JOURNAL OF APPLIED ECONOMICS AND BUSINESS





Education and Novel Technology Research Association

Journal of Applied Economics and Business

VOL. 2, ISSUE 2 - MARCH, 2014

The Journal of Applied Economics and Business (JAEB) is an international peer-reviewed, open-access academic journal that publishes original research articles. It provides a forum for knowledge dissemination on broad spectrum of issues related to applied economics and business. The journal pays particular attention on contributions of high-quality and empirically oriented manuscripts supported by various quantitative and qualitative research methodologies. Among theoretical and applicative contributions, it favors those relevant to a broad international audience. Purely descriptive manuscripts which do not contribute to journal's aims and objectives are not considered suitable.

JAEB provides a space for academics, researchers and professionals to share latest ideas. It fosters exchange of attitudes and approaches towards range of important economic and business topics. Articles published in the journal are clearly relevant to applied economics and business theory and practice and identify both a compelling practical issue and a strong theoretical framework for addressing it.

The journal provides immediate open-access to its content on the principle that makes research freely available to public thus supporting global exchange of knowledge.

JAEB is abstracted and indexed in: DOAJ, EZB, ZDB, Open J-Gate, Google Scholar, JournalITOCs and New Jour.

Publisher

Education and Novel Technology Research Association

EDNOTERA - Skopje, Macedonia

Web: www.aebjournal.org

E-mail: editorial@aebjournal.org

support@aebjournal.org

publisher@aebjournal.org

Editor-in-Chief

• Marianna Sigala, Department of Business Administration, University of the Aegean, *Greece*

Editorial board

- Alexandr M. Karminsky, Faculty of Economics, Higher School of Economics, Russia
- Anand Bethapudi, National Institute of Tourism and Hospitality Management, India
- **Bruno S. Sergi,** Department of Economics, Statistics and Geopolitical Analysis of Territories, University of Mesina, *Italy*
- **Dimitar Eftimoski**, Department of Economics, Faculty of Administration and Information Systems Management, St. Kliment Ohridski University, *Macedonia*
- **Evangelos Christou**, Department of Tourism Management, Alexander Technological Institute of Thessaloniki, *Greece*
- Irena Ateljevic, Cultural Geography Landscape Center, Wageningen University, *Netherlands*
- Irena Nančovska Šerbec, Department of mathematics and computing, Faculty of education, University of Ljubljana, *Slovenia*
- Iskra Christova-Balkanska, Economic Research Institute, Bulgarian Academy of Sciences, *Bulgaria*
- Karsten Staehr, Tallin School of Economics and Business Administration, Tallin University of Technology, *Estonia*
- Ksenija Vodeb, Department of Sustainable Tourism Destination, Faculty of Tourism Studies TURISTICA, University of Primorska, *Slovenia*
- Kaye Chon, School of Hotel and Tourism Management, the Hong Kong Polytechnic University, *China*
- Marianna Sigala, Department of Business Administration, University of the Aegean, *Greece*
- **Noga Collins-Kreiner**, Department of Geography and Environmental Studies, Center for Tourism, Pilgrimage & Recreation Research, University of Haifa, *Israel*
- Pèter Kovács, Faculty of Economics and Business Administration, University of Szeged, *Hungary*
- Ramona Rupeika-Apoga, Faculty of Economics and Management, University of Latvia, *Latvia*
- Renata Tomljenović, Institute for Tourism, Zagreb, Croatia
- Valentin Munteanu, Faculty of Economics and Business administration, West University of Timisoara, *Romania*

Content

Mario Situm	
The Age and Size of the Firm as Relevant Predictors for Bankruptcy	5-30
Nadica Iloska	
An Analysis of Bank Profitability in Macedonia	31-50
Mosab I. Tabash, Raj S. Dhankar	
Islamic Banking and Economic Growth:	
An Empirical Evidence from Qatar	51-67
Jasmina Popovska	
Modeling Financial Stability: the case of the Banking Sector in Macedonia	68-91
Alban Burazeri, Orfea Dhuci, Andromahi Kufo	
Credit Scoring Process Avoiding the Excessive Risk	92-104
Petra Platz, Zoltán Veres	
Understanding Consumer Preference Biases	105-119





THE AGE AND SIZE OF THE FIRM AS RELEVANT PREDICTORS FOR BANKRUPTCY

Mario Situm

Department for Corporate Restructuring & Reorganization, Fachhochschule Kufstein Tirol Bildungs GmbH, Research Fellow, Austria

mario.situm@fh-kufstein.ac.at

Abstract

This study analyses the potential of the age and the size of the firm for the purpose of bankruptcy prediction. Using a data base consisting of Austrian bankrupt and non-bankrupt companies for the period between 2000 and 2011 differences and similarities for these variables are analysed and some conclusions for the suitability as predictors for bankruptcies are reported.

Keywords

Business Failure Prediction; Age of the Firm; Size of the Firm; Crisis Indicators; Discriminant Analysis

INTRODUCTION

The prediction of business failures and bankruptcies has a long history in research so it was possible to determine numerous variables, which are suitable as early warning indicators within prediction models. Despite the accounting ratios and market-based variables certain non-financial variables showed a great ability for prediction. Within many studies it was shown that a combination of accounting variables with marketbased variables and non-financial indicators can improve performance of prediction models, so that the inclusion of non-financial ratios is recommended for further developments (Abdiali & Harris, 1995; Barniv et al, 2002; Gudmundsson, 2002; McKee & Lensberg, 2002; Grunert et al, 2005; Muller et al, 2009; Altman et al, 2010; Madrid-Guijarro et al, 2011; Iazzolino et al, 2013; Pervan & Kuvek, 2013).

Two special "non-accounting" ratios are the age and the size of the company, which were also analysed within different studies, whereas mixed results concerning the ability as predictors were found. As it will be shown the age can be proxied by a ratio derived from accounting figures (retained earnings/total assets). Nevertheless, the results show that its ability as proxy for the age of the firm is limited. The size of the firm can be replicated with different ratios, which are much more suitable as proxies for this task. The aim of this paper is to analyse the suitability of the age of the firm and the size of the firm for prediction purposes grounded on a data base of Austrian bankrupt and non-bankrupt companies for the period between 2000 and 2011. First, the theoretical framework is reported, which determines the ability of these factors as early warning indicators. In addition some results from prior research are presented and discussed. Second, the data base and the methodology used for the empirical part of this work are explained. The ratios for the statistical analyses are based on previous research, where these two factors have already been analysed. Within this section also the research hypotheses and research questions are posted. Third, the preliminary statistical analyses are presented, which are used to determine, whether there are differences for the chosen ratios between the two groups of companies. In order to derive the potential prediction variables a principal component analysis was applied. The remaining statistically significant ratios are then used to derive prediction models based on discriminant analysis, which are able to divide between bankrupt and non-bankrupt companies based on a computed linear combination of predictors. Finally, the results are summarized and critically reflected, compared to the existing empirical evidence, critically reflected and some recommendations for further research are given as well.

THEORY AND EMPIRICAL EVIDENCE FOR THE AGE AND THE SIZE OF THE FIRM

The Age of the Firm

The general assumption is that the higher the age of the firm is, the probability of bankruptcy decreases. The reason behind this theory is that young firms have knowledge about the average profitability, but they do not know their own potential. After they have learned about their potential profitability they can expand, contract or exit, based on the position of the distribution of profitability. This will depend on the ability of the firm to use inventions and innovations at the right time. The winners of this competition survive and remain on the market. These firms are increasing their productivity. They are also able to develop technological advantages, which are forcing losers to exit the market. Firms having passed this situation are showing a low probability of bankruptcy (Jovanovic, 1982: 650; Jovanovic & MacDonald, 1984; Bates, 1990).

These findings result in the bell-shaped curve shown in Figure 1 (Jovanovic, 1982: 650; Jovanovic & MacDonald, 1994: 324; Thornhill & Amit, 2003: 499-500; Dyrberg, 2004: 9-10; Ucbasaran et al, 2010: 542-543). Another factor increasing the path of the curve is that young companies and start-ups are overconfident about their decisions.





This overconfidence encourages entrepreneurs to exploit certain opportunities, which are not always good investments at all. Additionally they make decisions under situation of undercapitalization, so that false investment choices are mostly related to business failure (Ucbasaran et al,2010: 542 and 554). Empirical evidence shows that the probability of failure for young firms is higher than for older firms (Bates 1990: 555; Chava & Jarrow, 2004: 545; Cressy, 2006: 113)

Within the study of Altman (1968) the age of the firm was a relevant indicator within his Z-score model to distinguish between failed and non-failed firms. His second ratio "retained earnings/total assets" implicitly contains the age of the firm. Young firms will have a probably low ratio due to lack of time to build up cumulative profits. A low value implies a higher chance for the related firm to be classified as bankrupt. The probability of bankruptcy is higher for firms in earlier years, which is well described by the mentioned ratio and it also follows the above shown path of the curve within Figure 1 (Altman, 1968: 595).



FIG 1. EFFECT OF FIRM AGE ON THE PROBABILITY OF EXIT (Dyrberg, 2004: 11)

The ratio also appeared as potential predictor within other studies. RETA (Retained Earnings to Total Assets) was able to replicate the effect visualized within Figure 1 and bankrupt firms, therefore exhibited significantly lower retained earning relative to their total assets than non-bankrupt firms (Frydman et al, 1985; Gilbert et al, 1990; Charitou et al, 2004; Chi & Tang, 2006; McKee, 2007; Altman et al, 2010; Hauser & Booth, 2011). Nevertheless it seems that this empirical evidence is not valid for all branches. Within the study of Thornhill & Amit (2003) it was found that retail and wholesale branches failures typically occur more for older firms. In food, accommodation and beverage sector generally younger firms fail (Thornhill & Amit, 2003: 504). The age of the firm was in some studies also not able to be distinguished significantly between different states of financial distress, so that its ability as

predictor seems questionable (Poston et al, 1994; Chancharat et al, 2010: 36). Therefore different viewpoints collide: theory postulates a difference between old and young firms concerning their probability of exit, some empirical results confirmed this and other results found no predictive power for the age of the firm.

The Size of the Firm

The size of a firm is an interesting measure, as it appeared in several studies of business failure prediction as statistically significant variable. Within the work of Ohlson (1980) the size of the firm was one important predictor of bankruptcy, which was significant in several periods before the event of bankruptcy. The same conclusion was for e.g. found within the studies of Theodossiou et al, (1996), McKee (2007) or Fitzpatrick & Ogden (2011), whereas the definitions for the size of the firm differed across these studies.

It is assumed that the size of the company and the age of the company are highly correlated with each other. The growth of the firm seems to be proportional to the size of the company (Jovanovic, 1982: 649; Thornhill & Amit, 2003: 504). Figure 2 presents two curves for the relation of the size of the company to the probability of business failure based on two different hypotheses. Hypothesis A shows a U-shaped curve indicating that there exists an optimal size of the firm, where the probability of financial distress is the lowest. Firms with greater size than this "optimal size" are more endangered as they are assumed to have an inflexible organisation structure. They have difficulties in monitoring managers and employess as well as they have a not perfectly functioning communication structure (Dyrberg 2004: 12).

Hypothesis B generally assumes that financial distress is decreasing with increased size of the firm. The reason behind this is primarly the fact that bigger and long established firms are having the ability to adapt to new innovations, respectively they are able to create new innovations themselves. Based on the leading innovations these firms are having advantages in opposite to their competitors, which are inherent in market success (Jovanovic & MacDonald, 1994: 322-328; Pervan & Visic, 2012: 221). Companies with innovations can differentiate in opposite to their competitors and can reduce rivalry among the industry. This reduction in rivalry is reducing the risk of financial distress (Madrid-Guijarro et al, 2011: 177).

Empirical evidence showed that an increased size of the firm is associated with a lower probability of bankruptcy (Lennox, 1999a: 355; Theodossiou et al, 1996: 711; Chava & Jarrow, 2004: 552-553). Large firms are in most cases not born at foundation. Normally it takes a lot of time, until a company has growning into a large firm. This also means that such companies have passed the critical time of early years, when many businesses fail. The constituted firm's size can therefore be seen as a measure of its past performance and also as an indicator of its future performance and its risks (Ben-Zion & Shalit, 1975: 1018). Firms growing in size are also showing





increased profitability. This aspect can be associated with higher overall efficiency and performance (Pervan & Visic, 2012: 213 and 221). Such results primarly support the validity of hypothesis B.

Even in case of reorganization large firms showed better chances of survival. Due to their large and varied assets, large firms can better survive substantial losses and decreases in size compared to small firms. Large firms tend to have sufficient assets, which can be sold to provide cash for operating activities. Therefore small firms are having a higher probability of failure (Moulton & Thomas, 1993: 130; Dawley et al, 2003: 420). The arguments for the lower probability of failure for firms with increased size can be summarized as follows (Castanias, 1983: 1628-1629; Theodossiou et al, 1996: 704):

- Less business risk per dollar of assets invested;
- Less business risk per dollar of expected earnings;
- Easier access to borrowing markets;
- More tax offsets per dollar assets;
- Different marginal tax rates; and
- Lower costs of default per dollar of assets, per dollar of debt and per dollar of expected earnings.





DATA BASE AND METHODOLOGY

Data Base

The data base consists of Austrian companies from different industries, where they are distincted into non-bankrupt and bankrupt. The time period of observation

ranged from 2000 till 2011 and the analysis concentrated on the period of one year prior to bankruptcy. The number of companies within each group differed throughout the obsvervation period. The distribution is shown in Table 1.

Year	Solvent firms	Bankrupt firms
2000	1,209	15
2001	1,723	15
2002	2,442	18
2003	3,276	18
2004	4,337	27
2005	5,512	28
2006	6,102	21
2007	6,713	36
2008	7,011	49
2009	7,164	49
2010	7,247	30
2011	6,809	54
Total	59,545	360

TABLE 1. DISTRIBUTION OF BANKRUPT AND SOLVENT FIRMS, 2000-2011

Following events were assumed as bankruptcy:

- The firm declared bankruptcy under Autrian bankruptcy law;
- The firms openend a compensation under Austrian bankruptcy law;
- The firm was declared bankrupt after unsussessfull compensation;
- The firm opened a reorganization procedure;
- The firm faced a rejection of a creditor's petition for insolvency proceedings or bankruptcy due to insufficient assets; and
- The firm faced a rejection of a debtor's application for opening insolvency proceedings or a rejection of a petition for bankruptcy of the debtor due to insufficient assets.

Ratios Measuring the Age and the Size of the Firm

There are different possibilities to measure firm age and firm size. Following equations provide a selected overview about already used approaches for this task.

FirmSize = Ln (Total Assets)	(1)
FirmSize = Ln (Sales)	(2)
$FirmSize = Ln (Sales)^2$	(3)
$FirmAge = RETA = \frac{Retained Earnings}{TotalAssets}$	(4)
Firm Age = Age of the Firm in Years	(5)





The shown equations were found in following studies:

- Equation 1: Chi & Tang (2006) and Pervan & Visic (2012);
- Equation 2: Chancharat et al (2010);
- Equation 3: Chancharat et al, (2010);
- Equation 4: Altman (1968), Frydman et al, (1985), Gilbert et al, (1990), Charitou et al, (2004); and
- Equation 5: Chi & Tang (2006) and Chancharat et al, (2010).

The number of employees was used in the study of Lennox (1999a and 1999b) as potential proxy for the size of the firm. Within this work the natural logarithm of this ratio is used to replicate the size of the firm. The problem of absolute ratios is that they can range extremely and therefore some statistical problems can arise. In order to avoid this, the transformation for the number of employees is applied. It is also consistent with the transformations for total assets and sales, so that a better comparison to these variables can be made.

$$FirmSize = ln(Number of Employees)$$
(6)

Methodology, Hypotheses and Research Questions

In order to test the effect of firm size and age on bankrupty, tests for differences in means and in variances were applied. As an 11-year history is observed, these tests were made for each year and for the whole observation period. To assess the dependence of the different variables to each other, correlation analysis and principal component analysis were conducted. At last discriminant analysis is applied in order to develop models for the prediction of bankruptcy.

Based on the theoretical framework following research hypotheses are posted:

- H1: The age of the firm is statistically different between bankrupt and nonbankrupt companies for the the whole observation period.
- H2: The age of the firm is statistically different between bankrupt and nonbankrupt companies for the different years of observation period.
- H3: The size of the firm is statistically different between bankrupt and nonbankrupt companies for the the whole observation period.
- H4: The size of the firm is statistically different between bankrupt and nonbankrupt companies for the different years of observation period.

Besides that it is of interest, which of the used ratios and measures presented within this work are more suitable to determine differences between bankrupt and nonbankrupt firms. It is also to answer, whether the age and the size of the firm are relevant explanatory variables for the different years of the observation period.

RESULTS

Preliminary Statistical Analyses

The preliminary analyses concentrate on test for normality of data, tests for differences in means and in variances. These tests were applied twofold. First, the whole observation period was analyzed. Second, each year of the observation period was analyzed separately. This differentiation is necessary as several studies showed that explanatory variables are not stationary over time. This means that there are certain external factors, which are affecting their stability. A certain ratio can be an effective predictor in one year, but can loose its predictability in another time period.

		A	age	ln(Tota	l Assets)	ln(Sales)		ln(Sales) ²		ln(Empl.)		RE/TA	
Year	Group	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median
2000	non-bankrupt	34.186	22.000	16.210	16.118	16.198	16.132	265.276	260.242	4.248	4.382	0.027	0.004
2000	bankrupt	19.933	9.000	15.015	15.065	14.992	15.390	226.814	236.857	3.912	4.317	0.015	0.014
2001	non-bankrupt	33.250	21.000	16.068	16.019	16.028	16.013	260.401	256.412	4.076	4.248	0.026	0.010
2001	bankrupt	15.133	5.000	13.975	14.651	14.446	14.672	213.680	215.262	3.080	3.401	0.021	0.015
2002	non-bankrupt	31.776	19.000	15.925	15.945	15.949	15.924	257.453	253.562	3.963	4.094	0.022	0.007
2002	bankrupt	27.556	20.000	14.596	15.352	14.988	15.331	228.334	235.027	3.593	3.902	0.017	0.010
2003	non-bankrupt	32.373	19.000	15.864	15.891	15.879	15.829	255.278	250.569	3.881	4.052	0.016	0.004
2003	bankrupt	27.556	8.000	13.996	14.814	14.836	15.325	222.785	234.855	3.100	3.478	0.031	0.001
2004	non-bankrupt	32.571	19.000	15.926	15.953	15.987	15.905	258.606	252.954	3.932	4.094	0.013	0.000
2004	bankrupt	20.000	11.000	14.135	14.662	14.211	14.200	204.525	201.648	2.911	2.708	0.001	0.000
2005	non-bankrupt	33.064	20.000	15.958	15.981	16.011	15.946	259.405	254.275	3.929	4.094	0.010	0.000
2005	bankrupt	23.536	14.500	14.245	14.308	14.549	14.867	214.965	221.040	3.047	3.198	0.006	0.000
2006	non-bankrupt	33.296	21.000	15.977	16.004	16.037	15.968	260.355	254.963	3.910	4.094	0.009	0.000
2000	bankrupt	31.429	13.000	14.023	14.006	14.505	14.322	212.381	205.121	2.925	3.045	0.003	0.000
2007	non-bankrupt	32.998	21.000	16.000	16.043	16.045	15.982	260.596	255.439	3.865	4.060	0.009	0.000
2007	bankrupt	23.917	13.000	14.068	14.464	14.316	14.861	208.577	220.840	3.135	3.314	0.009	0.000
2008	non-bankrupt	33.427	21.000	16.065	16.104	16.119	16.076	262.941	258.442	3.887	4.094	0.008	0.000
2000	bankrupt	31.102	18.000	14.909	15.077	15.222	15.294	234.963	233.912	3.585	4.078	0.013	0.000
2009	non-bankrupt	34.271	22.000	16.050	16.131	16.041	16.027	260.490	256.868	3.884	4.094	0.009	0.000
2007	bankrupt	18.551	10.000	14.408	15.290	15.041	15.175	229.621	230.277	3.115	3.178	0.002	0.000
2010	non-bankrupt	34.958	23.000	16.163	16.209	16.150	16.120	263.995	259.856	3.962	4.159	0.011	0.000
2010	bankrupt	30.867	19.000	14.433	14.824	15.054	15.244	228.951	232.373	3.352	3.293	0.002	0.000
2011	non-bankrupt	35.909	24.000	16.279	16.292	16.283	16.217	268.200	263.002	4.053	4.248	0.010	0.000
2011	bankrupt	25.500	15.000	14.856	15.295	15.359	15.494	242.041	240.071	3.308	3.541	0.003	0.000
2000	non-bankrupt	33.726	21.000	16.049	16.080	16.075	16.025	261.531	256.815	3.937	4.094	0.011	0.000
- 2011	bankrupt	24.928	13.000	14.452	14.836	14.870	15.049	224.836	226.474	3.253	3.418	0.008	0.000

TABLE 2. RESULTS FOR MEANS AND MEDIANS

Several studies found this problem for different variables and also confirmed that the prediction power of these changed over time (Mensah, 1984; Doukas, 1986; Gombola et al, 1987; Begley et al, 1996; Sung et al, 1999; Grice & Dugan, 2001; Nam & Jinn, 2000; Berg, 2007; Hol, 2007; Nam at al, 2008; Sarlija & Jeger, 2011).





The means and medians for the different variables and groups are displayed in Table 2. As it can be seen, several means are differing substantially from the medians, so that departures from normality could be expected. This expectation is confirmed by the analysis for normality of data discussed below and presented in Table 4.

The data of means for the age of the firm are plotted for both groups for the obsveration period. This graph is shown in Figure 3. From these findings it can be seen that there are only certain years, where the age of the firm between nonbankrupt and bankrupt companies was markably different. In the years 2002, 2003, 2006, 2008 and 2010 the differences in means for the two groups were relatively low compared to the other years. Such a tendency implies that the age of the firm can not be a potential predictor of bankruptcy. It is also not fully consistent with the descritions of the theoretical framework concerning the age of the firm. Generally, all means of the bankrupt firms are lower than those of the non-bankrupt firms. Therefore the overall statement that bankrupt firms are in mean younger than nonbankrupt companies is true. This conclusion is not valid, when medians are observed. In the year 2002 the median age of bankrupt companies was higher than of non-bankrupt companies. From these analyses it could be concluded that the age of the firm is not a reliable predictor for bankruptcies in all years, respectively it is not the case that the means and median age of companies are differing substantially. This aspect is analysed further, when observing the differences in means and variances.

Year	Mean Age of Bankrupt Firms	Mean Age of Solvent Firms
2000	19.93	34.19
2001	15.13	33.25
2002	27.56	31.78
2003	27.56	32.37
2004	20.00	32.57
2005	23.54	33.06
2006	31.43	33.30
2007	23.92	33.00
2008	31.10	33.43
2009	18.55	34.27
2010	30.87	34.96
2011	25.50	35.91



FIG 3 MEAN AG	F FOR BAN	KRUPT AND	NON-BANK	RUPT FIRMS
FIG. 5 WILAN AC	JE FOR DAIN	KKUI I AND	INOIN-DAINK	KUT I FIKINIS

		Age	ln(Total Assets)	ln(Sales)	ln(Sales) ²	ln(Empl.)	RE/TA
Year	Group	Sign.	Sign.	Sign.	Sign.	Sign.	Sign.
2000	non-bankrupt	0.000	0.000	0.000	0.000	0.000	0.000
2000	bankrupt	0.000	0.200	0.005	0.009	0.000	0.001
2001	non-bankrupt	0.000	0.000	0.000	0.000	0.000	0.000
2001	bankrupt	0.001	0.200	0.200	0.200	0.200	0.118
2002	non-bankrupt	0.000	0.000	0.000	0.000	0.000	0.000
2002	bankrupt	0.026	0.110	0.200	0.200	0.200	0.019
2003	non-bankrupt	0.000	0.000	0.000	0.000	0.000	0.000
2003	bankrupt	0.000	0.033	0.148	0.141	0.200	0.000
2004	non-bankrupt	0.000	0.000	0.000	0.000	0.000	0.000
2004	bankrupt	0.000	0.144	0.200	0.200	0.200	0.000
2005	non-bankrupt	0.000	0.000	0.000	0.000	0.000	0.000
2005	bankrupt	0.000	0.200	0.200	0.200	0.200	0.000
2006	non-bankrupt	0.000	0.000	0.000	0.000	0.000	0.000
2006	bankrupt	0.000	0.200	0.200	0.200	0.194	0.000
2007	non-bankrupt	0.000	0.000	0.000	0.000	0.000	0.000
2007	bankrupt	0.000	0.200	0.027	0.093	0.200	0.000
2008	non-bankrupt	0.000	0.000	0.000	0.000	0.000	0.000
2000	bankrupt	0.000	0.019	0.030	0.200	0.004	0.000
2009	non-bankrupt	0.000	0.000	0.000	0.000	0.000	0.000
2007	bankrupt	0.000	0.003	0.200	0.200	0.200	0.000
2010	non-bankrupt	0.000	0.000	0.000	0.000	0.000	0.000
2010	bankrupt	0.007	0.166	0.200	0.200	0.200	0.000
0011	non-bankrupt	0.000	0.000	0.000	0.000	0.000	0.000
2011	bankrupt	0.000	0.015	0.200	0.200	0.200	0.000
2000	non-bankrupt	0.000	0.000	0.000	0.000	0.000	0.000
- 2011	bankrupt	0.000	0.000	0.001	0.067	0.000	0.000

TABLE 4. TESTS FOR NORMALITY OF DATA

*) values in bold denote variables, which are normally distributed with significance of 5%





The test for normality of data was applied based on Kolmogorov-Smirnov at the 5% level. The results for each year and for the whole observation period are shown in Table 4, where the p-values of the statistic are reported. Mixed results can be found here, but generally it must be concluded that the assumption of normality is hardly given as the majority of the p-values were lower than 0.05. It is interesting to note that for the group of non-bankrupt companies normality for the different variables never applied, whereas for the bankrupt group for certain variables and for certain years normality was given. It is conspicuous that the age of the firm never had a normal distribution for the different years and also for the whole observation period. A similar conclusion can be made for RETA, where this ratio was only normally distributed in 2001 for the bankrupt group.

		Age	ln(Total Assets)	ln(Sales)	ln(Sales) ²	ln(Empl.)	RE/TA
Year	Group	Sign.	Sign.	Sign.	Sign.	Sign.	Sign.
2000	Mean	0.096	0.008	0.007	0.003	0.333	0.084
2000	Variance	0.158	0.004	0.006	0.007	0.370	0.288
2001	Mean	0.002	0.002	0.019	0.017	0.041	0.419
2001	Variance	0.071	0.000	0.001	0.001	0.012	0.683
2002	Mean	0.543	0.009	0.056	0.050	0.370	0.467
2002	Variance	0.633	0.001	0.021	0.027	0.311	0.884
2002	Mean	0.581	0.001	0.018	0.013	0.036	0.597
2003	Variance	0.609	0.000	0.013	0.012	0.032	0.195
2004	Mean	0.016	0.000	0.000	0.000	0.001	0.000
2004	Variance	0.096	0.000	0.000	0.000	0.001	0.309
2005	Mean	0.160	0.000	0.000	0.000	0.007	0.193
2005	Variance	0.191	0.000	0.000	0.000	0.003	0.523
2007	Mean	0.854	0.000	0.000	0.000	0.004	0.034
2006	Variance	0.822	0.000	0.000	0.000	0.004	0.351
2007	Mean	0.057	0.000	0.000	0.000	0.003	0.884
2007	Variance	0.146	0.000	0.000	0.000	0.006	0.905
2008	Mean	0.623	0.000	0.001	0.001	0.122	0.581
2008	Variance	0.668	0.000	0.000	0.001	0.183	0.301
2009	Mean	0.000	0.001	0.000	0.000	0.001	0.000
2009	Variance	0.005	0.000	0.000	0.000	0.001	0.107
2010	Mean	0.479	0.000	0.001	0.000	0.021	0.000
2010	Variance	0.566	0.000	0.001	0.001	0.035	0.137
0011	Mean	0.010	0.000	0.009	0.010	0.001	0.000
2011	Variance	0.053	0.000	0.000	0.001	0.001	0.145
2000 -	Mean	0.000	0.000	0.000	0.000	0.000	0.087
2011	Variance	0.000	0.000	0.000	0.000	0.000	0.153

	TECTC EOD	DIFFERENCE			VADIANCES
ADLE 5.	IE313 FOR	DIFFERENCE	S IN MEAP	NJ AND	VANIANCES

*) values in bold denote variables, where the differences in means and variances are statistically significant at the 5% level

The next section provides the results for differences in means (Welch-test) and in variances (ANOVA). The respective significances are shown in Table 5. The results show that the differences in means and variances for the age of the firm, but also for the indirect measure of it (RETA) only showed in some years significant differences in means and variances on the 5% level. This is not suprising based on the previous analysis of means and medians, and confirms the above given statement that the age of the firm and RETA are not suitable indicators to divide between bankrupt and non-bankrupt companies.

