Identifying Business Models of Banks: Analysis of Biggest Banks from Europe and United States of America

Cluster analysis of business model identifying variables
Abstract

The modern banking industry as a whole is often accused of being too volatile, too interdependent, inflexible and operating under faulty business models (Huang, Lin 2012). It became difficult to predict, control or even understand how banks conduct their business. These issues and many others, though complex, can be addressed through a proper approach. Knowing under what business models banks operate and how business models change in perspective to time or a bank’s operative approach can provide valuable insight into the whole banking industry.

The thesis aims to determine the bank business models through the use of publicly available information. The problems faced include the proper determination of business model identifying variables, analysis for changes in business models, and bank behaviour in time and specific event perspectives. Additional interests include: a banks’ ability to self-identify their own business model, and self-identified business model comparability with analysis-derived business models. The sample consists of 63 banks from Europe and the United States of America. Institutions were observed in the time period between 2007 and 2012, which comprised the data set of 378 bank-year observations.

The business model determination procedure included: the observation of the bank’s position in the real world, a recording of that position by the use of 6 constructed identifiers, and assigning each observed bank its position (a point) in a confined multidimensional data set. By employing a hierarchical clustering analysis, the data set was used to group banks according to the shortest squared Euclidian distances measured between the banks.

The performed clustering analysis findings suggested a 3 cluster solution, thus identifying 3 distinctive business models. The pooled data analysis identified model A (1) with features of a wholesale-oriented universal banking business model containing 39 mostly European origin banks. The model B (2) containing 18 mostly banks from USA featured a retail banking business model. The model C (3) containing 6 banks mostly from USA was identified as the investment banking business model.

The clustering analysis performed for every year provided the evidence for significant change in the business model formation in the years 2008 and 2011, when both the number of banks and the business model defining variable values fluctuated significantly if compared to results obtained from the pooled data clustering. The identifier value fluctuation in 2008 was determined to be a result of the financial crisis of 2008, while the less volatile changes observed in 2011 identified the stock market fall of August 2011 and its consequences.
An investigation of bank dependency to a certain business model throughout the observed period provided evidence that banks do change their business model as a reaction to changing environments. However, a big part of an observed bank migration between business models is a consequence of a changed business model structure for the years corresponding to significant financial market events.

The analysis for self-defined business models proven to be complicated as observed banks in general do not provide an exact business model definition, often due to terminology misinterpretation or simply because banks find it unnecessary to provide such information. Consequently, a large part of acquired data is a result of interpretation of the latest published annual statements or official websites. The self-defined business models in general were communicated as universal banking business models, while the retail based models were more than 4 times less popular. In the same setting the investment oriented models matched exactly to those derived through clustering.

In summary, the performed study proved to be technically capable of identifying business models for the sampled banks and provided analytical insight in the constructed business models and banks within the observation period. Nevertheless, the results of the study are highly dependent on multiple factors that defined the processes and methodology of this study, thus, the results of the study should be evaluated with care.

**Keywords:**

Cluster analysis, business models, European banks, USA banks, self-defined business models, auto-defined business models
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1. Introduction

1.1 Motivation and problem statement

Background
The modern economy is a complex system of value creation and transformation, where people and entities play a significant role. The financial markets and institutions took it to new heights of efficiency and funding accessibility for further value creation. We learned to benefit from financial system implications, however, at the same time, we became dependant on it.

The closest and most recognisable financial institution for a common person is a bank. With perspective of added-value and safety, we increasingly entrust funds and personal financial operations to our banks. At the time of need, we trust these same financial institutions to aid us by lending the required funds. Never the less, the real dependency becomes apparent only when a failure of financial markets directly affects us.

The increasing number and severity of financial market failures are among major concerns for the public, industry professionals, and scholars. While specialists argue what is to be blamed, everyone’s trust in banks gradually decreases. The previous financial market failure investigations provided with suggestions of what could have been done to prevent disaster (Llewellyn 2010), yet similar tendencies keep reoccurring in later events.

The modern banking industry as a whole is often accused of being too volatile, too interdependent, inflexible and operating under faulty business models (Huang, Lin 2012). It became difficult to predict, control or even understand how banks conduct their business. These issues and many others, though complex, can be addressed through a proper approach. Knowing under what business models banks operate and how business models change in perspective to time or a bank’s operative approach can provide valuable insight into the whole banking industry.

The banking business model identification is a relatively new approach towards the banking industry analysis. Nevertheless, the banking business model analysis offers a wide range of applications. Several authors already employed this type of analysis, generating promising results. Ayadi et al. discusses the effects of the financial crisis by deriving business models from a sample of 26 European banks (Ayadi, Arbak et al. 2011). A follow-up study of Ayadi et al., that was published in 2012, employs similar techniques but uses a bigger European bank sample and focuses primarily on the impact of banking regulations (Ayadi, Arbak et al. 2012). A similar study aimed towards European banks’ business model identification is published by Robert Ferstl and David Seres, who used a large bank sample but showed a specific interest towards Austrian banks (Ferstl, Seres 2012).
All these previous studies show a variety of applications and even variations in the methodologies used, however, only European banks were analyzed in specific settings, thus allowing for further studies to be conducted. By building on and further exploring the field-tested methodologies, a banking business model analysis that includes banks from Europe and the United States of America could be performed.

With sufficient access to publicly available information regarding European and USA banks and their activities, a study could be performed to identify what business models banks operate under. Using the business model as a framework could provide us with the ability to better structure and classify banks, observe business model characteristics and possible changes. An additional analysis of how observed banks define their own business model could provide us with valuable insight into management’s understanding of what their business model is and how it compares to models derived with statistical tools.

Insights and analysis of structured data of this study could help in building future studies to understand why market failures affect so many banks. Findings and/or techniques could also be used to model future bank behaviour, effects on financial or regulative innovations, and for a number of other research and analytical purposes.

Problem statement
The primary goal of this thesis is to examine if it is possible to analyse the European and USA banking sector through the use of publicly available data, determine which variables characterize the banking business models and identify the major business models characteristic to the banking industry. Additionally, the chosen variable values will be compared in the perspective of time, in order to test whether the results would be able provide an insight of possible changes undertaken by banks as a response to recent significant events and the state of economy. Finally, the paper will seek to analyse how the sampled banks define their own business models and how it compares to the overall study findings.

Specifically, the paper will seek to determine:

1. Which variables define a business model of the bank?
2. What type of bank business models can be derived?
3. Do banks change/alter/evolve their business models as a response to a change in significant events or economic state?
4. When business models are identified, do their definition (variable means) change with the respect to time.
5. How banks identify their own business model and how it compares to study findings?

This paper will also consider additional questions:

1. What method should be used to determine bank business models?
2. Can we derive business model defining variables from publicly accessible information?
3. How can one identify the auto-defined business models of banks?

Research approach

Firstly, a whole scale literature review will be performed to collect all possible topic-related information published on reliable websites, academic articles and journals. Tendencies and abnormalities observed within the topic of interest will be identified and analyzed. Later, the derived banks’ business models will be interpreted and discussed using this gathered information.

This thesis investigates 63 biggest banks from Europe and the United States of America between the years 2007 and 2012. Data is acquired from the Banscope database. By relying on literature review findings, the data posing as variables most likely identifying the banks’ business models are chosen for cluster analysis. Later on, a hierarchical clustering analysis is performed to generalize the banks’ business models with the use of pooled data. Additionally, the same clustering technique is applied to the data for every year in the sampled period. The findings of both methods are compared, analyzed and interpreted from the perspective of time, banks and business models.

Accompanying the cluster findings is a study of how banks define their own business model is performed. The acquired results are compared with findings resulting from the cluster analysis.

1.2 Delimitation

The thesis is focused primarily on deriving the banking business models for the European and United States of America-centred banking industry: therefore, only banking institutions headquartered in these regions will be considered in the data sample for the business model determination. Such geographical selection was employed due to the anticipated similarity in cultures and business practices. Furthermore, only the largest active banks and banking groups with end-of-year data for 2007 to 2012 were considered. The size of the sampled institutions is chosen to exceed 40,000 million euros in total assets recorded in the year 2012, as it is expected that such a size will be sufficient to absorb full benefits of economies of scale. To ensure that the sampled banks are not controlled/influenced by external parties/shareholders, only independent banks were selected. A Bureau Van Dijk’s independence indicator (Bankscope 2013) was used that characterizes an entity’s independence from its shareholders. In an attempt to further isolate “self-managing” banks,
institutions that formed through mergers in the period of interest are eliminated from the final sample.

The banking business model concept used in this study can be defined as: a representation of a set of components utilised to outperform the competition and to achieve optimal profit in a financial market where a similar product strategy is used.

The business model identifying variable definition used in this study is described as: a publicly available, standardised data which records a tangible, comparable value of an element that significantly effects and defines a bank’s approach towards its funding, business driving products/services and/or risk-taking.

The derived business models will be analyzed through the use of descriptive statistics for the pooled and annually based data. Business models will be analyzed from three perspectives: identification of base business models and their features with the use of pooled data, identification of business models and their features for every year in the sampled period to assess formation changes of the models and bank-model membership throughout the sampled period. The self-defined business model identification will be restricted to the analysis of a bank’s annual statements (for 2012) and official websites. The acquired data will be interpreted, summarized and compared to the business models derived through clustering.

All findings of this thesis are unique due to the methodology used as well as the implied limitations, thus, the results must be interpreted with care.

1.3 Structure of the thesis

The structure of the thesis is as follows: Section 2 will present the banking business overview with the intention of introducing the essential elements of the banking industry that are necessary to comprehend how and why banks conduct their business in a certain way. The banking business is displayed through evolutionary views, where the most significant events and tendencies are presented. Section 3 will present a short overview of the most influential theories and general considerations of the business model. In addition, a summarised business model interpretation will be presented. Section 4 will present an explanatory summary of the banking business logic and practices. A short explanation of how banks generate funds, assess risk and provide revenue driving services will be presented. Section 5 will present the database and its construction approach; additionally, a list of the bank business model-defining variables will be provided together with a short characteristic analysis performed through the use of descriptive statistics. Section 6 will present the methodology used to identify the bank business models, justify the choice of algorithms, and present the necessary steps taken to generate credible results. Additionally, the generated
business models will be presented, described and interpreted. Section 7 will present an analysis of how banks identify their own business models and how they compare to results generated through clustering algorithms. Section 8 will summarize the findings and conclude the thesis.

2. Banking Business overview

This section presents the essential elements of the banking industry that are relevant to this study. The banking business is displayed through evolutionary views, where the most significant events and tendencies are presented. The impact of deregulation, industry’s and its major players’ growth and technological advances, were identified as industry shaping milestones that gradually formed the modern banking business models. The financial crisis of the year 2008 and its consequences play an important role in providing the reasoning for the latest business model evolution hypothesis.

2.1 The impact of deregulation

Within the past three decades, the banking industry undertook a substantial transformation from the initial heavily regulated environment where competition was nearly nonexistent, to an open and competition-driven industry. Generally recognised as being one of the first steps towards the present day deregulated environment, The Depository Institutions Deregulation and Monetary Control Act of 1980 equalized competitive positions amongst US commercial banks and other depository institutions by increasing deposit insurance coverage and allowing new product development. Later in 1994 through the Riegle-Neal Act, banks’ geographical expansion was also deregulated, allowing US banks to grow beyond state boundaries, providing yet another development opportunity. Finally, in 1999, the commercial banking industry undertook yet another deregulation. The Gramm-Leach-Bliley (GLB) Act further expanded banking activities by allowing commercial bank holding companies to engage in merchant banking activities such as securities underwriting, brokerage, mutual fund services and many other, as long as these activities are conducted in a separate subsidiary of the holding company. Similar deregulation procedures were later enforced in Western Europe as global competition increased rapidly. In Europe, the financial market deregulation has been shaped through the abolition of capital account restrictions and the adoption of common legislative standards (especially in EU). Nevertheless, legislation acceptance time varied significantly in each European country.

Through the implementation of these deregulations, commercial banks gained an ability to develop both in size and scope of operations. In turn, traditional banking business shifted towards less
traditional activities by leveraging their core competitive advantages: well-developed distribution networks, and experience in risk assessment gained through servicing retail and corporate customers.

*Economies of scale and technological advances*

Before the deregulation wave in late 20th century, banks in the United States and in Western Europe were highly dependent on the region they were operating in. Only high local demand for banking services could fuel the limited growth of local banks. Adding to that, strict industry regulations largely prevented profiting through economies of scale.

Only when deregulation acts, which allowed fair competition and geographical expansion, were implemented, banks became aware of new strategic possibilities. Now, banking companies were free to enter new markets either by acquiring existing competitor bank franchises or by opening one of their own. Furthermore, bank holding companies were finally able to create a system of branch offices by consolidating previously independent affiliates. Waves of acquisitions and takeovers followed radically, which changed the structure of banks. Newly grown banks learned to exploit their size and, as a result, decrease marginal costs. Having the ability to reduce service prices offered them a substantial competitive advantage. Additionally, to expansion in scale, bank holding companies heavily invested in non-traditional financial services. Insurance and merchant banking company acquisitions were another logical step towards expanding the scope of business. Bank holding institutions combined experience and knowledge gained in banking and by using it quickly adapted to insurance and merchant banking businesses. Risk assessments became more accurate and available for affiliates, decreasing service costs in newly acquired lines of business.

Following competition encouraged by deregulation, growth in scale and scope a new accelerator joined the mixture. In the late 20th century, technological advancement was met with growing application throughout the industries. The banking industry was no exception. By achieving economies of scale, which is necessary in order to apply technology efficiently, banks were able to swiftly adapt and adopt new technology. Technological solutions such as computers, internet, credit cards, and digital information storage radically changed many core processes in banking industry. Information accessibility increased rapidly, which, if combined with automated and optimised information processing, offered faster and more precise decision-making. These decreases in costs, information processing and customer servicing time summed up in substantial growth of profits. The Online service, electronic payments, credit cards, and online brokerage are just a few of among hundreds of products and their versions that became available with advancements in technology used. Most importantly, the very core of traditional banking – intermediation - undertook a major
update with this technological wave. By representing a link between parties with excess of liquidity (depositors) and those that are in need of liquidity (borrowers), banks earn a major share of their earnings. Furthermore, applied technological solutions accelerated geographical expansion in the form of increased presence in the home market to nearly unlimited global reach.

2.2 Financial Crisis of 2008

*The Gold Rush*

With newly-widened horizons of expansion and innovation, banks quickly recognised that only the front runners will be running the future financial markets and profiting from them; meanwhile, institutions that lagged behind will fail or be consumed by competition. Fuelled by obsessive optimisation and innovation, and barely restricted by optimistic regulators, banks entered the modern equivalent of the gold rush in the turn of the 21st century. Core features of this rush point to rapid and unsustainable financialisation tendencies. A banks’ role within the financial system strengthened. An increase in interconnectedness and integration among banks and financial institutions became evident.

A bank provides liquidity, transforms maturities, manages risk and develops financial innovations. The performance regarding these operations eventually defines whether a bank acts as a financial market shock absorber or originator. While the market expects banks to prevent market shocks, reality offers evidence of the opposite result. The financial crisis of 2008 shook markets to their core, uncovering major issues that were rooted into banking industry.

