



UDK: 336.717.063

DOI: 10.2478/jcbtp-2020-0039

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Bank Risk Profiles and Business Model Characteristics

Abstract: Current research, especially after the financial crisis, highlights different key determinants of high risk bank profiles. The main aim of this paper is to test, through an empirical model, the impact of various determinants of bank business models on the bank risk with the purpose of enabling early identification of signals of risk and timely application of prudential measures. There are two basic business models for banks: market-oriented wholesale bank business model and client-oriented bank business model. In the wholesale model, a significant share of the assets is comprised of securities in the trade portfolio, the bank is strongly involved in the international financial markets, while on the income side of the bank profile, a large part is related to non-interest income. In the client related business model, classical banking is dominant, which is visible in the high share of loan-related assets, a larger share of self-financing and a larger share of income from interest-operational income in the total income structure of the bank. In the panel analysis of the empirical data, as an indicator of the bank risk profile, the stock market price to stock market price volatility ratio was used with the presumption that the market price and its volatility, with sufficiently liquid shares listed on public stock exchanges, is representative of bank risk. The analysis is conducted on a homogenous example of 20 European banks in the period 2002-2017. Following the econometric analysis, the conclusion is that banks in which business model wholesale characteristics are dominant are more exposed to business risk in periods of market shocks and, as such, represent a danger for the long-term stability of the financial sector.

Key words: bank risk, business model, bank assets structure.

JEL Classification: C33, D53, F65, G21

1. Introduction

Bank business models are not static in their definition due to the influence of exogenous and endogenous economic variables, namely the financial system evolution, macroeconomic and prudential framework, competition environment, financial and technological innovation, client requests and business objectives. The basic concept of a bank business model is determined by diversification of business undertaken, the bank business objectives in budgeting assets and revenue structure, and bank funding structure. In the European banking system there are different models of banking firm activity structures. Based on their core activities, traditional banking firms, i.e. retail banking, are focused on customer deposit collection as a primary source of funding customer loans (Financial Conduct Authority, 2017) with originated-to-hold management objective.

Financial market development forced banks to evaluate traditional business models following the trends of diversification in different lines of business activities, extension of investment activities out of retail deposit funding capacities, growth of bank risk weighted assets, increase of maturity transformation of financial assets and liabilities, increases in portfolio of financial derivatives and financial alternative instruments (Borio, 2008).

Banks have moved to wholesale business models, increasing the ratio of direct funding on financial markets, interbank activities, own trading activities, brokerage services and wealth management. An implication of extending financial products and services is the increase in non-interest income ratio in total revenue (Boot & Thakor, 2010). Banks with substantial capital market activities belong to investment banks business model. Standard investment banks are not significant in the European banking system because universal banking tradition is rooted in business model evolution (Goodhart & Schoenmaker, 2016). The bank-based financial system in European countries increased the dominance of loans in bank assets structure and strong client relations services. In the period of liberalization of capital flows, the inclusion of particular banks in international financial markets had been intensive. With the evolution of business activities, banks expanded into higher-risk financial assets whereby underlying value, quality and liquidity were unknown (Bank of England, 2008). Those banks have been more exposed to market risk and more sensitive to capital market volatility.

The main hypothesis of the paper is that the key characteristics of the bank business models are connected with different bank risk profiles. The paper is structured into four paragraphs. Following the introduction of the research problem

and the main hypothesis, the second paragraph gives a theoretical overview of bank business models. In the third paragraph of the paper a panel data model is developed confirming the correlation between bank business performance and risk profile of the observed banks during the observed period (2002-2017). The analysis of business performance of the banking firms indicates that client-oriented banks are less dependent on external funding of lending activities and banks with a higher ratio of net interest in the total income structure are more resistant to microeconomic and macroeconomic shocks.

Significant variables that determine bank risk in the analytical models should be taken into account by banking system regulators in the process of ensuring stability (Vučinić, 2016) through their prudential activities.