The best ability to discriminate in all years showed the ratio ln(total assets). A similar results is given for ln(sales) and ln(sales)² except for the year 2002, where the differences in means of the groups were not statistically significant at the 5% level. Although, the levels of significance were almost close to the threshold of 0.05, so that the acceptance of the null hypothesis is relatively close to rejection. The ratio related to the number of employees showed mixed results, but for some years it is a relevant predictor between bankrupt and non-bankrupt companies.

These results confirm the already provided findings that the age of the firm and RETA are not relevant variables for the purpose of bankruptcy prediction and could therefore be excluded from further analyses. These results are somehow in contrast to the findings of previous research and do therefore also not confirm the theoretical framework concerning the age of the firm.

Firms with a higher age have passed the start-up phase and established a standing, a reputation and a certain market power. Normally such firms are also assumed to have a certain size, which must in practice not always be the case. There are numerous examples of small companies with a high age and a small size. Nevertheless, the age and the size of the company seem to be correlated with each other based on the theoretical framework. Therefore it is necessary to have a look at correlations of the variables for the different years in order to answer, whether this expected relation from literature is true. It is also to detect multicollinearity between data, which can be a problem for model building (Mensah, 1984; Lau, 1987; Houghton & Woodliff, 1987; Platt et al, 1994; Doumpos & Zopounidis, 1998; Liou & Smith; 2007; McKee, 2007; Gepp & Kumar, 2008; Nam et al, 2008; Vuran, 2009). Here a correlation analysis based on Pearson was applied.

The correlations of age to the ratios of size where all statistically significant at the 1% level, but the degree of correlations remained relatively low. The same appears for the correlation to the ratio RETA. Based on these results it can not be confirmed that the age and the size of the firm are highly correlated with each other like presented in the theoretical framework of this study. The same conclusion can be made for RETA as this ratio is also not showing high correlations to the variables for the size of the company. It is also interesting that there is no high correlation between the age





of the firm and RETA, although both should measure the same thing. Like demonstrated via PCA these both ratios are highly loaded on the same factor. It seems that RETA can be used as proxy for the age of the firm, but the extent to which it can replicate the age of the firm is somehow limited based on the low but statistically significant correlation coefficients.

		Age	ln(Total Assets)	ln(Sales)	ln(Sales) ²	ln(Empl.)	RE/TA
	Year	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.
	2000	1.000	0.182**	0.131**	0.135**	0.229**	0.128**
	2001	1.000	0.213**	0.169**	0.173**	0.254**	0.131**
	2002	1.000	0.231**	0.185**	0.181**	0.265**	0.098**
	2003	1.000	0.216**	0.162**	0.160**	0.215**	0.123**
	2004	1.000	0.224**	0.170**	0.167**	0.225**	0.114**
4 70	2005	1.000	0.235**	0.181**	0.178**	0.243**	0.171**
Age	2006	1.000	0.234**	0.179**	0.175**	0.236**	0.173**
	2007	1.000	0.236**	0.181**	0.177**	0.243**	0.143**
	2008	1.000	0.239**	0.188**	0.185**	0.248**	0.148**
	2009	1.000	0.238**	0.194**	0.191**	0.254**	0.156**
	2010	1.000	0.235**	0.188**	0.186**	0.236**	0.153**
	2011	1.000	0.230**	0.186**	0.183**	0.244**	0.115**
	2000	0.182**	1.000	0.768**	0.776**	0.616**	0.099**
	2001	0.213**	1.000	0.748**	0.783**	0.618**	0.063**
	2002	0.231**	1.000	0.768**	0.772**	0.646**	-0.031
	2003	0.216**	1.000	0.770**	0.782**	0.627**	0.020
	2004	0.224**	1.000	0.783**	0.786**	0.618**	0.023
la (Tabal Assata)	2005	0.235**	1.000	0.790**	0.791**	0.633**	0.099**
In(Total Assets)	2006	0.234**	1.000	0.793**	0.792**	0.623**	0.108**
	2007	0.236**	1.000	0.783**	0.785**	0.610**	0.096**
	2008	0.239**	1.000	0.768**	0.769**	0.597**	0.105**
	2009	0.238**	1.000	0.770**	0.769**	0.613**	0.110**
	2010	0.235**	1.000	0.744**	0.753**	0.584**	0.104**
	2011	0.230**	1.000	0.758**	0.759**	0.587**	0.036**
	2000	0.131**	0.768**	1.000	0.996**	0.676**	0.055
	2001	0.169**	0.748**	1.000	0.975**	0.645**	0.015
	2002	0.185**	0.768**	1.000	0.995**	0.700**	0.032
	2003	0.162**	0.770**	1.000	0.990**	0.728**	0.040*
	2004	0.170**	0.783**	1.000	0.995**	0.707**	-0.025
$\ln(c_{c_{1}})$	2005	0.181**	0.790**	1.000	0.995**	0.719**	0.028*
m(sales)	2006	0.179**	0.793**	1.000	0.995**	0.718**	0.032*
	2007	0.181**	0.783**	1.000	0.994**	0.709**	0.012
	2008	0.188**	0.768**	1.000	0.995**	0.698**	0.020
	2009	0.194**	0.770**	1.000	0.995**	0.728**	0.039**
	2010	0.188**	0.744**	1.000	0.994**	0.696**	0.036**
	2011	0.186**	0.758**	1.000	0.995**	0.701**	-0.010

TABLE 6. RESULTS OF CORRELATION ANALYSIS

		Age	ln(Total Assets)	ln(Sales)	ln(Sales) ²	ln(Empl.)	RE/TA
	Year	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.
	2000	0.135**	0.776**	0.996**	1.000	0.675**	0.052
	2001	0.173**	0.783**	0.975**	1.000	0.684**	0.008
	2002	0.181**	0.772**	0.995**	1.000	0.698**	0.032
	2003	0.160**	0.782**	0.990**	1.000	0.735**	0.039*
	2004	0.167**	0.786**	0.995**	1.000	0.707**	-0.021
ln(Sales) ²	2005	0.178**	0.791**	0.995**	1.000	0.715**	0.025
in(Sales)	2006	0.175**	0.792**	0.995**	1.000	0.712**	0.029*
	2007	0.177**	0.785**	0.994**	1.000	0.703**	0.008
	2008	0.185**	0.769**	0.995**	1.000	0.693**	0.016
	2009	0.191**	0.769**	0.995**	1.000	0.722**	0.035**
	2010	0.186**	0.753**	0.994**	1.000	0.693**	0.032**
	2011	0.183**	0.759**	0.995**	1.000	0.693**	-0.007
	2000	0.229**	0.616**	0.676**	0.675**	1.000	0.123**
	2001	0.254**	0.618**	0.645**	0.684**	1.000	0.071**
	2002	0.265**	0.646**	0.700**	0.698**	1.000	0.049*
	2003	0.215**	0.627**	0.728**	0.735**	1.000	0.077**
	2004	0.225**	0.618**	0.707**	0.707**	1.000	0.014
ln(Empl.)	2005	0.243**	0.633**	0.719**	0.715**	1.000	0.070**
in(Empi.)	2006	0.236**	0.623**	0.718**	0.712**	1.000	0.064**
	2007	0.243**	0.610**	0.709**	0.703**	1.000	0.057**
	2008	0.248**	0.597**	0.698**	0.693**	1.000	0.054**
	2009	0.254**	0.613**	0.728**	0.722**	1.000	0.060**
	2010	0.236**	0.584**	0.696**	0.693**	1.000	0.067**
	2011	0.244**	0.587**	0.701**	0.693**	1.000	0.042**
	2000	0.128**	0.099**	0.055	0.052	0.123**	1.000
	2001	0.131**	0.063**	0.015	0.008	0.071**	1.000
	2002	0.098**	-0.031	0.032	0.032	0.049*	1.000
	2003	0.123**	0.020	0.040*	0.039*	0.077**	1.000
	2004	0.114**	0.023	-0.025	-0.021	0.014	1.000
ΡΕ/Τ Λ	2005	0.171**	0.099**	0.028*	0.025	0.070**	1.000
KE/TA	2006	0.173**	0.108**	0.032*	0.029*	0.064**	1.000
	2007	0.143**	0.096**	0.012	0.008	0.057**	1.000
	2008	0.148**	0.105**	0.020	0.016	0.054**	1.000
	2009	0.156**	0.110**	0.039**	0.035**	0.060**	1.000
	2010	0.153**	0.104**	0.036**	0.032**	0.067**	1.000
	2011	0.115**	0.036**	-0.010	-0.007	0.042**	1.000

Mario Situm The Age and Size of the Firm as Relevant Predictors for Bankruptcy

*) significance at 5% level

**) significance at 1% level

Ln(total assets) showed high correlations to ln(sales) and ln(sales)², which are all over 0.7. This indicates a problem of multicollinearity between these variables, so that not all of them should be used for model building. Multcollinearity can cause problems in prediction models, when they are not appropriately handled. It is therefore suitable to leave out two of the three mentioned variables out in order to





receive a reliable and good prediction model. The ratio ln(employees) showed statistical significance and high correlations to the other measures of size, which were sometimes below and sometimes above 0.7%. It seems therefore that this ratio could be a potential predictor within a model, which can amend the other measures of size concerning prediction power. This assumption is also in congruence with the results concerning the differences in means and variances, where this ratio only for certain years showed the ability to differentiate between the two groups of companies.

Selection of Prediction Variables

Preliminary test principal component analysis (PCA) was applied s last for all years of observation period and on all years together. This is necessary in order to detect, how the different ratios are loaded and to which extent certain variables can be eliminated from further analyses. The results are shown in Table 7. The number of potential factors was given in advance by the restriction that only those factors should be used, whose eigenvalues are above one. It is interesting to note that with this pre-condition for all years only two factors were extracted. The shown results are based on Varimax-rotation and show the factor loadings of the ratios associated with the two factors. Additionally the percentage of variability after Varimaxrotation (variance) is given, which can be explained by the two factors.

The results show that the age of the firm and RETA are both highly loaded on the second factor for all years of the observation period, so that this factor could be assigned as the "age of the firm". This also implicates that RETA is a kind of proxy, which can be used to measure the age of the firm. Additionally this classification confirms the results from previous analyses, that the ratios for the age of the firm are not related to the size of the firm, which was not that clear at correlation analysis. The general ability of this factor as predictor is limited or even not given based on preliminary statistical results. Neither are having sufficient discriminatory power to act as reliable explanatory variables for the differences between the two groups of companies.

All the other ratios were highly loaded on the first factor, so that this one could be assigned as the "size of the firm". The related ratios are all measuring the size of the firm, so that they are proxies for this task. Such a result is also consistent with the ones from previous research. Concerning the ratios measuring the size of the firm the discriminatory power based on differences in means and variances as well as the correlations among them must be evaluated. The ratio ln(total assets) seems suitable as it showed the ability to discriminate between the groups within all years. Due to its high correlation with ln(sales) and ln(sales)² it should be sufficient to only consider this ratio for model building. As a complement the ratio ln(employees) is

appropriate because it also showed partially a good discriminatory power and could be added to ln(total assets) without causing problems of multicollinearity.

			Age	ln(Total Assets)	ln(Sales)	ln(Sales) ²	ln(Empl.)	RE/TA
Year	Group	Variance	Loading	Loading	Loading	Loading	Loading	Loading
2000	1st Factor	61.68	0.116	0.882	0.956	0.958	0.787	0.000
	2nd Factor	75.77	0.710	0.094	-0.012	-0.012	0.343	0.714
2001	1st Factor	61.36	0.172	0.880	0.942	0.958	0.790	-0.051
	2nd Factor	75.19	0.690	0.100	-0.028	-0.012	0.315	0.741
2002	1st Factor	63.02	0.202	0.894	0.945	0.944	0.821	-0.081
2002	2nd Factor	76.17	0.640	0.009	0.046	0.043	0.268	0.790
2002	1st Factor	63.40	0.167	0.881	0.952	0.956	0.836	-0.039
2005	2nd Factor	76.53	0.675	0.052	0.031	0.030	0.208	0.795
2004	1st Factor	63.43	0.194	0.880	0.955	0.955	0.830	-0.077
2004	2nd Factor	76.30	0.681	0.107	-0.012	-0.011	0.156	0.789
2005	1st Factor	63.57	0.183	0.878	0.959	0.957	0.834	-0.028
2003	2nd Factor	77.36	0.706	0.150	0.005	0.001	0.171	0.799
2006	1st Factor	63.47	0.178	0.876	0.960	0.957	0.833	-0.024
	2nd Factor	77.26	0.708	0.163	0.010	0.005	0.147	0.802
2007	1st Factor	63.03	0.190	0.871	0.959	0.957	0.825	-0.041
	2nd Factor	76.55	0.683	0.160	-0.005	-0.010	0.171	0.801
2008	1st Factor	62.35	0.195	0.860	0.956	0.955	0.821	-0.040
2000	2nd Factor	75.96	0.679	0.179	0.000	-0.005	0.157	0.806
2009	1st Factor	63.04	0.194	0.859	0.958	0.955	0.840	-0.030
2007	2nd Factor	76.71	0.684	0.180	0.021	0.016	0.138	0.811
2010	1st Factor	61.70	0.188	0.849	0.952	0.954	0.822	-0.028
	2nd Factor	75.32	0.685	0.179	0.008	0.005	0.150	0.805
2011	1st Factor	62.26	0.203	0.865	0.956	0.953	0.814	-0.072
	2nd Factor	75.38	0.665	0.094	-0.007	-0.008	0.219	0.790
2000 - 2011	1st Factor	62.83	0.194	0.872	0.955	0.955	0.824	-0.050
	2nd Factor	76.01	0.676	0.114	0.005	0.002	0.192	0.793

TABLE 7. RESULTS OF PRINCIPAL COMPONENT ANALYSIS

*) the variance at the second factor is the cumulated explained variance

Prediction Model based on the Size of the Firm

The last section is about developing prediction models, which could be used to assess bankruptcies in advance. Based on the previous analyses it can be assumed that ln(total assets), ln(sales), ln(sales)² and ln(employees) will be the relevant predictors within the models. Discriminant analysis is used as potential and generally recognized methods for the development of bankruptcy prediction models. Multivariate linear discriminant analysis was introduced by Altman (1968) for prediction task and was also applied within numerous studies for this purpose (Edmister, 1972; Altman, Haldeman & Narayanan, 1977; Houghton & Woodliff, 1978; Dietrich et al, 2005; Mohamad, 2005; Vuran, 2009). With this method it is possible to compute a linear combination of relevant independent variables, which are able to





discriminate between bankrupt and non-bankrupt companies, whereas statistical type I and type II errors must be accepted. When the computed score is below a certain threshold, the respective company will be assigned as bankrupt.

As previously discussed all of the variables show mainly non-normality of data. Nevertheless multivariate discriminant analysis is applied here as earlier research denoted that a certain deviation from non-normality must not definitely affect the prediction accuracy of the discriminant model. For each year and for the whole observation period one discriminant function was computed based on step-wise method using Mahlanobis-distance. Within Table 8 the relevant statistical results, the functions and the classification accuracy for initial group are shown. It is remarkable that ln(total assets) is the predictor, which was sufficient for the single years and for the whole observation period in order to develop an explanatory model.

Year	Diff. in Means	Diff. In Var.	Box-Test	Sign. for Discrimin ation	Type I error	Type II error	Overall accuracy	Overall accuracy cross validated	Function
2000	0.008	0.004	0.801	0.004	33.333	35.401	64.6	64.6	- 10.924 + 0.636x1
2001	0.002	0.000	0.179	0.000	20.000	21.068	78.9	78.9	- 9.533 + 0.594x1
2002	0.009	0.001	0.589	0.001	50.000	29.689	70.2	70.2	- 9.149 + 0.575x1
2003	0.001	0.000	0.489	0.000	38.889	24.084	75.8	75.8	- 8.750 + 0.552x1
2004	0.000	0.000	0.520	0.000	37.037	24.233	75.7	75.7	- 8.974 + 0.564x1
2005	0.000	0.000	0.539	0.000	35.714	25.726	74.2	74.2	- 8.828 + 0.554x1
2006	0.000	0.000	0.148	0.000	28.571	22.911	77.1	77.1	- 8.804 + 0.551x1
2007	0.000	0.000	0.781	0.000	38.889	23.328	76.6	76.6	- 8.732 + 0.546x1
2008	0.000	0.000	0.206	0.000	34.694	32.064	67.9	67.9	- 8.829 + 0.550x1
2009	0.001	0.000	0.000	0.000	51.020	26.647	73.2	73.2	- 8.464 + 0.528x1
2010	0.000	0.000	0.314	0.000	46.667	24.976	74.9	74.9	- 8.787 + 0.544x1
2011	0.000	0.000	0.503	0.000	40.741	27.787	72.1	72.1	- 9.049 + 0.556x1
2000 - 2011	0.000	0.000	0.001	0.000	40.000	26.650	73.3	73.3	- 8.832 + 0.551x1

FABLE 8.	RESULTS FOR D	ISCRIMINANT	ANALYSIS

The Table 8 is arranged as follows:

- The second and the third columns show the significances of tests for differences in means and variances for ln(total assets); for all years and for the whole observation period the results were statistically significant at the 5% level and therefore the pre-conditions for a good model were given;
- The fourth column shows the results from Box-test, denoting whether the covariance-matrices of the groups are similar; except for 2009 and the whole observation period the null hypothesis was given (equality of covariance-

matrices), which indicates that the covariances matrices are similar; this is an important pre-condition for the application of multivariate linear discriminant analysis; if the null hypothesis must be rejected, then the application of the model and its results are generally questionable;

- The fifth column shows the significance of Wilks-Lamdba for the derived functions; for values below 0.05% the results indicate that the obtained function can significantly discriminate between the goups on the 5% level and is therefore better than assignment of the firms into the two groups by chance;
- Columns six and seven show the type I (a bankrupt firms were a-posteriori assigned as non-bankrupt) and the type II (a non-bankrupt firms were a-posteriori assigned as bankrupt) errors for the shown discriminant functions;
- Columns eight and nine show the overall classification accuracy for the initial groups with and without cross validation (here the leave-one-out method was used); and
- The last column provides the classification functions based on linear discriminant analysis.

It is not suprising that ln(sales)² and ln(employees) did not appear as variables, because potential multicollinearity to ln(total assets) and their weaker ability to distinguish between the two types of companies based on differences in means and variances were considered at step-wise-method. Even if no other financial ratio is included, the computed models provided good results. Surely the overall accuracy is weak and type I errors are relatively high. This aspect can be explained by the missing normality of data and partially not given equality of covariance matrices. What must be emphasized in addition is that only one single measure appears in the functions (univariate approach). It is generally recognized that the classification accuracy of models is increasing, when a multivariate approach is used. This means that an extension of the derived models with other potential indicators like capital structure ratios, profitability ratios or liquidity ratios could improve the prediction quality substantially. Nevertheless, the variable ln(sales) itself is a potential explanatory variable for the occurrence of bankruptcy. Another important aspect is that the values for the constants and the weights of ln(total assests) are not fluctuating extremely for the different years and also compared to the whole observation period. This implies that this ratio is not heavily influenced by external factors, so that the variation in non-stationarity is relatively small.

SUMMARY OF RESULTS

The results of this study clearly show that the age of the company is not a relevant variable for the explanation of bankruptcies. This is in contrast to the findings of the theoretical framework, where a high age of the company is associated with lower





probability of bankruptcy. The ratio RETA did not show a high correlation to the age of the firm, but was loaded for all years of the observation period on the same factor like the age of the firm. Therefore it can be concluded that RETA is a proxy for the age of the firms, whose informational content about the "real" age of the firm is however limited to a certain degree. RETA itself only showed for some years significant differences in means between bankrupt and non-bankrupt firms, but was never a statistically significant discriminator for model building. This ratio is also not a relevant variable to explain the differences between both groups. This finding is in contrast to results from certain previous research (Altman, 1968; Frydman et al, 1985; Gilbert et al, 1990; Charitou et al, 2004; Chi & Tang, 2006; McKee, 2007; Altman et al, 2010; Hauser & Booth, 2011), but confirms results from studies with similar findings (Poston et al, 1994; Thornhill & Amit, 2003; Chancharat et al, 2010).

Year	Mean ln(Total Assets) of Bankrupt Firms	Mean ln(Total Assets) of Solvent Firms
2000	15.01	16.21
2001	13.97	16.07
2002	14.60	15.92
2003	14.00	15.86
2004	14.13	15.93
2005	14.24	15.96
2006	14.02	15.98
2007	14.07	16.00
2008	14.91	16.06
2009	14.41	16.05
2010	14.43	16.16
2011	14.45	16.28

TABLE 9. MEAN LN(TOTAL ASSETS) OF BANKRUPT AND SOLVENT FIRMS, 2000-2011

The variable ln(total assets) showed an impressive performance for the different years, but also for the whole observation period as well. It was the only ratio, whose means and variances were significantly different between bankrupt and non-bankrupt at the 5% level and confirms its importance for bankruptcy prediction task. The ratios ln(sales), ln(sales)² and ln(employees) are highly and at the 1% level significantly correlated with ln(total assets). Additionally these ratios are all together loaded on the same factor based on PCA. This indicates that they are measuring the same dimensions and are proxies for each other. Nevertheless, it is sufficient to only consider ln(total assets) for discrimination between different groups. Table 9 provides the means of ln(total assets) for bankrupt and non-bankrupt companies for different years.



FIG. 4 MEAN LN(TOTAL ASSETS) FOR BANKRUPT AND NON-BANKRUPT FIRMS

In contrast to the illustrations about the age of the firm one can see in Figure 3 that the curves for both types of companies are differing and based on the analyses theses differences are also statistically significant. Generally, the results provide evidence that firms with greater size are less likely to fail. This aspect is also in congruence with results from prior research (Ohlson, 1980; Lennox, 1999a; Begley et al, 1996; Theodossiou et al, 1996; Dawley et al, Chava & Jarrow, 2004; Chi & Tang, 2006; Hol, 2007; Pervan & Visic, 2012).

IMPLICATION, RESTRICTIONS AND RECOMMENDATIONS FOR FUTURE RESEARCH

The posted hypotheses can be now tested due to the obtained statistical results. H1 and H2 must be rejected. Based on the results from Table 5 there were several years, where the differences in means and variances for the age of the firms and for RETA were not statistically significant. Additionally neither variables were relevant as predictors within discriminant analysis. H3 and H4 can be accepted, when the size of the firm is proxied by ln(total assets). Within Table 5 this ratio showed statistically significant differences in means and variances between the two groups for all years and for the whole observation period.

To sum up the age of the firm, including its proxy RETA, are not relevant explanatory variables for the differences in bankrupt and non-bankrupt companies. The most suitable predictor is ln(total assets), which showed throught the different statistical tests and applications a good and stable ability to differentiate between the two groups of companies. Grounded on the obtained discriminant functions it is visible that the values for the constant and the weights for ln(total assets) were different for the individual years. However, their variablility was limited as the values ranged within a small interval. Such an implication is raising the question, to what extent and under which situation ln(total assets) could be a stationary variable





for bankruptcy prediction models.

This question can not be answered within this study, as this was not the purpose. But the results seem to give indication about this possibility, which would be a very helpful innovation for theoretical and practical purposes. The non-stationarity of ratios as predictors is one of the most important aspects in model building and a solution for this purpose will be a great step towards a potential theory for insolvency prediction. Therefore further research into this direction would be recommendable.

The age of the firm and the size were not highly correlated within this work. This is in constrast to the shown theoretical framework, but also to some results from previous research. The explanation for this can be found in the firm landscape of Austria, which is heavily based on small and medium-sized companies, which are in most cases family firms. Such families are passed on for generations and are having a certain age, which must not be correlated with size. The aims of family companies are different from those of companies managed by renumerated professionals. One of the main purposes of family companies is to guarantee the survival for the actual and the next generation and they are also showing altruistic tendencies like security for their employees, social and ethical responsibility. Profit is an important aspect for the survival of the family, but it is not the dominant strategic aspect. For the primarly goals it is therefore not necessary to grow in size, even if the company is having a high age.

By all means, the derived findings and results face some limitations. The first can be seen in the data base, which contains a small number of insolvent companies. Generally, it must be emphasized that the the phenomenon of bankruptcy is in practice an event, which does not occurr that often, so that insolvency rates (computed as number of insolvencies relative to the number of all companies) are relatively low. This is also true for the data base of this study shown in Table 1. Therefore the data to a certain degree well replicate the situation of the real world. Nevertheless, the different proportions between bankrupt and non-bankrupt companies can affect the reliability of the statistical results.

The second limitation can be seen in the regionality of data as the companies are all located in Austria. The results showed some divergence to prior literature, which could be reasoned on this special aspect. Austria shows structural differences to other countries. This puts in question the comparison of the findings from this work to results from other research based on firms from a totally different geographic region and economic structure. The comparison of ln(total assets) as potential predictor for bankruptcy prediction for different countries could therefore also be seen as an interesting task for further research.

REFERENCES

Abidali. A. F. & Harris, F. (1995). A methodology for predicting company failure in the construction industry, Construction Management and Economics, 13, 189-196.

Altman. E. I., Sabato. G. & Wilson. N. (2010). The value of non-financial information in small and medium-sized enterprise risk management, The Journal of Credit Risk, 6 (2), 1-33

Altman. E. I., Haldeman. R. G. & Narayanan, P. (1977). ZETA[™] analysis: A new model to identify bankruptcy risk of corporations, Journal of Banking and Finance, 1, 29-54.

Altman. E. I. (1968). Financial ratios. discriminant analysis and the prediction of corporate bankruptcy, The Journal of Finance, 23 (4), 589-609.

Barniv. R., Agarwal. A. & Leach. R. (2002). Predicting bankruptcy resolution. Journal of Business Finance & Accounting, 29 (3 & 4), 497-520.

Bates, T. (1990) Entrepreneur humand capital inputs and small business longevity. The Review of Economics and Statistics, 72 (4), 551-559.

Begley, J., Ming, J., & Watts, S. (1996). Bankruptcy classification errors in the 1980s: An empirical analysis of Altman's and Ohlson's models, Review of Accounting Studies, 1, 267-284.

Ben-Zion, U. & Shalit, S. S. (1975). Size, leverage, and dividend record as determinants of equity risk, The Journal of Finance, 30 (4), 1015-1026.

Berg, D. (2007). Bankruptcy prediction by generalized additive models, Applied Stochastic Model in Business and Industry, 23, 129-143.

Bruse, H. (1978). Die Prognosefähigkeit von Kennzahlen bei verschiedenen Maßen für das Unternehmenswachstum, Zeitschrift für Betriebswirtschaft, 48, 138-152.

Castanias. R. (1983). Bankruptcy risk and optimal capital structure, The Journal of Finance, 38 (5), 1617-1635.

Chancharat, N., Tian. G., Davy, P., McCrae, M. & Lodh. S. (2010). Multiple states of financially distressed companies: Tests using a competing risk-model, Australasian Accounting Business and Finance Journal, 4 (4), 27-44.

Charitou, A., Neophytou, E. & Charalambous, C. (2004). Predicting corporate failure : Empirical evidence for the UK, European Accounting Review, 13 (3), 465-497.

Chava, S. & Jarrow, R. A. (2004). Bankruptcy prediction with industry effects. Review of Finance, *8*, 537-569.

Chi. L.-C. & Tang. T.-C. (2006). Bankruptcy prediction: Application of logit analysis in export credit risks, Australian Journal of Management, 31 (1), 17-27.



Journal of Applied Economics and Business



Cressy. R. (2006). Why do most firms die young?, Small Business Economics, 26, 103 -116.

Dawley, D. D., Hoffman, J. J. & Brockman, E. N. (2003). Do size and diversification type matter? An examination of post-bankruptcy outcomes, Journal of Managerial Issues, 15 (4), 413-439.

Dietrich, J., Arcelus, F. J. & Srinivasan, G. (2005). Predicting financial failure: Some evidence from new Brunswick agricultural co-ops, Annals of Public and Cooperative Economics, 76 (2), 179-194.

Doukas, J. (1986). Bankers versus bankruptcy prediction models: An empirical investigation, 1979-82, Applied Economics, 18, 479-493.

Doumpos, M., & Zopounidis, C. (1998). A multicriteria discrimination method for the prediction of financial distress: The case of Greece, Multinational Finance Journal, 3(2), 71-101.

Dyrberg. A. (2004). Firms in financial distress: An exploratory analysis, Danmarks Nationalbank Working Papers, Nr. 17.

Edmister, R. O. (1972). An empirical test of financial ratio analysis for small business failure prediction, Journal of Financial and Quantiative Analysis, 7, 1477-1493.

Fitzpatrick. J. & Ogden. J. P. (2011). The detection and dynamics of financial distress, International Review of Finance, 11 (1), 87-121.

Frydman, H., Altman, E. I. & Kao, D.-L. (1985). Introducing recursive partitioning for financial classification: The case of financial distress, The Journal of Finance, 40 (1), 269-291.

Gepp, A., & Kumar, K. (2008). The role of survival analysis in financial distress prediction, International Research Journal of Finance and Economics, 16, 13-34.

Gilbert, L. R., Menon, K. & Schwartz, K. B. (1990). Predicting bankruptcy for firms in financial distress, Journal of Business Finance & Accounting, 17 (1), 161-171.