While deregulation and technological advances inflicted bank expansion, the competition was its main driving force. A tendency for *excess leverage and under-capitalisation* became noticeable among many banks as a means for increased competitiveness. Banks operated in a way that undermined their riskiness, which often was highly inflated due to rising proportions of leveraged assets (Wehinger 2008). A tendency to operate on *under-priced riskiness* became part of the business, as no substantial event challenged this approach. Additionally, market trust and high demand for cheap loans further encouraged banks to disregard any concerns about high levels of leverage. A supply and demand for cheap loans, provided increased levels of profit to banks as well as artificially *lowered the cost of capital*. While financial markets justified lowered capital costs by increased market efficiency, the actual risks kept accumulating in the banking sector. To make matters worse, banks with insufficient levels of funds to fill the demand for loans turned to short-term inter-institutional funding. Such funding offered the banks the ability to operate on more profitable *short-term strategies* and maximize the rate of return on equity. In the pursuit of greater
revenues, banks developed *internal reward systems* which were structured around the further preference for short-term business and underestimated risk-taking (Llewellyn 2010).

Risk underestimation was a common sight and was partially overlooked; however, the concept of risk itself was never ignored. In fact, most of the financial innovation done during the “banking gold rush” was meant to limit the risk or, preferably, transfer it. Developed financial instruments that transferred risks from the loan originators (*derivatives*) to external parties became extremely popular. These derivative contracts often featured extreme complexity and a combination of multiple loans, making it difficult to trace back to the risk-baring loans exactly. Despite the fact that derivatives were rarely fully understood by investors, demand did not fall. High returns and combined credit ratings were just too good to be ignored and became part of market euphoria. Ultimately, the lack of understanding and complexity of these securities inflicted doubtfulness and distrust in the real riskiness of the investments to be made. Cautious tendencies transferred into the market and exponentially slowed down derivative trade. Soon enough, banks and other financial institutions holding securities found it impossible to trade derivatives, as the demand simply disappeared. Similarly, cautiousness was quickly adopted by most financial markets and businesses in expectation of defaulted investments.

Incapable of liquidising huge holdings of securities, banks quickly realised the need for outside funding in order to keep operations running. However, by this time market funding was already nearly frozen. As mentioned earlier, banks which were formerly short-term oriented, were increasingly dependent on wholesale funding. In fact, bank business models were increasingly *integrating dependence on outside financial institutions*, eventually creating vast networks of banks largely functioning on the expectation that market situation will not change (Thakor, Boot 2010). Consequently, when tightly interconnected banks encountered funding issues, the effect was quickly transferred throughout the whole network. This effect became partially responsible for the severity of the financial crisis itself.

Additional additive to the scale of the market failure was *lack of diversity*. At the time when banks developed their strategies, they often diversified their business lines. If evaluated on its own, such a strategy offers significant operational safety in the event of one of the business lines failure. Never the less, when major part of market players adopts similar diversification strategies, a general business similarity is unavoidable and potentially catastrophic in the event of failure.
The Aftermath

The financial crisis of 2008-2009 is constantly being referred to when economy growth, stability and future is at question. Events that led to the crisis, the methods used to cope with it, and the harsh consequences of it now serve as an expensive lesson.

Trillions of euros spent by governments around the world to refinance banks and even countries added to the huge estimated losses for the global economy. Though the fiscal cost severity of this crisis is lower in comparison to historic crises (Deutsche Bank AG 2010), the overall effect was and still is substantial. In the attempt to properly manage and supervise the weakened industry, regulation was to be toughened up. While regulators are trying to come up with suitable regulatory instruments, industry players warn about the possibility of over-regulation. Technological and innovation advancements prevent the industry from being as tamed as it was before. A totally new approach has to be taken. Among regulatory institutions, the Basel Committee on Banking Supervision stands out, which in December 2009, suggested regulatory proposals in the form of “Basel III”. It was taken through the process of optimisation, testing and updating. New standard regulations were expected by the end of 2012 (currently postponed to January 2014). Suggested regulations for the banking industry form a long list of tools developed to achieve a balanced complementary effect. The list of these tools generally includes: capital requirements to ensure short- and long-term liquidity, standard stability indicators to assess additional stability features and totally new security measures covering bank interconnectivity, excessive expansion as well as other risks (Europe Intelligence Wire 2010).

In regards to the changing environment, banks have no other choice but to adjust to market “climate”. Business models developed during the “banking gold rush” were no longer performing because of the crisis, when funding became scarce. Many banks engaged in a survival mode, running only essential business lines. Further business model developments accrued post initial hit, when new, safe and steady, more traditional banking practices were adopted. Cautious industry and increased regulatory pressure does not allow for the rebirth of harmful pre-crisis practices. Regaining customer and shareholder trust is at its highest level of importance, thus representing the major tendencies in current banking business models.

2.3 The August 2011 stock markets fall

This event is identified as a sudden drop in stock prices in the August of the year 2011. The stock markets around the world were a part of the downfall; however the most significant effects were evident in United States of America and Europe, Asia–Pacific and even Middle East.
The Investors, concerned about the sovereign debt crisis in Europe (primarily Spain, Italy) and slower economic growth in United States, became increasingly unwilling to invest funds in activities related to these regions, eventually causing a mass effect.

Rating agencies started downgrading credit ratings for USA, France... The stock market indexes around the world quickly followed the downfall. Investment activities transferred to the commodity markets centred on gold and “safer” currencies (e.g. Swiss Franc and Japanese Yen) trades (BBC Business news 2011).

These tendencies continued till the end of the year and some effect was transferred event to the following year 2012. In the end, the 2011 stock market fall marked its presence in the balance sheets of many banks and financial institutions.

### 3. Literature Review on Banking Business Models

The following section is dedicated to providing an overview of the business model theory referred to in this paper. Due to the complexity and inconsistency in academic literature, a short overview of the most influential general considerations of the business model will be presented in the first part of the section. Additionally, a summarised business model interpretation will be presented in the second part of this section.

#### 3.1 Concept idea and supporting theory

A model is a tool used to capture and frame a complex system in a certain grid, which then could be portrayed in a manner to make it understandable for an observer. Business, structurally being a complex system, which lacks observable clarity, is a perfect example to which the benefits of a model could be applied. Business model is an important tool displaying the essence of business practices that lead to profits. Nevertheless, only well-defined business model provides the information necessary to identify, compare and possibly enhance a certain trait.

The business models topic is often debated in the latest business literature. The concept is used as an educative and analytical tool to explain and understand how businesses function. The term business model is widely applied and capable of including a range of business aspects. Business objectives, core customers, product management, business strategies, organization infrastructure and many other strategic and operational business processes fit in business model term. Because of this capability to explain so much, business model term suffers an “identity crisis”. Independent analysis undertaken by scholars and their individual approach towards business practices
investigation resulted in a broad range of diverse interpretations and definitions in existing literature. While scholars do not agree what a business model is, certain patterns in available definitions emerge.

A. Osterwalder and Y. Pigneur introduce the concept of business model in their book “Business Model Generation” through the generalized view of 470 practitioners from a number of different countries (Osterwalder, Pigneur 2010). Authors define the **business model as a representation of how organisation creates, delivers and captures value**. They use business models in an attempt to better explain how firms do business. Additionally, the book offers down-to-earth explanations and numerous practical examples aimed at educating new generation entrepreneurs. Identifying **decision making as an essential part of the business model formation**, some scholars turned to a managers’ perspective (George, Bock 2011). In search of a better business model conceptualization, the study analyses existing literature and 151 surveys of practicing managers. Findings point to the opportunity-centric business model perspective, which is based on resource transference and value structures. Here, the business model is a design of organisational structure with the purpose of seizing a commercial opportunity.

Another business model definition tendency, which primarily focuses on the identification of the actions taken and methods adopted within the business, largely falls under the **component consideration** approach. Here, the totality of the components and their interrelations form the business model. The well-structured definition based on the component consideration is provided by (Osterwalder, Pigneur et al. 2005: 3): “A business model is a conceptual tool containing a set of objects, concepts and their relationships with the objective to express the business logic of a specific firm”. Authors partially treat the business model as an analysis tool. They attempt to conceptualize business models, to separate associated definitions and to structure the terminology for the purpose of future topic development.

**Value Preposition**

Despite such a rich diversity in the business model definition approaches and themes, one major tendency is commonly observed. No matter which approach is taken to define the business model, it always builds up to a major consideration – **value preposition** (Amit, Zott 2011). In their recent study, C. Zott and R. Amit used a sample of 103 reviewed publications to classify the business model concepts and derive commonly observed themes. The authors managed to provide a well-structured version of the business model literature overview and, similar to other scholars, recognise that value creation, transformation and capture are at the core of every business model. In other words, the purpose of the business model is seen as **value achieved through a firm’s performance**.
and competitiveness. David W. Stewart and Qin Zhao support this definition in their study, concluding that “simply defined, a business model is a statement of how a firm will make money and sustain its profit stream over time” (RW.ERROR - Unable to find reference:25). The business model definition considerations through strategic, technological or competitive approaches, all rely on generated value as an indication of the business model performance. The ability to measure and compare performance in recognisable units of value (usually money) is the intended benefit of such reliance.

Value creation, though often interpreted as a simple profit, can refer to different forms of value. Besides the obvious economic value, some business models can be intended for social value objectives. For example, non profit organisations and some state- or privately-owned firms develop their businesses models optimised for social value (e.g. reduction of poverty of famine, increase in living standards). I. MacMillan and J. Thompson studies social value implications in business models and suggest a framework for social value optimised business model development (MacMillan, Thompson 2010). Though not essential, social value consideration became a certain norm in new business models. As discussions about social inequality are becoming more frequent, society expects successful firm’s contribution to social wealth. In turn, observable and well-advertised social value contributions often result in additional benefits for the firm (e.g. an increasing number of customers and loyalty). Further analysis through value consideration suggests that the previous frameworks are not capable of recognising the total value generated by business models (Amit, Zott 2001). As a response to these findings, the authors of the study introduce potential sources of value creation through business models. They list novelty, lock-in, complementarities and efficiency as main drivers, and at the same time, implying complimentary properties of individual value drivers. An additional argument is presented by G. Hamel, who suggest that a substantial share of value creation as well as absorption occur in the value network, consists of business related parties and structures (e.g. suppliers, distribution networks) (Hamel 2000).

The business model from the strategic point of view is defined as a collection of business specific decisions that develop and/or maintain competitive advantage. J. Richardson explains how firm activities function together under the intended business model, and at the same time, he formulates strategy as the process of business model implementation (Richardson 2008). The analogue view towards the business model as a reflection of an entity’s realized strategy is introduced by other researchers (Shafer, Smith et al. 2005), (Magretta 2002) and (Casadesus-Masanell, Ricart 2010). Business strategy as a term is often used as a synonym for the business model. Although both terms in a business environment often share a similar ultimate objective – sustainable profitability - they
are not the same thing. The business model is a system based on representation of business elements fitting together in an attempt to grasp a viable financial opportunity. Despite portraying a business “recipe”, it does not account for a critical performance dimension - competition. Considering a profitable business in real market conditions, the occurrence of competition is just a matter of time. **It is the strategy’s task to obtain and maintain the frontrunner position** (Magretta 2002). In other words, the business strategy represents a custom implementation of the business model with anticipation towards inevitable competition. On the other hand, a new business model that introduces radical changes in an industry’s economy and is difficult to replicate can become a competitive advantage by itself (Magretta 2002, Casadesus-Masanell, Ricart 2010). Beside the concerns for competition, a strategic point of view towards business models emphasizes generated value beneficiaries’ satisfaction. A business model, if looked at from this point of view, has to account for two sides of the business beneficiaries: customers and shareholders. It defines value sharing and delivery processes, ensuring mutual satisfaction. Never the less, an increasing tendency for customer focused value creation is observed (Chesbrough, Rosenbloom 2002).

**Business models and performance**

**Economic consideration** of business models relies on logic that generated value (profit) in a firm directly represents the performance of the business model. Here, as well as in strategic considerations of a business model, competition plays an important role. Scholars embrace the idea that the performance of a business model is highly affected and depends on its competitiveness. A conceptual attempt to explain a firm’s performance through the business model in a competitive environment was suggested by A. Afuah, who identified the business model as a set of components utilised to achieve profit – a measurement of performance (Afuah 2004). He created a strategic business model framework of profit determinants, which should be manipulated to reach the best performance. Seeking a more tangible outcome, a number of scholars conducted an empirical analysis, which incorporated similar conceptual logic. C. Zott and R. Amit analyzed business models and their performance within entrepreneurial firms (Zott, Amit 2007). The authors’ analytical approach towards the relationship of the business models and the firm’s performance rely on two distinct effects: the value generating potential of an employed business model and a firm’s ability to absorb generated value. They identify efficiency and novelty as two major axis affecting the outcome, which results from their definition of business model as a set of boundary-spanning transactions with external parties. The authors treat the business model as an independent variable, which translates to performance. Environmental factors take the role of value-effecting dependent variables.
A later publication by C. Zott and R. Amit introduced a new study which further focused on business models and firm performance relation. Questioning the effects of the business model and the product market strategy interactions impact on a firm’s performance, C. Zott and R. Amit examine a suspected contingency effect (Zott, Amit 2008). The contingency theory suggests that there is no optimal strategy for all firms and that the desired choice of strategy variables is altered according to contingency factors. In this case, a firm’s business model is treated as a contingency factor. Through the use of a purpose developed formal model and contingency theory, authors investigate a collected data set. Findings suggest “that novelty-centered business models—coupled with product market strategies that emphasize differentiation, cost leadership, or early market entry—can enhance firm performance” (Zott, Amit 2008:1). The authors formulate that both the business model design and product market strategy function complimenting each other, not substituting. This particular interpretation of the business model offers a wide applicability in empirical studies related to certain market business model analysis.

**Innovation in a business model design** is yet another factor showing high influence to overall firm performance. Joan Magretta presents the business model concept through an evolutionary view (Magretta 2002). His explanation is based on innovativeness developing new business models and optimal exploitation of the models that already exist, but could bring higher value. In his words, “…, a successful business model represents a better way than the existing alternatives” (Magretta 2002: 88). In his study, the author introduces well-known companies and their success stories, implying the value of innovative and unique business models (e.g. American Express traveller checks), as well as the benefits of better utilised, existing business models (e.g. Wal-Mart perfecting existing business model of a discount store). Magretta further expands the topic by discussing the adoptability of existing business models. He urges to question the suitability of the performing business model in a different environment (e.g. Disney World in Europe). Here, a diversity of external factors are described as a necessity for consideration before and after business model introduction. In author’s words - “Business modelling is the managerial equivalent of the scientific method – you start with a hypothesis, which you then test in action and revise when necessary (Magretta 2002: 90)”. G. George and A. Bock seconds the evolutionary thinking regarding the business model, and stresses the fact that organisations adjust and redesign their business models under the effects of changed operational environment (George, Bock 2011).
3.2 How is the banking business model defined?

The banking business model could be explained by all previously discussed business model conceptualisations. However, in order to limit the business model concept into a more manageable and study-related form, it is necessary to present a simplified banking business model rationale.

