economy, anchoring long-term inflation expectations is a necessary element for sustaining economic growth. An appreciation of the foreign currency dominant in the economy will not constrain central bank to adopt restrictive behaviour as to reduce the risk of inflation. Emerging economies that have better anchored inflationary expectations over the long term will be more protected from the potential tightening of global financial conditions. Under these conditions, central bank have larger room for manoeuvre for a possible monetary policy easing in order to support the economic growth.

Generalizing the observation above, increasing the anchoring of inflation expectations can greatly improve economic resilience to adverse external shocks in emerging economies. A better anchoring reduces inflationary persistence and limits the pass-through of a currency depreciation in the economy, giving monetary policy more room to focus on sustaining more stable economic growth.

The relevance of the central bank's communication increased significantly after the global financial crisis broke out, as a result of the complexity of the political objectives and the operations associated with them. Constrained by the low levels of the monetary policy interest rates, the major central banks have resorted to the implementation of some unconventional measures (Criste and Lupu, 2018). The way these decisions were communicated, the communication "intensity", as well as the content of the messages were essential to clarify the public about the bank's intentions, as to both eliminate the uncertainty and to create confidence and certain expectations. In this period, we notice, on the one hand, an increase of the central bank's communication,

revealed by the increase in the number of statements released to the public, and on the other, an increase in the interest related to the effects produced by the information communicated by the central banks.

The stage of monetary policy normalization, initiated by the Fed in 2014 and announced by the ECB, is still abandoned, given that the Fed has recently opted for a new easing monetary policy stance, which the market perceives as maintaining at least in the near future, mainly that the other global central banks (ECB, Bank of Japan) have delayed their intention to normalize their monetary policy stance. However, the normalization step remains a landmark in terms of the important role of central bank communication. The financial markets smoothly adjusted to the gradual normalization of the Fed's monetary policy, benefiting from both the clear communication of the central bank and the existence of a "security element" - the large volume of financial assets hold by the Fed.

As major central banks in developed countries will change their behaviour by moving to normalizing monetary policy stance, with rising interest rates and reducing the level of assets on the balance sheet, new challenges are emerging, considering not only the influence on their own economy, but especially on the others, either advanced or emerging economies. Therefore, it is important that the gradual approach of the normalization process be supported by adequate communication. Indicating clear trajectories of political changes helps anchor market expectations and reduce the risk of adverse reactions. On the other hand, the smooth adjustment also reflects a more general problem regarding the functioning of the monetary transmission mechanism. Although central banks have a wide range of intervention tools available, at the same time there is a high degree of uncertainty regarding the functioning of the monetary transmission mechanism. In this context, the difficulty encountered by central banks is the weakening of the link between short-term and long-term interest rates (mainly, after 2000), so that monetary policy actions need to be more strengthen in order to produces the expected effects. In addition, it is noted that long-term interest rates have become more sensitive to monetary policy surprises at higher frequencies (daily) over the same time period (Hanson et al., 2017), indicating a potential risk of sudden change (rising) of long-term interest rates, if the monetary policy tightening would be higher than expected.

# 3. Central Bank's policy instruments in supporting economic growth

Starting from the analysis of the factors that influenced the economic growth in the post-crisis period and taking into account the relations described above, we consider that the main contributions of the monetary authority in promoting economic growth, besides the anchoring of long-term inflation expectations, refer to applying macroprudential measures, by extending its role in ensuring financial stability, and also to its involvement in more complex analyses targeting financial markets, based on monitoring the financial conditions and prices of real estate assets measures that will permanently support an adequate communication policy in relation with the market and the public.

**3.1. Anchoring of the long-term inflation expectations**, the central bank's appanage, is a prerequisite for supporting economic growth, mainly for emerging economies with large trade and financial openness, reflected by the significant role of the foreign currency in the economy.

As a rule, an improvement in anchoring the inflation expectations can increase the resilience of the economy to adverse external shocks, providing the central bank more room to manoeuvre its monetary instruments as to contribute to supporting more stable economic growth.

# 3.2. Extending the central bank's role on financial stability and applying macro-prudential measures

Increasing the role of the financial factor on the dynamics of economic activity, on the one hand, and understating the one regarding inflation as an indicator that can signal the tendency of an unsustainable economic growth, on the other hand, point to the need to broaden the role of monetary authority by assuming responsibility for the financial stability policy. In this context, the macro-prudential instruments, which are designed to reduce the proclivity of financial crises occurrence or their severity, have greater or lesser influence on economic growth. They usually have the role of increasing the resilience of the financial system, thereby reducing the systemic risks arising from financial intermediation. Experience shows that economies more open or more financially developed have better results in supporting economic activity, following the systematic application of macro-prudential measures.