Gombola, M. J., Haskins, M. E., Ketz, E. J. & Williams, D. D. (1987). Cash flow in bankruptcy prediction, Financial Management, 16, 55-65.

Grice, J. S. & Dugan, M. T. (2001). The limitations of bankruptcy prediction models: Some cautions for the researcher, Review of Quantitative Finance and Accounting, 17, 151-166.

Grunert. J., Norden. L. & Weber, M. (2009). The role of non-financial factors in internal credit ratings, Journal of Banking & Finance, 29, 509-531.

Gudmundsson. S. V. (2002). Airline distress prediction using non-financial indicators, Journal of Air Transportation, 7 (2), 3-24.

Hauser, R. P. & Booth, D. (2011). Predicting bankruptcy with robust logistic regression, Journal of Data Science, 9, 565-584

Hol, S. (2007). The influence of the business cycle on bankruptcy probability, International Transactions in Operational Research, 14, 75-90.

Hopwood, W., McKeown, J. & Mutchler, J. (1988), The sensitivity of financial distress prediction models to departures from normality, Contemporary Accounting Research, 5 (1), 284-298.

Houghton, K. A. & Woodliff, D. R. (1987). Financial ratios: The prediction of corporate 'success' and failure, Journal of Business Finance & Accounting, 14 (4), 537-554.

Iazzolino, G., Migliano, G. & Gregorace, E. (2013). Evaluating intellectual capital for supporting credit risk assessment: An empirical study, Investment Management and Financial Innovations, 10 (2), 44-54.

Jovanovic. B. (1982). Selection and the evolution of industry, Econometrica, 50 (3), 649-670.

Jovanovic, B. & MacDonald, G. M. (1994). The life cycle of a competitive industry, Journal of Political Economy, 102 (2), 322-347.

Klecka, W. R. (1980), Discriminant analysis, SAGE University Papers, Series: Quantitative Applications in the Social Sciences, Newbury Park, SAGE Publications, Inc.

Lau, A. H.-L. (1987). A five-state financial distress prediction model, Journal of Accounting Research, 25 (1), 127-138.

Lennox, C. (1999). Identifying failing companies: A re-evaluation of the logit, probit and DA approaches, Journal of Economics and Business, 51, 347-364.

Lennox, C. S. (1999). The accuracy and incremental information content of audit reports in predicting bankrupt, Journal of Business Finance & Accounting, 26 (5 & 6), 757-778.

Liou, D.-K., & Smith, M. (2007). Macroeconomic variables and financial distress, Journal of Accounting – Business & Management, 14, 17-31.

Madrid-Guijarro, A., Garcia-Perez-de-Lema, D. & van Auken, H. (2011). An analysis of non-financial factors associated with financial distress, Entrepreneurship & Regional Development, 23 (3 - 4), 159-186.



Journal of Applied Economics and Business



McKee, T. E. (2007). Altman's 1968 bankruptcy prediction model revisited via genetic programming: New wine from an old bottle or a better fermentation process? Journal of Emerging Technologies in Accounting, *4*, 87-101.

McKee, T., & Lensberg, T. (2002). Genetic programming and rough sets: A hybrid approach to bankruptcy prediction, European Journal of Operational Research, 138, 436-451.

Mensah, Y. M. (1984). An examination of the stationarity of multivariate bankruptcy prediction models: A methodological study, Journal of Accounting Research, 22 (1), 380-395.

Mohamad, I. (2005). Bankruptcy prediction model with ZETAc optimal cut-off score to correct type I errors, Gadjah Mada International Journal of Business, 7 (1), 41-68.

Moulton, W. N. & Thomas. H. (1993). Bankruptcy as a deliberate strategy: Theoretical considerations and empirical evidence, Strategic Management Journal, 14, 125-135.

Muller, G. H., Steyn-Bruwer, B. W. & Hamman. W. D. (2009). Predicting financial distress of companies listed on JSE – A comparison of techniques, South African Journal of Business & Management, 40 (1), 21-32.

Nam, C. W., Kim, T. S., Park, N. J. & Lee, H. K. (2008). Bankruptcy prediction using a discrete-time duration model incorporating temporal macroeconomic dependencies, Journal of Forecasting, 27, 493-506.

Nam, J.-H., Jinn, T. (2000). Bankruptcy prediction: Evidence from Korean listed companies during the IMF crisis, Journal of International Financial Management and Accounting, 11 (3), 178-197.

Ohlson, J. A. (1980). Financial ratios and the probabilitistic prediction of bankruptcy, Journal of Accounting Research, 18 (1), 109-131.

Pervan, I. & Kuvek, T. (2013). The relative importance of financial ratios and nonfinancial variables in predicting of insolvency, Croatian Operational Research Review, *4*, 187-198.

Pervan, M. & Visic, J. (2012). Influence of firm size on its business success, Croatian Operational Research Review, 3, 213-223.

Platt, H. D., Platt, M. B. & Pedersen. J. G. (1994). Bankruptcy discrimination with real variables, Journal of Business Finance & Accounting, 21 (4), 491-510.

Pohar, M., Blas, M. & Turk, S. (2004), Comparison of logistic regression and linear discriminant analysis: A simulation study, Metodološki Zvezki, 1 (1), 143-161.

Poston, K. M., Harmon. K. W. & Gramlich, J. D. (1994). A test of financial ratios as predictors of turnaround versus failure among financially distressed firms, Journal of Applied Business Research, 10 (1), 41-56.

Sarlija, N., & Jeger, M. (2011). Comparing financial distress prediction models before and during recession, Croatian Operational Research Review, 2, 133-142.

Subhash, S. (1996). Applied multivariate techniques, New York, John Wiley & Sons, Inc.

Sung, T. K., Chang, N. & Lee, G. (1999). Dynamics of modeling in data mining: Interpretive approach to bankruptcy prediction, Journal of Management Information Systems, 16 (1), 63-85.

Theodossiou, P., Kahya, E., Saidi, R. & Philippatos, G. (1996). Financial distress and corporate acquisitions: Further empirical evidence, Journal of Business Finance & Accounting, 23 (5), 699-719.

Thornhill, S. & Amit, R. (2003). Learning about failure: Bankruptcy. firm age. and the resource based view, Organization Science, 14 (5), 497-509.

Ucbasaran, D., Westhead, P., Wright, M. & Flores, M. (2010). The nature of entrepreneurial experience. business failure and comparative optimism, Journal of Business Venturing, 25, 541-555.

Vuran, B. (2009). Prediction of business failure: A comparison of discriminant and logistic regression analysis, Istanbul University Journal of the School of Business Administration, 38 (1), 47-63.





AN ANALYSIS OF BANK PROFITABILITY IN MACEDONIA

Nadica Iloska

Sahara Global - Macedonia nadica_iloska@hotmail.com

Abstract

The aim of this paper is to examine the impact of the factors that affect bank profitability, first in a theoretical way, then empirically on a sample of Macedonian banks. We measure profitability by the return on assets (ROA) while the explanatory variables are chosen from the broader group of bank-specific factors. Based on a bank-level data for the period between 2008 and 2011, we employ the multiple regression model to determine the important factors that drive bank profitability. The empirical findings indicate that operating expenses and loan-loss provisions exhibit negative relationship with bank profitability, while the staff expenses, bank size and the share of loans in total assets affect the profitability positively. In addition, the results suggest that liquid assets, deposits and non-interest income have very weak influence on profitability. The knowledge of the factors that influence bank profitability is not essential just for the bank managers, but also for other stakeholders like the central bank, government and other financial authorities. The analysis of these factors can help both the bank managers and regulators in formulating future policies and actions towards improving the profitability of Macedonian banks.

Key words:

Bank profitability; Bank-specific factors; Multiple regression model.

INTRODUCTION

Banks mobilize, allocate and invest the greatest part of the economic agents' savings. Accordingly, their performance has substantial consequences on capital allocation, firm expansion, industrial growth and economic development. Therefore, efficiency and profitability of banks is of interest not just at the individual bank level, but also is important at a broader macroeconomic level.

The main role of the financial system is to channel the funds from savers to borrowers. If this process is done efficiently, than the profitability should improve, the flow of funds should increase, too, and there should be better quality services for customers.

Indeed, financial intermediation determines, among other factors, the efficient allocation of savings, as well as the return on savings and investments. In the developed nations, financial markets and the banking system work in unison to achieve this main purpose. Unlike this, in the developing countries financial markets are usually underdeveloped and undersized so in that case the banks fill in the gap between borrowers and savers and provide the profitable and secure funds channeling. Taking in consideration that savings and investments are among the most important determinants of economic growth, the health of the general economy of a country is in a great way dependent on the well-functioning financial system. That is especially true for countries like Macedonia, where the banking sector is the backbone of the economy. Macedonian banking sector is characterized by the dominant role of the banks (with 88.5% of total financial assets in 2012), with the capital market segment for long term finance being illiquid and, in some cases, underdeveloped, while non-bank financial intermediaries, such as life insurance companies and private pension funds, are still at an embryonic stage of development.

There are plenty aspects of banks which could be analyzed, but we focus specifically on bank profitability. Profitability is a reflection of how banks are run, given the environment in which they operate. More precisely, it should mirror the quality of a bank's management and the shareholders' behavior, the bank's competitive strategies, efficiency and risk management capabilities (Aburime, 2007). Profits affect bank's cost of raising capital in both ways, as a direct contributor to equity financing and as indicator for external investors' assessment of the financial strength of the bank. Moreover, even if solvency is high, poor profitability weakens the bank's capacity to absorb negative shocks, which will eventually affect solvency. Overall, healthy and sustainable profitability is vital in maintaining the stability of the banking system and contributes to the state of the financial system (Gottard et al, 2004). Therefore, the determinants of bank performance have attracted the interest of academic research as well as of bank management, financial markets and bank supervisors.

The paper provides an empirical analysis of the determinants that influence bank profitability in Macedonia, following the literature and taking into account country's particular characteristics. The remainder of the paper is structured as follows: a review of the relevant literature regarding the determinants of bank profitability is given in the next section; Section 3 contains description of the data on which the analysis is based and a brief review of the econometric method to be applied; the empirical results are outlined in Section 4; lastly, Section 5 summarizes the relevant conclusions and suggestions.

LITERATURE REVIEW

Given the importance of profitability for the good functioning of the banking system, the literature has devoted a lot of energy to understanding its main determinants. In the literature, bank profitability is usually expressed as a function of internal and





external determinants. The internal determinants originate from bank accounts (balance sheets and/or profit and loss accounts) and therefore could be termed micro or bank-specific determinants of profitability. The external determinants are variables that are not related to bank management but reflect the economic and legal environment that affects the operation and performance of financial institutions. The determinants have been widely studied both theoretically and empirically. Mainly, those studies can be grouped in two: studies focusing on an individual country (Kosmidou et al, 2006; Naceur & Goaied, 2008) or a geographical region (Olson & Zoubi, 2008; Bonin et al, 2005) that have examined bank-specific factors of profitability, while studies encompassing multiple countries (Hassan & Bashir, 2003; Valverde & Fernandez, 2007) have considered external factors in addition to a few internal factors of profitability. The main conclusion emerging from this numerous studies is that internal factors explain a great portion of profitability. Various measures of costs, higher liquidity, greater provisions for loan losses and more reliance on debt have been indicative of lower bank profits. Larger bank size, greater dependence upon loans for revenue, and higher proportions of equity capital to assets have generally been associated with greater profitability. Nevertheless, external factors have also had an impact on banks' performance. For instance, higher market concentration, greater GDP growth and inflation have generally been associated with greater profitability.

In this study, the main focus is on the first category of determinants, the bank-specific of microeconomic drivers of profits, based on the financial ratios derived from the main financial statements, that reflect the bank's management policies and decisions in the allocation of the resources and are direct indicators of the earning power and the costs of banks.

Many authors find a strong, positive correlation between bank's capitalization and its profitability (Staikouras & Wood, 2003; Pasiouras & Kosmidou, 2007; Sufian & Habibullah, 2009). Others, postulate a link between capitalization and risk aversion and according to this view, banks with a high level of capital are more risk averse and diversification options or other methods ignore potential to increase profitability(Goddard et al, 2004). With respect to the impact of the bank's size on its profitability, the results are ambiguous, but recent studies generally find a negative correlation (Kosmidou et al, 2006; Naceur, 2003; Jiang et al, 2003). Regarding the risks in the banking business, most of the studies find negative correlation (Ramlall, 2009; Vong, 2005; Kosmidou, 2008) while few find a positive one (Naceur & Goaied, 2008; Ali et al, 2011). A number of studies have concluded that expense control is the primary determinant of bank profitability. Lowering the expenses usually rises the efficiency and in the same time the profitability (Ramlall, 2009; Kosmidou, 2008),

except the salary expenses, which exhibit positive correlation with profitability, especially in the developing countries that employ high-quality staff that will not have negative consequences regarding the efficiency (Athanasoglou et al, 2005; Gottard et al, 2004). Although bank loans are the main source of revenues and are expected to affect profits positively, findings from various studies are not conclusive. While the study by Abreu and Mendes (2000) documents a positive relationship between the loan ratio and profitability, studies by Bashir and Hassan (2003) and Staikouras and Wood (2003) show that a higher loan ratio actually affects profits negatively. The latter study notices that banks with more non-loan earnings assets are more profitable than those that rely heavily on loans. Empirical evidence from Naceur and Goaied (2008) indicates that the best performing banks are those who have maintained a high level of deposit accounts relative to their assets. Moreover, when banks are more diversified, they can generate more income sources, thereby reducing its dependency on interest income, which is easily affected by the adverse macroeconomic environment. The results of Jiang et al (2003) show that diversified banks in Hong Kong appear to be more profitable.

DATA AND METHODOLOGY

Performance measure and dependent variables

In line with earlier studies that examined the determinants of bank's profits, we use return on assets (ROA) as a measure of profit performance and as the dependent variable. Bank profitability is best measured by ROA, because it is not distorted by high equity multipliers and represents better measure of the ability of a firm to generate returns on its portfolio of assets (Kosmidou, 2008; Naceur & Goaied, 2008). ROA indicates the profit earned per unit asset and most importantly, it reflects the management's ability to utilize the bank's financial and real investment resources to generate profits. Evaluating bank's performance is rather complex process, which involves the interaction between internal operations, external activities and the surroundings. For any bank, ROA depends on bank's policy decisions as well as on uncontrollable factors relating to the economy and government regulations (Hassan & Bashir, 2003). As we said before, this paper's focus will be on the determinants that include elements internal to each financial institution, treated as independent variables. The external determinants will be excluded due to the time dimension of the panels used, which is too small to capture the effect of control variables related to the macroeconomic environment (in particular the business cycle). In addition, external factors are much more useful if included in studies analyzing bank profitability among different types of banks in one country (big vs. small or state vs. private) or when we make comparison of bank profitability among banks in two or more countries. Since this analysis refers to all banks in one country, including external variables that cover a short period, could just distort the final results.





Moving on the explanatory side of profitability, internal determinants can be described as the factors that are influenced by bank management's decisions, actions and policies regarding funding resources and their usage, equity, liquidity and risk management, costs efficiency etc., that later reflect differences in bank operating results, including profitability. As potential determinants of Macedonian banks' profits we consider 10 bank-specific measures:

- *Capital* Capital refers to the amount of own funds (primarily by bank's owners, reserves and retained earnings) available to support a bank's business and for that reason it acts as a safety net in the case of unexpected situations. As such, the strength and quality of capital will influence bank profitability. Strong capital structure is essential for banks in developing economies, since it provides additional strength to withstand financial crises and increased safety for depositors during unstable macroeconomic conditions. Furthermore, lower capital ratios imply higher leverage and risk, which therefore lead to greater borrowing costs. Thus, the profitability level should be higher for the better-capitalized bank (Staikouras & Wood, 2003). On the other hand, a relatively high capital-asset ratio may signify that a bank is operating over-cautiously and ignoring potentially profitable diversification or other opportunities (Ali et al, 2011). Since Macedonia is a developing country, we expect this variable to affect the profitability positively. We use the ratio of Capital-to-Assets (K_TA) to proxy this variable.
- *Bank size* Bank size is usually considered an important determinant of profitability, but with no consensus on the direction of its influence. Generally, the effect of a growing size has benefits like economies of scale and reduced costs or economies of scope and product diversification, that provide access to markets that small banks cannot entry. In addition, large banks may be able to exert market power through stronger brand image or implicit regulatory (toobig-to-fail) protection. As a result, bank size will positively affect profitability. However, if the bank becomes extremely large in size, this effect turns out to be negative, because the bank is harder to manage and also due to bureaucratic and other reasons. Accordingly, the size-profitability relationship is expected to be non-linear (Eichengreen & Gibson, 2001). As a proxy we use the logarithm of the bank's total assets (LTA) in order to capture this possible non-linear relationship and also to lower the heteroskedasticity in the data, since banks of different size are included.
- *Risk management* The need for risk management is inherent in the banking business. Bank profitability depends on its ability to foresee, avoid and monitor risks, possibly to cover losses brought about by risks arisen. Poor asset quality

and low levels of liquidity are the two major causes of bank failures. Hence, in making decisions on the allocation of resources to asset deals, a bank must take into account the level of risk to the assets (Bobakova, 2003). Considering the nature of the Macedonian banks, here we include the liquidity risk and credit risk. Liquidity risk concerns the ability of a bank to anticipate changes in funding sources. This may have serious consequences on a bank's capacity to meet obligations when they fall due. Effective liquidity management seeks to ensure that, even under adverse conditions, a bank will have access to the funds necessary to fulfill customer needs, maturing liabilities and capital requirements for operational purposes. Without the required liquidity and funding to meet short-term obligations, a bank may fail. Intuitively, one would expect a positive relationship between profitability and liquidity of a bank, due to the lower risk. However, holding that relatively high proportion of liquid assets does not earn high profits, therefore the bank should be willing to accept lower returns. In recent years, almost all Macedonian banks have exhibited excess liquidity, so we expect it to affect profitability negatively (Gottard et al, 2004). We represent this variable with the ratios Liquid Assets-to-Total Assets (LA_TA) and Total Assets-to-Total Loans (TA_TL). Their higher value indicates that greater deal of the assets is short-term invested, which results in lower risk exposure and in the same time lower profitability. The second one - Credit risk is represented by the ratio Loan-loss Provisions-to-Total Loans (LLR_TL). It is a measure of bank's asset quality and reveals the extent to which a bank is preparing for loan losses by building up its loan-loss reserves against current income. If banks operate in more risky environments and lack expertise to control their lending operations, it will probably result in higher LLR_TL ratio. Changes in credit risk reflect changes in the health of the loan portfolio, which eventually will affect the bank's performance. A high ratio could signal a poor quality of loans and therefore a higher risk. However, on the other hand, according to the risk-return hypothesis, high ratio with sound quality of loans could imply a positive effect on profitability. Therefore, it is difficult to hypothesize the sign of this relationship.

• *Operative Efficiency* - Bank expenses are also a very important determinant of profitability, closely related to the approach of efficient expense management, because they offer a major opportunity to be decreased (in this era of new electronic technology) and hence improve efficiency and profitability. Here we use the ratio Operating Expenses/Total Assets (OE_TA) as an indicator of management's ability to control costs. The relationship between OE_TA variable and profitability is usually negative, as banks that are more productive and efficient aim to minimize their operating costs. On the other hand, if banks are able to transfer part of their operating expenses to their clients, this relationship may become positive (Vong, 2005).




- Productivity Superior management is a prerequisite for achieving profitability and stability of a bank. The contrary situation will occur if management quality is low, and where some workers will not exert full effort which will cause 'free riding' on good workers. Hence, better management leads to better result, but it is too hard to measure this quality like all the other variables. We suppose that the quality should be reflected in the operating expenses or more precisely in salary expenses, expressed by the Salary Expenses/Total Assets ratio (SE_TA). The main intention is to increase productivity and therefore profitability, usually done by keeping the labor force steady, ensuring higher quality of newly hired labor, reducing the number of employees and increasing overall output by investing in new technology. This suggests that higher productivity growth generates income that is partly channeled to bank profits. On the one hand, staff expenses, logically, are expected to be inversely related, because lower expenses mean higher efficiency and profitability. On the other hand, if managers are motivated (by salaries, benefits, power or prestige) and if they have discretion to pursue their own objectives, growth as well as profit may enter the bank's objective function (Gottard et al, 2004). Since labour expenses are high in the Macedonian banking system, we expect them to be a key determinant.
- Balance sheet structure On the asset side, we utilize Loan-to-Asset ratio (L_TA) to capture the effect that the share of loans has on profitability. Since loans are riskier and provide the highest return of any asset, this variable should positively affect profitability as long as the bank is working cautiously and not taking excessive risk. A large loan portfolio can also result in reduced bank profitability if it mainly comprises of substandard credits. However, they also posses higher operating cost arising from their origination, servicing and monitoring. Therefore, the conclusion is that L_TA affects profitability either positively or negatively, depending on the composition of the portfolio. In the end it is the quality, not the quantity of loans that matters. On the liability side, we use Deposit-to-Asset ratio (D_TA) to capture the effect of the proportion of deposits on profitability, which should be positive since they constitute a more stable and cheaper funding compared to borrowed funds. Increasing this ratio means that a bank has more funds available to use in different profitable ways and that should increase ROA ceteris paribus (Holden and El-Bannany, 2006). What may weaken this relation is the fact that they require widespread branching network and other expenses, especially if there is insufficient loan demand. Taking in consideration that traditional banking activities dominate Macedonian banks, we expect these both variables to positively affect profitability.

Non-interest Income - In recent years there has been a shift from interest to non-interest income not dependent on traditional financial intermediation. Banks have increasingly been generating income from off-balance sheet activities and fees. The trend of deregulation fostered diversification by the increased propensity of households to invest in different financial assets, and by the greater opportunities for firms to access the capital markets. On one hand, that income is good as it allows bank profits to be stabilized, since it is not affected by GDP fluctuations. On the contrary, there is much evidence that traditional intermediation activities remain the core business of most profitable banks and that non-interest income can never increase the profitability as much as interest income, in fact it generates lesser profits when compared to loans (Sufian & Habibullah, 2009; DeYoung & Rice, 2004). The ratio Non-interest Income-to-Total Income (NII_TI) is included in the regression as a proxy measure of diversification into non-traditional activities, expected to positively influence profitability.

Outline of the Econometric Methodology

The majority of studies on bank profitability, such as Athanasoglou et al (2005), Goddart et al (2004) and Ali et al (2011), use linear regression models to estimate the impact of various factors that may be important in explaining bank profits. Regression analysis will help us discover the relationship and the level of significance of each variable previously discussed on profitability.

To examine the determinants of the profits of Macedonian banks, we employ the following specification of the empirical model:

$$y_{it} = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \beta_5 x_5 + \dots + \varepsilon_{it}$$

where y_{it} is the dependent variable (in our case ROA), $\beta_0...\beta_n$ are the regression coefficients, x_{it} stands for the independent variables (equity, size, credit risk...), ε_{it} is the disturbance term that is assumed to be normally distributed with a mean of zero. The empirical evidence on the determinants of bank's profitability and ROA consists of cross-sectional units, denoted i = 1...17, observed at each of time periods, denoted t= 1...4 (in this case years). Regression estimates will be derived using the simple ordinary least squares (OLS) method. Because of the general quality of minimized bias and variance, OLS estimates are believed to be the most reliable regression estimates. The *t*-statistics associated with each OLS coefficient is used to test whether any parameter in the population is equal to zero, in which case between the dependent and the independent variable there is no linear relationship and no influence at all. However, that is for testing just one parameter. To test a regression with multiple parameters we employ the *F*-test, which checks whether a group of independent variables (all together) have or do not have any influence on the dependent variable. In that way we measure the overall significance of the regression (Gujarati, 2003).





Because we use time-component data we may face the problem of serial correlation. Although in its presence the OLS estimators remain unbiased, consistent and asymptotically normally distributed, they are no longer efficient. Consequently, the usual t, F and x^2 tests cannot be legitimately applied. That why we first check with the Breusch-Godfrey test for serial correlation, also known as the LM test. Further on, working with data that includes different-sized units (in this case small, middle and large-size banks) the assumption for homoskedastic variance of the residuals does not usually hold true. To check for residual heteroskedasticity, we employ the White's test.

For that instance, first we will test the sample to check if the residuals are normally distributed, then for the presence of serial correlation and heteroskedasticity. If their presence is confirmed, to avoid getting incorrect statistical significance and wrong conclusions, appropriate method for correction is used. In this case it is the Newey-West method, which transforms the standard errors into heteroskedasticity and autocorrelation consistent standard (HAC) errors and conducts statistical interference based on them. Since HAC standard errors are higher than the OLS standard errors, the t-statistic values with HAC standard errors are lower than before, which proves that OLS method underestimated the real standard errors.

Data Source and Sample Characteristics

To examine the factors that explain bank profitability, we utilize data for the Macedonian banking sector for the years 2008-2011. The variables included in the regression represent ratios from the data given in the financial statements. The income statement, balance sheet and the notes to the financial statements were obtained from the annual reports of each bank as reported on their individual websites. The period of analysis represents the years for which electronic data were available for the majority of banks. All variables are observed for each cross-section and each time period. We start with the complete sample of 17 banks in Macedonia, resulting in a total number of bank-year observations of 67. However, we end up with a smaller sample as we apply some selection criteria.

Table 1 shows the descriptive statistics for the variables used in our main regression. As can be seen ROA variable is the only one having negative mean value of -0.0053, which goes to the maximum of 0.067 and minimum of -0.111, with standard deviation of 0.0325. The negative mean value is due to the period when the data is collected, that covers the years of the world economic and financial crisis, and its effects spilled over the Macedonian banking system, too. Further on, for each variable we calculated mean, median, minimum, maximum value and standard deviation. We would like to draw attention to the high maximum value of K_TA and zero minimum value of

D_TA, which is due to the fact that one of the bank in the analysis (Macedonian Bank for Development Promotion) does not have any deposits in its portfolio.

	ROA	K_TA	LTA	LLP_TL	LA_TA	TA_TL	OE_TA	SE_TA	D_TA	L_TA	NII_TI
Mean	-0,0053	0.22124	22.7778	0.01905	0.3167	2.21351	0.09692	0.02156	0.62605	0.55275	0.16137
Median	0.0030	0.13411	22.7322	0.01076	0.3012	1.74409	0.08408	0.01840	0.64001	0.57337	0.15139
Maximum	0.0670	0.81733	25.1072	0.19597	0,7067	9.05846	0.20889	0.07751	0.87465	0.87279	0.60649
Minimum	-0,1110	0.06997	19.9862	-0,0632	0,1067	1.14575	0.01564	0.00274	0.00000	0.11039	0.05050
Std. Dev.	0.0325	0.17173	1.31214	0.03870	0,1382	1.35282	0.04381	0.01386	0.21117	0.18179	0.09806
Skewness	-1,4377	1.45975	0.01768	2.56795	0,7983	3.00656	0.69739	1.93757	-1,6229	-0,5277	3.24513
Kurtosis	5.1225	4.65659	2.49477	12.1866	0,5538	13.2721	2.99053	7.51643	5.59192	2.78923	14.6946
Jarque-Bera	35.658	31.4559	0.71607	309.235	730.300	395.505	5.43119	98.8664	48.1665	3.23328	499.396
Probability	0.0000	0.00000	0.69905	0.00000	0.02595	0.00000	0.06617	0.00000	0.00000	0.19857	0.00000
Observations	67	67	67	67	67	67	67	67	67	67	67

TABLE 1. DESCRIPTIVE STATISTICS

We also present the figures of skewness and kurtosis of the data that will be needed for the test of normality distribution Jarque-Bera (JB) test. If we have normally distributed residuals, skewness would be zero, or it can be tolerated from -0.5 to 0.5. Here, that holds true just for two variables, LTA (0.01768) and L_TA (-0.52767). For most of the variables, the value is above zero, so we have positive asymmetry (skewness), and just three of the variables (D_TA, L_TA, ROA) exhibit negative values. Regarding kurtosis, normally distributed residuals should have value equal to three. In this case just OE_TA satisfies that condition. Most of the other variables have coefficient higher than three. Hereby, we can conclude that just a few of the variables satisfy the assumption for normal distribution. The probability of accepting null hypothesis (H₀), that variables are normally distributed, is the highest for the variable bank size (LTA 0.6691) and is followed by L_TA and OE_TA.

Table 2 provides information on the degree of correlation between the explanatory variables used in the regression analysis. One of the assumptions of the linear regression model is that there is no multicollinearity among the independent (explanatory) variables. If correlation between explanatory variables is high, the estimation of the regression coefficients is possible, but with large standard errors and as a result, the population values of the coefficients cannot be estimated precisely. According to Kennedy (2008) multicollinearity is a problem when the correlation is above 0.80, which is not the case here.