The purpose and target of a bank is an optimal financial performance. To achieve this, banks rely on a set of a few major processes: (1) acquisition of necessary funds for operating activities; (2) loan service provision as a means to generate revenues; and (3) risk taking. To manage these processes, banks develop business models – representations of how the organisation (a bank) creates, delivers and captures value (Osterwalder, Pigneur 2010). As this study is focusing on economic value, the definition is further narrowed through a performance centric view. To account for competition and the different components optimal utilisation as the basis for banking business models, a conceptualisation similar to A. Afuah’s is used. A. Afuah identified the business model as a set of components utilised to achieve profits (Afuah 2004). For the purpose of a more tangible applicability and necessary business model comparability, a work by C. Zott and R. Amit is used as a definition core for the banking business model (Zott, Amit 2008). Applying similar conceptualisation in the banking business, the acquisition of necessary funds, loan service provisions and implied risk-taking can be interpreted as a base financial product market strategy, as these are the same products/services that banks are competing for in the financial market. A bank’s individually realised form and properties of these core activities combine unique business models (e.g. a bank acquires funding through retail sources (depositors) and uses it to issue housing loans maintaining relatively low risk levels). Therefore, a bank’s business model can be determined through the identification of how it does business; identifying funding strategies, the scope of activities and the nature of riskiness as determining variables.

*The banking business model concept used in this study can be defined as: a representation of a set of components utilised to outperform the competition and to achieve optimal profit in a financial market where a similar product strategy is used.*

The evolutionary logic of the banking business model is addressed by sympathising with G. George’s and A. Bock’s thinking that organisations adjust and redesign their business models under the effects of a changed operational environment (George, Bock 2011). The ability to adjust or transform the business model is regarded as one of the major features in the banking business model logic. A bank’s management is expected to alter their business model as a response to foreseen short- and long-term future opportunities and threats.
4. How banks earn money?

This section will present an explanatory summary of the banking business logic and practices. A short explanation of how banks generate funds, assess risk and provide revenue driving services will be presented. Additionally, the most popular banking services and products with a short discussion of their importance to the bank’s performance will be listed.

How do banks earn money? It is a simple question to which there is a short, traditional answer. Banks earn money by charging interest rates on provided loans. In fact, the very same question might have brought popularity to a famous “3-6-3 rule”. It humorously states that, bankers pay a 3 percent rate of interest on deposits they receive, charge a 6 percent rate of interest on loans they provide, and then at 3 o’clock, heads straight to the golf course. Such an expression provides a simplified and easily understandable version of reality. To this day, a bank’s position as an intermediary between depositors and borrowers proves to be the prime source of profits. Nevertheless, it is not the only source of income. Thus, the traditional answer for banks’ revenue origination question no longer holds as a satisfactory answer.

In addition to profiting from interest-bearing activities, banks receive a substantial amount of income from noninterest activities which are based on charging fees for provided financial services. Traditionally, these services include: transaction services (checking, cash management), safe-keeping services (safety deposit boxes, insured savings accounts), investment services (trust accounts, Certificates of Deposits (CD’s)) and insurance services (annuity contracts). Following major deregulations within the US and Western Europe banking industry in the late 20th century, banks adopted a number of activities which previously were separated from the banking industry. Noninterest income share expanded even more with newly introduced non-traditional activities like: investment banking, insurance agency as well as underwriting, securities brokerage and mutual fund sales.

Answering the question of bank earning origins adequately requires an insightful approach, which accounts for the modernisation and versatility within the banking industry. A vast number of services available, thousands of their variations specifically tailored to certain groups or individual customers, level of presence in certain markets and scale of operations shape banks as different and unique. Thus, only relatively generalized analytical approaches allow us to identify bank revenue driving activities.

Despite a high level of divergence, banks still operate on their core business models. These can be identified through observations on how banks deal with the core elements of the banking business.
Three major factors determine a bank’s general approach towards business: **Origin and type of the funding** necessary to maintain operations, **approach towards risk** associated with operations and **source of core revenues**.

### 4.1 Funding

Banks generally earn money by lending money at a certain interest rate. To operate profitably, a bank must obtain funds which would cost sufficiently less than the issued loan interest rate. The difference between cost of funds and rate of issued loans is known as the “spread”. In balance sheets it is referred to as an interest income and sums all interest bearing activities. If interest on loans and owned debt securities sufficiently outweighs interest paid on deposits and other source of funds, the bank is operating profitably.

**Deposits**

In most cases, deposits represent the largest share of bank funding. It is money entrusted to the bank by its customers for safe keeping and availability for future financial transactions, otherwise referred to as core deposits. In return, banks offer an interest rate which highly depends on the customers’ ability to access deposited money. The bank is willing to pay for a long term certainty regarding available funds. Therefore, savings depositors who are restricted from access to their funds for a certain period of time, are rewarded with modest interest rates, whereas checking account owners with full access to use their funds often do not receive any, or very small compensation in the form of interest.

In the banking industry, customer deposits (in particular longer term deposits) are referred to as “core deposits”. Investors, shareholders and industry specialists recognise the importance of customer deposits, and often rely on it as part of a bank’s riskiness assessment. The reasoning is rather simple; banks with sufficient access to deposit funding avoid additional exposure encountered when obtaining funds through trading or short term wholesale borrowing. Diversity and a high number of depositors prevent unstable funding risks and are less sensitive to sudden downfalls in financial markets.

**Wholesale deposits** are an alternative funding option for banks which are incapable of attracting a sufficient level of core deposits. Structurally, wholesale funds are largely similar to certificates of debt, just on an interbank level. This kind of mostly short-term based funding is widely used throughout the industry and is accepted as an adequate funding option in the time of need. Some fast turnover (mostly trading) banks prefer short-term funding as a means to manage their balance sheets in a pro-cyclical manner (Adrian, Shin 2010). A heavy reliance on wholesale funding implies a warning signal to investors and industry analytics. Competitiveness is first to be judged, as wholesale...
banking is more expensive than core deposit. It means that banks that rely on a more costly funding either settle for a narrower interest spread which leads to lower profits, or operate on a higher yield expectance. This in itself transfers to greater risks. Adding to this is a factor of uncertainty risks, as it is not certain how long and how much funding is available for a price that is acceptable for banks.

**Equity capital** is far from being a primary funding option for most of the banks. It is largely because such capital is much more expensive than other means of funding. Nevertheless, shareholder equity plays a strategic importance as a part of total capital. Many regulatory ratios incorporate shareholder capital as stability indicators or safety buffers. Common equity is capital raised by selling shares to an outside investor, thus, the price of capital. Apart from the initial capital rising, issuing shares usually represent a need for funds, which in turn is used either for acquisitions or capital position repairs after rough periods of elevated bad loans. Rapid changes in share equity identify abnormal events and, to some extent, the level of success of adopted business model.

**Debt issuance** is yet another method to aid in raising capital. As well as many corporations, banks use debt to stabilize their funding flows. Repurchase agreements are among the core sources of employing debt-funding on a short term basis. When reported on balance sheets, the debt usually exceeds equity (normal in the banking sector), however, if compared to the share of total deposits or loans, the ratio is much lower. Thus, despite performing as a funding stabilizer and often used by a majority of the banks, debt is not a vital source of bank funding.

### 4.2 Use of Funds

**Lending**

As mentioned before, issuing loans is the core business for the biggest majority of the banks. It also represents a substantial share of used funds, as well as an equivalent part of the net income. Typical properties of a common loan are designed for fixed terms, which limit implied risks to a minimum. The loan is required to be backed up by a certain security equivalent to the loan, usually with the same property the loan will be used for. A fixed rate ensures a steady revenue inflow distributed throughout the fixed period of time the loan is issued for. In general, banks will avoid allowing flexible terms or asking for a greater level of compensation if loan flexibility is granted. A bank’s performance is highly influenced by its ability to match provided loans with proper funding sources.

Another safety mechanism used as a part of lending operations is the **credit worthiness assessment**. In the process of loan consideration, the lending institution evaluates potential borrower’s financial profile. Income stability, owned assets and history of credit from the base of bank help to estimate
credit worthiness. The purpose of the loan is also incorporated in loan underwriting decision. A bank will favour real property purposed loans like buildings, machinary, inventory, etc., as in the event of non-payment, the bank will be able to reclaim some of the underlying asset value.

Credit worthiness assessment is so crucial that banks invest heavily in the development of extensive complex formulas to assess potential borrowers as precise as possible, thus limiting expected risk. High advances in credit worthiness assessment placed banks in a financial judge’s role in modern economy. Essentially bank loan officers decide which business opportunities or projects deserve the required capital. There are few interesting studies regarding credit worthiness assessments (credit scoring) available. A more recent study performed by L. Einavand M. Jenkins analyzes “the adoption of automated credit scoring at a large auto finance company and the changes it enabled in lending practices” (Einav, Jenkins 2013: 1). Findings suggest that the implemented automated risk assessment brought a significant increase in profits, resulting from newly optimized credit scoring practices.

**Consumer loans**

Consumer lending describes financing to individuals, which represents a substantial part of the total number of loans globally. While there are various forms of loans targeted to consumers, few general classes emerge.

**Mortgages** represent the largest share of consumer loans, as housing falls among the highest value of acquisitions. Such a type of loan is considered low risk; the acquired residence itself serves as collateral. In exchange for a high value low risk loan, a financial institution obtains stable income in the form of interest usually lasting up to several decades. In many cases, banks and financial institutions providing mortgage loans, gain a loyal, long-term customer with additional financial needs. Stable income and possible future earnings form the basis for every bank’s prosperity. Consequently, many banks construct their strategies around mortgage loans and their accessibility to the target customers. One of the examples which emphasizes the importance of mortgages and the mistreatment of this vital part of financing practices is the mortgage crisis of 2008. D. Demyanyk and O, Van Hemert made a study analysing the quality of the mortgages dated prior to the crisis, and to discuss the possibility of its early identification and prevention (Demyanyk, Van Hemert 2011).

**Credit cards** are a modern representation of a personal line of credit. Such types of loans offer ultimate flexibility in terms of convenient small scale borrowing for day-to-day use. Despite the attractive upsides, credit cards are amongst the most expensive type of loans (regarding interest rates charged) in financial markets.
Branded names like Visa or MasterCard are well-known for the majority of credit card users; however, neither of these brands representing companies is actually providing loans. These companies individually operate elaborate networks through which funds are being moved between a shopper’s bank and a merchant’s bank after an initial transaction. In essence, Visa and MasterCard ensure the movement of funds between the involved parties, eliminating the risk of fund absence or insufficient funds.

Due to the high-risk nature and share size of credit card-based micro loans, not many banks are willing to undertake such a line of business. However, banks that developed an efficient automated service network are more than capable of dealing with the task. These banks rely on nominally small, but great in numbers, service fees related to credit cards: late payment fees, over-the-limit fees and interchange fees collected from merchants for accepted cards/transactions.

**Commercial lending**

Another substantial part of total lending consists of business (commercial) customer lending. It is an essential market for both banks and businesses. Having the ability to borrow funds when needed at a reasonable price is one of the targets for corporations and small businesses, as unnecessary cash accumulation is considered to be a sign of inefficiency. Many companies use loans to offset financial market risks, liquidity risk, and to decrease income volatility and many other reasons that play an essential role in modern business management.

The popularity of business lending differs in respect to market location. In countries like the US where bond markets and alternative funding sources are largely available, business lending represents a considerably smaller share. European business practices traditionally rely on bank lending, often with long term relationships and loyalty to a particular bank.

Business lending services can be listed as: commercial mortgages, equipment purpose lending, and other loans assigned to particular business operations and their expansions. These “classic” loans are usually backed up by purchased property or equipment. Loan securing through the use of accounts receivable is a less common practice, though it is employed when a company has a history of steady revenues and no other property that could pose as collateral. Interest rates on provided loans are a direct reflection of business riskiness assessed by the bank. Just like customer credit worthiness assessments, business loan default risks are calculated through elaborate models, heavily relying on the past performance of the entity in question.
Securities acquisition is yet another form of a bank’s interest based income. Though a sizable share of capital in banks is locked in securities, it is not amongst the most desirable uses for generated funds. A few factors effect a bank’s position in respect to securities. A regulatory requirement for capital reserves in banks around the world is the main force driving securities acquisition and holding. Debt securities issued by national governments are recognised as a safe equivalent to cash capital. These securities offer reasonably small interest rates, but on the other hand, these rates are the only allowed benefit from bank reserves. The absence of profitable investments for an excess capital is another factor determining the share of capital directed to securities. Banks are willing to buy and hold securities in a “slow economy” phase, as it could be more reasonable to invest in low interest rate securities than to issue under-priced (from a particular bank’s perspective) loans. Consequently, banks became major acquirers of securities around the world. Sufficient safety and liquidity of government issued debt securities is a reason why the share of capital held in banks as securities became one of the core bank risk assessment indicators.

Non-Interest income
Throughout the history of banking, interest-based income always took the leading share in total revenues, up until a few decades ago. A deregulated and modernised banking industry turned to exploiting opportunities in non-interest based activities. Quickly enough, this part of the banking business increased in popularity and in some banks, even offset the interest based income. Minimal risk, limited capital needs, and high returns on capital encountered in non-interest activities, became a steady line of business for many banks.

Bank customers encounter an increasing number of service fees, which might be charged for nearly every operation a bank engages into. While being tied to specific operations and minimal in value, bank imposed fees become a lucrative source of income. Modern banks process a vast number of operations daily and when a majority of them charge fees, it does sum up to substantial earnings. Service fees can be charged for simply opening an account, overdrawing a certain limit in account, transferring money, paying utilities, cashing money at ATMs or using a safety deposit box. Reasonably higher fees might be encountered when customers are serviced by bank staff instead of automated self-service options. In many cases, fees can be attached to loans or even deposit contracts. Though banks tend to justify fees by the need to cover paperwork and other service expenses, in reality, it often becomes a source of easy profits. The absence of fees or their separation from advertised services often become essential parts of complex marketing campaigns engaged by banks in competitive situations.
**Derivative contract trading** is a huge and very important part of the investment banking business. Representing a fair share of the latest financial innovation, these contracts can be derived from nearly any kind of asset, including mortgages, bonds, equities, commodities and even exchange rates. The most common forms of derivative are known as options, futures and swaps. The benefit of using derivatives lays in a few major roles: (a) risk management, (b) price determination, and (c) liquidity enhancement. Despite benefits implied in derivative trade, one type of these contracts cause most of debates. Over-the-counter (OTC) derivatives gained their negative reputation due to their general mistreatment and trade deficiencies, which often resulted in certain asset class exposures. Due to OTC’s bilateral nature, it is extremely difficult to identify where the exposure is or what the value of such a contract is. Financial institutions focusing on derivative trading act in their own interest, thus often gambling on risk versus return tradeoffs. Under-regulation of these instruments and the self-cantered nature of a trading institutions’ risk management could result in a risk “spill-over” effect throughout the trading market (Acharya, Brenner et al. 2009). A similar situation was observed in the latest financial crisis. Banks engaging in derivative trading often centre their strategies on the volatile nature of these securities. Excess capacities are managed through reliance on short-term funding, often resulting in a heavy dependence to wholesale banks.