Macro-prudential policies could be aimed at supporting longterm economic growth through at least two channels:

1) limiting the occurrence of financial crises, which are usually followed by slow returns and long periods of low productivity. Countercyclical capital and liquidity buffers applied in "favourable" period can contribute to increasing the financial sector's ability to mitigate shocks;

2) reducing the macroeconomic and financial fluctuations due to debt accumulation, excessive development of lending activity or due to balance sheet and currency mismatches, in so far as they affect the long-term economic growth. The demand instruments (loan-to-value, debt-to-service-income), as well as loan-targeted measures, applied during expansion, help prevent excessive credit growth and leverage of the private sector.

The use of macro-prudential tools aimed at mitigating the buildup of vulnerabilities in a certain financial sector can also have positive effects on reducing the house prices synchronization, one of the main features of the current international macroeconomic environment that has an impact on economic growth.

**3.3. Involvement of the central bank in more complex analysis** regarding the financial conditions and broadening the monitoring of the real estate market developments

Given the role of financial conditions regarding both the monetary policy transmission and the informational content related to the future development of the economic activity, a valuable step for the authorities refers to estimate and monitor financial conditions. In this respect, the central bank could play an important role, being the institution able to help determine the risks to the economic growth. There are at least two arguments in this regard: first, having, as a rule, access to specialized financial data, the central bank holds inside information on financial markets, the banking system, etc. Secondly, the monetary authority has at its disposal a complex and specialized mechanism for processing information, analysing and evaluating financial and monetary indicators, which allows it to formulate value judgments regarding the evolution of financial conditions and potential risks on future economic growth. For a central bank, the major challenges concerning the financial conditions influence refer to two aspects which are the effects of globalization and financial integration:

- The financial conditions are increasingly affected by external shocks, so that the central bank must respond to a growing wider range of phenomena, complicating the matter of their responsibilities. However, the authority has its own instruments, those which give it autonomy and which it can use for the purpose of influencing/directing internal financial conditions;
- The yields on long-term bonds are increasingly set on international markets, weakening their reaction to short-term interest rates, those influenced by the central bank's monetary policy. This situation can also expose the respective economy to shocks that are not related to the economic fundamentals, and one of the important factors is the change of the investors' perception as to increase the level of confidence.

The financialization of the real estate assets and the synchronization of the housing market cycles, with house prices determination at the global level, have implications on economic growth, by increasing the exposure to external shocks. A high level of synchronization can indicate the risk of adversely affect the real economy, especially if the economy is going through a period of excessive lending (credit boom).

In addition to using macro-prudential tools, the central bank can contribute to identifying and assessing the risks arising from these developments by applying a "strategy" for monitoring the housing market, including: analysing developments, identifying influencing factors, causes and potential effects, estimating trends, developing scenarios, identifying risks, etc. A key problem, however, refers to the access to up-to-date and high-level data. Meeting these conditions helps to identify the sphere of influence of global financial conditions and of global investors on the dynamics of prices on the housing market. More detailed information on the participation of global investors in the housing markets could strengthen surveillance and control efforts.

# 3.4. Improving and intensifying the use of the central bank's communication policy

The relevance of the central bank's communication policy in relation with the public and the market increased significantly after the global financial crisis, as a result of the increased complexity of both the policy objectives and the operations associated with them. The communication, as the central bank's policy tool, continues to play a major role, including as a way for the central bank to support economic growth during the normalization of the monetary policy in developed economies. The intensification and improvement of the communication policy are all the more important considering the weakening of the link between the short-term and the long-term interest rates, as well as an increase in the sensitivity of the long-term interest rates to the monetary policy surprises.

# 4. Concluding remarks

While during and after the global financial crisis, the central bank has contributed to the economic recovery through conventional and unconventional policies and by extending their responsibilities, in the recent post-crisis period this institution is still subject to the challenges caused by the financial developments with impact on economic activity.

Based on the above observations it can be concluded that the main contributions of the central bank to support the economic growth would be:

1. anchoring long-term inflation expectations;

2. applying macro-prudential measures and extending the central bank's role in ensuring the financial stability;

3. involvement in more complex analysis targeting the financial markets, with the monitoring of the indicators regarding the financial conditions and the extension of monitoring the real estate market dynamics;

4. intensifying and improving the use of communication tool in relation with the market and the public.