The highest correlation coefficient is between OE_TA and SE_TA (0.7755), which is both logical and expected since staff expenses are component of the operating expenses. Also, the coefficient between LTA and SE_TA is high (-0.7258), which means that as the bank grows in size, staff expenses lower as a percentage of total assets; high negative correlation is spotted on the both sides of the balance sheet, between K_TA and D_TA (-0.6725) as two substitutes for bank resources and between LA_TA and L_TA (-0.7775) as two alternatives for assets allocation. All in all, the matrix shows that, in general, the correlation between the variables is not strong, suggesting that multicollinearity problems are either not severe or non-existent.

	ROA	K_TA	LTA	LLP_TL	LA_TA	TA_TL	OE_TA	SE_TA	L_TA	D_TA	NII_TI
ROA	1										
K_TA	-0,3218	1									
LTA	0,5207	-0,7782	1								
LLP_TL	-0,0861	-0,1987	0,1126	1							
LA_TA	-0,0962	0,4733	-0,4540	-0,0401	1						
TA_TL	-0,1623	0,5515	-0,5023	-0,1455	0,7257	1					
OE_TA	-0,7581	0,2503	-0,4959	0,2937	0,0631	0,1796	1				
SE_TA	-0,6630	0,6275	-0,7258	-0,1588	0,3585	0,4785	0,7755	1			
L_TA	0,2860	-0,5931	0,5461	0,0495	-0,7775	-0,8275	-0,3139	-0,5911	1		
D_TA	0,0622	-0,6725	0,5093	0,2466	-0,0093	-0,1926	0,1321	-0,1824	0,1136	1	
NII_TI	-0,1908	0,0216	-0,1743	-0,0568	0,0340	0,1372	0,3528	0,2282	-0,2105	0,1093	1

TABLE 2.	CORREL	ATION	MATRIX 1
----------	--------	-------	----------

EMPIRICAL RESULTS

Table 3 shows the results of the regression of ROA on the independent variables, as described earlier.

First of all, we must comment the value of the coefficient of determination – adjusted R² of 0.580618, meaning that around 58% of the variations in the dependent variable ROA can be explained with the influence of all independent variables, taken together. Although this result should not be neglected, the table also points out a few problems. At 10% level of significance, from all ten variables, just two are significant. First one is OE_TA, both with high negative coefficient (-0.820626) and high statistical significance (t-stat. -4.131241), suggesting that efficiency in expenses management is a robust determinant of bank profits. Their negative effect means that there is a lack of efficiency in expenses management since banks pass just a small part of increased cost to customers and the remaining part to profits. This may be due to the fact that just a few large banks dictate the interest rate policy, so the others need to follow them, and

that does not allow them to "overcharge". This result is in line with what we expected, but the next significant variable LLP_TL shows unexpected positive and highly significant coefficient (0.222737), which would mean that the more risky and low quality loans, the more profitable bank it is. In literature, the Risk-Return Hypothesis can justify this positive relationship. If we look at the other variables, we can notice that some slight influence can be spotted at staff expenses, non-interest income and deposits, but their coefficients are too low to be statistically significant. All variables have the expected signs, except the SE_TA, which has positive, possibly due to the fact that staff quality is important, as we said especially in developing countries like Macedonia.

Dependent variable: I	Dependent variable: ROA							
Method: OLS	Method: OLS							
Included observations: 67								
Variable	Coefficient	Std. Error	t-Statistic	Probability				
С	-0.049300	0.110833	-0.444811	0.6582				
D_TA	0.029357	0.024764	1.185460	0.2408				
K_TA	0.012382	0.035742	0.346436	0.7303				
L_TA	0.027643	0.033834	0.817002	0.4174				
LA_TA	-0.028372	0.039301	-0.721928	0.4733				
LLP_TL	0.222737	0.112339	1.982715	0.0523				
LTA	0.002569	0.004228	0.607515	0.5460				
NII_TI	0.049572	0.031629	1.567265	0.1227				
OE_TA	-0.820626	0.198639	-4.131241	0.0001				
SE_TA	0.766375	0.650226	1.178629	0.2435				
TA_TL	0.003994	0.003644	1.096143	0.2777				
Adjusted R-squared S.E. of regression	0.580618 0.021047	F-statistic Probability (F-statistic)		10.13742 0.000000				
		Durbin-Watso	on statistic	1.348617				

TABLE 3. REGRESSION RESULTS

On the other hand, the least significant variables are: K_TA with its low significance cannot prove that capital strength makes a significant contribution to bank profitability, expressed through the need to borrow less in order to support a given level of assets and reduced costs of funding due to lower prospective bankruptcy costs; banks do not make some extra profits, if they allocate greater part of their assets in loans; even weak, there is negative relationship between liquidity and profitability, confirming the trade-off among them; and banks are not large enough to experience the benefits of economies of scale or scope.

In addition to the above characteristics, a few more need to be pointed out. The standard error of the regression, or the unexplained variability, is 0.021047. The *F*-statistic is 10.13744 (p = 0.0000), meaning that the regression is statistically significant.





To assure the authenticity of the results, as we mentioned earlier, we employed additional tests. First of all, to check the normal distribution, the JB test is used. We also did this separately on each variable (in the part descriptive statistic) and the results showed that just one variable (LTA) exhibited normal distribution. Taking it now to the level of the regression, the test had the following results: test value of 57,792 with probability = 0.0000, which leads to rejecting H₀ (normally distributed residuals), and we come to a conclusion that the residuals in this regression are not normally distributed. The variables were also checked for serial correlation and the results from the Breusch-Godfrey test reveal that at 5% level of significance we can reject the null hypothesis implying that there is serial correlation between the residuals in this regression. In addition, the Durbin-Watson (DW) test (1.348617), shown in Table 3, leads us to the same conclusion, that residuals have positive serial correlation. That means, a note of caution is needed when interpreting the results.

In addition, the White's test has been employed to determine the presence or absence of heteroskedasticity and the results show that the null of no heteroskedasticity cannot be rejected just at 26%, which is really high level of significance and it is not the one that we are working with 5% level of significance. This result is due to the fact the most of the variables entered the regression model as ratios, in which way they are not influenced by the different size of the banks included in the sample. The only variable that was most likely to exhibit heteroskedasticity (bank size, LTA) is represented in a logarithmic form, which cushions this issue.

Concerning presence of serial correlation in the regression, which could distort the final results, we proceed with the empirical analysis using the Newey-West HAC standard errors. Contrary to what we have expected, this method did not change the previous results dramatically. Even in this case, the parsimonious regression proved that there is only one significant variable, OE_TA, excluding the LLP_TL, which was significant in the first place. This means that Macedonian banks pass insufficient part of their expenses to their customers (in terms of lower deposit rates and/or higher lending rates). In other words, if the share of operating expenses in total assets rises by 1 percentage point for the average bank, its ROA declines by 0.56 percentage points. Clearly, efficient expense management is a prerequisite for their improved profitability. The changes of the other main characteristics of the regression are almost insensible, like for example, now we have just a little bit smaller R² value (0.56821), meaning that all the other variables, apart from OE_TA, add little to the explanatory power. *F*-statistic exhibited its highest value until now, 87.85205 (*p* = 0.0000).

It is noteworthy to draw attention to the fact most of the results came out contrary to what we expected and only variable OE_TA is significant at 5%, with almost all the

other being insignificant even at 10% level of significance. In addition, we faced problems concerning the variables and their residuals, which were not solved even after applying the Newey-West method. That leads us to the conclusion that serial correlation was not actually the main problem, but obviously there is something wrong with the sample data used in the regression. The inspection of residuals has shown that outliers are present in the data. These deviations happened because one bank had unusually high earnings in 2010 (as it did not provide enough loan-loss provisions) and unusually low earnings in 2011. Similarly, another bank had the highest negative ROA values in the course of four years due to huge operating expenses that could not be covered even from both interest and non-interest income together. Under these circumstances, we decided to continue the analysis without these outliers, so we have got nearly same actual and fitted values for the residuals, without any large deviations.

Consequently, we proceed by running a new regression, excluding the outliers, which were responsible for the distortion of the results and moreover, preventing the precise estimation of the effects of each variable on profitability. Table 4 presents the estimation output from the new regression, including now 62 observations.

Dependent variable: 1 Method: OLS	ROA								
Included observation	Included observations: 62								
Variable	Coefficient	Std. Error	t-Statistic	Probability					
С	-0.136924	0.074796	-1.830642	0.0730					
D_TA	0.020207	0.014284	1.414676	0.1632					
K_TA	0.025788	0.021400	1.205084	0.2337					
L_TA	0.032103	0.018755	1.711698	0.0930					
LA_TA	-0.023510	0.021782	-1.079327	0.2855					
LLP_TL	-0.203489	0.079177	-2.570054	0.0131					
LTA	0.005911	0.002854	2.071087	0.0434					
NII_TI	0.017405	0.017762	0.979921	0.3318					
OE_TA	-0.657470	0.115563	-5.689272	0.0000					
SE_TA	1.509577	0.406192	3.716413	0.0005					
TA_TL	0.001349	0.002013	0.670094	0.5058					
Adjusted R-squared	0.793154	F-statistic		24.39049					
S.E. of regression	0.011397	Probability	(F-statistic)	0.000000					
		Durbin-Wa	tson statistic	1.651559					

TABLE 4. REGRESSION RESULTS AFTER EXCLUDING OUTLIERS

If we compare Table 4 and Table 3 we will notice that now at 10%, we have five statistically significant variables (not just two) and much more higher R^2 (0.793154), meaning that now we have higher explained variability by 20 percentage points. Moreover, the standard error of the regression is down from 0.021047 to 0.011397; *F*-





statistic inclined from 10.13742 to 34.39049; and the DW-statistic is now closer to 2, meaning we are closer to the value at which we can accept the null of no positive or negative serial correlation.

From Table 4 we can see that the most important variable in explaining bank profitability is OE_TA, now confirmed for the second time. The operating expenses variable presents a negative and significant effect on profitability (-0.657470). This implies a lack of competence in expenses management and the consequences we explained earlier. Moving to the next one, bank size (LTA) is highly significant statistically, but its coefficient is pretty low (0.006691), implying that there are substantial unexploited economies of scale, and hence no increasing returns to scale through the prioritization of fixed costs over a higher volume of services. Also, this confirms that large banks do not take full advantage of their market power in order to pay less for their inputs and are not able to secure financing for their operations at a lower cost than their smaller competitors. Next statistically significant variable is SE_TA, with the highest coefficient until now (1.509577). This confirms the Efficiencywage theory according to which productivity grows in line with increased salary and that higher productivity growth generates income that is mostly channeled to bank profits. As we mentioned before, this is quite common in developing countries, including Macedonia, where banks employ high-quality staff, motivated by salaries, benefits, power or prestige, which translates into higher efficiency and therefore higher profitability. The variable concerning credit risk LLP_TL finally got the right negative sign, meaning that when the loan-loss provision ratio goes up by 1 percentage point, profitability decreases by 0.20 percentage points. The empirical findings imply that Macedonian banks should focus more on credit risk management, which has been proven to be problematic in the recent past, because it may lead to serious banking problems. The best way it can be done is through policies that improve screening and monitoring credit risk, which in turn would assist banks to evaluate credit risk more effectively and to avoid problems associated with hazardous exposure. Last, but not least, L_TA ratio appears to be positively related to ROA (0.032103). Even though the coefficient is not as high as the previous ones, it proves that the more a bank allocates its resources in high interest-bearing instruments, the more its profitability improves. This means that the bank benefits much more from interest-paying instruments, as opposed to the cash or other items in the balance sheet. But we must keep in mind that actually quality is what is important, not quantity.

The variables with the lowest significance are similar to the previous ones. Starting with liquidity coefficients, we can say that even Macedonian banks keep high portion of their assets in liquid form, it does not seem to affect their profitability; low significance of NII_TI, tells us that diversification is not as beneficial for the banks as

we thought in first place, proving that bank profitability stems mainly from interestbearing assets; and finally, the ratio of capital or deposits to total assets does not play important part in explaining the profits.

We proceed with the analysis by testing for the presence of normal distribution, serial correlation and heteroskedasticity. Due to space storage, just the final results will be discussed. The JB test statistic is 5.5396 with probability of 0.0627, meaning that contrary to the first regression, now the absence of normal distribution may not be an issue. Next, based on the LM test, the obtained statistic is not sufficient to reject the null, i.e. there is no serial correlation in the residuals. On the contrary, the White's test results suggest that we can reject the hypothesis of homoskedastic variances and confirm the existence of heteroskedasticity.

Finally, the undertaken diagnostic tests show that even there is no serial correlation, the regression suffers from heteroskedastic variances and residuals are not normally distributed. Accordingly, Table 5 presents the estimates obtained from the new parsimonious regression, this time done by the Newey-West method (HAC standard errors) only considering the significant variables.

Dependent variable: ROA Method: OLS Included observations: 62 Newey-West HAC Standard Errors & Covariance (lag truncation=3)						
Variable	Coefficient	Std. Error	t-Statistic	Probability		
C L_TA LLP_TL LTA OE_TA SE_TA	-0.140642 0.025001 -0.240307 0.006691 -0.578371 1.502815	0.037824 0.012800 0.101096 0.001483 0.128986 0.593432	-3.718312 1.953228 -2.377013 4.512607 -4.483988 2.532412	0.0005 0.0558 0.0209 0.0000 0.0000 0.0142		
Adjusted R-squared S.E. of regression	0.797623 0.011274	F-statistic Probability Durbin-Wa	49.08363 0.000000 1.591435			

TABLE 5. PARSUMONIOUS REGRESSION USING NEWEY-WEST METHOD

As we can see, there are minor differences between the results, meaning that heteroskedasticity did not have some substantial influence on the regression. More precisely, the only difference we can notice is that the statistical significance has risen slightly for LTA, and declined for SE_TA, LLP_TA and L_TA, but to such small extent that is not worth mentioning. As we mentioned earlier, this method does not change the values of the coefficients of the variables and the coefficient of determination.





CONCLUSION

As financial intermediaries, banks play a crucial role in an economy, therefore a sound and well-functioning system is essential in providing for sustained growth and development. The most accurate confirmation is the recent financial crisis, which emphasized the fact that a profitable and lucrative banking system is best capable to absorb negative shocks and sustain the stability of the whole financial system. Accordingly, this study empirically analyses the determinants of Macedonian banks' profitability (measured by ROA), by taking into consideration bank-specific factors. Profitability seems to have been positively affected by productivity, bank size, balance sheet structure, capitalization and non-interest income, and negatively by operating expenses, credit and liquidity risk. Mostly, our empirical findings confirm the theoretical predictions.

In order of statistical significance operating expenses are of a paramount importance in affecting the profitability, providing support to the argument that their high ratio lowers efficiency and profitability, and implying that cost control remains a key task for bank management. While operating expenses are negatively and strongly affecting profitability, labor productivity growth has a positive and significant impact, showing that decisions on bank management are instrumental in influencing bank performance and that quality matters. Though banks tend to be more profitable when they are able to undertake more lending activities, yet due to the credit quality of lending portfolios, a higher level of provision is needed. Such a high level of provisions against total loans in fact affects the performance of banks adversely. Banks, therefore, need to improve profitability by improving screening and monitoring of credit risk. Finally, concerning the fact that the impact of bank size does not significantly determine bank profitability indicates that large banks in the industry have not significantly enjoyed economies of scale.

Overall, the findings suggest that bank profitability could be improved considerably if: operating expenses are minimized except for staff expenses; appropriate mechanisms to screen, monitor and forecast future levels of risk are put in place; and to start exploiting benefits of economies of scale and scope in order to enhance the quality of the banking system, making it thus more profitable. The design of all these changes must take into account the peculiarities of the Macedonian macroeconomic environment alongside the bank-specific circumstances.

Further development of the Macedonian banking system depends on its efficiency, profitability and competitiveness. In these circumstances, banks need to find a way to make the optimal utilization of their resources, while minimizing the expenses and losses. That is supposed to enhance their position, resistance and effectiveness, leading

to more stable and secure financial system. Finally, several other topics remain open for further research like the impact of external or macroeconomic factors, the comparative analysis with the banks from similar countries.

REFERENCES

Abreu, M. & Mendes, V. (2000). Commercial Bank Interest Margins and Profitability: Evidence for Some EU Countries, presented on the 50th International Atlantic Economic Conference. (www.iaes.org/conferences/past/charleston_50/prelim_ program/index.htm)

Aburime, U. T. (2007). Determinants of bank profitability: Company-level evidence from Nigeria, African Journal of Accounting, Economics, Finance and Banking Research, 2, 58-82.

Alexiou, C. & Sofoklis, V. (2009). Determinants of Bank Profitability: Evidence from the Greek Banking Sector, Economic Annals, LIV 182, 93-118.

Ali, K., Akhtar, M. F. & Ahmed, H. Z. (2011). Bank-Specific and Macroeconomic Indicators of Profitability - Empirical Evidence from the Commercial Banks of Pakistan, International Journal of Business and Social Science, 2(6), 235-242.

Athanasoglou, P. P., Brissimis, S. N. & Delis, M. D. (2005). Bank-specific, Industry – specific and Macroeconomic determinants of bank profitability, Working Paper 25, Athens: Bank of Greece.

Bobáková, I. V. (2003). Raising the Profitability of Commercial Banks, BIATEC, XI, 21-25. http://www.nbs.sk/BIATEC/BIA04_03/21_25.PDF.

Bonin, J. P., Hasan, I. & Wachtel, P. (2005). Bank performance, efficiency and ownership in transition countries, Journal of Banking and Finance 29, 31-53.

DeYoung, R. & Rice, T. (2004). Noninterest Income and Financial Performance at U.S. Commercial Banks, The Financial Review 39 (1), 101-127.

Eichengreen, B. & Gibson, H. D. (2001). Greek banking at the dawn of the new millennium, CEPR Discussion Paper.

Garcia-Herrero, A., Gavilá S. & Santabárbara D. (2007). What explains the low profitability of Chinese banks?, 1-18.

Goddard, J., Molyneux, P. & Wilson, J. O. S. (2004). The profitability of European banks: a cross-sectional and dynamic panel analysis, Manchester School 72 (3), 363-381.

Gujarati, D. N. (2003). Basic econometrics. 4th edition. New York: McGraw Hill.

Guru, B. K., Staunton, J. & Shanmugam, B. (2002). Determinants of commercial bank profitability in Malaysia, University Multimedia Working Papers, 1-20.





Hassan, M. K. & Bashir, A. H. M. (2003). Determinants of Islamic banking profitability. Paper presented at the 10th ERF Annual Conference, Morocco, 16-18 December.

Holden, K. & El-Bannany, M. (2006). Investment in Information Technology Systems and Other Determinants of Bank Profitability in the UK. (http://www.clicktoconvert.com).

Jiang, G., Tang, N., Law, E. & Sze, A. (2003). Determinants of Bank Profitability in Hong Kong, Hong Kong Monetary Authority Research Memorandum, September.

Kennedy, P. (2008). A Guide to Econometric 6th edition, Malden, Massachusetts: Blackwell Publishing.

Kosmidou, K. (2008). The determinants of banks' profits in Greece during the period of EU financial integration. Managerial Finance 34(3), 146-159.

Kosmidou, K., Pasiouras, F., Doumpos, M. & Zopounidis, C. (2006). Assessing Performance Factors in the UK Banking Sector: A Multicriteria Approach, Central European Journal of Operations Research, 14(1), 25-44.

Naceur, S. B. (2003). The Determinants of the Tunisian Banking Industry Profitability: Panel Evidence, Universite Libre de Tunis Working Papers.

Naceur, S.B., & Goaied, M. (2008). The determinants of commercial bank interest margin and profitability: Evidence from Tunisia, Frontiers in Finance and Economics 5(1), 106-130.

Olson, D. & Zoubi, T. A. (2008). Efficiency and Bank Profitability in MENA Countries, School of Business and Management, American University of Sharjah, Sharjah, UAE.

Pasiouras, F. & Kosmidou, K. (2007). Factors influencing the profitability of domestic and foreign commercial banks in the EU, Research in International Business and Finance 21(2), 222-237.

Ramlall, I. (2009). Bank-Specific, Industry-Specific and Macroeconomic Determinants of Profitability in Taiwanese Banking System: Under Panel Data Estimation, International Research Journal of Finance and Economics 34, 160-167.

Rumler, F. & Waschiczek, W. (2010). The Impact of Economic Factors on Bank Profits, Monetary Policy & The Economy Q4/10, 49-67.

Staikouras, C. & Wood, G. (2003). The determinants of bank profitability in Europe. Paper presented at the European Applied Business Research Conference, Venice, 9-13 June, 57-67. Sufian, F. & Habibullah, M. S. (2009). Determinants of bank profitability in a developing economy: Empirical evidence from Bangladesh, Journal of Business Economics and Management, 10(3), 207-217.

Valverde, S. & Fernandez, F. (2007). The determinants of bank margins in European banking. Journal of Banking and Finance 31(7), 2043-2063.

Vong, L. K. (2005). Loans and Profitability of Banks in Macao, AMCM Quarterly Bulletin, 15, 91-107.





ISLAMIC BANKING AND ECONOMIC GROWTH: AN EMPIRICAL EVIDENCE FROM QATAR

Mosab I. Tabash1*, Raj S. Dhankar2

^{1,2}Faculty of Management Studies, University of Delhi, Delhi, India *mosubtab@gmail.com

Abstract

This paper examines empirically the relationship between the development of Islamic finance system and economic growth in Qatar. Using econometric analysis, annually time-series data of economic growth and Islamic banks' financing from 1990 to 2008 were used. We use Islamic banks' financing funds given by Islamic banks to private sector through modes of financing as a proxy for the development of Islamic finance system and Gross Domestic Product, Gross Fixed Capital Formation and Foreign Direct Investment inflow as proxies for real economic growth. For the analysis, the unit root test, cointegration test and Granger causality tests were done. The empirical results generally signify that in the long run, Islamic banks' financing is positive and significantly correlated with economic growth in Qatar. This reinforces the idea that a well-functioning banking system promotes economic growth. Furthermore, the results show that Islamic banks' financing has contributed to the increase of investment and in attracting FDI in the long term and in a positive way. The results obtained from Granger causality test reveals a positive and statistically significant relationship between economic growth and Islamic bank's financing in the long run. The relationship, however, is neither Schumpeter's supply-leading nor Robinson's demand-following. It appears to be a bidirectional relationship. However, the results indicate that a causal relationship happens only in one direction, i.e. from Islamic banks' financing to Foreign Direct Investment and Gross Fixed Capital Formation. It means Islamic banking attracts Foreign Direct Investment into the country. We conclude that government of Qatar should give more attention on Islamic finance to attract more investments. The findings of research will be of interest to western and Islamic finance practitioners, policy makers and academicians, who are interested in Islamic finance industry.

Keywords

Islamic finance; Economic growth; Causality; Qatar.

INTRODUCTION

With global markets suffering from extreme turbulence in the wake of the credit crunch and subsequent banking crisis, it is the time to examine the merits of an alternative banking model which adopts a different attitude to risk and finance, based on the principles of Shariah¹. Islamic Banking had grown substantially in the decade. The recent financial shocks and volatility will provide a good opportunity for the sector as Non-Muslim bank customers opt for the relative safety of institutions based on the principles of Islam. Islamic banking and finance is well and truly established as one of the world's fastest-growing economic sectors. Islamic banks provide a variety of products, including: Murabaha, Ijara, Mudaraba, Musharaka, Al Salam and Istitsna'a, restricted and unrestricted investment accounts, syndications and other structures.

Islamic finance essentially promotes financial transactions with links to the real economy and abstains from financing activities that are detrimental to society. It supports financial inclusion by offering instruments suited to different socioeconomic groups. Apart from Islamic banking that meets the normal retail needs of consumers (e.g. mortgage and automobile financing, savings accounts), it also serves small and medium-sized enterprises. Moreover, there are institutions that help improve the livelihoods of low-income groups by offering Shariah-compliant microfinance products based on profit-sharing.

Islamic finance is ultimately founded on the principle of partnership and cooperation, which calls for a system of equity participation and risk-sharing. Such a system should promote equal distribution of risk and cooperation between the providers of funds (investors) and the users of funds (entrepreneurs). Islamic finance is community-oriented and entrepreneur-friendly, emphasizing productivity and the physical expansion of economic production and services. Hence, it shifts the overall focus from financial collateral or the financial worth of a borrower (the current predominant practice) to the entrepreneur's trustworthiness and the project's viability and usefulness. This feature has important implications for the distribution of credit risk as well as systemic stability. Islamic finance, therefore, falls under ethical finance. Both are concerned with the impact of financial decisions on society and attract ethically-sensitive investors.

The 2008 financial crisis led to difficulties in many conventional banks across the globe. Islamic banks, in contrast, were largely insulated from the crisis their highly regulated operational environment guided by Shariah principles prohibited investment in the type of instruments which adversely affected conventional banks and which prompted the crisis. The impressive growth rate of Islamic finance and its

¹"The Path", term of Islamic law consists of Islamic instructions based on the Holy Quran and Sunnah.





stability during financial crisis attracts the attention of many policy makers and financial experts worldwide.

Islamic finance will grow with rapid pace in the year 2014 and its volume will pass through US \$ 2 trillion where Islamic banking keeps 78%, Sukuk 16%, Takaful 1%, Islamic Funds 4% and Islamic Microfinance has 1% share in the Islamic Finance industry. In 2014, Dubai and London will be in competition to be the global hub of Islamic Banking and Finance, while Kuala Lumpur will also attempt to be in this contest but the Islamic finance industry can be grown more through synergizing approach and alliance with industry stakeholders rather than setting any competition.

These views were expressed by Islamic Finance expert, Mr. Muhammad Zubair Mughal, CEO - Al-Huda Centre of Islamic Banking and Economics (CIBE) during an analysis on Islamic finance industry in the beginning of 2014. He said that the Islamic finance industry growth will go on double digit in 2014, which will turn the US \$ 1.6 trillion volume of Islamic finance industry in December 2013 to US \$ 2 trillion by the end of 2014 including North African countries (Tunisia, Libya, Morocco, Senegal and Mauritania etc.), rising trends of Islamic finance in Europe and UK, also the rising and substantial share of international market of Sukuk shall contribute to it. It is anticipated that India and China may step towards the Islamic finance in 2014 where more than 200 million Muslim populations are in search of a compatible financial system with their religious beliefs and thoughts. He said there is no doubt that international financial crisis will not hit the Islamic finance industry but due to the Arab Spring, Islamic finance industry has faced recession in some countries of MENA but there are chances of their revival in 2014 (Zawya report, 2014).



FIG.1 ISLAMIC FINANCE ASSETS, 2000-2011 (Deutsche Bank, 2011)

Despite the financial crisis, which has plagued the economies of both industrialized and developing nations, the Islamic finance industry has been flourishing, and has enjoyed 29% growth in assets to reach more than US \$ 600 billion in 2008 (Figure 1).

Despite there are many studies examining the relationship between conventional finance and economic growth, the studies that examine the relationship between Islamic finance and economic growth are not too many. The present study tries to asses empirically the relationship between the development of Islamic finance system and economic growth in the case of Qatar.

The paper is organized as follows. Section one gives a general introduction about the current stage of Islamic finance. Section two presents the growth of Islamic finance in Qatar. Section three explains the research problem, Importance and questions. Section four illustrates the methodology of the research. Section five includes the literature review on the relationship between Finance and economic growth, and in particularly Islamic finance and economic growth. Section six explores the results and the analysis of the paper. Finally, section seven gives the conclusions of the paper.

ISLAMIC BANKING IN QATAR

Qatar has the highest GDP per capita in the world as of 2012, according to the World Fact book (CIA report, 2012). The economic growth of Qatar has been almost exclusively based on its petroleum and natural gas industries, which began in 1940². The banking sector in Qatar benefited from rapid economic growth. As a result, Islamic banks posted strong results over the past few years. During the period expanding from 1990 till 2008, combined assets of full-fledged Islamic banks of Qatar including Qatar Islamic Banks, Qatar International Islamic Bank, Qatar Islamic Bank, Masraf Al Rayan and First Finance Company, generated a impressive increase from less than US \$ 1,000 million in 1990 to more than US \$ 30,000 million in 2008, with a cumulative increase up to 0.98% (Figure 2).

The Banking industry in Qatar consists of 11 local banks registered with the central bank and 1 foreign bank with branches in Qatar. Under the list of local banks, there are 4 Islamic banks fully operating under Shariah principles, 3 conventional banks with Islamic windows and 1 conventional bank with no Islamic banking operations. Despite the fact that the Qatari banking sector is one of the smallest in the GCC in terms of total assets, loans and deposits, it achieved significant growth over the past years. On the whole, Qatari banks are enjoying stellar financial performance, adequate capitalization, as well as good asset quality. Besides that, banks enjoy government support, which is continuously working on regulating and improving the efficiency of the financial services sector (Blominvest report, 2011). Over the last

²This information can be reached through the website www.onlineqatar.com/info/tourist-info.aspx





years, financial performance has been supported by fast increasing volumes, despite pressure on net margins, due to mounting price competition. Some leading players have started to diversify geographically to gain scale. At the end of 2001, only three Qatari banks operated in full compliance with Shariah principles, namely Qatar Islamic Bank, Qatar International Islamic Bank and Masraf Al Rayan. However, since the change in QCB regulation on Islamic windows in 2001, some conventional Qatari banks created Islamic subsidiaries or branches.