**Additional non banking activities**

Nonbanking activities such as insurance or leasing are reasonably recent additions to the banking business. When deregulation eliminated restrictions for non-banking activities, there was no surprise that one of the first adopted businesses was insurance. Its strict regulatory background shares strong similarities with banks. Furthermore, both businesses rely on similar risk evaluation and pricing practices, as well as a liability backing with a minimal capital approach. Another popular and similar business to banking is leasing. Banks operating in this business segment show low- or non-interest in owning underlying assets; however, they are more than interested in acquiring interest-paying customers. Thus, it is a common practice for banks to form partnerships with equipment dealerships. Dealers end up being paid by partner banks for every lease agreement signed, whereas banks receive interests on the lease.

**Treasury services** are another non-banking activity gaining popularity amongst bank customers. Banks may offer to take over working capital and payroll management. Many customer businesses find it convenient and beneficial to pay for such services to their bank instead of hiring personnel capable of dealing with these tasks.
Modern banks sometimes also offer **payment processing services**. Setting up payment systems that use credit or debit cards, introducing electronic check handling, automated invoicing and supplier payment, or simply offering automated and efficient equivalents of daily payment related operations, all are among options offered to business customers. By providing such a service, banks charge either an implementation or servicing fee, while the customer enjoys additional payment method options and optimized payment processes.

### 4.3 Risk-taking

Being an essential part of banking business, risk-taking is one of the major concerns for every bank. The initial business objective is to operate on the lowest risk possible, while charging the highest risk premium. Two major risk-taking strategies exist as a means to profit from this risk and the premium relation.

**Traditional banking risk strategy** involves internal risk management, when an institution uses a number of developed competitive advantages to limit and mitigate taken risks within its own business structure. Employing this strategy, banks accept credit risk when lending to their customers, holding this asset on its balance sheet and maintaining an appropriate level of capital to cover unexpected risks, which are estimated through customer credit-worthiness analysis. Banks minimise unexpected risks, utilising advantages of gathered customer-related information, thus avoiding asymmetric information dilemma. Additionally, it allows for the mitigation of adverse selection and moral hazard, further lowering the unexpected risk. Through the summation of faced risks, the bank decides whether it is economically viable to issue the loan, with the available risk premium. The greater the spread between calculated risk and available risk premium, the greater the profits will be generated for the bank. Such an approach towards risk defines the role of a bank as a financial intermediate and effective financial stress absorber.

This banking strategy by nature, does not permit any form of risk transfer to other parties. All risk mitigation and elimination advantages accessible for the loan-originating institution are not available to a possible loan purchaser. As a consequence, interested parties would face a greater unexpected risk and asymmetric information related threats. The initial loan issuer would be driven to pass on primarily lower quality, riskier loans. Such behaviour is expected due to the adverse selection and moral hazard. Reacting to such situations, an external party would be forced to charge higher risk premium to account for the greater uncertainty. Due to competition in the market, such difference in prices would not be tolerated, making risk-transfer in a traditional banking risk strategy, unreasonable.
Fundamentally, a different approach is offered through **risk-transfer strategy**. Accordingly, a bank employing such an approach would seek to transfer risk to an external party. While this was unreasonable in a traditional banking model, the latest advances in financial instrument development made it possible. Securitisation and other credit derivatives were purposely developed to fit the task. Securitisation defines the process when a bank, through financial engineering, transforms an illiquid asset or a group of assets into a tradable security. It allows the sale of loans with credit risk transfer and elimination from originators balance sheet. The extent of risk-transfer highly depends on securitisation procedures and channelling through a bankruptcy-remote special purpose vehicle. Collateralized debt obligations (COD’s) - a form of derived securities - slightly differ from others, as the originating banks still hold them in balance sheets. Furthermore, despite the original intention to shift risk, derivatives were blamed for transforming risk. It became evident in the early stages of the financial crisis of 2008. Security buyers, through the initial transaction, acquired the credit risk; however, due to mistrust developed through the driven security market freeze, credit risk changed to liquidity risk. Transformation developed even further when security originator banks were no longer able to sell constructed securities at economically viable prices or refinance maturing debt, liquidity risk turned to funding risk (Llewellyn 2010).

### 4.4 Bank classifications

Each bank generally operates under certain funding strategies accompanied with specific revenue sources and risk taking practices. The choice of these elements and a variety of their combinations makes the bank unique. Never the less, the most distinctive features regarding funding, sources of revenue and risk taking imply the bank's general tendency towards certain class of banking.

**Universal bank**

The Banks that are classified as such provide a variety of financial services, which may include lending, depositing, investment, securities trade, asset management and many other financial services expected from any kind of bank. Such type of banking is more common in Europe then in United States of America, which is a result of USA’s requirements to separate investment and commercial banking practices.

**Retail bank**

Similarly to a retail stores representing one big brand, banks that fall under this classification aim to be as close to their customer as possible and offer a wide variety of retail oriented services. Households and private customers are offered mortgage, loan, savings services, which are often accompanied with personal lines of credit (debit and/or credit cards). In some cases retail banks undertake even private investment management services (limited by regulations).
Investment bank
Banks are classified as such when they concentrate their services on securities (and currencies, commodities and other instruments) trading or promotion. Additionally, investment banks assist in mergers and acquisitions, raising capital or issue securities on behalf of their private, institutional (prime client) or even governments.

Commercial bank
This type of bank can be simply defined as a financial institution targeting businesses. Similarly to retail banks, the commercial bank also accepts deposits, makes loans and offer basic investment products, but services are focused on large businesses and corporations.

Wholesale bank
As the term implies, such type of bank provide large scale financial services for other banks, financial institutions and corporations. These types of banks are also involved in large scale financing, underwriting, consultancy and other wholesale financial practices.
5. Data

The following section will explain the construction of the database, present the logic of what is considered to be a bank business model defining variable, and what features it must contain to serve as a business model determinant. A final list of these variables will be provided together with a short characteristic analysis performed with the use of descriptive statistics. Furthermore, data availability and collection procedures will be introduced.

5.1 Sample selection

The sample selection process is aimed to incorporate the biggest and industry effecting banking institutions headquartered and operating in the United States of America (USA) and in European countries. Such geographical selection was employed due to the anticipated similarity in cultures and business practices. A broader analysis about cultural, linguistic and geographical background significance in financial markets is presented by R. Stulz and R. Williamson, who performed their analysis from an investor’s point of view (Stulz, Williamson 2003). The institution size and influential potential on the industry is determined by the recorded size of banking activity, represented by the total consolidated assets recorded in the end of year 2012. A preference for big banks also ensures that effects of optimisation and economies of scale would be accounted for in the final sample. Smaller institutions, for example, might not be equally capable of serving large (corporate) clients, achieving lower costs through high-volume production or accumulating sufficient funds for the desired optimisation solutions.

The final sample under study consists of the 63 largest (exceeding 40,000 million euros in total consolidated assets in the end of the year 2012) active banks and banking groups with end-of-year data for 2007 to 2012, comprising of a total of 378 bank-year observations. To ensure that sampled banks are not controlled/influenced by external parties/shareholders, only independent banks were selected. A Bureau Van Dijk’s independence indicator (Bankscope 2013) was used, that characterizes an entity’s independence from its shareholders; “A” indicates the absence of shareholders with more than 25% shares, “B” indicates the absence of shareholders with more than 50% shares, “C” and “D” indicates at least one shareholder with more than 50% shares. The sampled banks were required to be identified with no less then “A” or “B” indicators (appendix 1). In an attempt to further isolate “self-managing” banks, institutions that formed through mergers in the period of interest are eliminated from the final sample. Radical changes involved in an institution merger often resulted in the construction of new strategies and prolonged institution transformation procedures, thus possibly affecting the value of the chosen sample and further analysis.
The sampled banks used in the study are listed in appendix 2. Additionally, a set of related information accompanies the sampled institutions, including: total consolidated assets, country of registration and type of banking institution. The sample includes: **23 institutions from USA and 40 from Europe** (Austria (2); Belgium (1); Switzerland (1); Germany (3); Denmark (1); Spain (5); France (2); Great Britain (6); Greece (2); Italy (7); Luxembourg (1); Netherlands (1); Norway (1); Poland (1); Portugal (2); Sweden (4)). More than half (33) of the institutions throughout the list are identified as bank holding institutions. Bank holding institutions employ similar management techniques as a bank or banking group – all develop business models for the best performance. Bank holding institution status also allows a number of benefits, like tax exemptions, eased capital raising and money borrowing. Having better access to funding and liquidity were among the reasons encouraging many distressed investment banks to convert to bank holdings in the aftermath of the 2008 credit crisis. The example of such case is presented in the press release of Morgan Stanley (Morgan Stanley 2008). Never the less, regulatory framework applied to bank holding institutions are similar and often exceed traditional bank regulations.

**Variable data availability, source and delimitations**

A large amount of data about banks’ operations are reported publicly either voluntarily or as a regulatory requirement. While voluntarily published information is limited by the individual bank’s need to inform investors and customers, information disclosure required by regulatory institutions is a must. Furthermore, largely unified international accounting practices ensures that a certain standardisation regarding issued information if followed. Therefore, if summed up and periodically collected, such data can provide significant insight into the banking industry and individual institutions.

A lack of resources and limited access to information was a major issue considering the data collection for this study. Resorting to the available options, a choice was made to rely on ready-made available databases. Data collected for this study primarily comes from Bankscope – a comprehensive, well renowned database, containing a wide array of bank-related information. The database offers financial statements, ratings and other intelligence on 30,000 banks, accounting for the last 16 years.

Bank selection procedure involved inputting necessary delimitations (presented in “Sample selection” section) to an automated web based search system and limiting the data set to a manageable sample size of 100 banks. Afterwards an automatically generated output was manually screened for same delimitations. An additional elimination was undertaken to exclude institutions which are headquartered in different locations, but using same name as group they belong to. After
all screening procedures a sample set of 63 banks was constructed. Expansion of data set was considered but proved to be unreasonable, as further observed banks suffered high level of dependency on other institutions and/or ran a much smaller scale of banking operations, which potentially threatened the comparison of sampled institutions.

Additional information of a less standardised nature was collected through the use of annual statements issued by the sampled banks. Such information lacks structure, common standardization practices and might be influenced by the public image developing processes as annual statements are often developed to address the investor and general public.

5.2 Bank business model defining variables

What is bank business model defining variable?

Banks, while serving as financial intermediates, became an important part of personal and even institutional wealth management, largely due to the wide range of services, products and customers served. In an attempt to optimise performance, individual banks became more focused on business lines and products which they were particularly good at. Because of this divergence and the inability of outsiders to clearly identify business lines or products the bank is particularly good at, it became increasingly difficult to determine the business model the banks were operating.

Defining a bank’s business model requires a large collection of data that could identify the institution’s business model with the highest possible explanatory power. In this study, the approach to determine a bank business model will be based on core bank process defining variables. As it was broadly explained in a previous section (“How banks earn money”), bank business develops around three major processes: (1) acquisition of funds for operations; (2) service/product provision as a means to generate revenues; and (3) risk taking. If correctly identified, measured and compared, these processes can be translated in business models, representing a group of individual entities with similar business essentials. To achieve higher representation power of banks’ business processes, a well-defined variable definition must be chosen:

The business model identifying variable is described as: publicly available, standardised data, which records a tangible, comparable value of an element that significantly effects and defines a bank’s approach towards its funding, business driving products/services and/or risk-taking.

Applying such a description eases the selection process and lowers the amount of data to be gathered. Nevertheless, not all publicly available data can be used as variables immediately. Data
construction (combining available data) will be necessary to derive variables with a higher power to define bank business processes.

In order to limit the number of variables, a 3 step variable selection technique was employed. First, a database of multiple variables was compiled in an attempt to gather as much publicly available information as possible. A total of 99 variables with dedicated bank/year observation formed the dataset (the list of collected variables and their coverage percentage is available in Appendix 3.). The second step involved in the elimination of variables unfit or incapable of sufficiently representing a banks’ business model. The coverage ratio calculation was employed in order to identify variables that featured the lowest percentage of missing or unavailable bank/year observations. Inconsistent data reporting does not allow proper data analysis, thus a higher coverage ratio is preferred for further variable limitation. In the third step, which addresses relevance to the study, only data which identifies a bank’s financial performance, financial activities (asset and liability structures, funding practices, product orientation), and riskiness were considered for the set of indicators to be used in further analysis.

5.3 Construction of variable subset for further analysis

Determining a manageable set of instruments that would be capable of identifying optimal similarities/distinctions between business models requires additional procedures. The choice of variables will eventually determine the basis for business model identification, thus playing an essential role in this study.

Selection methodology

Two major guidelines form the further variable selection procedure. First, it is assumed that banks actively and intentionally construct, use and modify individual business models through management. This implies that chosen variables (e.g. describing risk-taking positions or funding), can be influenced by the bank. Nevertheless, while it is assumed that market conditions or systematic risk cannot be directly affected, responsive alterations to a bank’s revenue sources and other operations could be employed to adjust accordingly. For example, through long-term observations, a bank recognises that because of the estimated stable low-market risks (systematic risk), interbank lending became significantly cheaper and a potentially more attractive source of much-needed liquidity. On the other hand, the same situation could cause a bank to reconfigure revenue strategies as interest-based profits could be diminishing with lowering interbank borrowing rates and increased competition. Such assumption is aimed to account for the possible relatively long-term banking business model changes as a response to a changing operating environment.
The second guideline introduces the representation rule. It implies that chosen variables aim for significant representation of a particular feature of the banking business model. At the same time, over- or under-representation must be avoided to achieve the best result. For example, if “interbank assets” would be chosen as business model defining indicator, the use of “repurchase agreements” as another indicator would cause over-representation. Interbank assets incorporate repurchase agreements in its calculation. As presented in the example, composite variables could offer representation advantage, as more components can be integrated in one variable. Ideally, chosen variables would be able to account for all major business model defining bank activities.

Subset of variables

Based on judgement of the previously introduced delimitation, selection methodology and results of existing literature of similar studies (e.g. Ayadi, Arbak et al. 2011, Ayadi, Arbak et al. 2012), the subset (Appendix 4) of six variables is constructed. The correlation analysis performed on selected variables, shows no significant signs of over-representation of particular banking business features – no extreme positive correlations between variables were identified. Observed negative correlations show expected negative relations between variables, coherent with variable selection intentions (e.g. It is expected and intended that “Net Interest Income” would be negatively correlated with “Trading Assets”, as these variables represent different bank revenue structures. Banks tend to focus on one revenue structure, thus neglecting the other). A full correlation analysis is available in Appendix 5.

In the end, collected information forms a substantial data set with multiple dimensions. The First dimension lists selected banks, the second is formed by chosen business model identifying variables and the last dimension is the time of data record (2007-2012). All variables were constructed under 100% coverage rule. All observations recorded as “0” were treated as a values and crosschecked with banks’ balance sheets and income statements to prevent misinterpretation of “not available (N/A)” data as being equal to 0.