The paper addresses, as a principle, the instruments available to the central bank in order to support/promote economic growth. In this way, it represents an openness to the deepening of the field based on research at regional level, but also on categories of economies, emerging and developed, which could highlight certain particularities.

#### References

- Adrian, T; Duarte, F.; Grinberg, F.; Mancini-Griffoli, T. (2019), "Monetary Policy and Financial Conditions: A Cross-Country Study", Federal Reserve Bank of New York, Staff Report No. 890, June.
- Barajas, A; Beck, T; Dabla-Norris, E.; Yousefi, S.R. (2013), "Too Cold, Too Hot, Or Just Right? Assessing Financial Sector Development Across the Globe", International Monetary Fund Working Paper 13/81, March.
- 3. Beck, T; Feyen, E (2013), "Benchmarking Financial Systems: Introducing the Financial Possibility Frontier", World Bank Policy Research Working Paper No.6615, September.
- Boar, C.; Gambacorta L; Lombardo, C.; Pereira da Silva, L. (2017), "What are the effects of macroprudential policies on macroeconomic performance?", BIS Quarterly Review, September.
- Carrière-Swallow, Y.; Gruss, B.; Magud, N.E.; Valencia, F. (2016), "Monetary Policy Credibility and Exchange Rate Pass-Through", IMF Working Paper, WP/16/240, December.
- Criste, A. (2017), "Rethinking a Global Sustainable Monetary Policy in a Post-Crisis Era", Financial Studies, Vol. 21, Issue 2(76), pp.56-69.
- Criste, A.; Lupu, I. (2018), "Ongoing Trends for Central Banks" Strategy", Acta Universitatis Danubius. Œconomica, Vol 14, No 1, pp. 33-44.
- 8. Fatás, A; I Mihov (2012), "Fiscal policy as a stabilization tool", CEPR Discussion Papers, No DP8749, January.
- 9. International Monetary Fund (2017), "Is Growth at Risk?", Global Financial Stability Report, October.
- 10. International Monetary Fund (2018a), "A Decade after the Global Financial Crisis: Are We Safer?", Global Financial Stability Report, October.
- 11. International Monetary Fund (2018b), "Challenges to Steady Growth", World Economic Outlook, October.

- 12. Hanson, S.; Lucca, D.; Wright, J.H. (2017). "Interest rate conundrums in the twenty-first century". Staff Reports 810, Federal Reserve Bank of New York, revised 01 Aug 2018.
- Kormendi, R; P Meguire (1985), "Macroeconomic determinants of growth: cross-country evidence", Journal of Monetary Economics, Vol. 16, No 2, pp. 141–63, September.
- 14. Peek, J; Rosengren, E.S; Tootell, G.M.B. (2016), "Does Fed Policy Reveal a Ternary Mandate?" Working Papers 16-11, Federal Reserve Bank of Boston, revised 01 Sep 2016.
- 15. Taylor, J.B. (2000), "Low Inflation, Pass-Through, and the Pricing Power of Firms", European Economic Review 44(7), pp. 1389-1408.
- 16. Ueberfeldt, A.; Duprey, T. (2018), "How to Manage Macroeconomic and Financial Stability Risks: A New Framework", Staff Analytical Note 2018-11, Bank of Canada, Financial Stability Department, May.

# ROMANIA'S TRADE RELATIONSHIP WITH THE EUROPEAN UNION IN THE PROSPECT OF JOINING THE EURO AREA

#### Camelia MILEA, PhD\*

#### Abstract

The choice of the research topic is due to the national challenge, that the entry of our country into the euro area will have mainly positive consequences for the Romanian economy. The article<sup>1</sup> presents the evolution of the Romanian current account deficit in relation to the European Union. It can be seen that the degree of commercial integration of our country with the European Union is at a high level, and that the commercial relationship with the European Union countries is the main cause of Romania's trade deficit. Using qualitative and quantitative assessments, interpretations and comparative analyses, the article shows that Romania is not in a situation favourable to the economic convergence with the European Union countries in terms of the current account deficit. The analysis is performed for the period 2006-2018, in order to compare the current situation (from 2018) with that in the year before our country entered the European Union.