FIG 2. ISLAMIC BANKS' ASSETS IN QATAR, 1990-2008

This is notably the case for the three leading banks: Qatar National Bank (QNB), Commercial Bank of Qatar (CBQ), and Doha Bank (DB). Shariah-compliant assets, offered by both fully Islamic banks and Shariah-compliant windows (or branches) of conventional banks, experienced strong growth of more than 91% in 2006. This trend is likely to continue as banks see Islamic banking as an opportunity to attract new clientele. Islamic banking assets in Qatar witnessed a strong growth over the last couple of years, mainly driven by robust economic growth, increased demand for Shariah-based products and government willingness to promote the Islamic banking industry.

Many underway projects, including petrochemical, housing and construction projects are demanding Shariah-based products and this is likely to act as a future driver for Islamic banking. Qatar Islamic Bank (QIB) is the largest Islamic Bank in the country, accounting for 8.1% of the total lending market share. The bank has international presence in collaboration with the Arab Finance House in Lebanon, the Asian Finance Bank in Malaysia and Durat Al Doha in the Cayman Islands. The bank is seeking opportunities in Egypt, Turkey and Kazakhstan for potential

expansion of its Shariah-compliant banking operations. The product portfolio in the industry includes Murabaha, Ijara, Istisna, and Mudaraba. During the period expanding from 1990 till 2008, Islamic banks' financing of all full- fledged Islamic banks of Qatar generated an impressive increase from less than US \$ 110 million in 1990, to more than, US \$ 21,313 million in 2008 with a cumulative increase up to 91.60 % due to the support of the government and centeral bank for the Islamic finance industry as shown in Figure 3.



FIG 3. ISLAMIC BANKS FINANCING GROWTH IN QATAR, 1990-2008

Shariah-compliant assets, offered by both fully Islamic banks and Shariah-compliant windows (or branches) of conventional banks, experienced a strong growth of more than 91% in 2006 (Blominvest report, 2011). This trend is likely to continue as banks see Islamic banking as an opportunity to attract new clients.

The Islamic Banking industry in Qatar has a great potential for growth backed by a booming economy, new line of projects and people's increasing acceptance of Shariah-based products. Compared to Saudi Arabia and Kuwait, Islamic banking in Qatar still claims a small share in the total banking assets. With the increased awareness, the Islamic banking industry in Qatar is expected to grow well in the near future.

RESEARCH PROBLEM, QUESTIONS AND IMPORTANCE

It is clear that Islamic financial development sector plays an important role in the overall development of an economy. Although, there are many empirical studies that examined the relationship between finance and economic growth, but specific empirical studies on the relationship between Islamic finance and economic growth, are not too many. To help in filling this gap in literature, this study tries to examine empirically the relationship between Islamic finance and economic growth, and its





direction in Qatar. Further, the study gives an answer to the following research questions.

- 1. Does Islamic financial development have a significant relationship with economic growth in the long-term in Qatar?
- 2. Does Islamic financial development lead to economic growth in Qatar?
- 3. Does economic growth lead to Islamic financial development in Qatar?

The importance of this study emanates from the fact that it addresses an important sector in the World economy and particularly in Middle East economies, namely the Islamic finance industry. It touches everyone in the society, and has a great effect on any economy positively or negatively. Muslims represent about a quarter of the world's population, and there is greater awareness of and demand for Islamic-based financial products by Muslim and Non-Muslim consumers.

RESEARCH METHODOLOGY

The qualitative and quantitative methods have been used. The data set is extracted from Word Trade organization, Global Development Finance and Islamic Banks and Financial Institutions Information (IBIS) database for all Islamic banks' financing in Qatar³. To serve our purpose, appropriate variables were established and the long term relationships between those variables are determined by using econometric estimation methods. We use annually time series data from 1990 to 2008 for the variables.

To serve our purpose, appropriate variables were established and the long term relationships between those variables are determined by using econometric estimation methods. We use annually time series data for the variables - Islamic banks' financing through modes of financing as a proxy for financial sector and two variables representing real economic sectors: the Real Gross Domestic Product (GDP) and the Gross Fixed Capital Formation (GFCF), and Foreign Dircet Investment (FDI) as proxies for economic growth. GDP is a common statistic to represent the income level of a particular country within a certain time range. Study about finance-growth nexus always uses GDP as the principal variable reflecting economic growth. We use the GFCF as a representation of investment, as it is economic indicators of the level of business activity that measure net new investment by enterprise in the domestic economy in fixed capital assets during an accounting period. FDI is a common

³The Islamic Banks and Financial Institutions Information (IBIS) database is built to help researchers and finance professionals working in the area of Islamic economics and finance. It seeks to provide comprehensive data and information on the activities of Islamic finance institutions, up-to-date research and literature. It can be reached through the website http://www.ibisonline.net/ IBISHomepage.aspx

measure of the economic growth. It promotes economic growth in a capital scarce economy by increasing volume, as well as efficiency of physical investment. In other words, FDI supplies long-term capital with new technologies, managerial skills, and marketing capabilities which, in turn, increase economic growth by creating employment, increasing managerial skills, diffusing technologies and fostering innovations (Asiedu, 2002).

The first step of the study is to determine the relationship between the financial deepening and economic growth, and whether the series are stationary or not. In the model, for a correct evaluation, time series should be separated from all effects, and the series should be stationary. Thus, logarithms of time series were taken. Augmented Dickey-Fuller (ADF)(1981) and Phillips-Perron (PP)(1988) tests are used. After that, Johansen co-integration test was used to examine the long-term relationship between financial deepening and economic growth. And then, the Granger causality test is used to test the causality between Islamic bank financing and economic growth. We use Eviews⁴ software to test and analyze the results.

LITERATURE REVIEW

The nexus between, and the importance of financial development towards economic growth have received much attention in the literature of development economics. From the many research works carried out in this field, there are at least three types of causal relationships between financial development and economic growth that have been found:

- (1) Supply-leading;
- (2) Demand-following; and
- (3) Bi-directional causal relationships.

Supply-leading relationship is the creation of financial institutions and instruments in advance of demand for them in an effort to stimulate economic growth. Demandfollowing relationship, on the other hand, appears as a consequence of the development of the real sector. This implies a continuous widening of markets and a growing product differentiation which makes necessary more efficient risk diversifications as well as better control of transaction cost (Hermes & Lensink, 1996).

Out of the extensive research carried out in this field, there are no sufficient works conducted within the Islamic financial framework. The main objective of this chapter, therefore, is to narrow the gap in literature by examining the long-run relationship between Islamic financial development and economic growth, particularly in the context of Qatar, using econometric analysis.

⁴Eviews is a statistical and econometric software package, which provides data analysis, regression, and forecasting tools. It is produced by Quantitative Micro Software (QMS) in Irvine, California, USA.





Huang and Lin (2009) re-examined the dynamic relationship between financial development and economic growth on the dataset used in Levine et al. (2000). Using a novel threshold regression with the instrumental variables approach, they support a positive linkage between financial development and economic growth, and found that financial development has an important effect on growth in low-income countries.

Gries et al. (2009) have tested for the causality between financial deepening, trade openness, and economic development. This study focuses on 16 Sub-Saharan African countries, using 20 annual time series observations. For the purpose of establishing the causal relationships, the Granger Angel method, the Vector Auto-Regression (VAR), and the Vector Error Correction Model (VECM) were used. This study shows support for the hypothesis of finance-led growth. It, however, suggests that the adoption of a more balanced policy approach may reduce financial system deficiencies among the Sub-Saharan Countries.

Kar et al. (2011) focused on developing countries and also introduced new indicators of financial development with a view to establishing the causal relationship between financial development and economic growth. Using countries, which constitute the Middle East and North Africa (MENA) for the period 1980 to 2007, the study uses a simple linear model. This model defines economic growth as a function of financial development. Six new indicators of financial development was introduced and these include; the ratio of narrow money to income, ratio of broad money to income, ratio of quasi money to income, ratio of deposit money bank liabilities to income, ratio of domestic credit to income, and ratio of private sector credit to income. On the other hand, the real income was employed as a proxy for economic growth. The Granger Causality test was employed to establish the causal relationship between financial development and economic growth. The study concludes that the direction of causality is bi-directional, but it is country or financial development indicator specific. This study, however, suggests that a strong link may exist between financial development and the real sector.

Bangake and Eggoh (2011) also supported the view of an existing two-way directional causality between financial development and economic growth among developing countries. This study focuses on seventy-one countries, which included eighteen developing countries, for the period 1960 to 2004. The study carried out its empirical analysis using both the Panel Cointegration tests and the Panel cointegration estimation (i.e. Dynamic OLS and panel VECM approach). It establishes that both financial development and economic growth have influence on one another, but suggests that a long-run policy approach may prove beneficial among the developing countries.

Hassan et al. (2011) focused more on the low- and middle-income countries from 1980 to 2007. This study comprises 168 countries, which are classified by geographic regions, and uses the panel estimation techniques (i.e. the VAR models). The study came up with two important findings. These include; a strong long-run linkage between financial development and economic growth, and two-directional causality exist between financial development and economic growth among the Sub-Saharan African countries, the East Asian countries, and the Pacific countries. This study emphasized the need for the adoption of long-run policy measures among the developing countries.

Ibrahim (2012) has examined the impact of financial intermediation on economic growth in Nigeria. Time series data from 1970 to 2010 were used and were gathered from the CBN publications. For the analysis, the unit root test and cointegration test were done accordingly and the error correction model was estimated using the Engle-Granger technique. The growth rate of the real gross domestic product is used as a proxy for this variable. For financial intermediation, two indicators commonly used in the literature are used as proxy. These are the ratio of broad money supply (M2) to nominal gross domestic product (NGDP) and the ratio of domestic credit to the private sector (CPS) to the nominal gross domestic product (NDGP). While the former measures the capability of the banks to mobilize funds for investment purposes, the latter measures the financial opportunities available to firms, most especially new firms. The paper established that financial intermediation has a significant impact on economic growth in Nigeria.

With regard to the relationship between Islamic financial development and economic growth, Abduh and Omar (2012), Furqani and Mulyany (2009), and Majid and Kassim (2010) are among the limited studies in this area. Abduh and Omar (2012) identifies that the relationship is bi-directional. Therefore, the government policies in supporting the development of Islamic finance in Indonesia are strongly needed in order to support the economic development. However, using different time span of quarterly data, findings from Furqani and Mulyany (2009), and Majid and Kassim (2010) are different in terms of the direction of the relationship. Furqani and Mulyany (2009), on the one hand, states that the relationship between Islamic financial development and economic growth is following the view of "demand-following", which means that growth in real sector economy stimulates Islamic banking institutions to change and develop. On the contrary, finding from Majid and Kassim (2010) is in favour of the supply-leading view.

In this study, we examine the relationship between Islamic banking and economic growth in case of Qatar. This study has some advantages compared to other Islamic finance studies, for example, the data for all full-fledged-Islamic banks are used. More variables for economic growth are utilized and more data is collected, since time series data from 1990 to 2008 is used.





RESULTS AND DISCUSSIONS

Descriptive Statistics

Table 1 presents summary statistics about the variables used in the econometric analysis for Qatar. Figure 4, 5 and 6 show the relationship between GDP, GFCF, FDI, and Islamic banks' financing in the Qatar graphically.

TABLE 1. SUMMARY STATISTICS (US \$ MILLION)

Statistics	GDP	GFCF	FDI	IBF
Mean	26,081.03	10,169.18	1,003.988	2,189.131
Median	12,393.13	4,098.080	338.8100	861.0000
Maximum	111,019.8	43,369.10	4,100.000	21,313.00
Minimum	6,883.120	1,806.320	4.880000	0,110.0000
Std. Dev.	29,341.49	11,961.62	1,463.291	4,161.294
Observations	19	15	19	19

120000 -		
100000 -		
80000 -		
60000 -		← GDP ← IBF
40000 -		
20000 -		
0- 19	90 1992 1994 1996 1998 2000 2002 2004 2006 2008	

FIG 4. GDP AND IBF GROWTH, 1990-2008

From Table 1 and Figures 4, 5 and 6, one may observe that the maximum value for the IBFinancing in 2008 reached to (21,313.00) from (0,110.000) in 1990 with standard deviation of (4,161.294). This gives us an indication of high growth of the Islamic finance industry in the recent years. The statistics show that the median for GDP, GFCF, FDI, and IBFinancing is less than the mean, which indicates that the values are positively skewed.



FIG 6. FDI AND IBF GROWTH, 1990-2008

Unit Root Test

Results of ADF and PP Tests applied to time series show that all series belong to economic growth and financial deepening indicators are not stationary at level. To make that series stationary, first differences of series have been taken. Failure to reject the null hypothesis of unit roots implies that the linear combination of the variables is non-stationary; hence we cannot pursue for the cointegation tests.

The results of Table 2 indicate that the data at the first difference is stationary at α 1%, 5%, and 10% level of significance respectively. For GDP variable, if *p* value is less than α , then Ho is rejected, and the series is stationary. The first row shows that the *p* value (0.0011) is less than α (0.01) in ADF test. Similarly, for GFCF, the result from the second row shows that the *p* value (0.0369) is less than α (0.01) and for FDI, the *p* value (0.001) is less than α (0.01) in PP test and also, for IBFinancing, the *p* value (0.01) is less than α (0.01) in ADF test. This suggests that the null hypothesis is rejected for





all variables. Hence, the failure to reject the alternative hypothesis indicates that the series are stationary.

TABLE 2 LINIT DOOT TECT

	IADLE 2. UNIT ROOT TEST							
		AD	0F Test	Phillip-Person Test				
		Level 1	First difference	Level 1	First difference			
Country	Variable	t- statistic	t- statistic	t- statistic	t- statistic			
_		P value	P value	P value	P value			
	GDP	-2.008418	-4.889116**	-2.016949	-1.039912***			
		0.1618	0.0011	0.0011	0.0038			
Qatar	GFCF	-0.494621	-4.116133	-0.638820	-4.624110**			
		0.9690	0.0369	0.911	0.0149			
	FDI	-3.893924**	-1.901131**	-3.810923**	-1.904116**			
		0.0348	0.0010	0.0316	0.0010			
	IBFinancing	-2.3914	-4.1212**	-2.4421	-11.8241			
		0.3688	0.01	0.31	0.0001***			
*,**,*** Si	gnificant at 1%	*,**,*** Significant at 1%,1%,10% level of significance						

Johansen Co-integration Test

Table 3 shows the results of Johansson test for the long relationship between Islamic banks' financing and economic growth. The trace test rejects the null hypothesis if the trace statistics exceeds the critical value.

TABLE 3. JOHANSEN 5 TEST (TRACE STATISTIC)						
		Critical	values			
		Trace statistics	5%	1%		
GDP						
Null hypothesis	Ho: r = 0	23.61001**	15.41	20.04		
Alternative hypothesis	H1:r ≥ 1	4.991680**	3.16	6.61		
GFCF						
Null hypothesis	Ho: r = 0	19.11819*	15.41	20.04		
Alternative hypothesis	H1:r ≥ 1	1.181891	3.16	6.61		
FDI						
Null hypothesis	Ho: r = 0	18.01122*	15.41	20.04		
Alternative hypothesis	H1:r≥1	0.013164	3.16	6.61		
** Significant at 1% level						

TABLE 3. JOHANSEN'S TEST (TRACE STATISTIC)

The first row of Table 3 shows that the trace statistics (23.61001) exceeds the critical value of (15.41) at 91 percent confidence level for GDP and the trace statistics (19.11819) exceeds the critical value of (15.41) at 95 percent confidence level for GFCF. Similarly, for FDI, the trace statistics (18.01122) exceeds the critical value of (15.41) at 95 percent confidence level. It suggests that the null hypothesis of no cointegrating relationships is rejected. The results confirm that there is a cointegrating relationship among the variables.

The eigenvalue test tests the null hypothesis of r versus r+1 cointegrating relationships. This test rejects the null hypothesis if the eigenvalue test statistics exceeds the respective critical value. Table 4 presents the results from this test. Similarly, the result from the first row of Table 4 shows that the eigenvalue test statistics (18.61839) exceeds the critical value (14.01) at 95% confidence level for GDP and the eigenvalue test statistics (18.31089) exceeds the critical value of (14.01) at 95% confidence level for GFCF. Similarly, for FDI, the eigenvalue test statistics (18.00141) exceeds the critical value of (14.01) at 95% confidence level. This suggests that the null hypothesis is rejected. Hence, the failure to reject the alternative hypothesis indicates that there is one cointegrating relationship among the variables.

	Max-	Critical values			
		Eigenvalue	5%	1%	
GDP					
Null hypothesis	Ho: r = 0	18.61839**	14.01	18.63	
Alternative hypothesis	H1:r = 1	4.991680**	3.16	6.61	
GFCF					
Null hypothesis	Ho: r = 0	18.31089	14.01	18.63	
Alternative hypothesis	H1:r≥1	1.181891	3.16	6.61	
FDI					
Null hypothesis	Ho: r = 0	18.00141*	14.01	18.63	
Alternative hypothesis	H1:r ≥ 1	0.013164	3.16	6.61	
** Significant at 1% level					

TABLE 4. JOHANSEN'S TEST (MAX-EIGENVALUE STATISTIC)

The results from Table 3 and 4, if read together, show that the null hypotheses of non-cointegation are rejected at 1% level of significance. This suggests that in the long run Islamic banks' financing contributes in the growth of GDP and investment of Qatar. It is clear from Table 4 that there is a long term relationship between Islamic Banks financing and foreign direct investment in Qatar.

Granger Causality Test

Statistics and probability values constructed under the null hypothesis of noncausality are reported in Table 5. It can be observed that there is a causal relationship between Islamic banks financing and GDP. However, our results show that two-way causality exists from Islamic banks' financing to economic growth and from GDP towards Islamic Banks' financing; since the probability values 0.01931 and 0.03306 are less than 0.01. So, the null hypothesis is rejected, and it can be concluded that the higher flow of Islamic finance has led to the growth of the economy. At the same time, the development of the real sector economy stimulates Islamic banking institutions to change and develop.

Furthermore, the results show there is a unidirectional causality between Islamic banks' financing and investment since it is significant at 1% level, as (0.04094) less





than (0.01). Thus, Islamic banks' financing granger causes the development of real economic growth in Qatar. The causality between Islamic banks' financing and FDI is also a unidirectional since it is significant at 1% level, as 0.01661 less than (0.01) for two variables respectively.

Null Hypothesis	F statistics	Probability
IBF does not Granger Cause GDP	1.11321	0.01931**
GDP does not Granger Cause IBF	4.13842	0.03306**
IBF does not Granger Cause GFCF	1.31921	0.04094*
GFCF does not Granger Cause IBF	1.22686	0.29161
IBF does not Granger Cause FDI	1.26112	0.01661**
FDI does not Granger Cause IBF	1.06169	0.31916
***** Significant at 5, 10% level of significance		

TABLE 5. PAIR WISE GRANGER CAUSALITY TESTS

CONCLUSION

This paper makes an attempt to examine the relationship between the development of Islamic finance and economic growth in the long-term in Qatar using econometric analysis. We analyzed empirically the relationship between Islamic banks' financing and economic growth. Data for all variables are stationary after first difference. Therefore, the Johansen's co-integration technique has been applied. The cointegration results provide evidence of a unique cointegrating vector. In other words, there is a long-term stable relationship between Islamic banks' financing and economic growth in case of Qatar. That means Islamic banks' financing and economic growth move together in the long-run.

We also find that the causality relation exist in a bi-directional relationship from Islamic banks' financing to economic growth and vice versa. Our results also indicate that improvement of the Islamic financial institutions in the Qatar will benefit from economic development, and it is important in the long run for the economic welfare, and also for poverty reduction. Furthermore, the results from causality tests shows that there is a causality relation exist from the IBfinancing to investment and FDI of Qatar. The results presents that Islamic finance is a suitable environment for attracting FDI into the country and FDI reinforces Islamic finance. The results of study are quite significant as it is one of the pioneering studies of Islamic finance.

REFERENCES

Abduh, M. & Omar, M. (2012). Islamic banking and economic growth: the Indonesian experience, International Journal of Islamic and Middle Eastern Finance and Management, 5(1), 35-47.

Asiedu, E. (2002). On the determinants of foreign direct investment developing counties: Is Africa different? World Development, 30(1), 107-119.

Bangake, C. & Eggoh, J. (2011). Further Evidence on Finance-Growth Causality: A Panel Data Analysis, Economic Modeling, 35(2) 176-188.

Blominvest report. (2011). Islamic banking in MENA region', Economic Research Department project, Feb. Available at: http://www.blominvestbank.com/Library/Files/Islamic%20Banking.pdf (accessed 19 Oct. 2013).

Central Intelligence Agency (CIA) report, US, 2012, World fact book for Qatar, can be reached through the website, https://www.cia.gov/library/publications/the-world-factbook/geos/qa.html#Econ.

Deutsche Bank. (2011). Global Islamic Banking Report, November, London, UK.

Dickey, D. & Fuller, W. (1981). Likelihood Ratio Statistics for Auto-regressive Time Series with a Unit Root, Econometric journal, 49(4), 1017-1072.

Furqani, H. & Mulyany, R. (2009). Islamic Banking and Economic Growth: Empirical Evidence from Malaysia, Journal of Economic Cooperation, 30(2), 59-74.

Gries, T., Kraft, M. & Meierrieks, D. (2009). Linkages between Financial Deepening, Trade Openness, and Economic Development: Causality Evidence from Sub-Saharan Africa, World Development, 37(12), 1849-1860.

Hassan, K., Sanchez, B., & Yu, J., (2011). Financial development and economic growth: new evidence from panel data, The Quarterly Review of Economics and Finance, 51, 88-104.

Hermes, N. & Lensink, R. (1996). Financial Development and Economic Growth: Theory and Experiences from Developing Countries, Routledge, New York, NY.

Huang, H. & Shu-Chin, Lin. (2009). Non-Linear Finance-Growth Nexus: A threshold with Instrumental Variable Approach, Economics of Transition, 17(3), 439-466.

Huang, H. & Shu-Chin, Lin. (2009). Non-Linear Finance-Growth Nexus: A threshold with Instrumental Variable Approach, Economics of Transition, 17(3), 439-466.

Ibrahim, A. (2012). Financial Intermediation and Economic Growth in Nigeria, British Journal of Arts and Social Sciences, 4(2), 164-179.

Islamic banks and financial institutions database (http://www.ibisonline.net/IBIS Homepage.aspx).

Kar, M., Nazlioglu, S. & Agir, H. (2011). Financial Development and Economic Growth nexus in the MENA countries: Bootstrap Panel Granger Causality Analysis, Econometric Modelling, 28(1-2), 685-693.

Levine, R., Loayza, N. & Beck, T. (2000). Finance and the Sources of Growth, Journal of Financial Economics, 58, 261-300.



Journal of Applied Economics and Business



Majid, S. A. & Kassim, S. (2010). Islamic finance and economic growth: The Malaysian experience, In: Kuala Lumpur Islamic Finance Forum, Kuala Lumpur, 2-5 August.

Phillips, P. (1988). Time Series Regression with a Unit Root, Econometrical journal, 11, 277-301.

Zawya report, (2014). http://www.zawya.com/story/2014_will_be_promising_for_ Islamic_Finance_Industry-ZAWYA20131231113149/.





MODELING FINANCIAL STABILITY: THE CASE OF THE BANKING SECTOR IN MACEDONIA

Jasmina Popovska

Fund for innovations and technology development Skopje, Macedonia popovska_jasmina@yahoo.com

Abstract

The global financial crisis from 2007-2009 has additionally emphasized the necessity of paying special attention to the financial system stability, especially to the stability of banking system. In Macedonia, the effects of the crisis were felt during 2008-2009, and the National Bank of the Republic of Macedonia (NBRM) has immediately undertaken several measures in order to increase the banking sector stability. However, there is a need for an aggregate indicator to follow the banking sector development that will give an overall image of the banking sector condition. In this paper, a simple index of financial stability of the Macedonian banking sector is constructed, that will adequately reflect the effects of the crisis in 2008-2009. The index is based on the main financial stability determinants by CAMELS, using a selection method for the most representative financial indicators. Furthermore, the index will be compared with two other similar aggregate measures of financial or banks stability in order to test its performance.

Key words

Financial stability; Index; Banking; Aggregate indicator.

INTRODUCTION

The global economic crises that began with the mortgage market boom in the U.S. in the second half of 2007 and that amplified in 2008-2009 spreading in the other developed European countries, has been followed by shocks on the global financial system with the size unseen since the Great Depression. The developing countries, including Macedonia, felt more intensely the effects of the crises by the end of 2008 and the beginning of 2009. The security and stability of the financial system, especially of the banking sector, as its foundation, has attracted even more the public attention due to the difficulties, which the global markets faced during the crisis. In general, the regulation of the banking sector has been strengthened, after seeing it as inefficient enough to diagnose crises emerging in such scale, nor preventing the collapse of several major banks, which spilled over from the banking sector into the other sectors of the economy.

Composite indices comprised of banks' financial indicators (especially those published by the International Monetary Fund - IMF) are increasingly used as a basis for assessment of the stability of the financial system and the banking sector. Regulators mostly use financial indicators based on the CAMELS rating for ranking individual banks by their financial soundness and risk level. Furthermore, they calculate aggregate financial indicators for the overall banking sector to estimate its main risks and financial soundness level. There are numerous studies on financial stability that rely on the basic assumptions of CAMELS, which emphasize the importance of this method and its practical use, though there are, also, some studies that try to discredit its usefulness. Despite numerous controversies, this method still has a significant role in practice, especially in the central banks and international institutions, and its use is unavoidable in the assessment of the financial stability of individual banks and the banking system as a whole.

Although the effects of the crises were not as severe in Macedonia as they were in the developed countries, still the banking system showed signs of deceleration in its activities and weaknesses of the financial indicators. The regulator of the banking sector (NBRM) in order to supervise the financial stability calculates quarterly aggregate financial indicators for the banking system, including the basic groups of indicators given by CAMELS. However, there is a lack of publicly available aggregate measure (indicator, index) for the overall banking system that could be used in assessing financial stability and even building a model for prediction of future financial crisis.

This paper attempts to introduce additional elements in the analysis of the financial stability and to provide a potential tool for monitoring the banking sector, such as the index of financial stability of the banking sector to the affected stakeholders (regulators, investors, debtors, savers, public and private sector, etc.). Furthermore, the purpose of this paper is to estimate the index and to examine its ability to fully capture the performance and the state of the banking sector, as well as the impact of the separate factors in the model. The index will include the most representative financial indicators for financial stability of the banking sector chosen by the statistical method "principle component analysis". Furthermore, the index will be compared with two other similar aggregate measures of financial or banks stability in order to test its performance.

FINANCIAL STABILITY

In theory, there are numerous definitions of "financial stability", which have constantly been reviewed and adapted in accordance with the new conditions, especially after each of the major financial crises in 1980's and 1990's, as well as the





crisis from 2007-2009. However, the most encompassing definition is given by the ECB, which defines financial stability as a condition in which the financial system is capable of withstanding shocks, thereby reducing the likelihood of disruptions in the financial intermediation process, which are severe enough to significantly impair the allocation of savings to profitable investment opportunities (ECB, 2013). Therefore, financial stability is considered as a state of the financial system, which is closely associated with the risks reduction to minimum level and shocks resistance.

The Czech National Bank defines "financial stability as a situation where the financial system operates with no serious failures or undesirable impacts on the present and future development of the economy as a whole, while showing a high degree of resilience to shocks". Financial stability may be disturbed both by processes inside the financial sector leading to the emergence of weak spots, and by strong shocks. Such shocks may arise, among other things, from the external environment, domestic macroeconomic developments, and the position of the main debtors and creditors of financial institutions, economic policies or changes in the institutional environment. Any interaction between weak spots and shocks can result in the collapse of major financial institutions and disruption of the functions of the financial system as regards financial intermediation and payments. In the extreme case, it may even lead to a financial crisis with adverse implications for the economy (CNB, 2013).

Domestic macroeconomic environment, international environment (external influences and spillovers) and the situation of the banking sector are typically considered as major determinants of the financial stability. The identification of most important determinants of financial stability is also affected by financial crises, which revise the existing determinants and usually change the perception of their impact respectively to the causes of the survived crisis, often changing the complete structure of the determinants. The financial crisis of 2007-2009 was a result of the mortgage and real estate markets inefficiencies, and spilled over to the other institutions, markets and economies, affecting mostly the less liquid institutions. Adopting Basel III and its recommendations is related to establishment of regulation in liquidity risk management and improvement of capital adequacy.

Financial stability in the developed economies is mainly determined by the condition of non-banking financial institutions (investment funds, pension funds, private equity funds, brokerage houses etc.). However, in developing countries where stock exchanges, investment funds, pension funds and insurance companies are underdeveloped, and where investments rely on the traditional bank loans, banks are the main pillar of financial stability and overall stability of the economy. The banking sector has the main role and significant impact on the macroeconomic conditions. The importance of banks in the economy is proved by the recent financial crisis, which began partly because of the irresponsible bank management, investments in high-risk financial instruments, "adjustment" in financial reports and bonuses, when the regulation was loosened and there was lack of strict internal and external control, which is adequate to the financial innovations in banking. Many authors emphasize the importance of the banking system and its crucial role in economic growth (Levine, 1997 and 1998; Levine et al, 2000).