5.4 Descriptive statistics of a variable subset

5.4.1 Customer Deposits over Assets (CDA)

Customer deposits are described as all type of non-bank institutional and private (household) deposits. More precisely, this indicator comprises three forms of deposits collected: current, savings and term-based. As a part of a total balance sheet, this measurement helps with identifying the nature of a bank’s funding practices. CDA is constructed as Customer Deposits/Total Assets (variable construction in greater detail is available in appendix 6).
Figure 1. Descriptive statistics and a box plot for Customer Deposits over Assets (CDA)

<table>
<thead>
<tr>
<th>Year</th>
<th>Mean</th>
<th>Std. Error</th>
<th>Std. Deviation</th>
<th>Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>0.429</td>
<td>0.026</td>
<td>0.208</td>
<td>0.043</td>
</tr>
<tr>
<td>2008</td>
<td>0.434</td>
<td>0.026</td>
<td>0.210</td>
<td>0.044</td>
</tr>
<tr>
<td>2009</td>
<td>0.453</td>
<td>0.027</td>
<td>0.216</td>
<td>0.047</td>
</tr>
<tr>
<td>2010</td>
<td>0.459</td>
<td>0.027</td>
<td>0.215</td>
<td>0.046</td>
</tr>
<tr>
<td>2011</td>
<td>0.467</td>
<td>0.028</td>
<td>0.222</td>
<td>0.049</td>
</tr>
<tr>
<td>2012</td>
<td>0.478</td>
<td>0.028</td>
<td>0.225</td>
<td>0.051</td>
</tr>
</tbody>
</table>

A higher share of customer deposits in bank’s total assets (CDA) signals a more traditional, stable and relatively controlled bank’s funding strategy. Banks with high levels of CDA are generally classified as retail banks, often implying that banks of such nature have generally a better-developed retail networks, operating in depositing intensive regions. However, high levels of CDA can also be identified in asset management financial institutions and clearing houses.

Figure 1 presents a summary of an instrument’s empirical distributions. The descriptive statistics table, together with a box-plot, show a relative consistency. In the box-plot, horizontal bars mark the median; the blue boxes represent 50% of the data around the median (spaced between the 25% quartile and the 75% quartile). Vertically spanning black lines mark 95% of the recorded data. Black circles and stars mark the outliers.

A steady ratio’s average increase is observed on an annual basis. A slightly higher average increase was recorded in the year 2008; if compared to 2007, the CDA average increased by nearly 2%. This could be interpreted as a consequence of the financial crisis, when depositing savings became more attractive than investing in collapsing investment markets. Another type of cause could lay in a bank’s intentions to secure funding through retail sources rather than borrowing in an increasingly expensive wholesale market.
5.4.2 Income from Fees and Commissions over Operating Income (IFO)

Figure 2. Descriptive statistics and a box plot for Income from Fees and Commissions over Operating Income

<table>
<thead>
<tr>
<th>Year</th>
<th>Mean Statistic</th>
<th>Std. Error</th>
<th>Std. Deviation Statistic</th>
<th>Variance Statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>0.297</td>
<td>0.016</td>
<td>0.130</td>
<td>0.017</td>
</tr>
<tr>
<td>2008</td>
<td>0.327</td>
<td>0.033</td>
<td>0.263</td>
<td>0.069</td>
</tr>
<tr>
<td>2009</td>
<td>0.256</td>
<td>0.014</td>
<td>0.110</td>
<td>0.012</td>
</tr>
<tr>
<td>2010</td>
<td>0.269</td>
<td>0.014</td>
<td>0.108</td>
<td>0.012</td>
</tr>
<tr>
<td>2011</td>
<td>0.275</td>
<td>0.015</td>
<td>0.116</td>
<td>0.014</td>
</tr>
<tr>
<td>2012</td>
<td>0.269</td>
<td>0.015</td>
<td>0.122</td>
<td>0.015</td>
</tr>
</tbody>
</table>

Source: Author’s Calculations

Variable components - Income from fees and commissions, represent netted fees and commissions obtained as revenue from loan unrelated bank activities. This measurement, when divided by operating income, constructs the variable IFO.

A higher IFO suggests that an investigated bank is obtaining a larger share of its revenues relying on commission and fee-based activities. In extreme situations IFO mean values can be proportionally inflated due to shrinking operating income caused by abnormal operating expenses.

Assets management and investment related banks, for example, tend to have a higher IFO values.

Figure 2 presents a summary of an instrument’s empirical distributions. Descriptive statistics tabled together with a box-plot, display a slightly curved pattern of IFO annual averages. From the year 2007 to 2008, the highest increase in IFO was recorded – 3%. Though undoubtedly influenced by a few outliers, the increase also corresponds to a bank’s reaction to the initial hit of the crisis. Many banks resorted to the increasing fee and commission charges, thus supporting prime revenue sources. But it also could have been inflated due to suffered abnormal operating expenses. A decrease of 7% on average observed in between 2008 to 2009 shows post crisis effects. With the financial markets stagnate, banks, while competing for survival and a shrunken (by quantity and quality) customer base, experienced a lower income from fees and commissions. Average IFO values slightly increased and got more stable throughout the years 2010-2012. The value observed in 2011 also could have been partially inflated due to suffered abnormal operating expenses in a consequence of stock market fall of 2011.
5.4.3 Interbank Liabilities over Total Assets (BLA)

Figure 3. Descriptive statistics and a box plot for Interbank Liabilities over Total Assets

Interbank liabilities are defined as deposits from banks minus the repurchase agreements included in those deposits. The BLA is defined as interbank liabilities over total assets.

A high value of BLA often shows that a bank is more dependent on short-term funding obtained from other banks. Banks tend to increase borrowings in wholesale markets when they are suffering the funding shortage.

<table>
<thead>
<tr>
<th>Year</th>
<th>Mean Statistic</th>
<th>Std. Error</th>
<th>Std. Deviation Statistic</th>
<th>Variance Statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>0.090</td>
<td>0.010</td>
<td>0.076</td>
<td>0.006</td>
</tr>
<tr>
<td>2008</td>
<td>0.083</td>
<td>0.009</td>
<td>0.074</td>
<td>0.005</td>
</tr>
<tr>
<td>2009</td>
<td>0.085</td>
<td>0.009</td>
<td>0.073</td>
<td>0.005</td>
</tr>
<tr>
<td>2010</td>
<td>0.088</td>
<td>0.009</td>
<td>0.074</td>
<td>0.006</td>
</tr>
<tr>
<td>2011</td>
<td>0.086</td>
<td>0.009</td>
<td>0.073</td>
<td>0.005</td>
</tr>
<tr>
<td>2012</td>
<td>0.086</td>
<td>0.010</td>
<td>0.077</td>
<td>0.006</td>
</tr>
</tbody>
</table>

Source: Author’s Calculations

Figure 3 presents a summary of the instrument’s empirical distributions. Descriptive statistics table together with a box-plot, shows on average a relevantly constant BLA value. The highest average value of 9% observed in 2007, supports the pre-crisis bank funding scenario of a greater and more common reliance on wholesale funding. Observations in the years after the crisis indicate slightly lower average BLA values with minor increase (0.3%) in 2010 suggesting the slow recovery of the financial markets.

5.4.4 Net Interest Income over Operating Income (NIO)

A net interest income is a result of subtracting total interest expenses from gross interest and dividend income. The result shows the share of a bank’s income that is originating from interest-bearing activities. Net interest income over operating income is referred to as NIO.

A higher NIO suggests that the investigated bank is obtaining a large share of its revenues by relying on interest income. Such revenue structure is recognised as more traditional and relatively stable. In
extreme situations NIO mean values can be proportionally inflated due to shrinking operating income caused by abnormal operating expenses.

Banks prioritising such income usually fall into the retail bank classification.

Figure 4 presents a summary of an instrument’s empirical distributions. The descriptive statistics tabled together with the box-plot, show an observable fluctuation in average NIO value throughout the years. A general tendency of ratio increase is observed starting with the year 2007 up until 2012. Two exceptions distort this tendency. The average NIO value of the year 2008 identifies the increase of approximately 13% if compared to the previous year. Though affected by a few outliers, the observed sharp increase in average NTO value also identifies as being an effect of the financial crisis. While other (parallel) banks’ income structures suffered big losses, the net interest income remained less effected, thus proportionally corresponding to a higher share of total income. Never the less, NTO also was inflated due to suffered abnormal operating expenses.

Source: Author’s Calculations

In the year 2011, there was an observed increase in average NTO value of approximately 2.5%, it signalled increased attention to interest bearing activities instead of investment alternatives, which due to the market fall were much less attractive.
5.4.5 Tangible Common Equity over Tangible Assets (TEA)

Tangible common equity is defined as total equity minus goodwill and intangible assets. It identifies a bank’s loss absorbing capital, thus signalling its perception to an unexpected risk of loss. In other words, tangible common equity stands for a leverage ratio. Tangible common equity over tangible assets is termed TEA.

A high value of TEA often shows that a bank is more risk averse, thus better preparing for a possible loss. However, maintaining high levels of tangible common equity often contradicts the profitability instinct. The resulting TEA levels is a summation of regulation implied norms and shareholder decisions. Banks with higher TEA levels (everything else being equal) are generally recognised as safer.

Figure 5. Descriptive statistics and a box plot for Tangible Common Equity over Tangible Assets

Figure 5 presents a summary of an instrument’s empirical distributions. The descriptive statistics table together with the box-plot, show a general average TEA growth with the exception of the value recorded in 2008; when compared to 2007, the average value dropped by approximately 0.6%. This effect could be related to a general loss absorption generated by the initial hit of the financial crisis.

A relatively sharp increase in the average TEA value (approximately 0.8%) is recorded in 2009. The growth could be a result of bank recapitalisation and the regulation procedures that followed the crisis. Later years show relative average value stability, which is generally higher than in the year 2007, which is a result of implied stricter bank regulations. The outlier observation in the box-plot (years 2011-2012), suggest that few banks struggled to maintain positive TEA values, implying possible distress.
5.4.6 Trading Assets over Total Assets (TAA)

Trading assets is constructed by taking total assets and subtracting liquid assets, total loans and intangibles. It represents a bank's assets that are dedicated for investment activities. Trading assets over total assets is termed TAA.

A high value of TAA often shows that a bank is oriented towards investment operations. At the same time, TAA can be a good proxy of the market and liquidity risks that bank is subjected to.

Banks that maintain high levels of TAA are classified as investment banks.

Figure 6 presents a summary of an instrument’s empirical distributions. The descriptive statistics tabled together with the box-plot, show an increase in average TAA value through the observed years. Two year value observations show bigger than average value increases when compared to earlier years. In the year 2008, the ratio average increased by approximately 2.7% compared to 2007. It shows the result of a pre-crisis escalation in trading market activity. When markets stagnated, more trading assets remained on a bank’s balance sheets; also, these assets became less liquid. The situation remained relatively steady until 2011, when trading markets once again became less liquid due to the stock market fall of 2011. An increase by approximately 1.5% on the average TAA value in 2011 compared to 2010 signal increased amount of less liquid assets maintained on the balance sheets.

In the box-plot observed, the outliers are clearly more investment-oriented as their average TAA values are multiple times higher than most of the sampled banks.

<table>
<thead>
<tr>
<th>Year</th>
<th>Mean Statistic</th>
<th>Std. Error</th>
<th>Std. Deviation Statistic</th>
<th>Variance Statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>0.220</td>
<td>0.019</td>
<td>0.151</td>
<td>0.023</td>
</tr>
<tr>
<td>2008</td>
<td>0.247</td>
<td>0.019</td>
<td>0.152</td>
<td>0.023</td>
</tr>
<tr>
<td>2009</td>
<td>0.247</td>
<td>0.019</td>
<td>0.148</td>
<td>0.022</td>
</tr>
<tr>
<td>2010</td>
<td>0.248</td>
<td>0.017</td>
<td>0.133</td>
<td>0.018</td>
</tr>
<tr>
<td>2011</td>
<td>0.263</td>
<td>0.017</td>
<td>0.137</td>
<td>0.019</td>
</tr>
<tr>
<td>2012</td>
<td>0.265</td>
<td>0.017</td>
<td>0.137</td>
<td>0.019</td>
</tr>
</tbody>
</table>

Source: Author’s Calculations
5.5 Data identifying self-defined business models

Self-defined or auto-defined business models are interpreted as business models expressed and/or communicated by the banks themselves. Data identifying such business model expressions differ significantly from the data obtained for statistical analysis. As it cannot be expressed by a number based standardised reported data, obtaining self-defined business model identification data requires a more qualitative research approach.

After considering all possible information channels, through which banks are most likely to communicate their business model and other business related information to the public (publicly available information approach), a choice was made to rely on banks’ annual statements and official websites as the most appropriate source.

The first step taken to obtain required data was an acquisition (downloaded copy) of all 63 banks’ latest annual statement for the year 2012, if not available, an annual statement from the year 2011 was chosen as a replacement. Second step involved looking through the annual statements and searching for quotes possibly identifying self defined bank’s business model. If such quote was not available in the annual statement, the same procedure was repeated for the bank’s official website. In many cases, acquiring a specific quote naming banks business model was impossible, thus a proficient author’s interpretation, based on analyzed sources, was recorded.

Acquired data was divided into 3 major categories: (1) Target activities; (2) Target markets; (3) target clients. Collected generalized raw data is available in appendix 7.
6. Identifying Banking business models

This section will explain what methods were used to identify a bank’s business models, justify the choice of algorithms, and present necessary steps taken to generate credible results. Additionally, generated business models will be presented, described and interpreted. The sampled banks will be grouped according to their business models and observed for changes in respect to the observed time period.

6.1 Business model determination methods and limitations

Identifying business models with the use of multiple instruments that comprise a multi-dimensional data set is a complicated task and can’t be done by relying on just human observation. The possibility for error and multiple biases is simply too great. Therefore, a statistical clustering technique was employed to identify the business models relying solely on a mathematical algorithm.

A cluster analysis is defined as the gathering of inspected populations based on chosen factors. Factor-based group (cluster) formation relies on similarities that are shared among population members. In this particular case, we intend to assign banks (population) into clusters based on similar observation values observed in a certain factor’s (variable’s) scale. The process of cluster formation by its nature ensures cluster dissimilarity as each cluster distinguishes itself with different characteristics.

This technique is commonly used for exploratory statistical data analysis. Its applicability is expanded by various algorithms and methods governing the identification of similarity properties that eventually constitute cluster location, size and number.

Considering the gathered data sample size, its features and study objectives, the hierarchical cluster analysis was chosen as a prime clustering technique. Such an analysis starts with treating each sampled bank as a separate cluster, and then in later sequences, it lowers required criteria and combines clusters together, continuously reducing the number of formed groups until only one cluster remains. In the cluster formation procedure, the technique relies on distance dissimilarities between banks measured in the variables’ scale.

In statistical software programming, the hierarchical clustering technique is often accompanied by a dendrogram (a tree diagram) as part of the output. It graphically represents the cluster formation and merger in individual cycles, thus displaying grouping tendencies and hinting at an optimal number of clusters. The latter feature of the dendrogram will be further discussed in the performed clustering procedure description.
Hierarchical clustering techniques require a choice between factor distance evaluation methods. In this study, Ward’s method was chosen as the best-suiting collected data properties. This method is based on the analysis of variance approach to evaluate the distances between clusters. Essentially, Ward’s method forms clusters by minimising the sum of squares of two clusters from the previous sequence generation. The detail description of this method is explained by J. H. Ward himself in his paper on hierarchical grouping (Ward 1963).

The technique was chosen for its superior ability to perform better, compared to other methods, with a relatively small data set featuring few outliers. Additionally, this technique is recognised by several studies as highly efficient and reliable. G. W. Milligan presents a detailed assessment of Ward’s method as well as other clustering methods (Milligan 1981).