2. Bank business model and risk: literature review

In the pre-crisis period of worldwide economic and financial growth, banking firms have been changing their business model and have reshaped the financial system. In the cross-border consolidation of business activities, banks increased interbank assets and the ratio of trading financial assets. Deregulations of the capital flows increased customer growth and the extension of financial commitments in banks' structural products. Mergers and acquisitions on international levels are undertaken as extension of cross border activities, assets growth, and profit increase (Page & Jones, 2006). Risk models in managing bank exposure to potential losses had been done in non-adequate market assumption, which led to an underestimation of bank potential losses (Ercegovic, 2008).

Since 2007, the European Banking System has experienced a period of banking and financial crisis leading to significant losses for banks what improved bank risk management approach (Županović, 2014). Banking crises are always related to high rates of lending growth and the credit quality of loan portfolios. The analyses of the crisis effects revealed that banks were not affected equally. Some banks recovered in a short period of time, while others lost most of the assets and have shown a decrease in relevant business performance (ECB, 2010).

In theoretical discussions, there is a lack of consensus on the impact of a bank's business model on bank risk. Foos, Norden & Weber (2010) show that higher rates of loan growth are associated with greater risk. Altunbas, Manganeli & Marques-Ibanez (2011) conclude that banks with high non-interest income ratio in total revenue, and an unstable deposit base are riskier than others. Other authors show that banks with a high level of fee and trading income ratio are riskier

than others (Demirgüç-Knut & Huizinga, 2010). Shleifer and Vishny (2010) show that traditional banks with stable retail deposit source of funding are more stable in the long run and more resistant to market turbulences. Banks funded by interbank deposits and debt or hybrid instruments are exposed to refinancing risk during the market instability. Beltratti and Stultz (2012) found that banks which were strongly capitalised and had higher loan to assets ratio performed better in crisis period.

Adding to the literature reviewed, one of the contributions of this research is to develop a comparable measure of bank risk during the observed period. In the research model, the dependant variable of risk measure is defined with market price to market price volatility ratio. Banks included in empirical research are listed on the official markets with high free float stock ratio, and significant market liquidity. Market price and market price volatility are the result of the estimation performed by eligible market participants and professional investors. The estimation includes the earning potential and risk of particular banking firms. Investment decisions by qualified investors are made based on publicly available information. The market price of bank shares represents the utility of investors' position and, more than other measures, it indicates the intrinsic risk hidden in nonperforming assets and other operations risk-related to bank potential income and market- competitive position.

Individual bank risk profile will be analysed in relation to bank performance parameters. Because of the absence of a generally accepted theoretical definition of a bank business model based on empirical evidence, the research includes prevailing model parameters in order to recognize product and market orientation of selected banking firms. High ratio of trade assets, high ratio of interbank assets and large contribution of trading income in total revenue indicate a wholesale market-oriented banking firm. Banks with high loan ratio in total assets, high level of self-financing with customer deposits, higher cost-to-income ratio due to the cost of extended retail network, and high contribution of net interest income and operative income in the revenue structure, are basic parameters of customer-related banks. The impact of anticipated variables on bank risk is tested in a panel data model. The description of all variables and the expected impact of independent variables are given in Table 1.

Table 1: Description of variables and expected impact of the independent variables

Label	Definition of the variable	Expected impact
Brisk	Bank risk	Dependent variable
TL/TD	Total Loan in Total Deposits	-
INBA	Interbank Assets	+
TC/RWA	Total capital in RWA	-
OpMRG	Operating Margin	+
TL/TA	Total Loan in Total Assets	+
DERA	Derivative Assets	-
Int/OpINC	Interest income in operating income	-
TD/TA	Total Deposits in Total Assets	+
TRADs	Trading Securities	+
TIER1	TIER1	+

3. Data and empirical model

The research hypothesis implies that the bank business model is related to bank performance risk. Empirical research is carried out on the sample of 20 publicly listed system-important banks in the European Union banking sector during the period 2002 – 2017.¹ Assuming that financial markets, in the real time, have available data to estimate the market price of the bank shares whereby those shares have significant free float with quotation on official markets, the basic risk measure and dependent variable in the model is the market price-to-volatility ratio (Brisk) where the volatility ratio is measured during the period of financial crisis from 2008 to 2017. The reduction of the interval of bank price volatility measurement only to the crisis and post-crisis period is motivated by the desire to emphasize the resistance of the banking firms on market disturbance and to find out their recovery capacities. High stock prices in the pre-crisis period, high volatility of the stock prices in times of financial crisis, and low recovery potential after the financial crisis indicate high intrinsic risk of the bank business activities and an inadequate adaptation to the new regulatory framework. Those banks had exploited global financial deregulation trends in the pre-crisis period and extended their cross-border business, including their activities on financial markets.