Considering the significant role of the banking sector for monetary and financial stability of the economy, the regulatory bodies, primarily the central banks and the international financial institutions, constantly follow its stability through identification and connection of the determinants and indicators of financial stability. The indicators of financial stability established by the IMF, which are applied by central banks on national level, are mostly in aggregate form for the entire banking system and are defined as macro prudential indicators. "These macroprudential indicators comprise both aggregated microprudential indicators of the health of individual financial institutions, and macroeconomic variables associated with financial system soundness. Aggregate microprudential indicators are primarily contemporaneous or lagging indicators of soundness; macroeconomic variables can signal imbalances that affect financial systems and are, therefore, leading indicators. Financial crises usually occur when both types of indicators point to vulnerabilities, that is, when financial institutions are weak and face macroeconomic shock. The ability to monitor financial soundness presupposes the existence of indicators that can be used as a basis for analyzing the current health and stability of the financial system. Indicators of the current health of the financial system are primarily derived by aggregating indicators of the health of individual financial institution. One commonly used framework for analyzing the health of individual institutions is the so-called CAMELS framework, which involves the analysis of six groups of indicators reflecting the health of financial institutions" (Evans et al, 2000). The CAMELS framework groups these indicators in six groups: capital adequacy, assets quality, management quality (performance), profitability, liquidity and interest rates and market sensitivity.

Some central banks in order to estimate the condition of the banking sector at a given moment, as well for a historical comparison between different periods, or comparison with other economies, develop aggregate indicator or model that encompasses all the determinants of financial stability in only one indicator. This is the case with the financial stress indices of Canada and Switzerland and the financial stability index of the Netherlands, which despite microprudential indicators include also macroeconomic variables in the model. However, where there is an obvious dominance of banking sector in the financial sector and underdeveloped other





components of financial sector, such as capital market, private equity funds, pension funds and insurance companies, the microprudential indicators defined by the IMF are dominating. This is the case with the Romanian, Czech, Turkish, Albanian and Serbian indices.

FINANCIAL STABILITY IN MACEDONIA

Banks have a central role in the financial sector of Macedonia, too. Macedonian financial sector is characterized by a simple structure where the banking system is the most significant segment and the role of the non-deposit financial institutions is still small, while the share of the saving institutions is only 0.8% of the total asset of the banking system (NBRM, 2012).

EBRD (2010) pays special attention to the global financial crisis and its effects on transition economies, including Macedonia. Considering the macrofinancial vulnerability of most European developing countries and the size of the shock, it was expected that it would spill over quickly in transition countries. However, the crisis in the transition economies, including Macedonia, carries out in three phases: March 2008, December 2008 and March 2009. In March 2008, the signs of the crisis were obvious in some of transition economies, by the end of 2008 all transition economies felt the effects of the crisis to some extent, and in the first quarter of 2009 the crisis had already spread.

NBRM maintains the financial stability through monitoring and control of financial institutions and the entire financial system according to the CAMELS framework, calculation and monitoring of the financial stability indicators generally set by the IMF, stress-testing as a tool for foreseeing the potential weaknesses of the financial system and risk estimation, monitoring of the macroeconomic variables and the impact of the environment on the financial system. These studies and analysis are presented in two publicly available reports published by NBRM, the quarterly Report on the banking system and the annual Report on the financial stability. Both reports for 2011 and 2012 emphasize the central role of banks in the Macedonian financial sector and pay special attention to the risks in banking, such as credit risk, liquidity risk, foreign currency risk, interest rate risk and insolvency risk. Credit risk is the most significant risk whose careful monitoring is necessary in order to maintain the financial stability in Macedonia after the financial crisis. There is a decrease in the asset quality of the banks measured through the share of nonperforming loans in the total loans. This is mostly due to the reduction of the economic activity and deteriorating results of enterprises, which do not have the capacity to service regularly their liabilities to banks. However, the share of nonperforming loans is under average regarding the other countries in the region and
the results of the stress test simulations show resilience of the banking system to the simulated shocks. In addition, according to the NBRM Report for 2012, the liquidity risk is within acceptable parameters and liquidity assets grew in 2012, partly as result of the measures taken by NBRM and also as caution measures undertaken by banks management. In 2012, the comparison between financial stability indicators of the Macedonian banking sector and the banking sector of other 24 countries, including developed European countries and countries from the region, showed that the Macedonian banking system was among those with highest indices of stability. When compared by the capital adequacy ratio, Macedonian banking sector is in the upper part of the list of 18 analyzed countries. It can be concluded, by the EBRD and NBRM reports, that the Macedonian banking sector has been stable during and after the recent financial crisis. There have been difficulties in the private sector that affected the banking sector in the peak of the crisis (end of 2008 - beginning of 2009) that resulted in non-performing loans growth and higher credit risk. However, the undertaken measures from NBRM and the individual banks have maintained the banking sector stability and the risks within acceptable limits (EBRD, 2010 and 2013; NBRM, 2012 and 2013).

FINANCIAL STABILITY INDICES

The constructed index in this paper is based on similar methodologies used extracted from the literature on financial stability and financial stress. However the methodology is adapted to the local economic conditions of Macedonia as an emerging country and furthermore it is connected to the theoretical CAMELS rating. Usually the consulted work of the other authors encompassed usage of independent variables that are considered relevant for the assessment of the stability and vulnerability of the financial sector. The core function of these indices was historical comparison, and for some even comparison between separate economies.

Illing and Liu (2003) have created an index of financial stress for Canada aiming to provide a quantitative score for the macroeconomic financial stress. They included measures for the possible loss, risk and insecurity of banking, foreign exchange rates, and debt and capital market. Similarly, Hanschel and Monnin (2005) have created an index for financial stress for Switzerland. This index measures the level of stress of the banking sector in a given moment. In addition, Van den End (2006) creates an index for the financial stability for the Netherlands including the interest rates, foreign exchange rates, real estate prices and indices of financial institutions' stocks. These indices are used as indicators for stress and crises prediction, and not only that contain microprudential indicators for the banking sector, but also macroeconomic indicators and indicators for the other financial markets.

However, due to the lack of developed stock exchange and to the predominance of the banking sector over the other financial sectors in the financial system in some





countries, these indices are mostly comprised of microprudential indicators defined by the IMF. Thus, Albulescu (2010) has developed aggregate index for stability of financial system in Romania, while Geršl and Hermánek (2006) calculate an aggregate indicator for financial stability in the Czech Republic, based on the indicators for financial stability of the IMF. The Central Bank of Turkey (2006), in its regular report on financial stability in 2005 introduced the index for financial stability, based on the CAMELS methodology. This aggregate index is based on the assumptions similar to the indices of financial stress for Canada and Switzerland. This index is calculated as an arithmetic mean of a set of six sub-indices. In 2011, the National Bank of Albania has calculated similar index retrograding from 2005 to 2011. The National Bank of Serbia (2011) calculates an aggregate indicator on financial stability in order to compare the state in banking systems and separated economies by the method of elimination and choice that are transmitting reality (ELECTRA MLO - ELimination Et Choix Traduisant la REalité). The benefit of such aggregate indices is greater in terms of a national economy for monitoring the conditions of the banking sector continuously and for historical comparison. Their usage for comparing separate and individual economies is less effective due to differences in accounting policies and the lack of standardization.

Evans et al, (2000) emphasize the meaning of financial (quantitative) indicators in the evaluation and monitoring of the financial stability of individual financial institutions and the system as a whole, as well as the prediction of future movement and actions. They define macroprudential indicators that contain two sets of indicators: macroeconomic variables related with the stability of the financial system and aggregate microprudential indicators that summarize the financial reports' data of individual financial institutions. They believe that financial crises appear when the two sets of indicators show vulnerability i.e. weakness of the financial institutions in conditions of macroeconomic shocks. These indicators are not themselves enough for general overall assessment of the stability of the financial system, because part of the factors that influence on them are immeasurable i.e. cannot be easily quantified (institutional, law and regulation framework, the structure of the financial system and markets, accounting standards, rules for classification of loans, reservations and recognized outcome, etc.). Macroprudential indicators should be interpreted apropos to the specific condition of each separate economy taking into account the conditions in which each financial system is functioning and the relevance of each of the indicators for a single economy. Therefore, such indicators usually could be used more for historical comparison within the framework of a single economy, rather than in comparison between different economies that might not have similar characteristics. Indicators are been used as the foundation in individual models of financial stability and risk

management. IMF has identified a set of indicators based on their long-term experience and knowledge gained through monitoring the financial sector, technical assistance and their program activities.

The aggregate microprudential indicators are based on the CAMELS framework, which includes analysis of six groups of indicators that reflect the financial health of the financial institutions, namely: capital adequacy, assets quality, management soundness, profitability, liquidity and sensitivity to market risk. These six areas are useful in the analysis of the various possible areas of vulnerability. The CAMEL rating model was created in 1970's by the US federal regulators in order to provide structured approach to the assessment of the banks. Later, this model was upgraded with a sensitivity component that encompasses banks' level of reaction on the changes in market risk and it was called CAMELS. The model has a wide range of usage by the international financial institutions but also by national central banks and individual financial institutions, in order to evaluate the financial state and risk exposure.

Similarly to other central banks, NBRM acknowledges the CAMELS approach using it for the classification of indicators that signal certain risks. Thus, NBRM regularly calculates the indicators for financial stability at the individual bank level when it evaluates their rating, but also at the level of the banking system as a whole. However, there is a lack of aggregate indicator or index for financial stability or banking sector stability that will encompass all determinants of financial stability and will be easier to follow by the relevant stakeholders in decision making, together with in-depth qualitative analysis.

METHODOLOGY

The research in this study is implemented through several methodological procedures:

- Descriptive statistics;
- Transformation of variables standardization;
- Analysis of the correlation matrix;
- Principle component analysis with oblique rotation;

- Checking the dimensions of financial stability by CAMELS with the results of the principle component analysis;

- Principle component analysis for each dimension separately in order to choose the most representative financial indicator;

- Construction of sub-indices for each individual dimension;

- Construction of an index for the stability of the banking sector – a composite variable as an average of the sums of sub-indices; and



Journal of Applied Economics and Business



- Comparison of the constructed index with two other measures of financial soundness: Shar's s-score and Boyd and De Nicolo's z-score.

SELECTION OF VARIABLES

In order to construct a simple index of financial stability in Macedonia, the most explanatory financial indicators are selected from a wide range of indicators usually used in the theory and practice in assessment of the financial condition of the banks and bank's risks. As a pragmatic solution, the financial indicators at the level of the whole banking sector, regularly published in NBRM's quarterly reports for financial stability for the period from 31.12.2005 to 31.12.2012 are taken into consideration as an initial base. Furthermore, only indicators that are relevant and important by the classification of CAMELS are selected. For example, indicators for the structure of liquidity and credit portfolio are considered as a second range and less important than the direct liquidity indicators (the share of high liquid assets in total bank assets) and credit quality (the share of non-functional loans in total loans). Additionally, those indicators whose information is already included in some other indicator as well as the indicators that have discontinued time series and contain less information for the CAMELS category are excluded from the analysis. According to CAMELS, indicators are classified as indicators for capital adequacy, quality assets, management quality, profitability, liquidity and market sensitivity. Considering that NBRM do not publish indicators for the quality and efficiency of the management, the choice of the indicators is made according to the theory and the studies in this area such as Chowdhury (2011). The variables are exclusively quantitative because of the attempt of the study to result with a quantitative index. In sum, there are 21 financial indicators used in the initial analysis of this paper (see Annex 1).

The financial indicators that are included in the analysis are being transformed, i.e. standardized in order to create indicators that are on the same scale and to avoid some of the variables to have greater influence on the index then due to scale measurement. The variables are standardized by subtracting the sample mean from each individual observation in the sample and further on the difference is divided with the standard deviation of the sample. The standardization of variables is conducted by the formula (1).

$$z = \frac{x - \mu}{\sigma} \tag{1}$$

where z is the standardized value or *z*-score, *x* is the observation of the variable; μ is the sample mean and σ is the standard deviation of the sample.

Standardized variables have normal distribution with zero mean and standard deviation of 1 - N(0,1). The z-score, or standardized value, of an observation y is its

distance from the mean measured in units of standard deviations. Positive z-scores lie above the mean, negative z-scores below the mean. This type of statistic is called a measure of relative standing. Standardization of financial indicators is often applied in the construction of composite variables, especially in financial stability or financial stress indices, such as the indices of Hanschel and Monnin (2005), the National Bank of Turkey, the National Bank of Albania and others. Standardization is also recommended in the guidelines for constructing composite indicators by Saisana and Tarantola (2002).

The financial indicators that have a negative impact on the financial stability of the banking sector went through additional transformation and received negative sign (multiplied by "-1"), in order to calculate sub-indices with exclusively positive impact on the aggregate index, i.e. their growth to have a positive effect to the growth of the aggregate index and vice versa. According to Hollo et al, (2012) in most of the studies the authors use standardization of the data in order to construct sub-indices which further are aggregated by using equal ponders or with ponders calculated by principle component analysis.

The index, the subject of this study, is calculated as an arithmetic mean of the six sub-indices. The method of calculating the index as an arithmetic mean of the sub-indices is used by the National Bank of Turkey and National Bank of Albania. Also, according to Saisana and Tarantola (2002) this method of aggregation of the indicators is used in calculating the human development index and the index of technological advancements of the United Nations, the two synthetic indices of Isla for environment, the index of sustainable and economic wealth of CES and NEF etc. The index of the financial stability for the Macedonian banking sector is calculated by the formula (2).

$$IFS_t = \frac{\sum_{j=1}^n x_{j,t}}{n} \tag{2}$$

where *n* is the number of variables (sub-indices), *Xj*,*t* is the *j*-the variable in time *t*.

A negative value of the index means that the index is below the sample mean, while a positive value of the index means that it is above the sample mean. The index shows the distance of its value from the sample mean expressed in number of standard deviations.

Each of the sub-indices represents one of the dimensions of financial stability according to CAMELS. The sub-indices are calculated as weighted sum of the selected financial indicators appropriately for each sub-index. The sub-indices are calculated by using equal weights, based on the examples and experiences of other authors while constructing indices. According to Saisana and Tarantola (2002), there is no unique method for determining the weights of indicators in the sub-indices. Some authors rely on statistical methods, such as principle component analysis





while others rely on the experts' opinion on the importance of the individual indicators. However, one of the most used methods is the equal-weights system, especially in the case of highly-correlated indicators. Supporters of equal-weights believe that if the weights obtained by principle component analysis are being used, indices might be ineffective, because sometimes the indicators have negative values, even though they have positive effects on the dimension that they measure. For example, equal weights of indicators are used in the following indices: the OECD composite leading indicators, the index of environmental sustainability of the World Economic Forum, the indicator for economic sentiment of the European Commission, the aggregate innovation index of the European Commission (DG Enterprise), the index of financial stability of the banking sector of the National Bank of the Czech Republic, while the National Bank of Turkey and the National Bank of Albania use equal weights for all sub-indices, except for the quality of asset.

The sub-indices (I) are calculated by the formula (3).

$$I_t = \sum_{j=1}^n \omega_j \frac{x_{j,t} - \hat{x}_j}{\sigma}$$
(3)

where *n* is the number of the financial indicators, ω_j is the weight of the appropriate indicator, $X_{j,y}$ is j-the financial indicator in time *t*, \hat{x}_j is the sample means of the *j*-the indicator, and σ is the standard deviation of the financial indicator. The last part of the formula represents the standardization process of the financial indicators.

The applied principle component analysis on the initial sample using the oblique rotation method (due to high correlation of the variables-indicators) has confirmed only four dimensions of the financial stability by CAMELS (all of the results from the principle component analysis are presented in Annex 1) such as: capital adequacy, assets quality, liquidity and profitability, while management and market sensitivity are present in all four dimensions. This is somehow expected and predictable, especially considering the role of the management with its central in risk management, i.e. all dimensions of financial stability depend on management quality and effectiveness. Management decisions also affect capital adequacy, assets quality, liquidity and profitability of the banks. Additionally, market sensitivity, as measured by the interest rate risk and the foreign currency risk, has impact on the other dimensions of financial stability, because they depend on the interest and currency structure of loans, deposits, assets and liabilities, and liquid assets.

Also, the correlation matrix shows great number of pairs of highly-correlated variables. The Kaiser-Meyer-Olkin measure for adequacy of the sample is 0.587, which indicates that the variables are significantly correlated. The Bartlett's test shows that there is at least one statistically significant correlation in the correlation matrix. These tests show that it is justified to use the method of principle component

analysis. The total variance is explained by the four components with the percentage of 92.45% and the variance of each variable is explained by a component, with over 77%, which is a significant result. The indicators for capital adequacy mostly pertain to the first component, the assets quality indicators are mostly attached to the second component, the liquidity indicators to the third component, while the profitability indicators are mostly related to the fourth component.

However, the purpose of this paper is not to question and review the theoretical background of CAMELS. Although there are four identified basic dimensions in the principle component analysis, in the calculation of the financial stability index in Macedonia all the six dimensions of the CAMELS-based financial stability are taken into consideration. Therefore, aiming to lower the number of variables included in the index of financial stability and choosing the most representative indicators for each of the separate six dimensions for financial stability according to CAMELS, we perform the principle component analysis without rotation (because the number of variables in separate individual dimensions is small) for each of the dimensions. The goal of this procedure is to include two or maximum three most representative and reliable indicators for each of the six dimensions in the index of financial stability, in line with other relevant cases (the central banks of Turkey, Albania, and Czech Republic). Thus, after performing the separate principle component analysis, the initial twenty-one basic indicators has decreased to the most representative eleven indicators (see Annex 2).

For all individual dimensions of financial stability, the tests show high correlation between the variables and justify the application of the principle component analysis (the results of the principle component analysis for each of the individual dimensions of the financial stability are presented in Annex 2). In addition, only one component explains a big part of the variables' variance.

In the separate principle component analyses, based on the value of correlation coefficient between the component and the variables, we select the following indicators as most representative for each individual dimension:

- Capital adequacy: capital adequacy ratio (0.971), Tier I capital and risk weighted assets ratio (0.963), and capital and reserves to total assets ratio (0.957);
- Assets quality: total allocated loss-loan provisions to non-functional loans ratio (0.910), and non-functional loans to gross loans ratio (0.903); and
- Management: loan to deposit ratio (-0.917) and loan growth (0.849).

Although asset growth is right behind these two indicators, as in the case with most of the dimensions we include only two indicators:

• Profitability: ROAA (0.976) and ROAE (0.940);





- Liquidity: here we consider only two indicators, highly-liquid assets to the total assets ratio, and highly-liquid assets to short term liabilities (contractual maturity) ratio, that are both included and highly-correlated (0.988); and
- Market sensitivity: net open foreign currency position to own funds ratio (0.976) and the spread between the interest rates on denar-denominated loans and deposits (0.969).

CONSTRUCTION OF THE FINANCIAL STABILITY INDEX FOR THE BANKING SECTOR IN MACEDONIA

As we previously mentioned, the index is calculated as an arithmetic mean of six sub-indices: the sub-index for capital adequacy, the sub-index for assets quality, and the sub-index for management, the sub-index for profitability, the sub-index for liquidity and the sub-index for market sensitivity. Each sub-index is calculated as a weighted-sum of the previously chosen most representative indicators for the dimensions of financial stability by the principle component analysis method. In each sub-index we use the method of equal weights for the indicators that are included, hence for the sub-index composed of three indicators their individual weight is 0.33, while for the sub-index for market sensitivity is composed of one indicator for interest risk and one indicator for foreign currency risk, so their individual weights are 0.50.

RESULTS AND DISCUSSION

The index of financial stability for the banking sector of Macedonia for the period of 31.12.2005 to 31.12.2012 is shown in Figure 1. It can be noticed that the constructed index shows significant decrease during the global economic crisis. The index of financial stability dropped from 0.4 standard deviations in the second quarter of 2008 to -0.22 standard deviations, i.e. it went below the mean. However, in the last two quarters of 2009 there was an evident stabilization and in the following quarters even "healing" of the banking sector. This stabilization was due to the prudential measures taken by NBRM in the observed period, directed towards increasing the stability of the banking sector and decreasing the risks (increased rate of the required reserve for foreign exchange liabilities of the banks, the inclusion of NBRM instruments in the calculation of the rates for required level of liquidity, measures for decreasing of the loan risk as well as providing FX deposits of the banking sector when it reached its highest value in the period from 2005 to 2008, right before the crises.



FIG 1. FINANCIAL STABILITY FOR THE BANKING SECTOR IN MACEDONIA (2005Q4 - 2012Q4)

Figure 2 presents the financial stability index (CAMELS) along with the sub-indices for the period 2005-2012: capital adequacy sub-index (C), assets quality sub-index (AQ), management sub-index (M), profitability sub-index (E), liquidity sub-index (L) and market sensitivity sub-index (S).



FIG 2. DECOMPOSITION OF IFS IN MACEDONIA (2005Q4 - 2012Q4)

It is noticeable that during the crises in 2008-2009, the most negative influence on the index came from the sub-indices for asset quality, profitability and management. It is also evident that the financial stability through the whole observed period is strongly connected with the sub-index of management quality and effectiveness (see Figure 3). This leads to the conclusion that the index of financial stability of the





Macedonian banking sector represents the condition of the banking sector well enough (the values of the index and sub-indices are presented in Annex 3).

The performance of financial stability index is checked by its comparison with other aggregate financial stability indicators, the Shar's s-score (Shar, 2010) and Boyd and De Nicolo's z-score (Boyd & De Nicolo, 2005). The calculated aggregate indicators and the index for the Macedonian banking sector are analyzed in order to identify if they move in same or opposite direction and if they adequately reflect positive and negative events in the economy.

Shar's model categorizes banks as solvent and insolvent on basis of IMF recommendations for control of vulnerability of financial systems. The same method is used when calculating the aggregate s-score for Macedonian banking sector for the period 31.12.2005 - 31.12.2012 on quarterly basis by the formula (4).

$$S = 1.5X1 + 1.2X2 + 3.5X3 + 0.6X4 + 0.3X5 + 0.4X6$$
⁽⁴⁾

where:

X1 is Capital to Asset ratio;

X2 is Shareholders capital to total assets ratio;

X3 is Capital adequacy coefficient;

X4 is Non-functional loans to total loans ratio;

X5 is Costs to Revenues ratio;

X6 is Total loans to Assets ratio;

"S" is solvency: 50% < S < 70%

Banks that have "S" value above 70% are considered solvent and are called supersound banks, while banks with "S" value under 50% are considered insolvent. The area between 50% μ 70% is defined as gray zone due to the risk of wrong classification. This model is focused on capital adequacy, asset quality and profitability (earnings). Every indicator in the formula has different weight depending of their estimated importance and impact on the solvency indicator. Boyd and De Nicolo's z-score is calculated by the following equation:

Z-Score=(ROAi,t+CARi,t)/SDROA(5)

where ROA is the return on assets, CAR is the total capital to total assets ratio of bank i in year t, and SDROA is the standard deviation of ROA for each bank for the whole period. Higher values of z-score indicate that bank is less risky and more stable, and it shows the number of standard deviations under the expected value of bank's return on assets when the capital is expended and bank is insolvent.





TABLE 1. CORRELATION MATRIX BETWEEN IFS, Z-SCORE AND S-SCORE FOR MACEDONIAN BANKING SECTOR (2005Q4 - 2012Q4)

	CAMELS	S_SCORE	Z_S
CAMELS	1.000000	-0.836024	-0.452394
S_SCORE	-0.836024	1.000000	0.681035
Z_S	-0.452394	0.681035	1.000000

CONCLUSION

The construction of the financial stability index of the banking sector in this paper is an attempt towards creating a more appropriate framework for evaluation of the financial stability comparing to the previous practice of NBRM, which lacks a full overview of the banking sector, focusing only on individual dimensions of financial stability. Although the constructed index gives a good overview of the stress periods of the banking sector in Macedonia (2008-2009 crises), in order to make a financial stability assessment of the financial system other important variables should be also





included. The index has few limitations, such as the short time series (quarterly published by the NBRM) and the financial indicators that are mainly based on accounting and historical values. The index has positive sides and is well reflective on the condition of the banking sector but it should be used in combination with other indicators, with focus on the qualitative analysis in order make accurate conclusions. Nevertheless, it is a good foundation for constructing other indicators, such the index of financial stability of the financial sector as a whole or indices of financial stress that are used for crises prediction or it could be used as a variable in macroeconomic models. On the other hand, the index could be also used for predicting the reactions of the banking sector in conditions of negative shocks. Although macro stress-tests for system have numerous limitations when it comes to crises prediction, they still have their good side in the possibility for creating a wider picture for the future macroeconomic perspectives, with the financial system as a whole and the unique approach for assessment of risk exposure of all institutions. Still, such a macro stress-test could be useful for considering the aspect of financial stability when defining the measurements of monetary and fiscal policy, i.e. when defining the level of influence on the vulnerability of the financial system.

The index of financial stability of the banking sector in Macedonia shows that the banking system has been continuously stable as a result of the previous conservative policies of the banks and NBRM. This is confirmed with the stability that Macedonian banking sector showed after the harsh effects of the last global economic crises that were absorbed quite quickly without more serious consequences.

REFERENCES

Albulescu, C. T. (2010). Forecasting the Romanian Financial Sector Stability Using a Stochastic Simulation Model, Journal of Economic Forecasting, 0(1), 81-98.

Bank of Albania. (2011). Financial stability report 2011 H1.

Boyd, J. & De Nicoló G. (2005). The Theory of Bank Risk-Taking and Competition Revisited, Journal of Finance, 60(3), 1329-1343.

Central Bank of the Republic of Turkey. (2006). Financial Stability Report, 2.

Czech National Bank. (2013). Financial stability, Prague: Czech National Bank. Available at: http://www.cnb.cz/en/financial_stability/ (accessed on 4.5.2013).

Chowdhury, S. (2011). An inquiry into the financial soundness of Commercial Banks in India using 'camel' approach, Sri Krishna International Research & Educational Consortium, 1(7), 88-121.

European Bank for Reconstruction and Development (EBRD). (2010). Transition report 2009 - Transition in crisis, London.

European Bank for Reconstruction and Development (EBRD). (2013). Transition report 2012 - Integration across borders, London.

European Central Bank (ECB). (2013). What is financial stability?, Frankfurt A/M: European Central Bank. Available at: http://www.ecb.europa.eu/pub/fsr/html/index. en.html, (accessed on 04.05.2013).

Geršl, A. & Hermánek, J. (2006). Financial Stability Indicators: Advantages and Disadvantages of their Use in the Assessment of Financial System Stability, Occaisonal Publications – Chapters in Edited Volumes, in: Financial Stability Report 2006, chapter 0, Czech National Bank (CNB), Research Department, 69-79.

Hanschel, E. & Monnin, P. (2005). Measuring and forecasting stress in the banking sector: evidence from Switzerland, BIS papers chapters, in: Bank for International Settlements (ed.), Investigating the relationship between the financial and real economy, 22, 43-49.

Hollo, D., Kremer, M. & Lo Duca, M. (2012). CISS - A Composite Indicator of Systemic Stress in the Financial System, Available at SSRN: http://ssrn.com/abstract=1611717 or http://dx.doi.org/10.2139/ssrn.1611717 (accessed on 5.4.2013).

Illing, M. & Liu, Y. (2003). An Index of Financial Stress for Canada, Bank of Canada Working Paper 2003-14.

Levine, R. (1997). Financial Development and Economic growth: Views and agenda, Journal of Economic Literature, 35, 688-726.

Levine, R. (1998). The Legal Environment, Banks and Long-Run Economic Growth, Journal of Money, Credit and Banking, 30(3), 596-613.

Levine, R. & Beck, T. (2000). Finance and the Sources of Growth, Journal of Financial Economics, 58(1-2), 261-300.

National Bank of Republic of Macedonia. (2012). Financial stability report of the Macedonian banking sector in 2011, Skopje.

National Bank of Republic of Macedonia. (2013). Macedonian banking system report in 2012, Skopje.

National Bank of Serbia (2012), Annual Financial Stability Report for 2011.

Evens, O., Leone, A. M., Gill, M. & Hilbers, P. (2000). Macroprudential Indicators of Financial System Soundness, Occasional Paper 192, 1-49.



Journal of Applied Economics and Business



Saisana, M. & Tarantola, S. (2002). State-of-the-art Report on Current Methodologies and Practices for Composite Indicator Development, EUR 20408 EN, Institute for the Protection and Security of the Citizen Technological and Economic Risk ManagementI-21020 I Joint Research Centre European Commission Composite Indicator of Systemic Stress (CISS), 1-72.

Shar, A. H. (2010). Performance Evaluation of Banking Sector in Pakistan: An Application of Bankometer, International Journal of Business and Management, 5(9), 81-86.

Van den End, J. W. (2006). Indicator and boundaries of financial stability, Netherlands Central Bank, Research Department, DNB Working Papers 097.