**Keywords:** trade relationships, trade deficit, risks, unfavourable situation

JEL Classification: F14, F15, F36, F45

### 1. Introduction

For Romania, a country which depends on imports, but also concerned with development, the consolidation of the convergence is imperative in order to avoid the deterioration of the equilibria in the

<sup>\*</sup> Scientific Researcher III, "Victor Slăvescu" Centre for Financial and Monetary Research, Romanian Academy, Bucharest.

<sup>&</sup>lt;sup>1</sup> The article is based on the research project "The External Deficit and the Foreign Direct Investments in Romania. Trends and Challenges in the Perspective of Joining the Euro Area", C Milea (coord,), "Victor Slăvescu" Centre for Financial and Monetary Research, 2019.

perspective of the accession to the single currency area, the deficiencies of the euro area could not be corrected, by its architects, in a foreseeable term.

The entry into the euro area and initially in the ERM II must be correlated with the situation of the national economy, with the level of development of the production potential and with the resistance to asymmetric shocks, so that the entry into the euro area will bring to our country more advantages than disadvantages.

The adoption of the single currency can create problems in the context of the existence of imbalances in the Romanian economy. Thus, Romanian exports may suffer a shock generated by the loss of the exchange rate instrument and its support in maintaining the competitiveness of Romanian products, differentiated, however, for the trade with the European monetary area, for the trade with non-euro area member countries, and also for exchanges with countries outside the European Union. The magnitude of the shock depends on the degree of improvement of the exports' structure in the direction of the increase of the share of goods with a high processing level and high added value.

Consolidating the tendency to improve the structure of goods exports is dependent on supporting efficient activities, by attracting investments in sectors with high added value, respectively by increasing the capacity of the Romanian companies to adapt to the standards of the external markets and to cope with possible adverse developments. The large share of the multinational companies in the foreign trade of Romania imposes policies that should contribute to the improvement of the value chains.

The enhancement of Romania's trade relations with the euro area should entail increased investments and improved productivity associated with an inflow of new technologies.

The analysis will be carried out in the period 2006-2018, in order to compare the current situation (the year 2018) with that of the year previous to our country's joining the European Union.

# 2. The Evolution of the Trade Relation between Romania and the European Union

In the case of our country, the external deficit is determined by the negative balance of the current account, which has as main cause the deficit of the goods balance (the trade balance). Hereinafter, we shall analyse the evolution of the trade relation between Romania and the European Union, and its effects on the external deficit of our country.

Since 2007, the year of Romania's entry into the European Union, we can see an intensification of the trade relations between Romania and the countries of the European Union. As a result, the degree of commercial integration of Romania with the European Union is at a high level (see Table 1). Thus, the share of Romania's exports to the European Union in the total exports of our country has increased from 70.5% in 2006 to 76.7% in 2018, and the share of Romania's imports from the European Union in the total imports of our country has increased from 68.7% in 2006 to 74.7% in 2018.

Romania is experiencing a deficit in the trade relations with the European Union all over the analysed period. The deficit of our country's trade balance with the European Union has increased sharply between 2006 and 2008, then it has decreased in 2009, in the context of the economic-financial crisis, it has increased between 2010 and 2012, it has decreased in 2013, and it has resumed its increase between 2014 and 2018 (see Table 1).

Analysing the share of Romania's trade deficit with the European Union in the total trade deficit of our country, we find that the main cause of our country's trade deficit is the trade relationships with the countries of the European Union. Between 2009 and 2012, there was an increase in the importance of the trade deficit with the European Union in the total trade deficit of our country (128.7% in 2013). Starting with 2014, this indicator is on a downward slope, representing 65.4% in 2018.

The countries from the European Union with which Romania has the largest trade deficits in 2018 are: Poland (2500 mil. euro), Hungary (2400 mil. euro), Russia (2000 mil. euro), the Netherlands (1500 mil. euro), Germany (1400 mil. euro), Austria (1200 mil. euro).

#### Table 1

### Romania'a trade relation with the European Union

	Share of exports (%)	Share of imports (%)	Trade balance deficit Romania- EU (mil. Euro)	Share of trade balance deficit Romania- EU in Romania's total trade balance deficit (%)		
2006	70.5	68.7	-9767	65.6		
2007	72.0	71.3	-15318	70.4		
2008	70.8	69.7	-16037	68.2		
2009	74.6	73.2	-6849	69.4		
2010	72.6	72.6	-6918	72.8		
2011	71.3	72.8	-7736	80.1		
2012	70.4	73.6	-8540	88.6		
2013	69.6	75.8	-7408	128.7		
2014	71.1	75.4	-6809	112.4		
2015	73.7	77.2	-8341	99.8		
2016	75.1	77.1	-8871	89.0		
2017	75.8	75.8	-9797	75.6		
2018	76.7	74.7	-9894	65.4		

Source: author's calculations based on National Institute of Statistics data.