¹ Banks included in research sample: Unicredit, Deutsche Bank, Credit Suisse, Erste Bank, Societe Generale, Banco Santander, Banco Bilbao, BNP Paribas, Intesa Sanpaolo, Commerzbank, KBC Bank, UBS, Credit Agricole, HSBC, Nordea Bank, Swedbank, Barclays, Danske Bank, Royal Bank of Scotland, Lloyds Banking Group.

The general features of the observed research sample variables were determined by descriptive statistics (Table 3 in Appendix), whereas the dynamic analysis of the dependent variable was formed based on the calculation of the average value for all banking groups for each of the observed years, as shown in Appendix at Figure 1. A very stable Brisk ratio growth, starting in 2002, recorded its first negative correction in 2007, and at the end of 2008 it fell sharply to only 1.61 basis points. The ratio increases to approximately 2.43 bp in 2009 did not obviously encounter a real base in quality of the banks' business performance. Further movement of the Brisk ratio was marked by the still negative pressure and expectations from the official markets and it can certainly be expected that the Brisk ratio will remain yet below pre-achieved levels.

The determinants of Brisk ratio will be analysed by a panel regression model. Although the econometric analysis is improving and becoming more accurate, empirical research has shown that the data being analysed has simultaneous temporal and spatial components. Such data containing the temporal and spatial components of some variables are called panel data. Panel data are repeated observations on the same cross-section, typically of individuals or firms in micro-economics applications, observed for several time periods (Cameron & Trivedi, 2005). Verbeek (2004) points out that the main advantage of the panel data compared to time series or cross-sectional assemblies is that they allow the identification of certain parameters or questions without the need to limit the assumptions. Panel data allows the analysis of changes at individual level, i.e. the main advantages of panel analysis is the ability to model individual dynamics. The panel analysis also highlights the heterogeneity control at an individual level, and the difference between the observed units is assumed. Models that do not have this feature can have negative implications in the context of the bias estimation (Wooldridge, 2002). Panel data analysis extracts maximum information from a limited number of observations over a given period and maximizes the number of degrees of freedom. Finally, the higher efficiency of model parameters is assured with less restrictive assumptions.

However, before the formation of the final model and interpretation of given results it was necessary to check the correlation between the selected variables. The correlation matrix is shown in the Table 4 in Appendix. Based on the correlation matrix results, it can be concluded that the presence of multicollinearity in certain variables is moderate and expected, taking into account the observed bank sample. Moreover, starting with the structure of the selected variables, such as the variables of profitability and capital positions, correlation is expected to be very pronounced. The proper selection of combinations of variables in the function of

logical interpretation of the obtained results, ensure the stability and reliability of the produced models even with the moderate presence of multicollinearity.

Considering that the observed variables of this empirical research are of a dynamic nature, static panel models are not appropriate for estimating the research variables due to the absence of autocorrelation, i.e. the dependence of the present value of a variable on its previous value. Therefore, for the purposes of this study, a panel analysis was performed using a dynamic panel with a GMM estimator with one step i.e. the Arellano-Bover/Blundell-Bond linear dynamic panel-data estimation.

The basic model for the selected variables can be written as follows:

$$y_{it} = \mu + \gamma y_{i,t-1} + \beta_1 x_{it1} + \beta_2 x_{it2} + \dots + \beta_k x_{itk} + \alpha_i + \varepsilon_{it}; \quad i = 1, \dots, N, t = 1, \dots, T.$$

where i is the unit, t is time, μ is a constant member, γ a parameter of a dependent variable with a lag, $\beta_1, \beta_2, \dots, \beta_k$ are parameters of exogenous variables, $x_{i,t}$ are independent variables, α_i is a specific error for a i -th bank, and $\varepsilon_{i,t}$ represents the error of relation of the i -th bank.