ANNEX 1

Principal component analysis of the initial set of variables (financial indicators)

	Pattern Matrix					
		Component				
		1	2	3	4	
Capital adequacy ratio		-0.982	-0.196	0.010	0.240	
Regulatory Tier I capital/ris	k weighted assets	-0.961	-0.082	-0.121	0.082	
Local currency spreads be	etween reference lending and	0.911	-0.104	0.092	0.108	
deposit rates						
Equity and reserves to total	assets	-0.832	-0.150	-0.367	0.136	
Loans to deposits ratio		0.797	-0.027	-0.159	0.395	
NPLs / gross loans		0.780	0.485	-0.098	-0.188	
Foreign currency spreads l	petween reference lending and	0.728	-0.217	-0.049	0.420	
deposit rates						
Net open foreign exchange	position / equity	0.712	-0.109	0.151	0.356	
Interest margin/gross incom	ne	0.591	-0.224	0.129	0.405	
NPLs net of total provision	/ equity	0.058	0.973	0.163	0.054	
Total provisions to non-per	forming loans	0.088	0.963	0.052	0.013	
Interbank market interest ra	ate	0.062	0.305	0.909	-0.049	
High liquid assets / total ass	sets	0.184	-0.017	0.885	0.070	
High liquid assets to	o total short-term liabilities	0.096	-0.033	0.863	0.211	
(contractual maturity)						
Large exposures /equity		0.298	0.532	-0.614	0.206	
Personnel expenses/noninte	erest expenses	0.445	0.194	0.524	0.331	
Asset growth	•	0.013	-0.305	0.120	-0.961	
ROAE		-0.057	0.303	-0.268	-0.722	
ROAA		-0.204	0.237	-0.274	-0.682	
Noninterest expenses/gross	income	0.039	0.166	-0.361	-0.678	
Loan growth		-0.412	0.463	-0.023	-0.503	
Extraction Method: Principa	al Component Analysis.					
Rotation Method: Oblimin	with Kaiser Normalization.					
Rotation converged in 14 ite	erations.					
KMO and Bartlett's Test						
Kaiser-Meyer-Olkin Measur	re of Sampling Adequacy.				0.587	
Bartlett's Test of Sphericity	Approx. Chi-Square				1274.606	
	df				210	
	Sig.				0.000	
	Communalities			Extrac	ction	
Capital adequacy ratio					0.969	
Regulatory Tier I capital/risk weighted assets					0.988	
Equity and reserves to Assets					0.984	
NPLs net of total provision / own funds					0.947	
NPLs / gross loans					0.968	
Total provisions to Non-Pe		0.962				
Large exposures /own fund				0.796		
ROAA				0.952		
ROAE				0.944		
Interest margin/gross incor				0.846		





Noninterest expenses/gross income	0.774
Personnel expenses/noninterest expenses	0.946
Local currency spreads between reference lending and deposit rates	0.962
Foreign currency spreads between reference lending and deposit rates	0.956
Interbank market interest rate	0.873
Net open foreign exchange position / own funds	0.962
High liquid assets / Assets	0.962
High liquid assets to total short-term liabilities (contractual maturity)	0.958
Assets growth	0.831
Loans growth	0.855
Loans to deposits ratio	0.981
Estruction Mathe 1 Driver al Commence at Anglesia	

Extraction Method: Principal Component Analysis.



Component Correlation Matrix							
Component		1 2		3	4		
dim ensi on0	1	1.000	0.245	0.298	0.434		
	2	0.245	1.000	-0.145	-0.250		
	3	0.298	-0.145	1.000	0.224		
	4	0.434	-0.250	0.224	1.000		
Extraction Method: Principal Component Analysis.							
Rotation Method: Oblimin with Kaiser Normalization.							

Total Variance Explained								
Compon ent		Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings
		Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
	1	11.250	53.572	53.572	11.250	53.572	53.572	9.642
	2	4.864	23.163	76.735	4.864	23.163	76.735	4.274
	3	2.353	11.206	87.941	2.353	11.206	87.941	5.450
	4	0.947	4.509	92.450	0.947	4.509	92.450	7.009
	5	0.445	2.119	94.568				
	6	0.297	1.415	95.984				
	7	0.266	1.267	97.250				
	8	0.177	0.842	98.093				
0	9	0.138	0.657	98.750				
ion	10	0.084	0.399	99.149				
Sue	11	0.065	0.310	99.460				
ime	12	0.036	0.173	99.633				
p	13	0.030	0.141	99.773				
	14	0.025	0.119	99.892				
	15	0.008	0.038	99.931				
	16	0.007	0.036	99.966				
	17	0.004	0.018	99.985				
	18	0.002	0.008	99.993				
	19	0.001	0.004	99.997				
	20	0.001	0.002	99.999				
	21	0.000	0.001	100.000				
Extraction Method: Principal Component Analysis.								
a. V	Vhen c	omponent	s are correl	ated, sums of s	squared	loadings ca	nnot be added	to obtain a total
vari	iance.	-				-		





ANNEX 2

Principal component analysis of the individual dimensions of the financial stability

Component Matrix ^a	
·	Component 1
Capital adequacy ratio	0.971
Regulatory Tier I capital/risk weighted assets	0.963
Equity and reserves to Assets	0.957
NPLs net of total provision / own funds	-0.648
Extraction Method: Principal Component Analysis.	
a. 1 components extracted.	
Component Matrix ^a	
	Component 1
Total provisions to Non-Performing Loans	0.910
Non-Performing Loans / Gross Loans	0.903
Large exposures /own funds	0.810
Extraction Method: Principal Component Analysis.	
a. 1 components extracted.	
Component Matrix ^a	
	Component 1
ROAA	0.976
ROAE	0.940
Interest margin/gross income	-0.880
Noninterest expenses/gross income	0.868
Personnel expenses/noninterest expenses	-0.805
Extraction Method: Principal Component Analysis.	
a. 1 components extracted.	
Component Matrix ^a	
	Component 1
Net open foreign exchange position / own funds	0.976
Local currency spreads between reference lending and deposit rates	0.969
Foreign currency spreads between reference lending and deposit rates	0.939
Interbank market interest rate	0.491
Extraction Method: Principal Component Analysis.	
a. 1 components extracted.	
Component Matrix ^a	
	Component 1
High liquid assets / Assets	0.997
High liquid assets to total short-term liabilities (contractual maturity)	0.997
Extraction Method: Principal Component Analysis.	
a. 1 components extracted.	
Component Matrix ^a	
·	Component 1
Loans to Deposits ratio	-0.917
Loans growth	0.849
Assets growth	0.847
Extraction Method: Principal Component Analysis.	
a. 1 component extracted.	

ANNEX 3

The index of financial stability of the banking sector and its sub-indices

obs	CAMELS	С	А	М	Е	L	S
2005Q4	-0.478499	2.6994	-1.950000	-0.840395	0.155	-1.240	-1.695
2006Q1	-0.280667	2.3496	-1.625000	-0.483600	0.965	-1.135	-1.755
2006Q2	-0.360507	1.8612	-1.345000	0.080760	0.175	-1.080	-1.855
2006Q3	-0.344238	1.5576	-1.065000	-0.913030	0.740	-1.030	-1.355
2006Q4	-0.202968	0.8151	-0.755000	-0.007905	0.890	-0.670	-1.490
2007Q1	-0.154538	0.6336	-0.185000	-0.200830	0.870	-0.695	-1.350
2007Q2	0.139423	0.4884	-0.125000	-0.036860	1.765	-0.170	-1.085
2007Q3	0.132668	0.1980	0.245000	0.408010	1.315	-0.525	-0.845
2007Q4	0.287839	-0.1815	1.355000	0.138535	1.145	-0.140	-0.590
2008Q1	0.271908	-0.5544	1.365000	0.690850	1.035	-0.695	-0.210
2008Q2	0.402922	-0.7689	1.565000	0.676430	1.705	-0.675	-0.085
2008Q3	0.311355	-0.9174	1.700000	0.620530	1.305	-0.910	0.070
2008Q4	0.320559	-0.5973	1.840000	0.570655	0.695	-0.875	0.290
2009Q1	-0.045888	-0.3498	0.820000	0.504470	-0.945	-1.060	0.755
2009Q2	-0.221814	-0.3201	-0.025000	0.014215	-0.555	-1.075	0.630
2009Q3	-0.170618	-0.4290	-0.340000	-0.149710	-0.295	-0.655	0.845
2009Q4	-0.005443	-0.5874	0.050000	0.114745	-0.370	-0.060	0.820
2010Q1	-0.100953	-0.3762	-0.425000	0.005485	-1.060	0.275	0.975
2010Q2	-0.031793	-0.5742	-0.480000	0.073445	-0.750	0.645	0.895
2010Q3	-0.095979	-0.6798	-0.950000	0.038925	-0.620	0.705	0.930
2010Q4	0.082671	-0.8976	-0.030000	-0.256375	-0.135	1.015	0.800
2011Q1	-0.041438	-0.5412	0.145000	-0.077430	-1.380	0.820	0.785
2011Q2	0.104931	-0.6303	0.280000	0.099885	-0.920	0.940	0.860
2011Q3	-0.088776	-0.5643	0.070000	-0.198355	-1.090	0.645	0.605
2011Q4	-0.017986	-0.5412	-0.060000	-0.286715	-0.720	1.085	0.415
2012Q1	0.008923	-0.1980	0.025000	-0.178465	-1.610	1.385	0.630
2012Q2	0.230516	-0.1947	0.109995	0.057800	-0.745	1.410	0.745
2012Q3	0.074662	-0.3201	-0.385000	-0.246925	-0.885	1.665	0.620
2012Q4	0.278711	-0.3696	0.180000	-0.218135	-0.655	2.105	0.630

(CAMELS –Financial stability Index, C – Capital adequacy sub-index, A – assets quality sub-index, M – management sub-index, E – profitability sub-index, L – liquidity sub-index, S – market sensitivity sub-index)





CREDIT SCORING PROCESS AVOIDING THE EXCESSIVE RISK

Alban Burazeri¹, Orfea Dhuci¹, Andromahi Kufo^{1*}

¹Alpha Bank - Albania, Albania

*aburazeri@alpha.gr

Abstract

There are many ways that credit risk can be managed. The first line of defense is the use of credit scoring or credit analysis to avoid extending credit to parties that entail excessive credit risk. Credit scoring technologies have sharply reduced the cost of credit evaluation and improved the consistency, speed, and accuracy of credit decisions. Creditors must decide whether to use a customized or generic scoring system or a combination of both. This paper provides a framework for the evaluation of alternatives by comparing generic with customized credit scoring models. Customized credit models are developed for the use of a single creditor. Generic scoring models are sold in the marketplace for use by multiple creditors. Creditors must decide whether to use customized scoring, generic scoring, or a combination of both. The creditor will also have to choose among competing scoring models being those generic or customized. Proper evaluation should consider among other factors, the credit product and type of decisions, the creditor's capabilities, the environment, the target market, and the characteristics and costs of the models available. The primary purpose of this paper is to provide a framework for these evaluations. We'll try to compare generic with customized credit scoring models in terms of feasibility, development, implementation, economic, and management issues. Each approach has advantages and disadvantages and, furthermore, the scoring model should be integrated with an overall evaluation system.

Keywords

Application processing system; Credit score; Customized credit scoring system; Judgmental credit evaluation; Scorecard.

INTRODUCTION

Credit risk is risk due to uncertainty in a counterparty's (also called an obligor's or credit's) ability to meet its obligations (Jorion, 2005). Because there are many types of counterparties - from individuals to sovereign governments - and many different types of obligations - from auto loans to derivatives transactions - credit risk takes many forms. Institutions manage it in different ways.

In assessing credit risk from a single counterparty, an institution must consider three issues:

- Default probability: What is the likelihood that the counterparty will default on its obligation either over the life of the obligation or over some specified horizon, such as a year?
- Credit exposure: In the event of a default, how large will the outstanding obligation be when the default occurs?
- Recovery rate: In the event of a default, what fraction of the exposure may be recovered through bankruptcy proceedings or some other form of settlement?

Under the revised framework on International Convergence of Capital measurement and Capital Standards of the Basel Committee on Banking Supervision, known also as Basel II agreement, the above are named as risk components (Basel Committee on Banking Supervision, 2004). The risk components include measures of probability of default (PD), loss given default (LGD), the exposure at default (EAD), and effective maturity (M). When we speak of credit quality of an obligation, this refers generally to the counterparty's ability to perform on that obligation. This encompasses both the obligation's default probability and anticipated recovery rate. To place credit exposure and credit quality in perspective, recall that every risk comprise two elements: exposure and uncertainty. For credit risk, credit exposure represents theormer, and credit quality represents the latter.

For loans to individuals or small businesses, credit quality is typically assessed through a process of credit scoring (Mays, 2004). Prior to extending credit, a bank or other lender will obtain information about the party requesting a loan. In the case of a bank issuing credit cards, this might include the party's annual income, existing debts, whether they rent or own a home, etc. A standard formula is applied to the information to produce a number, which is called a credit score. A credit score is a numerical expression based on a statistical analysis of a person's credit files, to represent the creditworthiness of that person, which is the perceived likelihood that the person will pay debts in a timely manner. Based upon the credit score, the lending institution will decide whether or not to extend credit. The process is formulaic and highly standardized.

Many forms of credit risk, especially those associated with larger institutional counterparties, are complicated, unique or are of such a nature that that it is worth assessing them in a less formulaic manner. The term credit analysis is used to describe any process for assessing the credit quality of a counterparty. While the term can encompass credit scoring, it is more commonly used to refer to processes that entail human judgment. One or more people, called credit analysts, will review information about the counterparty. This might include its balance sheet, income statement, recent trends in its industry, the current economic environment, etc. They





may also assess the exact nature of an obligation. For example, senior debt generally has higher credit quality than does subordinated debt of the same issuer. Based upon this analysis, the credit analysts assign the counterparty (or the specific obligation) a credit rating, which can be used for making credit decisions.

Many banks, investment managers and insurance companies hire their own credit analysts who prepare credit ratings for internal use. Other firms (including Standard & Poor's, Moody's and Fitch) are in the business of developing credit ratings for use by investors or other third parties. Institutions that have publicly traded debt hire one or more of them to prepare credit ratings for their debt. Those credit ratings are then distributed for little or no charge to investors. Some regulators also develop credit ratings.

Credit risk modeling is a concept that broadly encompasses any algorithm-based methods of assessing credit risk. The term encompasses credit scoring, but it is more frequently used to describe the use of asset value models and intensity models in several contexts. There are many ways that credit risk can be managed or mitigated. The first line of defense is the use of credit scoring or credit analysis to avoid extending credit to parties that entail excessive credit risk. Credit risk limits are widely used. These generally specify the maximum exposure a firm is willing to take to a counterparty. Industry limits or country limits may also be established to limit the sum credit exposure a firm is willing to take to counterparties in a particular industry or country. Calculation of exposure under such limits requires some form of credit risk modeling. Transactions may be structured to include collateralization or various credit enhancements. Credit risks can be hedged with credit derivatives. Finally, firms can hold, and they are required from the regulators to do so, capital against outstanding credit exposures.

GENERIC vs. CUSTOMIZED CREDIT SCORING MODELS

To go back to credit scoring one may note some benefits of such a process. First of all, credit scoring promotes great efficiencies and time-savings in the loan approval process. Secondly, credit scoring reduces subjectivity in the loan approval process ensuring that the same standards are applied to all applicants. It is widely accepted nowadays that credit scoring technologies have sharply reduced the cost of credit evaluation and improved the consistency, speed, and accuracy of credit decisions.

The benefits of credit scoring apply not just to the loan acquisition process but also to credit scores used to manage accounts. Using credit scores for decisions about loan collection and modification, line management, and loss recovery strategies can speed these decisions, eliminate bias, and help lenders make the right decisions.

There are two models of credit scoring: generic and customized. Customized credit models are developed for the use of a single creditor. Generic scoring models are sold in the marketplace for use by multiple creditors. Typically, a customized model is based on data from a creditor's past lending experience while a generic model is based on data from the past lending experience of a number of creditors. Creditors must decide whether to use customized scoring, generic scoring, or a combination of both. The creditor will also have to choose among competing scoring models being those generic or customized. Proper evaluation should consider among other factors, the credit product and type of decisions, the creditor's capabilities, the environment, the target market, and the characteristics and costs of the models available. The primary purpose of this paper is to provide a framework for these evaluations.

We will try to compare generic with customized credit scoring models in terms of feasibility, development, implementation, economic, and management issues. Each approach has advantages and disadvantages and, furthermore, the scoring model should be integrated with an overall evaluation system. Conceptually, a customized credit scoring system should be more accurate than a generic one. The customized system is tailor-made from the creditor's own past experience to fit the creditor's lending environment and objectives. However, there are situations in which the development and implementation of a customized scoring system are either nit feasible or not the most appropriate alternative.

Three important issues in the decision are: (i) feasibility; (ii) development; and (iii) implementation. We will focus the discussion primarily on new applicant scoring models, but similar points could be made for other types of models.

- i. Feasibility. Few credit situations are absolutely perfect for modeling. Therefore, tradeoffs between what would be ideal and what can be done must be considered in deciding between customized and generic systems.
 - a. Historical lending experience. No historical data *equals* no customized scoring system. Usually the question is, what data are available and how close are they to what is really needed? Ideally, the scoring model should be used for the same product, market area, and economic environment that generated the historical experience. Experience in auto car loans, for instance, may not be relevant to a scoring system for credit cards.
 - b. Data retention. Information used to report past decisions must have been retained for a relatively long period in a usable form in order to build a custom model. These archived records should be used to develop customized scoring models and validate generic ones.





- c. Know outcomes of past decisions. The outcomes of past decisions must be available in a quantifiable form. Account payment histories can be used to classify outcomes as good or bad loans.
- d. Age of decision. The decisions must have aged enough to allow appropriate measurement and classification of the outcomes. For example, bankcard accounts approved three months previously are not old enough to be accurately classified as good or bad risk outcomes, whereas accounts approved two years ago probably are. At the other extreme, bankcard accounts approved 10 years ago are too old, since the relationship between their historical credit applications and credit bureau reports and their outcomes would not likely reflect current relationships. Model developers will specify a sample time frame in which decisions must have occurred if they are to be included in the development.
- e. Sample size. The number of credit decisions made must have been large enough to allow an appropriate sample size. Credit scoring developers often ask for a sample of at least 4,500 applicants, whereas: 1,500 goods; 1,500 bads; and 1,500 rejected, in order to develop a customized new applicant scoring model.
- f. Economic factors. The costs and benefits of a customized model must be compared to those of a generic scoring model. Costs are included in developing, implementing, and managing the system. Both systems, generic and customized could be purchased as a package or on a transaction basis.
- ii. Model development issues. During the development of any credit scoring model, decisions are made that will affect its performance and implementation.
 - a. Objective of the model. In development of a customized scoring model, a creditor selects the objective of the model and the target population. Objectives may be general, like reduction in credit losses from new accounts, or specific, reduction in bankruptcy filings by new accounts within a six-month window after approval. The objective will influence decisions ranging from outcome definitions to implementation.
 - b. Target population. Target population refers to the applicants who will be evaluated by the model. For a customized model, applicants who do not fit the target population can be eliminated from the development sample. For instance, if the scoring model will not be used on student

loans (decisions will be made judgmentally), data on student loans can be eliminated from the development sample.

- c. Data/sample development. The development of any scoring system requires that the data be in computer-readable form.
- d. Dependent variable definitions. The dependent variable is the outcome. The most traditional dependent variable for a new applicant model is whether payment performance is good or bad. One creditor might require that an account be 60 days or more past due before it is considered a bad account whilst another might specify 90 days or more. Customized scoring can accommodate either.
- e. Independent variable definitions. Independent variables are the characteristics that determine the value of the credit score. In a customized model for new applicant scoring, the independent variables are typically taken from the application form and the credit bureau report.
- f. Model development procedures. A creditor can select different scoring development techniques by choosing a development firm that uses those techniques or allows creditors to select from alternative techniques in creating a customized model.
- g. Rejected applicants. There is payment history only for applicants who have been extended credit and have used it. Lack of information about the performance of the rejected population creates a statistical and practical problem. Model developers attempt to compensate for this with reject inference procedures.
- h. Development time. It can take from three to twelve months to develop a customized scoring model. Implementation adds more time, ranging from a month to years. Generic scoring systems already on the market are available for use on relatively short notice. Sometimes a creditor's need is so immediate that the general models are the only feasible alternative.
- iii. Implementation issues. Implementation can be as important as the predictive accuracy of the system. Implementation issues include information interpretation and entry, computer automation, forecasts of performance, validation and monitoring, adverse action reasons, shred experience and advice, security, and management.
 - a. Information interpretation and data entry. In order to implement most scoring systems, applicant information must be entered into a computer. The cost of data entry is a function of the number of





applicants, the amount of information entered, and the amount of information required. Accurate and consistent interpretation of some information can be quite difficult, as with classification of employment information into occupational categories.

- b. Computer automation. Nearly all credit scoring systems use computers for implementation. Although customized implementations will differ, in general information is entered, edit checks are performed, exclusions and policy rules are implemented, scores are calculated, additional information is requested as needed, actions are recommended, and adverse action reasons determined. Software to implement the customized model can be developed internally or purchased.
- c. Forecasts of performance. It is relatively simple to develop performance forecasts for customized scoring models. Typically, the developer calculates the scores for a sample of known outcome applicants from the creditor's files, which may be the development sample, a holdout or validation sample, a sample from a specified time frame or geographical region, or a sample for a product entirely different from that used in model development.
- d. Validation/monitoring. The predictive power of the model will change as the relationship between variables and outcome change. It is important to monitor changes and react. In addition, proper monitoring of a scoring system provides a wealth of information about customers, marketing efforts, and the overall credit evaluation system. In order to validate or monitor the performance of any scoring model, the actual score at the time of the credit decision must be retained.
- e. Adverse action reasons. Creditors must inform declined applicants either of the specific reasons why they received adverse action or of their right to receive specific reasons which must comply with the regulatory intent that they be accurate, educational, and informative.
- f. Share experience and advice. Since every customized scoring model is unique, creditors cannot discuss their experience with others while, on the other hand, creditors using exactly the same generic bureau scoring models can and sometimes do share experiences in order to learn from each other.
- g. Security of the scoring system. The details of a scoring system must be secure from those who would manipulate the system. In a customized

scoring system, software and implementation procedures must guard against manipulation.

h. Management. The management of any credit scoring system is the critical element for successful implementation. Management must address each of the issues presented in this section during implementation and provide ongoing active management of the scoring system and the overall evaluation system.

The final factor in choosing between a customized and a generic scoring system (or a combination of both) is the type of credit decisions being made and the generic models available, along with their strength and weaknesses and their inherent advantages and disadvantages.

- i. Type of decisions and models available. There are many types of credit decisions, among them targeting a preapproved offer, approving "take one" applicants or young college student applicants, increasing or decreasing credit limits, amount of loan, and collection prioritization. The type of credit decision being made has a direct impact on the choice between a generic and a customized model. With regard to the availability nowadays this is not an issue any more. You can find a wide variety of generic models and at the same time you can create a customized one in a relatively short time selecting among a lot of industry professionals.
- ii. Portfolio valuation and rating agencies. Generic credit score models play a central role in the valuation of credit portfolios. They create a standard measurement for portfolio risk by which different portfolios can be compared that is usually simple, fast, accurate, and relatively inexpensive.
- iii. Creditor strengths and weaknesses. Creditors should consider their own strengths and weaknesses when choosing between generic and customized models. In general, creditors with extensive experience in the use and management of scoring systems will select customized scoring models when feasible, to use either alone or in conjunction with generic models. Such creditors can derive maximum benefit from customized systems due to their input into development, their knowledge of how to integrate policy rules with the scoring models, their experience in implementing scoring systems, and their expertise in monitoring and management. Creditors with limited staff will often opt for generic scoring, as will those who are new to scoring, in order to gain experience before attempting to develop customized models.
- iv. Inherent advantages and disadvantages
 - a. Advantages of generic systems:
 - Available to all creditors. Development feasibility is not an issue;





- Not limited by the creditor's historical experience with population groups, credit products, and geographic areas;
- Available immediately, without development time or cost;
- Less reliant on the user's knowledge of and experience in using scoring;
- Easy to implement often the scores are generated by others;
- Less expensive for small numbers of decisions;
- Detailed in their treatment of credit bureau information;
- Very economical in their use of credit bureau information;
- Better able to predict certain outcomes, such as bankruptcies;
- Supported by a network of advice; and
- Secure, because they are usually protected from credit bureaus or other industry professionals.
 - b. Disadvantages of generic systems:
- Potentially less accurate because they are not based on the creditor's own experience, products, and customers;
- Available to competitors;
- More expensive to high-volume users paying on a transaction basis;
- Proprietary details of the scoring system are often confidential;
- Harder to use in forecasting system and monitoring performance; and
- Rigid in their definition of adverse action codes and selection procedures.

Figure 1 presents a typical application processing system workflow, so one can see how the application scoring system fits in the overall credit evaluation system.

Alban Burazeri, Orfea Dhuci, Andromahi Kufo Credit Scoring Process Avoiding the Excessive Risk



FIG 1. APPLICATION PROCESSING SYSTEM





CONCLUSIONS

Creditors must decide whether to use a customized or generic scoring system or a combination of both. This paper provides a framework for the evaluation of alternative by comparing generic with customized credit scoring models. One may argue that the main conclusions of this research are:

First, there are two basic processes for credit evaluation: judgmental and credit scoring. The judgmental evaluation is the most subjective one, cannot capture without bias the credit risk, and therefore is not capable to avoid the excessive risk. Credit scoring technologies have sharply reduced the cost of credit evaluation and improved the consistency, speed, and accuracy of credit decisions. In our region, a lot of banks and other lenders have moved towards credit scoring technologies but still there are players in the market that should move urgently in the same direction. These becomes more important considering the recent movements of several big financial groups present in the region from wholesale versus retail banking activities.

Second, generic scoring systems have taken a major role in credit evaluation. They can level the playing field between smaller and larger creditors. Generic credit bureau credit scoring systems (if available, which is not always the case in small countries coming out from controlled economical environments) allow the use of credit bureau information for managing existing accounts economically and efficiently. They provide a potential standard measurement that can be used to evaluate and price portfolios. The overall credit environment will often determine whether to use customized or generic scoring systems or both. Many creditors will use both customized and generic systems - weighted and integrated properly in the credit environment - in order to minimize credit risk. Any component of an evaluation system, including scoring systems, policy and exception rules, and even judgmental analysis, must be designed and implemented to fit within the overall evaluation system. Coordination of the components is critical. It is also critical that the overall evaluation system and its components be closely monitored in order to properly manage the system. The solution should be based in best practices and should account for future scalability, flexibility, and migration.

Third, in most of the cases for creditors in small countries despite of the fact that they could be experienced in the business - even though this should not be taken as a recipe - the starter could be a generic scoring system possibly developed using regional data and closely monitored, followed up by the main course that could be a bespoken system consisting of a generic and customized scoring system used in a sequential or matrix based approach in the overall credit evaluation system. If you opt (i.e. start with generic and then switch to beskopen) for such an approach you should pay attention, among others, to the integration of generic scoring with other systems in a first place and to the continuous fine-tuning of the overall system in a second place. Considering that you have (or you intend to):

(i) an application processing system supposed to manage the application workflow from the applicant's entry in the point of sale until approval or rejection;

(ii) a generic scorecard with a certain number of characteristics, interpretation rules for missing data, and a numerical output;

(iii) some basic policy rules and credit bureau report interpretation guidelines; and

(iv) clear definition of willingness to pay and ability to pay including here wellknown ratio like debt burden etc.

In this line, we recommend the following:

(a) Encompass and encrypt the scorecard (Rockford, 1997) in a object - a DLL (Microsoft Developers Network, http://msdn.microsoft.com) could work just fine - by creating so a black box that receives as input the scorecard characteristics as gives as an output a score;

(b) Encompass and encrypt everything else in separate objects (small black boxes) and pack them in a library including here basic policy rules (for instance, no applicants less than 18 years old etc.), credit bureau interpretation guidelines (for instance, more than 90 days past due etc.), ability to pay and credit limit definition rules (for instance, debt burden ration less than 45% etc.) and all the rest of the components involved in the credit assessment process; and

(c) Deliver the objects to the application processing system by integrating everything within a normalized relational database management system (Date, 2004) and, at the same time, securing and protecting your business logic (ANSI/ISO/IEC 9075:1999, SQL, http://webstore.ansi.org).

Of course, such an approach is difficult due to the lack of integrated regional databases and we would kindly recommend to regional governments to facilitate such a process by removing or lessening to the most possible extent the legal boundaries for the cross-country information exchange.

REFERENCES

ANSI/ISO/IEC 9075:1999, SQL - http://webstore.ansi.org

Basel Committee on Banking Supervision, International Convergence of Capital Measurement and Capital Standards - A revised framework, The Bank for International Settlements, 2004.

Date, C. J. (2004). An Introduction to Database Systems, 8th ed., Addison-Wesley.





Jorion, P. (2005). Financial risk manager handbook, 3rd ed., Wiley.