When we compare the situation of our country with regard to the current account balance with the situation in the other countries of the European Union, we observe that Romania is one of the few member states of the European Union where the current account deficit worsens from 2015 to 2018 (see Chart 1). We encounter this situation only in the case of Greece, Latvia, Poland and Hungary.

#### Chart 1

The current account balance in the European Union, the euro area and in some member states of the European Union in the period 2015-2018 (% in GDP)



Source: AMECO data

Moreover, it can be noticed that in the last year of the analysed period (2018), Romania is on the most unfavourable position among the countries of the European Union, regarding the share of the current account deficit in GDP. Thus, our country has the largest current account deficit as a share of GDP among all the countries of the European Union, in 2018 (see Chart 2). This situation raises question marks regarding the economic policies implemented in the country, the consumption model, and the stage of the structural reforms.

#### Chart 2

The current account balance in Romania, the European Union, the euro area and in some other member states of the European Union in 2018 (% in GDP)



Source: AMECO data

Although Romania's current account deficit in 2006 was large by international standards (see Chart 3), our country was on an average position compared to other new EU member states. In the following years, Romania has had the same trend as the other analysed countries, recording a decrease of the current account deficit. This evolution has continued until 2014. Since 2015, the current account deficit of our country (as a share of GDP) has increased continuously and the most from the analysed countries, reaching the value of -4.6% in GDP in 2018, under the conditions in which most of the other countries of the European Union have had current account surpluses that year. We can conclude that Romania has failed to solve the economic problems, to restructure its economy in a way that should ensure sustainable economic development.

Chart 3





Source: AMECO data

If we analyse the average of the current account deficit in GDP over the last 3 years (indicator in the scoreboard of the procedure for macroeconomic imbalances within the alert mechanism of the European Commission), we can notice that in 2018 only Germany exceeds the upper admitted threshold with the value of 7.96% of GDP, Romania being the only country approaching the lower admitted threshold of the indicator, with the value of -3.3% of GDP<sup>2</sup> (Table 2).

 $<sup>^2</sup>$  According to the procedure for macroeconomic imbalances within the alert mechanism of the European Commission (2018), it is estimated that an imbalance between - 4% and 6% of GDP is acceptable, provided that it does not become permanent.

#### Table 2

The evolution of the current account balance in Romania and in some other member states of the European Union in 2006-2018 (% in GDP)

	2006	2008	2009	2012	2013	2014	2015	2018	Average for the last 3 years
European Union	-1,25	-2,23	-0,64	0,52	0,96	0,83	0,87	1,34	1,32
Euro area	-0,17	-1,84	-0,47	0,95	2,11	2,33	2,64	3,10	3,16
Bulgaria	-17,04	-21,97	-8,30	-0,85	1,28	1,24	0,12	5,35	4,01
Czechia	-2,47	-1,87	-2,27	-1,56	-0,53	0,18	0,25	0,29	1,17
Germany	5,77	5,69	5,84	7,13	6,55	7,20	8,58	7,33	7,96
Estonia	-14,94	-8,64	2,54	-1,88	0,29	0,71	1,76	1,98	2,10
Greece	-11,49	-15,11	-12,34	-3,49	-1,43	-0,74	-0,81	-2,83	-2,15
Spain	-8,85	-8,90	-4,09	0,09	2,04	1,70	2,03	1,94	2,60
Latvia	-20,90	-12,33	7,70	-3,64	-2,75	-2,27	-0,88	-0,68	0,59
Lithuania	-10,62	-13,19	2,11	-1,57	1,69	3,47	-2,44	0,29	-0,11
Hungary	-7,28	-7,07	-0,73	1,58	3,45	1,17	2,33	-0,51	2,11
Poland	-4,00	-6,67	-3,95	-3,71	-1,26	-2,07	-0,56	-1,03	-0,49
Romania	-10,46	-11,44	-4,66	-4,80	-1,08	-0,66	-1,23	-4,60	-3,29