The number of observation units (bank groups) exceeds the number of observation periods that meet the requirement for the estimator. The analysis also found that the number of instruments does not exceed the number of cross-sections, so the properties of the GMM estimator system are not compromised. To keep the number of instruments under control, a one-step dependent variable with two lags is used as an instrument.

Finally, the one-step estimator with the application of *robust standard* error will be used for testing the research hypothesis. By using the robust standard error in a model for which the Sargan test cannot be used, the validity of the models is estimated on the basis of the autocorrelation test of the first differences of the second-order residuals. Table 2 presents the results of researching models of analysing the main determinants of the Brisk ratio of banking firms. All models satisfy the second-order autocorrelation test of the first residual differences AR (2) and specifically the test at the significance level of 5% does not reject the null hypothesis regarding no correlation of second order first residual differences, indicating that there is no autocorrelation between the residuals in the model. It can be concluded that the models are well-specified. The coefficients with the dependent variable from the previous periods are statistically significant and contribute to the reduction of the dependent variable of the current period, which is in line with the expectations and the basic assumptions.

Table 2: Results of the panel analysis influence of the selected model variables on the bank risk

Variable	MODEL1	MODEL2	MODEL3	
Banks business indicators				
Brisk	L1	-0.2544873*** (0.0850151)	-0.4120421*** (0.0923873)	-0.3747129*** (0.1027961)
	L2	-0.1575137** (0.079252)	-0.2514874*** (0.0359134)	-0.1386184*** (0.0461772)
TL/TD	-1.066979* (0.5893245)			
INBA	0.1526742* (0.0882609)			
TC/RWA	-0.4246773** (0.2200359)			
OpMRG		0.0043403*** (0.0015706)		
TL/TA		0.9961476*** (0.4051853)		
DERA		-0.0387572 (0.0905158)		
Int/OpINC			-0.9724157*** (0.3532769)	
TD/TA			2.488589*** (0.488206)	
TRADs			0.1155191 (0.1429941)	
TIER1			0.0078863* (0.0047937)	
μ	-0.0202392** (0.0088224)	-0.0324426 ** (0.0136958)	-0.0772321*** (0.0215661)	
Number of observations	254	158	139	
Number of groups	20	20	18	
AR(1) test	0.0001	0.0026	0.0014	
AR(2) test	0.1786	0.5745	0.8224	

Source: Author's Calculation (2019).

Notes: *denotes significance at 10%; **denotes significance at 5%; ***denotes significance at 1

Estimated parameters of panel model give significant results in connection of bank risk with bank business model behaviour.

Due to the Regulation of credit institutions and the implementation of Basel III capital accord (Regulation (EU) No 575/2013, 2013) all selected banks significantly increased regulatory capital (Ercegovac, 2016). Banks with higher regulatory capital ratio (TC/RWA) should be less risky and more resistant to financial and economic shocks.² The model recognized that banks primary oriented to customer activities, banks with high ratio of self-financing (TL/TD), banks with higher net-interest income in revenue structure (Int/OpINC) and banks with lower ratio of interbank assets and instruments (INBA) are more stable in economic cycles. Overbanking within the European Union can impact the financial system which, in turn, will require treatment of high systemic risk with potential fiscal and economic costs. Banks with intensive loan growth in their total asset structure (TL/TA) as well as consequently high endogenously created deposits ratio (TD/TA), show higher risk exposure then banks with more stable performance indicators. A significant ratio of interbank assets is related to wholesale and investment-oriented banks. They are more market-oriented with intense cross border activities and more intensely exposed to the crisis of interbank market efficiency. Market-oriented wholesale banks are more exposed to the price volatility of debt and equity securities but the variable of trade securities (TRADs) in bank assets is not statistically significant in the model due to deleverage of clients during the financial crisis and an increase in the ratio of sovereign debt to satisfy new regulatory requirements. Global banks are present in primary issue and underwriting of financial securities with high ratio of debt securities in total assets. The collapse of financial markets and valuation models from the beginning of the financial crisis (supported by the sovereign debt crisis) has been the source of bad debt assets and losses for large wholesale and investments banks (Katsimi & Moutos, 2010). Global present banks have a smaller ratio of interest income in total operating income due to the orientation to customer services in investment banking activities, brokerage services, custodian activities, paymaster servicing, and health management causing the high operating margin (OpMRG) which could not be stable during the crisis period indicating the positive impact on bank business risk. The crisis of the financial markets and the new regulatory framework for European banks decreased the fee income from market-related activities (Directive (EU) 2014/65, 2014) and caused that banks with higher interest income in total operating income (Int/OpINC) are more stable during the banking cycles. Market directives regarding financial instruments increased the