The last parameter of a used cluster analysis is the distance measurement. The Squared Euclidean distance was chosen as most suitable for this study. In short, it is a geometric distance in multidimensional space and can be computed as: distance \((x, y) = \sum (x_i - y_i)^2\). Besides being a common method for distance measurements, the squared Euclidean distances are usually computed from non-standardised data. Having no restrictions on the standardization prevent a possible data diluting effect.

The hierarchical clustering procedure by itself does not provide an exact answer of how many clusters should be formed in order to reach the optimal solution. To determine the “correct” number of clusters, Calinski and Harabasz’s pseudo-F index was used (Caliński, Harabasz 1974). Its role as a stopping rule is based on the variance ratio criterion (VRC). For a calculation with \(N\) objects and \(K\) segments, the ratio is defined as between-segment variation \((SS_B)\) over within-segment variation \((SS_W)\), or simply as: \(VRC = (SS_B / (K-1)) / (SS_W / (N-K))\). The criterion is otherwise recognised as the F-value of a one-way ANOVA with \(K\) standing for the number of factor levels. Later, \(\omega_k\) is computed to determine the optimum number of clusters: \(\omega_k = (VRC_{k+1} - VRC_k) - (VRC_k \cdot VRC_{k-1})\). Here, the value of \(K\) is chosen, so \(\omega_k\) would be minimised. This stopping rule has proven to perform well in numerous cases (Milligan 1985).

Clustering-related procedures were conducted using SPSS Statistics 17.0. The available built-in functions offered constructive and reliable data processing possibilities, which were more than sufficient for this study.

**Limitations**

A data standardization procedure was considered to be used in the study: each indicator standardised to a mean of zero and a standard deviation of one. Nevertheless, standardised data
clustering showed no substantial effect on formed clusters. Bank cluster memberships remained unchanged when compared to “raw” data clustering. Further use of standardisation was dismissed as specifics of clustering procedures were chosen to better suit non-standardised data.

The presence of outliers in a data set was noted, and their effect in clustering results were investigated. With the use of the widely recognised “2.2 outlier labelling rule” (Hoaglin, Iglewicz 1987) which is particularly fit for the sample size of this study, maximum and minimum acceptable values were derived. Observation values exceeding those of derived values were labelled as outliers. Due to a relatively high number of identified outliers, the elimination of these bank year observations was not feasible. The data set would no longer be sufficient for further analysis. Instead, an attempt to replace the outlier values with derived maximum tolerable values was made (this would allow the data set to remain fit for analysis and still recognise observation values as extremes). The attempted modified data clustering results showed no significant variation from clusters formed using unaltered observation values. Therefore, further use of modified data in the study was not considered.

A comparison between the standardised values, modified values and original values cluster membership (for 3 clusters) is provided in appendix 8.

In the end, the chosen clustering procedure is well-supported by the existing literature, but it is not necessarily the only or best solution. Every chosen detail, from data set, variable, to clustering method and stopping rule, sums up to a unique solution. Even a slightest change in a choice of sampled banks or model-defining variable could present a totally new outcome. Therefore, the generated results should be treated with care and within the established boundaries of this study.

6.2 Results

6.2.1 Determining the number of clusters

By implementing the techniques and methodology introduced in the previous section, a two-method procedure was derived in order to properly identify the optimal number of clusters.

In the first method, a clustering analysis was performed using pooled variable data (separate variable year observations were summed and divided by the number of observed years). The output dendrogram (provided in appendix 9) can be used as a “hint” for optimal cluster number.

In the software-generated dendrogram sampled banks, represented by their list number, are grouped in different clusters. With an increasing number of sequences, larger clusters are formed with increasingly dissimilar elements. The optimal number solution is hinted by a significant distinction of tree clear groups (identified by horizontal lines, hinting 3 cluster optimal solution).
For the second method, the optimal solution is identified with the use of pseudo-F index. The procedure involved K-means pooled data clustering for a specified number of clusters (2-10). Each cluster combination solution provided ANOVA tables with the pooled variable F-values (VRC), which, when summed provide a VRC value for a particular cluster number solution. Later, ω was calculated to ensure the optimum solution. Table 1 summarises the calculated pseudo-F indexes.

The solution suggested by the highest pseudo-F index (162.6) points to a distinctive three-cluster optimal solution. The findings are confirmed by the lowest ω value (-42.9).

By summarising the findings of the two cluster number optimisation methods, a solution is identified as a tree-cluster configuration.

Table 1. Pseudo-F index values for a range of cluster number solutions

<table>
<thead>
<tr>
<th>Number of Clusters</th>
<th>Pseudo-F index</th>
<th>ω</th>
<th>Number of Clusters</th>
<th>Pseudo-F index</th>
<th>ω</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>148.2</td>
<td></td>
<td>7</td>
<td>122.6</td>
<td>9.9</td>
</tr>
<tr>
<td>3</td>
<td>162.6</td>
<td>-42.9</td>
<td>8</td>
<td>119.7</td>
<td>-2.0</td>
</tr>
<tr>
<td>4</td>
<td>134.1</td>
<td>33.0</td>
<td>9</td>
<td>114.7</td>
<td>14.5</td>
</tr>
<tr>
<td>5</td>
<td>138.7</td>
<td>-7.8</td>
<td>10</td>
<td>124.2</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>135.5</td>
<td>-9.6</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Author’s calculations

6.2.2 Characterisation of identified business models

Building on the previously identified optimal 3-cluster configuration, the clustering analysis is performed with the pooled data. The use of pooled data smoothes abnormally high model variations during observation period and allows a baseline model introduction. The generated clusters should feature distinctive properties, thus providing the basis for separate business model identification and characterisation. The descriptive statistics for 3 models and a graphical representation of an individual model’s (cluster’s) standardised identifier means is provided in figure 7.

**Model A** – This is the most common business model amongst observations in this study. A total of 39 banks belong to this group, which represents approximately 62% of sampled banks. One noticeable identifier of this model is the highest mean amongst all identified models for Net Interest income over Operating income (NIO), corresponding to 62.7%. Such a high level of NIO suggests that banks in this group are heavily relying on interest income as a prime income source, which is a feature common for traditional retail institutions. On the other hand, a group’s mean for Income from Fees and commission over Operating income (IFO) is the second highest among derived business models, and corresponds to approximately 26.3%. Banks grouped under Model A also
feature a second highest mean for Trading Assets over total Assets (TAA) of approximately 23.2%, which implies a secondary interest in trading activities.

Figure 7. Descriptive statistics for 3 clusters (generated using pooled data) and graphical representation of individual model’s identifier means standardised scores.

<table>
<thead>
<tr>
<th>Cluster (obs. nr.)</th>
<th>CDA</th>
<th>TAA</th>
<th>TEA</th>
<th>NIO</th>
<th>IFO</th>
<th>BLA</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Model A (39)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minimum</td>
<td>0.000</td>
<td>0.060</td>
<td>0.012</td>
<td>0.423</td>
<td>0.144</td>
<td>0.006</td>
</tr>
<tr>
<td>Maximum</td>
<td>0.584</td>
<td>0.528</td>
<td>0.094</td>
<td>0.912</td>
<td>0.431</td>
<td>0.306</td>
</tr>
<tr>
<td>Mean</td>
<td>36.6%</td>
<td>23.2%</td>
<td>3.9%</td>
<td>62.7%</td>
<td>26.3%</td>
<td>11.9%</td>
</tr>
<tr>
<td>St. dev.</td>
<td>0.117</td>
<td>0.097</td>
<td>0.015</td>
<td>0.107</td>
<td>0.061</td>
<td>0.053</td>
</tr>
<tr>
<td><strong>Model B (18)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minimum</td>
<td>0.574</td>
<td>0.008</td>
<td>0.000</td>
<td>0.255</td>
<td>0.022</td>
<td>0.000</td>
</tr>
<tr>
<td>Maximum</td>
<td>0.992</td>
<td>0.325</td>
<td>0.111</td>
<td>0.821</td>
<td>0.658</td>
<td>0.038</td>
</tr>
<tr>
<td>Mean</td>
<td>71.4%</td>
<td>20.1%</td>
<td>5.9%</td>
<td>58.7%</td>
<td>24.3%</td>
<td>1.6%</td>
</tr>
<tr>
<td>St. dev.</td>
<td>0.089</td>
<td>0.082</td>
<td>0.024</td>
<td>0.145</td>
<td>0.127</td>
<td>0.013</td>
</tr>
<tr>
<td><strong>Model C (6)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minimum</td>
<td>0.000</td>
<td>0.199</td>
<td>0.028</td>
<td>-0.247</td>
<td>0.300</td>
<td>0.000</td>
</tr>
<tr>
<td>Maximum</td>
<td>0.661</td>
<td>0.854</td>
<td>0.063</td>
<td>0.410</td>
<td>0.727</td>
<td>0.242</td>
</tr>
<tr>
<td>Mean</td>
<td>24.0%</td>
<td>49.4%</td>
<td>5.0%</td>
<td>16.1%</td>
<td>52.1%</td>
<td>8.6%</td>
</tr>
<tr>
<td>St. dev.</td>
<td>0.279</td>
<td>0.230</td>
<td>0.013</td>
<td>0.237</td>
<td>0.161</td>
<td>0.086</td>
</tr>
<tr>
<td><strong>All (63)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minimum</td>
<td>0.000</td>
<td>0.008</td>
<td>0.000</td>
<td>-0.247</td>
<td>0.022</td>
<td>0.000</td>
</tr>
<tr>
<td>Maximum</td>
<td>0.992</td>
<td>0.854</td>
<td>0.111</td>
<td>0.912</td>
<td>0.727</td>
<td>0.306</td>
</tr>
<tr>
<td>Mean</td>
<td>45.3%</td>
<td>24.8%</td>
<td>4.6%</td>
<td>57.1%</td>
<td>28.2%</td>
<td>8.6%</td>
</tr>
<tr>
<td>St. dev.</td>
<td>0.214</td>
<td>0.136</td>
<td>0.020</td>
<td>0.188</td>
<td>0.122</td>
<td>0.067</td>
</tr>
</tbody>
</table>

* The values marked in the radar plot for each derived model’s identifier signify a (positive/negative) number of standard deviations (above/below) the total sample mean.

Source: Author’s calculation
Another distinctive feature of this model is the highest mean of all 3 models for Interbank Liabilities over total Assets (BLA), featuring 11.9%. This group shows the highest dependency on interbank borrowing, thus implying that nearly 12% of their average total funding comes from a pricier source - wholesale banks. An orientation towards non-traditional funding practices is also implied by a comparably small share of customer deposit-based funding with a mean of approximately 36.6% of total assets (CDA). General funding practices of banks forming this model does not allow for the classification as a purely retail bank model.

The last distinctive feature of this model is that it has the lowest mean of all 3 models for Tangible common Equity over tangible Assets (TEA), which corresponds to 3.9%. This comparably low mean value implies that this group is more leveraged then other groups. The higher leverage of this group could also be partially explained by losses suffered during and after the financial crisis. On the other hand, some risk is compensated by the diversified business and funding practices.

This banking business model clusters mostly the banking groups, which operating under one name, tend to have a diverse selection of available services, that might also by divided into different business model oriented divisions, yet in the end they are consolidated in one balance sheet with universal banking properties.

Summarising all observations, this group could be classified as wholesale oriented universal banking model.

**Model B** – This is the second most common business model amongst sampled banks. A total of 18 banks belong to this group, which corresponds to approximately 28.5% of the total sample. The most distinctive feature of this cluster is a very high Customer Deposit share in total assets (CDA). The model mean for CDA is approximately 71.4%, which is nearly a two times greater mean value then the one observed in Model A, and nearly three times larger than in Model C. The cluster clearly groups banks that heavily rely on customer deposits as the main source of funding. However, the maximum value of approximately 99.2% for CDA identifies certain outlier. Under closer inspection, two institutions were identified to have abnormal levels of CDA: LCH Clearnet Group Limited with the CDA value of approximately 99.2 % and Northern Trust Corporation with CDA value of approximately 77.6%. These institutions are not retail oriented, but are from a very distinctive banking businesses. LCH Clearnet Group Limited is a clearing house, thus such a level of CDA is normal due to clearing margin requirements. Northern Trust Corporation on the other hand is an asset management financial institution by nature holding large amounts of CDA. Both of these abnormal institutions could form clusters of their own.
The group’s recorded mean for Interbank Liabilities over total assets (BLA) of approximately 1.6%, which is the smallest recorded BLA mean value among all business models, confirms customer deposit-based funding strategy.

The banks grouped under business Model B obtain a greater share of their income from interest based revenue sources, which is clearly identified by the mean for Net Interest income over operating income (NIO) of approximately 58.7%, which is the second highest NIO mean recorded among all business models. For this group of banks, the non-interest based income is a secondary revenue line, which is identified by the mean value of approximately 24.3% for Income from Fees and Commissions over Operating income (IFO). Low trading operation intensity is identified by Trading Assets share in grouped banks’ balance sheets (TAA) that records a mean of approximately 20.1%, which is the smallest TAA mean value among the derived business models.

Banks grouped under Model B feature the highest mean value recorded among the derived models for Tangible common Equity over tangible Assets (TEA), which is approximately 5.9%. A high level of loss-absorbing capital identifies a low level of grouped banks’ leverage and lower overall riskiness.

By summarising all cluster identifier mean values it is possible to conclude, that Model B is a retail business model.

**Model C** – This is the least common business model amongst the sampled banks. A total of 6 banks belong to this group, which represents approximately 9.5% of sampled banks. The model distinguishes itself with the highest mean among all derived models for Income from Fees and commissions over Operating income (IFO) of approximately 52.1%. It clearly shows that the group’s revenue structure is mostly based on non-interest income. A similar conclusion is provided by the lowest mean recorded for Net Interest income over Operating income (NIO), which is represented by approximately 16.1%. In addition, the recorded highest mean in the sample for Trading Assets over total Assets (TAA) of approximately 49.4% points to the overall model’s tendency towards Investment banking.

Funding practices of banks under Model C show the lowest level of reliance on Customer Deposits (CDA), corresponding to the mean of less than a quarter (approximately 24%) of total funding. A groups’ funding acquired through wholesale banks corresponds almost identically to the mean of the total sample, which is identified by the mean of approximately 8.6% for Interbank Liabilities over total Assets (BLA).

Banks operating under Model C feature the second largest mean among the derived models for Tangible common Equity over tangible Assets of approximately 5%. The measured value shows that banks in this group maintain a slightly higher level of loss-absorbing capital then the mean of the total sample.
By summarising all the features of this group of banks, a group’s classification as an investment-oriented business model can be implied.

### 6.2.3 Business model membership based on banks’ headquarter location

The clustering procedure performed on pooled data grouped banks according to specific identifiers ignoring the geographical origin of sampled institutions. An additional cluster analysis was performed to address possible banks’ model and geographical origin correlation. Figure 8 graphically displays how many banks from two major regions (USA and Europe) are members of a certain cluster. A more detail list of banks included in derived clusters together with their names and location is available in table 2.