Source: AMECO data

From Chart 4, we can see that Romania exceeds the lower threshold (of -4% of GDP) of the indicator "current account balance, share in GDP (3-year average)" (from the scoreboard of the procedure on macroeconomic imbalances within the alert mechanism of the European Commission) in 2008-2012. Between 2013 and 2017, the indicator is within the allowed limits.
Financial Studies – 4/2019

## Chart 4

The current account balance in 2008-2017, as share in GDP, 3year average<sup>1</sup>



*Note:* <sup>1)</sup> According to the scoreboard of the procedure on macroeconomic imbalances within the alert mechanism of the European Commission. Source: European Commission data

## 3. Conclusions

Romania has an economy dependent on imports. The improvement of the current account balance, as well as the long-term economic perspectives of Romania, depend on the economy's ability to move from the production of relatively low technology goods to high technology products and services, with higher value-added. This requires an increase in the financing of research and innovation activities. In addition, in order to reduce the current account deficit, we consider that it is useful and necessary to promote the consumption of national products through a campaign that should motivate the population and lead it towards Romanian goods.

Romania's economic growth model, based on consumer spending, affects the country's ability to sustainably reach the standard of living in the European Union. The need to put the economy on a sustainable path towards convergence with the standard of living in the European Union, requires ensuring the continuity of reforms and the transition to a growth model based on investments.

From the analysis it can be seen that the degree of commercial integration of our country with the European Union is at a high level, and the commercial relationships with the countries of the European Union represent the main cause of the trade deficit of our country. There is an intensification (albeit discontinuous) of Romania's trade relations with the countries of the European Union, after our country's accession to the European Union.

The analysis shows that Romania is not in a favourable situation for the economic convergence with the European Union countries in terms of the current account deficit. This is due, on the one hand, to the fact that the current account deficit of our country (% of GDP, 3-year average) risks again to exceed the lower limit admitted in the procedure for macroeconomic imbalances within the alert mechanism of the European Commission (after exceeding the lower threshold (of -4% of GDP) in the period 2008-2012), in other words, Romania may become ineligible for the adoption of the euro. On the other hand, the evolution of the current account deficit of our country compared to that of the other members of the European Union places Romania on one of the most unfavourable positions, in the sense of having a current account deficit throughout the analysed period, a deficit that increases since 2015, unlike most European Union countries where the current account deficit shrinks, or even turns to surplus. Moreover, our country has the largest current account deficit as a share of GDP of all European Union countries, in 2018. This situation raises question marks regarding the economic policies implemented in our country, the consumption model, and the stage of the structural reforms. It seems that Romania has failed to solve the economic problems, to restructure its economy in a way that should ensure sustainable economic development.

In addition, the persistence of these trends may reduce the ability of the economy to adapt to shocks that may occur domestically or may spread from abroad and may affect the growing needs of the economy for external financing, generated by the high and increasing external deficit, through worsening lending conditions, and even reducing loans obtained and long-term investments.

## References

- 1. European Commission (2018), *Statistical Annex of Alert Mechanism Report 2019*, Brussels, 21.11.2018 SWD(2018) 466 final
- European Commission (2018), Convergence Report Economic and Financial Affairs, ISSN 2443-8014 (online), 2018, institutional paper 078 | May 2018
- European Commission (2019), Country Report from 2019 on Romania, European Semester 2019: Evaluating the progress made in structural reforms, preventing and correcting macroeconomic imbalances, as well as the results of the thorough balances carried out under the Regulation (EU) no. 1176/2011, Bruxelles, 27.2.2019 SWD(2019) 1022 final
- 4. National Bank of Romania (2008-2019), *Monthly Bulletin:* December 2007, December 2008, December 2010, January 2012, July 2012, January 2013, January 2014, June 2014, January 2016, December 2016, December 2017, January 2018, May 2019, August 2019, Bucharest
- 5. National Bank of Romania (2018), Annual Report 2017 Balance of Payments and International Investment Position of Romania, Bucharest
- National Institute of Statistics (2019), Statistical Bulletin of International Trade no.12/2018, ISSN 1843-049X, ISSN-L 1843-049X
- 7. \*\*\* https://ec.europa.eu/economy\_finance/ameco

## **Financial Studies**

"Victor Slăvescu" Centre for Financial and Monetary Research Casa Academiei 13, Calea 13 Septembrie, Building B, 5<sup>th</sup> floor Bucharest, 050711, Romania Phone: +40 21.318.24.19 Fax: +40 21.318.24.19 E-mail: <u>s.vraciu@icfm.ro</u>