² The variable of bank Tier 1 (TIER1) is slightly significantly related to risk profile because of the similar capital structure trends in the sample during the observed period.

costs of investment services and asked for a new approach in client information, better execution of obligations, cost transparency, and systematic internalisation of business model definition which caused the reduction of net fee income.

Fair value of derivative instruments (assets or liabilities) is not a significant factor in bank risk exposure. Financial derivatives are mostly used for management of foreign exchange, interest rate or other risk-related position. New regulatory request in over-the-counter derivative markets forced banks to reduce derivative activities because of collateral request and portfolio compression (Regulation (EU) No 648/2012, 2012). Empirical results confirmed the theoretical base and the research hypothesis that wholesale and globally present banks are more risk-exposed than traditional client-related banks.

4. Conclusions and forthcoming bank development directions

The global financial crisis led the European banking sector into structural reforms. System-important banks reduce the volume of assets and activities because of overbanking in Europe. The most important result of prudential policy measures is visible in the increase of Tier 1 and regulatory capital ratio. Banks will implement policy measures mostly by decreasing bank risk weight assets or with capitalization of undercapitalized banks. CRD Directive enforced banks to self-finance where the loan activities will be funded by client deposits (Cerutti & Claessens, 2017). The policy effect on the European Banking Sector is the downsizing of large and internationally present banks and a reduction of their cross border activities (Schoenmaker, 2017). Due to the fact that net interest income is an indicator of bank long-term stability, fee income from traditional bank activities will continue to be the management objective in order to diversify revenue structure. Current prudential framework determines further development opportunities of commercial banks in Europe. A traditional universal banking model, which is the objective of prudential authorities, is assets-intensive and low-margin model. Banks will decrease interbank (Kleymenova, Rose & Wieledek, 2016) and financial markets activities and increase cross selling activities to customers to improve their fee ratio in total net banking income. In structuring the new banking business model, banks have to take into consideration the future digital business development in the following segments: frictionless customer relations to the banking services, new payment and settlement opportunities, product development, reporting and information to client, straight through processing of middle and back-office activities, and artificial intelligence and business intelligence in decision making. Minimum regulatory technical standards in payment system organization (Directive (EU) 2015/2366, 2015), data pro-

tection of bank clients (Regulation (EU) 2016/679), and banks' outsourcing audit standards (European Payments Council, 2010), increase the costs and development opportunities of European Banks which will increase the cost-to-efficiency ratio mostly for the banks that cannot explore a benefit of scope. Regulatory policy implications will force European banks to strengthen their position in the European Union market and to develop core banking business and strong connections to bank customers. Integrated financial security mechanism will reduce banks' speculative activities and high leverage ratio and assets growth (Dumičić, 2017). Empirical results have shown that financial markets evaluate low risk position of banks measured with the stable parameters of bank core business. In a trade-off between a high growth of the financial sector and long term financial stability, European authorities, shareholders and stakeholders of banking firms are clear when claiming that the financial and fiscal stability is the primary objective in the long run despite high capital costs, slower economy growth, and reduction in bank performance measures.