Mays, E. (2004). Credit scoring for risk managers - The handbook for lenders, Thomson South Western.

Microsoft Developers Network - http://msdn.microsoft.com

Rockford, L. (1997). Professional Visual Basic Business Objects, Wrox Press.





UNDERSTANDING CONSUMER PREFERENCE BIASES

Petra Platz^{1*}, Zoltán Veres²

¹Marketing and Management Department, Széchenyi István University, Hungary ²Research Centre, Budapest Business School, Hungary *platz@sze.hu

Abstract

The goal of this article is to identify and group consumer preference biases in purchase situations. We suppose the contextual dysfunctions of the transitive preferences have: (1) physiological; (2) psychological; and (3) environmental reasons. The primary axiom of the concerning marketing research project is that underlying preferences related to product attributes are not valid under all circumstances: the consumer preferences are context dependent. Furthermore, we suppose that preference reversals unconditionally happen, which is eventually expressed in the post-purchase's unsatisfied feeling. Based on a proper explanation of biases, the frequency of preference inconsistencies could be decreased. By applying improved selling techniques, which consider the imperfections of human nature, shoppers would lack the negative post-purchase impressions.

Keywords

Marketing research; Preferences; Buying behavior.

INTRODUCTION

Bettman (1979) attempted to undercover the influencing factors of inconsistencies in consumer choice. However his summary covered the evaluative conflict, the information search's imperfections, the adaptation phase, the question of choice complexity; none of the factors were explained it details. Bettman instead of summarizing the ideas simply listed them; so his collection functions as a guide for the scholars and practitioners what to bear in mind. Our research group observed the issue from a mathematician's, an IT technician's, an ergonomist's, a psychologist's and marketing scholars' views. From the different optics, we expect a complex understanding of the consumer preference biases. As a first stage, we narrowed our focus directly to the consumer preferences related to the product attributes. We expect our results to give a useful contribution to the measurement methodology of consumer attribute preferences.

A QUESTIONABLE AXIOM OF MARKETING

It must be admitted that Bettman's article (1979) was inspiring, because its idea violates a basic axiom of marketing. The theoretical principle says: the consumer evaluates certain product attributes in different ways before purchase; which refers to an existing preference system prior to the buying situation. Supposing a well-known operating mechanism makes the consumer's behaviour predictable. Notwithstanding that, the stability of this preference system varies on individual level; depending on the depth of the experiences, the intentions, the power of will, the willingness of the purchase or the importance etc. Recent researches, for example Eliaz and Spiegler (2006) focused on proving inter temporal inconsistencies in practice. However, they worked with a very wide interpretation, their result was that some consumers underestimated their future preference reversals: they thought they keep their value ranking as the time goes by - according to the research: most of them did not manage. The preference intransitivity caused by time shift can be understood by the changes of the circumstances and can be explained by the effects on the consumer in the meantime, but what happens, if we narrow our focus on a couple of minutes; exactly onto the buying situation. Considering decision making about goods with different complexities can the preferences change in a short time interval, too? If yes, why?

We remark if preference biases really happen, we have to calculate with them during the primary research. However, the classical marketing tools designed for the measurement of attribute preferences (e.g. conjoint analysis, self-explicated method or other similar experiments) do not consider any inconsistencies.

DESCRIPTION OF TRADITIONAL EXPERIMENTAL DESIGNS USED IN PREFERENCE RESEARCH

In this chapter first we compare two traditional methods (the self-explicated method and the conjoint analysis) used in consumer preference measurement. We show a third approach to the problem through an experimental research design developed for the analysis of underlying consumer preferences. We marginally mention relative new ways (logit models) to discover the buying preferences, which application is not widespread yet.

Self-explicated method and conjoint analysis

A relevant difference between self-explicated and conjoint analyses lies on their angles:

- In the case of self-explicated methodology the candidates are directly asked to evaluate certain features and characteristics. Researchers calculate utility based on these answers. A significant critic of the self-explicated method is that consumers do not know or they are hardly able to define the relative importance of an attribute (Hlédik, 2012). The experiment of Bond et al. (2008)





proved that decision makers tend to leave out - according to their evaluation - relevant viewpoints even if it is about an important decision;

- The original conjoint method helps measuring the relative importance of those product attributes, which were taken into consideration in the decision process, so as the utility that belongs to particular attribute levels (Malhotra & Simon, 2008). During the conjoint analysis respondents are not asked directly to evaluate product portfolios. Researchers calculate utilities from particular preferences. By understanding consumer preferences in the case of complex products with lots of attributes the application of the traditional conjoint analysis is adequate (Lakatos, 1999), at the same time it has some deficiencies: it can handle a sample with maximum 9 attributes and the involved characteristics assume homogeneous consumers (assuming that every consumer use the same routine to define the preference order). The retractable number of the attributes depends on the way researchers show the profiles. Hair et al. (2010) emphasizes that while in the full profile method there are six or less factors that can be involved in the case of the trade-off method this number is between seven and ten.

Further non-compliance is that the respondents never have to consider for decision all of the preferences at one time (Green & Srinivasan, 1990), which is true for the other hybrids developed from these basic techniques. The revealed preference method (similar to the conjoint analysis) has many versions. One of the most common is developed by Green and Srinivasan (1990), which consists of two steps. In the first step, the respondents assign the unacceptable level of characteristics to each attribute. The rest of the attributes will be evaluated on a scale between 10 and 0, where 0 means the less desirable and 10 the most desirable value. In the second step participants share 100 points among these attributes, depending on their importance. A part of utility is based on the product of the importance weights and the desirability order of the attribute levels. Netzer and Srinivasan (2011) converted the self-explicated to a socalled adaptive self-explicated method, while Scholz et al. (2010) introduced a Paired Comparison-based Preference Measurement (PCPM), which was developed from the Analytic Hierarchy Process (AHP) aspect. In the adaptive self-explicated method instead of ranking the attributes based on their importance, instead of dividing the constant sum among the attributes, the requirement is to share the serial constant sum out among pairs between two-two attributes.

Many different versions of the conjoint analysis have been developed through the years. The popular ones are choice-based conjoint analysis and the adaptive or hybrid conjoint analysis. The most well-known method is the adaptive conjoint analysis, which is suitable for handling big samples with even 30 attributes. During the

computer-assisted version, the respondent first evaluate the characteristics of each attribute with the help of the self-explicated method. This technique is called adaptive, because during the application the computer's decisions depend on the current answer (preferences) which characteristics should be compared. Netzer et al. (2008) developed a web-based upgrade method combining the conjoint analysis with the self-explicated method, which unites the advantages of both models and eliminate their disadvantages.

Experimental research design

Veres et al. (2012) built a research design based on Stephenson's Q-grid technique (1953). This experimental design is a computer assisted method that runs in Microsoft Excel. However, the research group heavily relied on the conclusions derived from the literature review, so they tried to use a new approach, considering preference biases in measurement. The essence of this attribute measurement is that it stops at the first point, when the respondent gives an intransitive answer. The main inspiration was given by Chen and Risen (2010). These researchers worked also with a multi-step task. In their experiment they represented the different stages of preference building: rank or rate - choose - rank or rate again (Figure 1). In case the ranking of a certain good improves, or declines - simply changes - in the circulation, these are examples for cognitive dissonance reduction.



FIG 1. THREE STEPS OF FREE CHOICE PARADIGM (Chen & Risen, 2010)

Veres et al. (2012) marked the introduction to the experiment as a critical part from the aspect of the expected results. This experimental research design applies an indirect technique similar to the conjoint analysis. The subjects were not aware of the research's theoretic focus: the intransitivity of preferences. Similar to the Multi Attribute Utility Theory this research puts psychological value into the focus, which is based on the subjective evaluation of the individual. This is why the participants are allowed to think aloud; telling more about their evaluation concept. Based on their "discussions" the researcher gains insights into the current decision-making process.

First, the respondents were informed about the scenario. The participants were given enough time: they were not asked to decide fast or to share their first ideas - as it is common in surveys. The narrator ensured the participants that there are no right answers. In marketing researches we can expect new results from experiments, which represent lifelike purchase situation: letting decision process work as it usually does. Right before the pair-wise part the question was formed like which would you choose




as a present for your beloved one? With this formulation on one hand the money's influence was reduced and on the other hand the participants were motivated to take the best option. The experimental method includes the sorting based forced choice. The Q methodology saves as much as possible from the subjectivity of the participants. The Q method enables the selection and exclusion of the most and least important values sorted on the extremities of the answer grid. Only the neutral values (sorted in the middle of the grid) are transmitted to the next phase of experiment. The application operates in the following order: after filling the Q-grid the program cuts the columns with values of the positive and negative extremes (the so-called inherent preferences as discussed at Simonson, 2008), and then generates a pair-based comparison in random sequence using only the neutral features from the middle column of the grid. The program calculates the maximum number of options and tests the respondents until the first inconsistent answer appears. The participants can only go through all the comparisons if their responses remain transitive all along.

Logit models

The choice experiments have another type of methodology, called Random Logit Model (RLM). Many forms of the RLM also have been developed. The first logit model, the conditional one was introduced by McFadden (1973). The logit models are easy to deal with, however they have some strong limitations. One of the premises is that the consumer preferences are homogeneous, meaning that they evaluate the same attributes in a same way. It also supposes that the involved profiles are independent from each other. This, basically, means that if one attribute changes in a certain profile that involves a proportional change in the probable choice of other profiles. The logit model considers only one good solution. During the data processing, one can explain the non-significant parameters as they had were not important or a possible reason can be a preference inconsistency: the different preferences among attribute levels can neutralize the effects on one another (Train, 2003).

All above described methods however visibly or in a latent way suppose transitivity of the attribute preferences and also neglect the moderating effects of the environment.

POTENTIAL REASONS FOR BUYING PREFERENCE BIASES

Some discrepancies appear only during the measurement because of the model's reduced reality. Each influencing factor cannot be handled within one design. We should bear in mind that some mistakes are common made due to the internal

environment of the individual and external circumstances or due to the nature of preference construction processing. In the line, one may note:

- Importance of the product attributes according to the buyers' evaluation;
- Accuracy of the attribute preference weights;
- Stability of the attribute preference weights;
- Complexity of the product;
- Task (rating-ranking-choice);
- Closeness to lifelike circumstances;
- Decision making environment; and
- Memories and former experiences.

The logic of choice

Mérő (2007) believes in the similarity of people's decision making structures, explaining why they behave predictable (!). The contradiction is the following: economists consider humans as rational decision makers, who follow rational patterns in certain situations, so their behavior can be foreseen. There are signs which refer to human irrationality rather than rationality. Goldstein and Hogarth (1997) have already refined that our decision-making seems to be irrational, but it is descriptive in a rational way, by understanding its specificities. In this sense we should think like this: humans follow their irrational human nature: they follow irrational patterns, so their decisions can be foreseen. Economists should calculate with the built-in biases. Harman (1995) says one shall differentiate between theoretical and practical rationality, so as psychological and logical functions have to be separated. In marketing framework, rationality means stable consumer decisions which are constructed in the situation and they are realized in actions. This context follows Samuelson's (1947) preference manifestation idea. The expressed preferences can be observed in the situations of purchase. According to Kovács (2009) to economize is to choose. This softer aspect supposes only a foreseeability link to the theoretical preferences (Richter, 1966).

On Kano's categories

The Kano et al. model (1984) assumes the existence of nonlinear and asymmetric correlations between attribute-level performance of goods (products and services as well) and their overall consumer evaluation. Practically it means that certain product attributes have a primary impact on desire. The product features must be differentiated as the followings: the threshold attributes are basic requirements; every product variant has these characteristics. E.g.: thinking of the cell phone, it is sending SMS. The wider range and higher quality of performance attributes the product has, the more satisfied the consumer becomes. E.g.: the speed of the Internet. The excitement attributes are not expected, it often makes consumers surprise. Following the logic of development if the features from the excitement attributes do not churn,



they mostly get to the performance attribute category. The threshold category is of a binary nature so if this category extends that involves a birth of a new product. E.g.: since we can surf on the Internet with our cell phones we call them smartphones.



FIG 2. Kano model (Kano et. al. 1984)

Gap in the dyad

The technological development boundlessly increases product complexity causing competence asymmetry in usage; because the technological knowledge diffuses slowly among end-consumers (Veres, 2008). The gap especially can be experienced between the laic consumers and the professional producers, i.e. in consumer goods' market. The lack of required technological skills or information causes deficits: the consumer cannot enjoy all the benefits which the product offers, because s/he does not recognize them. The consumer is also unable to judge the real value of such products, consequently competence asymmetry weakens the correct judgment of product attributes meaning by the consumer. In this case the personal selling can support the purchase.

Nondiscrete preference values

When the 'very important' and the 'not important' columns are cut from the Q-grid only the neutral attributes left. They quasi fluctuate in a - sometime - wide interval, consequently their preference level cannot be handled as an equally discrete value. These neutral attributes are not stable, they are rather context-dependents as compared to the inherent preferences, and their rank is defined on the scale through the decision (not earlier!), which can be ad absurdum random (Veres et al, 2012).

Chen and Risen (2010) conducted research on such attributes, which stand close to each other. In their research, however for the identification of these neutral attributes

they applied another methodology. The position of the 'not relevant' attributes compared to one another is not stable, which can be resulted in the change of the preference order (Hlédik, 2012). The level of the preferences is unstable: the difference between the level of two attributes and even its measures are not equal in each case: there are overlaps or unequal distances, which enhance the change in the preference order (i.e. turn of preferences).

The context always influences the preference stability (as discussed by Warren et al, 2011). Goldstein (1990) differentiated between global and local attributes. Slavic and Lichtenstein (1971) supposed that the importance weights are judged on the intuition so can it happen that under certain circumstances one attribute is clearly better than another, while in a different case this might turn. These kinds of characteristics are called local preferences: their value is context-dependent. In contrast the global attributes are independent from the stimuli they represent a fix value in the preference order. The rate of the global attributes is lower compared to the local ones. The weight of the global attributes lies in the personality of the consumer, and their judgment is likely to change if cognitive dissonance appears. In the case of local attributes, their value appears on an aggregated level: they cause a complex change in the preference pattern. Yet, the consumer is not aware of it. Observing the structure we can say that the interval of global preferences is narrower then the interval of local preferences: in case local preferences change their places - in this relative long interval - that makes the probability of preference reversal higher.

Inconsistencies in rating

The transitivity assumption is only relevant if the elements of product pairs are considered to be superior or inferior only by one product attribute (or more, but harmonious and consistent to each other). As in the old example: suppose John prefers (A), a Ferrari to (B), a Mercedes, in the dimension of superior elegance, and (B) to (C), a Buick, in the same dimension, but C to A in a different dimension: durability. Of course, such an empirical finding would be inconsistent with the above transitivity axiom. (Since here A > B & B > C & C > A holds.). Nevertheless - because of the limited mental capacity - smaller number of products and attributes to take into consideration leads to a more conscious and reliable decision. Bettman et al. (1998) stress the outcomes: uncertainty in the value of attributes increases in case of more complex products. Hlédik (2012) conducted a longitudinal test-retest research about cell phones among young adults, who were mentally and psychologically competent and experienced that most of the respondents were inconsistent: most of the participants were unable to assign the same weights to one cell phone attribute when the experiment was repeated in two weeks time. They happened to be inconsistent regarding important, not important and neutral characteristics.





Assuming that the consumer is not aware of his own preference structure, consumer is unable to identify the importance, and besides this revealed preference order always represents a status quo, which might be influenced by one of the shopper's identities. The strongest determining factors are the consumer's profile and his/her actual conditions.

Boundaries of brain capacity

According to Lehrer (2012) different parts of the brain are responsible for an emotional and for rational decisions. He proves that in cases, when our emotions influence us, we are excited, and there is not enough time left to measure the rational arguments. There are also outside effects, which should be worked-up (just like during the purchase). The Loewenstein and O'Donoghue's (2004) theory just strengthens that the decision-making path has two parallel lanes: the rational and the emotional one. They furthermore suggest that consumers are more capable to decide in a less considered way if they perceive an emotional stimulus during the purchase - notwithstanding that in such cases extra cognitive energy is required to take the rational way instead of the emotional one. Neuromarketing based researches (Lindstrom, 2009) using FMRI showed that different parts of the brain is activated during different decision paths; meaning that different decision methods end up with different solutions. Our model does not identify them, because both has a preference ranking, from the aspect of the stated preferences it does not count which was an emotional, and which was a rational linked criteria, respectively.

On a personal level the identity economics says that in our decisions the position of our currently dominant *selfes* plays a determining role: human beings are conform to their close environment; they want to unconsciously choose that behavior model which fits the expectations of others (Király, 2014). This principle might violate the axiom of the individual utility maximization or the total self-expression. These meaningful personal differences in the identities and the perception can lead to non-homogenous consumer choices.

We have to consider that consumers spare the collected information on different abstraction levels. First, the information goes to the short-term memory, where at one time 4 bits can be contained until 30 seconds. The activation theory (Donohew, 1980) says that the number of workable bits of information per minute depends on the complexity. Second, the characteristic of the long-term memory is that the contained information can be reached through a specific, associative way: the LTM has a weblike structure: the information nodes can be linked to another if the consumer is able to make the path between them. This mechanism refers to a very individual system. The memory nodes do not represent the same importance, so via the activation the more important nodes appear more often. Bettman (1979) emphasized another issue related to human memory: the reminiscences are not based on real stimulus - during the recall the brain reconstructs the required information, based on memories. This mechanism contains serious distortions by its nature. First, by the stimulus survey the data should be handled in a way to be suitable for the reminiscence: even at the beginning, one should be aware of how he wants to use it later in order to choose the right form of storage. The recall method is deeper, so it requires bigger capacity than the STM. The attribute preference order building requires appropriate and recallable bits of information. The new original stimulus makes the process more complicated by forming the original memories of the product. The process is complete, if the consumer is able to link the new bit of information to the former node, practically to put the new data to the right place. This method works vice versa: the existing and available memories influence the categorization of the new experiences (Bettman, 1979) except the situation, when the brain creates a new node for the new stimulus. This is called the assimilation-contrast theory (Monroe, 1971).

Other influencing factors

During the improvement of the system of preference biases there are several other influencing factors which have not been explicated in details yet, like:

- **Risk**: the monetary, the performance and the subjective risks moderate the perception of the buyers;
- **Prior experience:** Mangleburg et al. (1998) found the attitude of consumers with prior experience is different: the personal experiences reduce the external influencing effects, which potentially could cause preference inconsistencies;
- Transition utility (the concept was developed by Thaler, 2003): a high degree of desire may reduce the appearance of external originated discrepancies. We decided to narrow our focus on product attributes, we neglected the brand and the effects in connection with the label: originally, there is a strong relationship between actual self-identity and product image, which supports the preference order construction (Birdwell, 1968; Belch, 1978). This differentiation cannot be measured; we cannot estimate the importance of a certain brand in the model. The shoppers with a little enthusiasm are not motivated to invest time and energy in the decision making process, which is also true, or can be felt even better during an experiment. These subjects with the low involvement construct their preference system more holistic, by using simple criteria (Sirgy & Johar, 1999);
- **Location**: it would be essential to conduct data survey in-store or on-line purchase situation to reveal the differences in the appearing preference bias types. The effect of other environmental circumstances (as explored by environmental psychology) are not built in: (1) those impacts which meet the consumer directly during the purchase. We did not separate these influencing





factors so we did not consider visuals, trials, voice alerts or subliminal messages, POS techniques, sensory branding etc. We did not count with the shopkeepers appearance; (2) new bits of information for the consumer, which also influence the current decision. Early studies revealed that those consumers, who find knowledge important, they not only tend to expand their information base, but used them consciously in processing utilitarian attributes. Therefore, the "qualified consumers" during the evaluation do not pay that much attention to the circumstances and the visible experiences, like image - they are supported by their prior information;

- **Culture**: our research team supposes that cultural differences regarding this area are insignificant: one culture is not less transitive than the other. The technique of preference order construction is universal, determined by evolutionary characteristics. Our goal is rather to identify specific consumer-related behaviors in buying situation. We did not differentiate the attribute representations of joint or community preferences. Community preferences are about to keep in mind the interest of the society, or a certain segment of society, instead of caring about the advantages for the individual. A community preference could be a sustainable development, equality, transparency, protection of environment;
- **Perception**: the perception happens through more senses and products are reaching towards the consumer thought all the modalities of perception. Not any experiment can involve all those attributes, which are percepted by different senses; we only present the attributes in a written description. The determining part of the evaluation consist of at least visible attributes or even more, it may include multiple modalities;
- **Time pressure**: this issue should also be considered during both the purchase and the experiment. We cannot identify - nor the decision maker himself which thinking structure, System (1) for thinking fast or System (2) for thinking slow were used in the decision making process. The cognitive work for evaluation in real life and also in the laboratory cannot be spared: the strict time constraints result a different choice than under "normal" circumstances.

CONSEQUENCES AND FURTHER RESEARCH

This study was inspired by the unknown logic of the consumer decisions. This is why based on the evaluation of the traditional methodology and the understanding of the experimental design we intended to group the consumer preference biases; how and when they appear and influence the buying behavior. The findings suggest extending the analysis considering the following theoretical cornerstones:

- However we have not dealt with the common preferences, we agree on that the preference intransitivity might have an effect on an aggregated level, which would explain macroeconomic processes in context of behavioral economics (Koltay & Vincze, 2009). Developing large database conclusions can be drawn about a certain segment, not only individuals, which could give an explanation on certain economic or commercial trends; and
- Involving more psychology theories (from gestalt, cognitive and behavioral schools), we could identify and differentiate between the preference structuring method and stability.

The expected results rock the traditional framework of consumer behavior and selling techniques, especially the Pareto principle in case of intransitive preferences where the market is unable to establish the optimum. Considering preference intransitivity, both scholars and practitioners should rethink the methodology of service quality perception and measurement, so as product development strategies.

REFERENCES

Belch, G. E. (1978). Belief systems and the differential role of the self-concept. In: Hunt HK, editor. Advances in Consumer Research, vol. 5. Ann Arbor (MI): Association for Consumer Research, 320-325.

Birdwell, A. E. (1968). A study of influence of image congruence on consumer choice, Journal of Business Research, 41, 76-88.

Bettman, J. R. (1979). Issues in Research on Consumer Choice. In NA - Advances in Consumer Research Volume 06, eds. William L. Wilkie, Ann Abor, MI : Association for Consumer Research, 214-217.

Bond, S. D., Carlson, K. A. & Keeney, R. L. (2008). Generating objectives: Can decision makers articulate what they want? Management Science, 54(1), 56-70.

Chen, M. K. & Risen, J. L. (2010). How Choice Affects and Reflects Preferences: Revisiting the Free-Choice Paradigm, Journal of Personality and Social Psychology, 99(4), 573-594.

Donohew, L. (1980). An activation model of information exposure, Communication Monographs, 47, 295-303.

Eliaz, K. & Spiegler, R. (2006), Contracting with Diversely Naive Agents, Review of Economic Studies, 73(3), 689-714.

Goldstein, W. M. (1990). Judgments of Relative Importance in Decision Making: Global vs Local Interpretations of Subjective Weight, Organizational Behavior and Human Decision Processes, 47, 313-336.





Goldstein, W. M. & Hogarth, R. M. (1997). Research on Judgment and Decision Making: Currents, Connections, and Controversies. Cambridge: Cambridge University Press.

Green, P. & Srinivasan, V. (1990). Conjoint Analysis in Marketing: New Developments with implications for Research and Practice, Journal of Marketing, 54(4), 3-19.

Hair, J. F., Black, W. C., Babin, B. J. & Anderson, R. E. (2010). Multivariate Data Analysis. Seventh Edition. Upper Saddle River, NJ: Prentice Hall.

Harman, G. (1995). Rationality. In: E. E. Smith & D. N. Osherson (eds.), Thinking (3, 175-211), Cambridge, MA: The MIT Press.

Hlédik, E. (2012). Attribute Preference Stability for Complex Product, Marketing & Menedzsment, 46(1-2), 104-112.

Király (2014). A közgazdaságtan és a szociológia határán - az identitás-gazdaságtan által ... elméleti kérdések, [Between economics and sociology – by identity-economics... theoretical questions], Közgazdasági Szemle, 61, 92-107 (in Hungarian).

Koltay, G. & Vincze, J. (2009). Fogyasztói döntések a viselkedési közgazdaságtan szemszögéből, [Consumer decisions from the viewpoint of behavioural economics], Közgazdasági Szemle, 56, 495-525 (in Hungarian).

Kano, N., Nobuhiku, S., Fumio, T. & Shinichi, T. (1984). Attractive quality and mustbe quality, Journal of the Japanese Society for Quality Control, 14(2), 39-48.

Kovács, M. (2009). Kinyilvánított preferencia és racionalitás [Revealed preference and rationality], Közgazdasági Szemle, 56, 546-562 (in Hungarian).

Lakatos, I. (1999). A falszifikáció és a tudományos kutatási programok metodológiája [Falsification and methodology of scientific research programmes]. In Forrai, G. & Szegedi, P. (szerk.). Tudományfilozófia: Szöveggyűjtemény. Budapest: Áron Kiadó (in Hungarian).

Lehrer, J. (2012). Hogyan döntünk?...és hogyan kellene? [How do we decide ... and how to...?]. Budapest: Akadémiai Kiadó (in Hungarian).

Loewenstein, G. & O'Donghue, T. (2004). Animal Spirits: Affective and Deliberative Processes in Economic Behavior, Working Papers 04-14. Cornell University, Center for Analytic Economics.

Lindstrom, M. (2009). Buyology. Random House Business Books. New York.

Malhotra, N. K. & Simon, J. (2008). Marketingkutatás [Marketing research]. Budapest: Akadémiai Kiadó (in Hungarian).

Mangleburg, T. F., Sirgy, M. J., Grewal, D., Axsom, D., Hatzios, M., Claiborne, C. B., & Bogle, T. (1998). The moderating effect of prior experience in consumers' use of userimage based versus utilitarian cues in brand attitude, Journal of Business and Psychology, 13(1), 101-113.

McFadden, D. (1973). Conditional logit analysis of qualitative choice behavior. In: Zarmebka, P. (Ed.), Frontiers in Econometrics. Academic Press, New York.

Mérő, L. (2007). Mindenki másképp egyforma [Everybody is similar in a different way]. Budapest: Tercium Kiadó (in Hungarian).

Monroe, K. B. (1971). Measuring Price Thresholds by Psychophysics and Latitudes of Acceptance, Journal of Marketing Research, *8*, 460-464.

Netzer, O. & Srinivasan, V. S. (2011). Adaptive Self-Explication of Multi-Attribute Preferences, Journal of Marketing Research, 48(1), 140-156.

Netzer, O., Toubia, O., Bradlow, E. T., Dahan, E., Evgeniou, Th., Feinberg, F. M., Feit, E.M., Hui, S. K., Johnson, J., Liechty, J. C., Orlin, J. B. & Rao, V. R. (2008). Beyond conjoint analysis: Advances in preference measurement, Springer Science, 19, 337-354.

Richter, M. K. (1966). Revealed Preference Theory, Econometrica, 34(3), 635–645.

Samuelson, P. A. (1947). Foundations of Economic Analysis. Cambridge, MA: Harvard University Press. Reprinted in 1983.

Scholz, S. W., Meissner, M. & Decker, R. (2010). Measuring Consumer Preferences for Complex Products: A Compositional Approach Based on Paired Comparisons, Journal of Marketing Research, 47, 685-698.

Simonson, I. (2008). Regarding Inherent Preferences, Journal of Consumer Psychology, 18(3), 191-196.

Sirgy, M. J. & Johar J. S. (1999). Toward an Integrated Model of Self-Congruity and Functional Congruity. In E - European Advances in Consumer Research 4, eds. Bernard Dubois, Tina M. Lowrey, and L. J. Shrum, Marc Vanhuele, 252-256.

Slavic, P. & Lictenstein, S. (1971). Comparison of Bayesian and regression approaches to the study of information processing in judgement, Orgnizational Behavior and Human Performance, *6*, 649-744.

Stephenson, W. (1953). The study of behavior: Q-technique and its methodology. Chicago: University of Chicago Press.

Thaler, R. (2003). Mental Accounting Matters. In Cramerer, C., Loewenstein, G. & Rabin, M. (eds.) Advances in Behavioral Economics. Princeton: Princeton University Press, 75-103.

Train, K. (2003). Discrete choice methods with simulation. Cambridge University Press, U.K.





Veres, Z. (2008). Egy régi mánia: A gap-modell az elégedettségkutatásban [An old mania: The gap-model in satisfaction research]. Marketing & Management, 42(2), 4-17 (in Hungarian).

Veres, Z., Tarján, T. & Platz, P. (2012). Interrelaciones del carácter del producto y las preferencias por el producto [Relationship of product attributes and preferences]. In Ferkelt, B. & Molina, A.V. (eds.): Interdisciplinarity and Synergies in Economics and Business, European Academic Publishers, Madrid, CD-ROM, 160-166 (in Spanish).

Warren, C., McGraw, A. P. & Van Boven, L. (2011). Values and preferences: Defining preference construction, Interdisciplinary Reviews: Cognitive Science, 2(2), 193-205.