*Figure 8. Business model membership based on location*

**Model membership based on banks’ headquarter location**

<table>
<thead>
<tr>
<th></th>
<th>Model A</th>
<th>Model B</th>
<th>Model C</th>
</tr>
</thead>
<tbody>
<tr>
<td>US Banks</td>
<td>4</td>
<td>14</td>
<td>5</td>
</tr>
<tr>
<td>Eur. Banks</td>
<td>35</td>
<td>4</td>
<td>1</td>
</tr>
</tbody>
</table>

*Source: Author’s calculation*

Model A is highly dominated by European banks, as it can be clearly seen in the figure above. European institutions, represented by red colour, sum up to 35 banks, which is approximately 89.7% of Model A observations. At the same time, only 4 institutions from United States of America are included in Model A, which makes the wholesale oriented universal banking business model the least popular business model among institutions from USA.

The reasoning behind such model’s unpopularity might lie in banking traditions specific to USA. Here Banks tend to separate commercial and investment banking services, thus making universal banking oriented business model largely non-existent.

Model B is overwhelmingly more popular among banks headquartered in United States of America. In fact, 14 banks or (approximately 77.8%) of the 18 banks that are grouped under this model. Only 4
banks under Model B are headquartered in Europe, making highly retail oriented business model more than 3 times less popular in Europe than it is in USA (based on study sample).

**Table 2. A list of banks grouped by their model and headquarter location**

<table>
<thead>
<tr>
<th>Bank name</th>
<th>Location</th>
<th>Model</th>
<th>Bank name</th>
<th>Location</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>HSBC Holdings Plc</td>
<td>GB</td>
<td>A</td>
<td>LCH Clearnet Group Limited</td>
<td>GB</td>
<td>B</td>
</tr>
<tr>
<td>Deutsche Bank AG</td>
<td>DE</td>
<td>A</td>
<td>Nationwide Building Society</td>
<td>GB</td>
<td>B</td>
</tr>
<tr>
<td>BNP Paribas</td>
<td>FR</td>
<td>A</td>
<td>Alpha Bank AE</td>
<td>GR</td>
<td>B</td>
</tr>
<tr>
<td>Barclays Plc</td>
<td>GB</td>
<td>A</td>
<td>PKO BP SA</td>
<td>PL</td>
<td>B</td>
</tr>
<tr>
<td>Banco Santander SA</td>
<td>ES</td>
<td>A</td>
<td>Wells Fargo &amp; Company</td>
<td>US</td>
<td>B</td>
</tr>
<tr>
<td>Société Générale</td>
<td>FR</td>
<td>A</td>
<td>US Bancorp</td>
<td>US</td>
<td>B</td>
</tr>
<tr>
<td>Lloyds Banking Group Plc</td>
<td>GB</td>
<td>A</td>
<td>Capital One Financial Corporation</td>
<td>US</td>
<td>B</td>
</tr>
<tr>
<td>UniCredit SpA</td>
<td>IT</td>
<td>A</td>
<td>PNC Financial Services Group Inc</td>
<td>US</td>
<td>B</td>
</tr>
<tr>
<td>Rabobank Group</td>
<td>NL</td>
<td>A</td>
<td>BB&amp;T Corporation</td>
<td>US</td>
<td>B</td>
</tr>
<tr>
<td>Nordea Bank AB (publ)</td>
<td>SE</td>
<td>A</td>
<td>SunTrust Banks, Inc.</td>
<td>US</td>
<td>B</td>
</tr>
<tr>
<td>Intesa Sanpaolo</td>
<td>IT</td>
<td>A</td>
<td>Fifth Third Bancorp</td>
<td>US</td>
<td>B</td>
</tr>
<tr>
<td>Banco Bilbao Vizcaya Argentaria SA</td>
<td>ES</td>
<td>A</td>
<td>Regions Financial Corporation</td>
<td>US</td>
<td>B</td>
</tr>
<tr>
<td>Commerzbank AG</td>
<td>DE</td>
<td>A</td>
<td>Northern Trust Corporation</td>
<td>US</td>
<td>B</td>
</tr>
<tr>
<td>Standard Chartered Plc</td>
<td>GB</td>
<td>A</td>
<td>KeyCorp</td>
<td>US</td>
<td>B</td>
</tr>
<tr>
<td>Danske Bank A/S</td>
<td>DK</td>
<td>A</td>
<td>M&amp;T Bank Corporation</td>
<td>US</td>
<td>B</td>
</tr>
<tr>
<td>DZ Bank AG</td>
<td>DE</td>
<td>A</td>
<td>Comerica Incorporated</td>
<td>US</td>
<td>B</td>
</tr>
<tr>
<td>DnB ASA</td>
<td>NO</td>
<td>A</td>
<td>Huntington Bancshares Inc</td>
<td>US</td>
<td>B</td>
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<tr>
<td>Skandinaviska Enskilda Banken AB</td>
<td>SE</td>
<td>A</td>
<td>Zions Bancorporation</td>
<td>US</td>
<td>B</td>
</tr>
<tr>
<td>Svenska Handelsbanken</td>
<td>SE</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>KBC Group NV</td>
<td>BE</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Banca Monte dei Paschi di Siena SpA</td>
<td>IT</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Swedbank AB</td>
<td>SE</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Erste Group Bank AG</td>
<td>AT</td>
<td>A</td>
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<td></td>
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<tr>
<td>Banco de Sabadell SA</td>
<td>ES</td>
<td>A</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Banco Popular Espanol SA</td>
<td>ES</td>
<td>A</td>
<td></td>
<td></td>
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</tr>
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<td>Raiffeisen Landesbanken Holding GmbH</td>
<td>AT</td>
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<td></td>
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<tr>
<td>UBI Banca</td>
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<td>A</td>
<td></td>
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<tr>
<td>Banco Popolare</td>
<td>IT</td>
<td>A</td>
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<tr>
<td>Millennium bcp</td>
<td>PT</td>
<td>A</td>
<td></td>
<td></td>
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<tr>
<td>Espirito Santo Financial Group S.A.</td>
<td>LU</td>
<td>A</td>
<td></td>
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</tr>
<tr>
<td>Mediobanca SpA</td>
<td>IT</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Piraeus Bank SA</td>
<td>GR</td>
<td>A</td>
<td></td>
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<tr>
<td>Bankinter SA</td>
<td>ES</td>
<td>A</td>
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<tr>
<td>Banca Carige SpA</td>
<td>IT</td>
<td>A</td>
<td></td>
<td></td>
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<tr>
<td>Banco BPI SA</td>
<td>PT</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>JP Morgan Chase &amp; Co.</td>
<td>US</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bank of America Corporation</td>
<td>US</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Citigroup Inc</td>
<td>US</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>SLM Corporation-Sallie Mae</td>
<td>US</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Banks are distributed according to their business model. Additionally, a light red colour marks institutions located in Europe, while light blue colour marks banks located in United States of America.
Such situation could be influenced by European geography itself. When compared to states in USA, European countries are relatively small and very different, making it very difficult to expand geographically in order to acquire more customers and build a retail network of equivalent size. Instead, more centralized universal banking practices are preferred to maintain growth. On the other hand, USA market offers more attractive geographical growth options: states are unified by same federal laws, same language and culturally very similar customer base.

Model C represents the smallest group of banks when compared to total sample. Only 6 banks are grouped under Model C. It is also the least geographically balanced model, as 5 banks or approximately 83.3% of the group are headquartered in United States of America. Only 1 institution from Europe is grouped in this model.

Such dominance of banks from USA in Model C could be explained by few general observations. USA financial markets have a long history in investment banking (Adams 1978). Some would even argue that culturally Americans themselves tend to risk more, thus making investment more popular. Another type of reasoning relies on banking tradition in US, where commercial and investment banking activities were separated, thus creating single business line oriented institutions. At the same time, European banks incorporated multiple business lines by taking the universal approach.

6.2.4 Business models derived for each year in the observation period

The previously introduced business model formation required the use of pooled data to reliably establish the baseline business models and identify banks that used those models most often. However, such methodology does not clarify whether business models changed over time or if banks used different business models in different time periods. To address this shortcoming, a separate clustering analysis for 3 cluster solutions was performed for each year of the sampled period.

It is important to mention that hierarchical clustering procedure does not maintain previously derived cluster centres (pooled), thus grouped business models display variation in formed cluster identifier means. This method allows financial market anomaly identification, which are reflected in fluctuations of the model identifier means. Furthermore, formed business models will naturally adjust their identifier requirements to facilitate banks with model specific features. Thus banks will not be removed from clusters just because their identifier means no longer fit the means derived with pooled data and at the same tame will be capable to identify only banks that fit the model.

Change of business models over time

The clustering results for each year were summarized by the use of descriptive statistics and together with accompanying radar plots of standardised identifier means for individual cluster are
available in appendix 10. A more compact summary of derived models’ identifier means are available in figures 9, 10 and 11.

**Model A**

Figure 9 displays annual variables’ means and a line chart of their standardised values for Model A, which was previously defined as a wholesale oriented universal banking business model. The line chart shows a substantial variables’ mean change in the year 2008 and a slightly smaller one in the year 2011.

From the year 2007 to 2008, Model A’s customer deposit funding share dropped by approximately 4.55%. Such a drop signals significant customer deposit withdrawal or/and the increase in other means of operation funding, which is likely as at the same time the mean for BLA increased by approximately 2.46%. The increase of CDA mean value of approximately 4.49% experienced from 2010 to 2011 show a possible effect of 2011 stock market fall. The funds originally dedicated for stock investment were diverted to depositing due to experienced and/or expected losses in stock prices.

*Figure 9. Annual variables’ means and a line chart of their standardised values for Model A*

<table>
<thead>
<tr>
<th>Year</th>
<th>CDA</th>
<th>TAA</th>
<th>TEA</th>
<th>NIO</th>
<th>IFO</th>
<th>BLA</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>33.23%</td>
<td>14.66%</td>
<td>4.48%</td>
<td>61.95%</td>
<td>27.97%</td>
<td>11.81%</td>
</tr>
<tr>
<td>2008</td>
<td>28.68%</td>
<td>38.75%</td>
<td>1.26%</td>
<td>129.30%</td>
<td>85.90%</td>
<td>14.27%</td>
</tr>
<tr>
<td>2009</td>
<td>36.49%</td>
<td>22.44%</td>
<td>4.04%</td>
<td>60.37%</td>
<td>24.01%</td>
<td>12.16%</td>
</tr>
<tr>
<td>2010</td>
<td>35.50%</td>
<td>23.23%</td>
<td>4.12%</td>
<td>60.34%</td>
<td>25.80%</td>
<td>12.26%</td>
</tr>
<tr>
<td>2011</td>
<td>39.99%</td>
<td>24.01%</td>
<td>3.84%</td>
<td>65.98%</td>
<td>24.67%</td>
<td>10.74%</td>
</tr>
<tr>
<td>2012</td>
<td>33.87%</td>
<td>24.86%</td>
<td>4.31%</td>
<td>57.35%</td>
<td>27.28%</td>
<td>13.63%</td>
</tr>
</tbody>
</table>

This conclusion is also supported by a drop in wholesale funding of approximately 1.52% (BLA) in the same period, which shows that banks were slightly reorienting towards longer term funding. However, a sudden CDA value drop of approximately 6.12% experienced from 2011 to 2012, which is the biggest recorded CDA mean difference throughout the observation.

* The values marked in the plot for each derived model’s identifier signify a (positive/negative) number of standard deviations (above/below) the identifier mean for all years.

**Source:** Author’s Calculations
period, suggest that depositors diverted their funds back to the stock market after it has regained relative stability.

The model’s mean for interbank liability share of total assets increase from 2011 to 2012 of approximately 2.89% supports suspected funding strategy changes of 2012. Lowered interbank borrowing rates and need to replace retracted deposits encouraged banks to use wholesale funding. In the year 2008 when compared to 2007, the cluster’s tangible common equity share in tangible assets suffered a dramatic decrease of approximately 3.22% in, which is the biggest recorded TEA mean difference throughout the observation period. This significant drop in tangible common equity signals the absorption of substantial losses experienced in 2008.

Another sign of crisis in the year 2008 is represented by an extreme increase in Model A’s IFO mean of approximately 57.93% and NIO mean of approximately 67.35% between the years 2007 and 2008. These are the biggest recorded IFO and NIO means’ annual difference throughout the observation period. Such a proportional increase in income from fees and commission as well as interests based income as part of operating income show that banks faced huge operating expenses. It is because the operating expenses are deducted from banks revenues to form operating income, which in this case was even surpassed by NIO mean value (129.3%).

Similar effects of the financial crisis caused a significant proportional increase of trading assets over total assets (TAA), which increased by approximately 24.01%. In this case, banks, being unable to liquidise trading assets sufficiently, were forced to keep them in balance sheets. Combined with decreased value of other banks assets, the proportion of trading assets increased significantly.

The dramatic shock caused by the financial crisis of 2008 was gradually absorbed by the banks that managed to relatively restore their business identifier proportional means by the year 2009. Never the less, the nominal scale of banks’ businesses shrank substantially.

Model B

Figure 10 displays annual variables’ means and a line chart of their standardised values for Model B, which was previously defined as a retail business model. The line chart shows a substantial variables’ mean change in the years 2008 and 2011.

From the year 2007 to 2008, Model B’s customer deposit funding share dropped by approximately 13.89%. Such a drop signals significant customer deposit withdrawal or/and increase of other means of operation funding, which is partially true as at the same time the mean for BLA increased by approximately 3.29%. In later years CDA mean value was maintained relatively stable with an
exception in the year 2011
(compared to 2010), when CDA
mean value increased by
approximately 6.94%. It shows
a possible effect of 2011 stock
market fall. The customer
funds originally dedicated for
stock investment were
diverted to depositing due to
experienced and/or expected
losses in stock prices. This
conclusion is also supported by
a drop in wholesale fund
of approximately 1.26% (BLA) in
the same period, which shows

Source: Author’s Calculation

that abundance of cheaper customer deposits limited the need for interbank funding. However, a
CDA value drop of approximately 10.51% experienced from 2011 to 2012, which suggest that
depositors diverted their funds back to the stock market or other means of fund utilisation after it
has regained relative stability. The model’s mean for interbank liability (BLA) share of total assets
increase from 2011 to 2012 of approximately 2.25%, which can be explained by retail banks’ need to
replace shrieked deposit funding.

In the year 2008 when compared to 2007, the models tangible common equity share in tangible
assets decreased by approximately 1.12%, which signals the absorption of losses experienced in
2008. Never the less, in the following years TEA mean value experienced a gradual increase and
peaked in the year 2011 with the mean of approximately 7.25%, which could be a result of increased
regulatory capital requirements and incentive to signal stability. An additional explanation could be,
that retail banks generated so much cheap funding, that were unable to fully utilise it, thus
accumulating TEA. This reasoning is supported by TEA mean drop of approximately 1.62% in 2012
compared to 2011, when accumulated cheap funds (customer deposits) were reclaimed by
customers, thus forcing banks to better utilise remaining capital.
Considering the fact, that Model B is characterised as retail bank business model, there is no surprise that banks income share from fees and commission (not the main source of revenues) maintained a relative stability throughout the observation period. Never the less, the years 2008 and 2011 could be treated as abnormal due to the higher IFO mean values. The increased IFO mean in 2008 by approximately 2.28% (compared to 2007) as well as higher IFO mean in 2011 by approximately 3.74% (compared to 2010), both could be explained by the peaked CDA values during same years – More customer deposits means more customers, more customers means more service fees.