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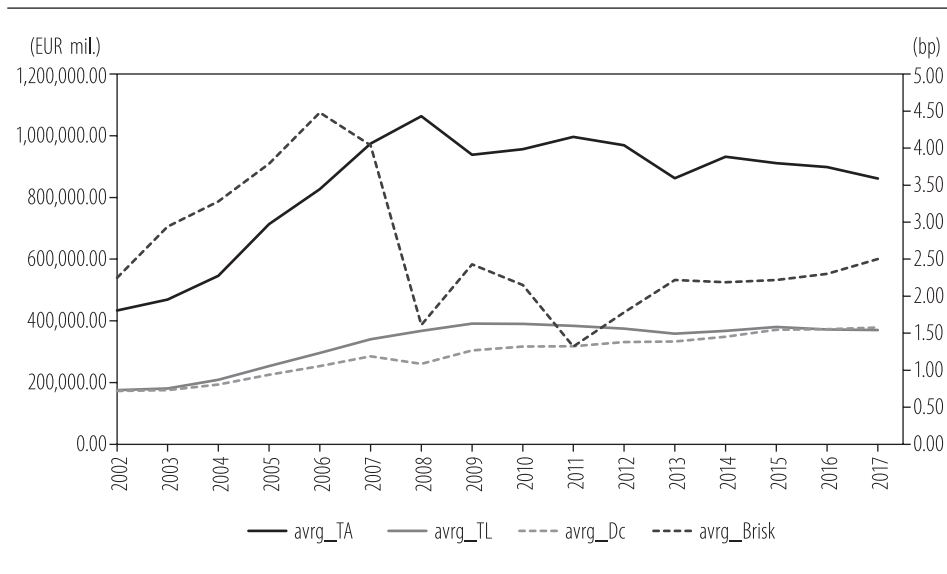
Appendix

Table 3: Descriptive statistics of sample variables

Variable	Obs	Mean	Std. Dev.	Min	Max
Banks business indicators					
Brisk	320	2.59	1.69	0.00	8.42
TL/TD	319	1.211286	0.4692908	0.3374373	2.670259
INBA	314	101665.7	96305.02	3469.44	491925.2
TC/RWA	320	0.1480941	0.0411267	0.085	0.318
OpMRG	320	24.54551	14.88303	0.068	157.861
TL/TA	320	0.4292839	0.152824	0.0984439	0.7480062
DERA	178	163504.8	185029.5	1617	859582
Int/OpINC	320	0.0297028	0.0113811	0.0120191	0.0715112
TD/TA	320	0.3663046	0.1087848	0	0.6793422
TRADs	157	106879	110657	1434	519600
TIER1	320	11.57	4.00	6.30	28.70

Source: Author's calculation (2019).

Figure 1: Dynamics of the average value of bank total assets, loans, deposits and bank risk



Sources: Bloomberg and authors' calculation (2019).

Notes: Avg_TL – total average loan; Avg_Dc – total average customer deposits; Avg_Brisk – total average Brisk

Table 4: Correlation matrix of sample variables

	Brisk	TL/TD	INBA	TC/RWA	OpMRG	TL/TA	DERA	Int/OpINC	TD/TA	TRADs	TIER1
Brisk	1										
TL/TD	0.0014	1									
INBA	0.1016	-0.4428	1								
TC/RWA	-0.0001	0.0227	-0.1462	1							
OpMRG	0.4024	0.2581	-0.2114	0.4536	1						
TL/TA	0.0929	0.6588	-0.6764	-0.0293	0.2752	1					
DERA	0.0575	-0.3844	0.4617	-0.0941	-0.0974	-0.6415	1				
Int/OpINC	0.0068	0.2734	-0.4002	-0.4765	-0.1508	0.6475	-0.5247	1			
TD/TA	0.1999	-0.3297	-0.3420	0.0063	0.0962	0.4656	-0.3726	0.4130	1		
TRADs	0.2243	-0.3383	0.2308	-0.1280	-0.1036	-0.6087	0.3887	-0.3631	-0.3399	1	
TIER1	0.0345	0.0960	-0.1841	0.9419	0.4914	-0.0253	-0.0511	-0.4796	-0.0769	-0.0668	1

Source: Author's Calculation (2019).