The net interest income, being the main source of revenues for retail banks show a relatively sensitive reaction to the financial market conditions. Identifier’s (NIO) value increases by approximately 6.7% in 2008 (compared to 2007), which is a result of suffered great operating expenses. An immediate drop in NIO mean value by approximately 8.31% in 2009, suggests somewhat rebalanced banks’ expenses and income. The later increase in NIO mean by approximately 5.81% experienced in 2010, suggest that bank managed to efficiently generate higher share of revenue from interest bearing activities. However, NIO mean value dropped by approximately 6.09% in 2011 (compared to 2010), which was due to abundance of cheap deposit funding and decrease in lending interest rates. In 2012 the NIO mean value once again increased by 6.89% (compared to 2011), which is a result of a decrease in cheap deposit based funding and banks’ ability to efficiently utilise remaining funds in better priced loan market.

The trading asset share in total assets (TAA) maintained a small but steady growth (approximately 1.04% in average) throughout the observation period with a minor drop (approximately 0.64%) in 2012. Such growth could be a result of generally increased availability for cheap funding and/or small margins on issued loans encouraging engaging in investment activities instead.

**Model C**

Figure 11 displays annual variables’ means and a line chart of their standardised values for Model C, which was previously classified as investment oriented business model. The line chart shows a substantial drop in investment model’s core identifier means in the year 2008 (compared to 2007) and proceeding to fall until 2009 (compared to 2008). The core identifier mean values increased steadily in the rest of the observed period.

The trading assets over total assets, being one of the core investment oriented business model identifier, show a wave pattern throughout the observation period. The TAA mean value increased significantly (approximately 14.61%) in the year 2008 when compared to 2007. Such an increase in TAA mean value suggest that investment banks were unable to liquidise a part of their short-term
trading assets due to “frozen” trading markets during the financial crisis year of 2008, thus a substantial part of these assets remained on balance sheets together with longer termed assets. The TAA mean value fall recorded in the years 2009 (by approximately 3.46% compared to 2008) and 2010 (by approximately 6.77% compared to 2009) signal better trading market’s liquidity and business models reorientation towards shorter term trading.

Source: Author’s Calculations

In the following years the TAA mean values grew again by approximately 5.27% in 2011 (compared to 2010) and by approximately 7.44% in 2012 (compared to 2011) identifying the second market illiquidity period – stock market falls of 2011. Once again, investment banks unable to efficiently liquidise short termed assets maintained them in the balance sheets together with increased number of longer termed trading assets.

The TEA mean for the retail model is steadily increasing (by approximately 0.64% in average per year) throughout the observation period starting with approximately 2.93% in 2007 up until 2012 with approximately 6.15 %. Steady increase in TEA was encouraged by regulations.

Business model funding practices changes together with financial market stability. Customer deposit based funding mean dropped by approximately 7.02% in the year 2008 compared to 2007. This was caused by customer distrust in investment options during and after the financial crisis. Lower CDA mean value remained relatively unchanged until 2010. The CDA mean value increased only in 2011 (by approximately 4.39%) and maintained this level throughout the year 2012. The increase could be explained by relatively cheap and abundant customer based funding and higher investment returns if compared to deposit interests available in the market.
The wholesale funded share (BLA) in this business model maintained high sensitivity to the wholesale loan interests. In 2008 BLA mean value dropped by approximately 8.56% compared to 2007, this was due to relative unavailability of all types of funding (compared to 2007) and especially of short termed wholesale funding, which reached extremely high prices during the crisis. The investment model’s BLA mean value increased steadily in the years 2009 (by approximately 3.18% compared to 2008) and 2010 (by approximately 6.07% compared to 2009), which was fuelled by increasingly cheaper wholesale funding and higher investment returns. The BLA mean value dropped once again in the years 2011 (by approximately 1.02% compared to 2010) and 2012 (by approximately 2.21% compared to 2011), which was a result of higher wholesale funding prices and decreased market liquidity for short termed trading assets.

The investment model revenues are primarily fuelled by income from fees and commissions, which, represented by IFO, show a general growing tendency (by approximately 2.06% annually) throughout the observation period with exception of the year 2009, when IFO mean value decreased by approximately 2.8% compared to 2008. The IFO’s growth tendency is parallel to TAA, as commissions and fees are obtained through trading activities. Never the less, the increased IFO mean value by approximately 4.66% in the year 2008 is the abnormal one. The increase in IFO is caused by effects of financial crisis, when suffered operating expenses immediately inflated the proportional share accounted for income from fees and commission.

The models interest based income share (NIO) follows parallel curve pattern to CDA, as operations funded by CDA are usually interest bearing activities. Thus observed NIO means fluctuate similarly by reacting to external factors as CDA does.

The annually derived bank business models show a sensitive reaction to external factors such as abnormal events (crises and market falls) and changes in regulative environment. Therefore derived business model mean fluctuations can be interpreted as a good proxy for financial market’s annual change evaluations.
The business model of banks for each observed year

The clustering procedure performed on the data for each observed year not only provided information on how business models changed, but also identified banks grouped under these business models.

When a specific bank is grouped under different models in observed years, there could be few explanations:

- The bank might have changed his business model intentionally to focus on different activities;
- The bank might have suffered radical changes in their operations due to external or internal reasons;
- The bank might have simply fallen behind the required means for model identifiers;
- Business model identifier means could be severely affected by dramatic market events, thus making grouping requirements too extreme for some institutions.

The cluster membership data for each year is available in Appendix 11.

After looking through clustering result for each year, two years stand out with significant differences in bank-model membership from the rest of observation period.

The year 2008 was earlier identified as abnormal due to the financial crisis experienced that year. Because of the crisis many banks suffered extreme fluctuations in their revenue sources, severe funding issues and increased riskiness. Consequently, many banks reported data, which was far from established original business model norms in a year before (2007) or after. Therefore, the banks grouped under specific models in the year 2008 differ from banks’ originally intended models. Similarly, in the year 2012 though much less intensively, many banks changed their models as well. This year’s changes could be accounted to the stock market fall of the August 2011, which gradually transferred the effect in the year 2012. Knowing about these events, the results including data from these years should be treated with caution.

Observations

In the year 2007 model A grouped 25 banks, model B grouped 24 banks and model C grouped 14.
In the year 2008 model A grouped 5 banks, model B grouped 53 banks and model C grouped 5.
In the year 2009 model A grouped 39 banks, model B grouped 18 banks and model C grouped 6.
In the year 2010 model A grouped 35 banks, model B grouped 22 banks and model C grouped 6.
In the year 2011 model A grouped 43 banks, model B grouped 14 banks and model C grouped 6.
In the year 2012 model A grouped 29 banks, model B grouped 29 banks and model C grouped 5.

19 banks or 30.16% of total sample have not changed their business model throughout the observation period. Of these: 1 bank is in model A (DZ Bank AG); 5 banks are in model C (Goldman
Sachs Group, Inc; Morgan Stanley; Prudential Financial Inc; State Street Corporation; Charles Schwab Corporation); and 13 banks are in model B (Wells Fargo & Company; US Bancorp; PNC Financial Services Group Inc; BB&T Corporation; SunTrust Banks; Fifth Third Bancorp; Regions Financial Corporation; Northern Trust Corporation; KeyCorp; M&T Bank Corporation; Comerica Incorporated; PKO BP SA; Huntington Bancshares Inc).

25 banks or 39.68% of total sample have changed their business model only once, 4 of them are banks headquartered USA. 18 banks that changed business model once, did so in the crisis year of 2008 (all of them changed from model A to model B).

If changes occurred on 2008 were to be ignored, 44 banks or 69.84% would have not changed their business model in the observed period. Under the same assumption: 19 or 48% of banks under model A would have maintained their business model; 13 or 72.22% of banks under model B would have maintained their business model; 5 or 83.33% of banks under model C would have maintained their business model.

9 banks or 14.29% of total sample changed their model 2 times, but did not maintained new model for more than 1 year. Of them: 5 banks of 7.94% of total sample changed their business model from A to B to C (2007-2008-2009) identifying a fundamental change in business model, possibly under banks’ management decisions.

10 banks or 15.87% of total sample spent 2 years or 33.33% of observed period under different business model. Of them 3 banks maintained new model in 2 consecutive years suggesting, that banks operate on the line between two models, or intend to change the model (Bank of America Corporation; Banco BPI SA; Piraeus Bank SA).

3 banks or 4.8% of the sample maintained 1 different business model for 3 years of 50% of observed time period (HSBC Holdings Plc; Rabobank Group; Piraeus Bank SA).

6 banks or 9.5% of total sample were a member of all 3 business models throughout the observation period implying volatile changes within the banks (Barclays Plc; Société Générale; Commerzbank AG; Skandinaviska Enskilda Banken AB; BNP Paribas; KBC Group NV).
7. Self-defined business models

This section will investigate how banks identify their own business models and how it compares to the results from clustering analysis. Additionally, the description of applied methods will be provided. Generated results will be discussed and re-evaluated. Finally, the results from clustering analysis and auto-definitions will be compared; conflicting findings will be evaluated and discussed.

7.1 Data analysis and result

Self-defined or auto-defined business models are interpreted as business models expressed and/or communicated by the banks themselves. In many cases, observed during the data collection process, the banks do not communicate their business model in a standardised manner, instead a big variety of approaches identifying their business models are available among sampled banks.

Seeking for a standardised approach, acquired data was divided into 3 major categories: (1) Target activities; (2) Target markets; (3) target clients. Later, by summarizing observations in these categories, the final bank’s business model was determined. The Model determination relied on these guidelines: (1) specific business model is determined as such if the bank clearly specifies the banks classification in observed data sources; (2) If clear identification is unavailable, banks' business models are derived by summarising prioritised target activities, target markets and target clients. In this case, author’s general impression, after reading annual statements and official websites, is the decisive factor.

The generalized auto-defined business models are presented in appendix 12.

Identified business models and member banks

42 banks of the total sample were identified as universally oriented banks
11 banks of the total sample were identified as retail oriented banks
6 banks of the total sample were identified as investment oriented banks
4 remaining banks were classified as members of unique business models: LCH Clearnet Group Limited – a clearing house; SLM Corporation-Sallie Mae – a student loan originating and servicing financial institution; Northern Trust Corporation – an asset management financial institution; Banco BPI SA – a commercial bank).

When compared to clustering approach, self-defined business models were more diverse, but maintained relatively similar proportions of grouped banks under same 3 business models. However, at the same time 12 banks were allocated in a different business model when compared to
clustering results. 4 of them were misclassified because of their uniquely different identified business models.

6 banks auto-defined as universal, were classified as retail banks in clustering derived models (US Bancorp; Capital One Financial Corporation; PNC Financial Services Group ; BB&T Corporation; SunTrust Banks; Fifth Third Bancorp). The auto-defined classification of these banks was heavily influenced by their own emphasis on their universality and diversification.

2 banks auto-defined as retail oriented, were classified as universal banks in clustering derived models (Banco Bilbao; UBI Banca). The auto-defined classification of these banks was heavily influenced by their own emphasis on retail segment.

The investment business model was auto-defined with 100% match if compared to clustering defined business models. 35 or 89.7% banks self-defined as universal, matched universal banks classified through clustering. 9 or 50% banks self-defined as retail, matched retail banks classified through clustering.

Despite the introduced data categorisation, acquiring relative information proved to be difficult. The observed banks in general do not provide an exact business model definition, often due to terminology misinterpretation or simply because banks find it unnecessary to provide such information.

Additionally, sampled banks, being biggest in the market, rarely operate under one business line. Instead a diverse operation approach is taken with one or few leading business lines. Even if such a bank favours specific line of business, it would still try to promote the universality of available services to the public and its shareholders. Therefore, such a relative overrepresentation of available but not essential business lines makes the final business model identification less precise.

It is also important to note, that banks operate similarly to most corporations when considering communicated information, thus making the communicated information to public and shareholders heavily influenced by their promotional campaigns. As a result, banks might be trying to promote a certain business line, thus communicating business model that does not match their actual balance sheets.

In summary, auto-defined business models partly matched to those derived through clustering with a reasonable accuracy. However, the used model identification process relies on less tangible data and methodology making the results sensitive to the degree of interpretations. Therefore, from the perspective of academics, the derived results could be seen as potentially bias due to high involvement of author's interpretations.
8. Conclusions

The thesis used a sample of 63 biggest banking institutions from Europe and United States of America with annual observations in the time period between 2007 and 2012 in order to determine sampled banks’ business models and investigate their structure and behaviour in respect to internal and external processes using publicly available information. For the purpose of model identification 6 cluster identifiers/variables summarising banks’ funding practices, revenue sources and riskiness were constructed from gathered data.

The observations’ grouping methodology was based on hierarchical clustering analysis, as its features best suited the studied collected data and study objectives. The performed preliminary hierarchical clustering analysis and pseudo- F index pointed to 3 cluster solution. By using pooled identifiers, hierarchical clustering analysis derived 3 distinctive models, which later were identified as: model A – the universal banking business model grouping 39 banks; B – the retail banking business model grouping 18 banks; C- The investment banking business model grouping 6 banks.

With intention to study business models’ evolutionary processes during the observed period, a separate clustering analysis was performed for every year in the period of 6 years between 2007 and 2012. The investigation identified that business model identifiers’ means differ accordingly to the changes both in the financial markets and internally within the banks. The closer analysis of formed clusters clearly showed the indication of the financial crisis of the year 2008, which was followed by a lengthy slow growth period. Additionally, the observed abnormal readings in the year 2011 hint the effect of the stock market fall in August 2011.

The analysis for cluster membership in the same period show abnormal variations in a number of banks grouped under the models. Substantial bank movements between business models were identified in the years 2008 and 2012. While the banks’ movement in 2008 was related to the crisis, the migration between models in 2012 was suspected to be caused by the lasting effect of the market fall in 2011. The observed model migrations were largely linked to the extreme model identifier mean fluctuations, never the less some banks performed better than others maintaining established models.

The secondary approach used to determine banking business models was based on banks’ auto-definitions. The analysis for self-defined business models has proven to be complicated as some of the observed banks in general do not provide an exact business model definition, often due to terminology misinterpretation or simply because banks find it unnecessary to provide such information. Consequently, a large part of acquired data is a result of interpretation of the latest
published annual statements or official websites. The self-defined business models in general were communicated as universal banking business models, while the retail based models were more than 4 times less popular. In the same setting the investment oriented models matched exactly to those derived through clustering.

In summary, the performed study proved to be technically capable of identifying business models with the use of 6 derived identifiers for the sampled banks and provided analytical insight in the constructed business models and banks within the observation period. Nevertheless, the results of the study are highly dependent on multiple factors that defined the processes and methodology of this study, thus, the findings of the study should be evaluated with care.

Notes:
The data and calculations concerning the study can be found in a digital attachment or requested from the author.

An additional list of publications, that served as inspirations and provided ideas for the study: (Chen 2009); (Haldane, May 2011); (Mayo, Brown 1999); (Ciarrapico, Cosci 2011); (DeYoung, Rice 2004);(Goisis, Giorgetti et al. 2009); (IONESCU 2012); (Sengupta, Noeth 2012); (Thakor, Boot 2010)
References


