Business Models of Banks for the Financial Markets in the EU*

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Abstarct:

Purpose: The purpose of the article is to identify models of banks' activity in the securities and derivatives markets, as well as to analyse changes in these models on the example of the largest banks in the EU.

Design/Methodology/Approach: The proposed method uses cluster analysis of the main indicators for banking investment based on the agglomerative hierarchical clustering algorithm of Ward and the Tau Index as the criterion for evaluating the optimal number of clusters. The research covers 29 largest EU banks, spanning the period 2007–2018.

Findings: Before the global financial crisis it was possible to clearly identify two clusters, one of which reflected the high engagement of a number of banks in the securities and derivatives market, then after the Great Recession, can be distinguished four main models: (1) a highly active investment strategy in the securities and derivatives markets; (2) an active investment strategy in the securities market; (3) active mix-investment strategy in the securities and derivatives markets; (4) moderate investment strategy in the securities and derivatives markets.

Practical implications: The data analysis shows that significant modifications in the investment strategies of banks confirm to some extent the effectiveness and the further need of certain additional regulations to ensure the financial soundness of banking institutions at the EU level, as well as the effectiveness and the further need of the changes in the national legislation of individual EU countries concerning the banking proprietary trading in the securities and derivatives markets.

Originality/Value: The paper has enabled to develop an understanding of the modification of the business models of largest EU banks in the financial instruments market.

Keywords: Bank, investment strategy, securities, derivatives.

JEL codes: G15, G21, G24, G32, M19.

Paper type: Research article.

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1. Introduction

The financial disturbances that began in 2007 exposed the shortcomings of modern banking models, especially in the developed economies of the United States and Europe. Banking institutions were too sensitive to market fluctuations, and their risk management systems were ineffective in mitigation the negative impact of realized financial risks (in particular market risk, credit risk and insufficient liquidity risk).

The post-crisis period is characterized by a significant increase in regulation and in some cases inflation of regulation, with reference to the financial system and banking institutions in particular. This factor, as well as the experience of the Great Recession, significant progress in information technology and the current market environment of low-interest rates, are transforming the focus of banks' business strategies. This is especially true for banking investment activities in the securities and derivatives markets. Changes in banks' participation in financial instruments transactions, along with the impact on modifications to their balance sheets and income source structures, may have a negative impact on market activity, especially on their liquidity.

The purpose of the article is to identify models of banks' activity in the securities and derivatives markets, as well as to analyse changes in these models on the example of the largest banks in the European Union.

2. Literature Review

The analysis of recent research on the subject of the article can be carried out in two aspects (1) the role of securities and derivatives in the banking activities and (2) approaches to identifying business models of banks based on cluster analysis.

Regarding the first group of studies, can be distinguished scientific papers that focus on the analysis of the current state of banks' securities transactions of individual countries. Abbassi, Iyer, Peydró, and Tous (2016) find that, during the crisis, banks with higher trading expertise ("trading banks") increase their level of security investments as compared to other banks ("non-trading banks").

On the global level Committee on the Global Financial System (2018) defines shifts in bank business models, advanced economy banks have tended to reorient their business away from trading and more complex activities, towards less capital-intensive activities, including commercial banking. ECB (2016) indicates that in the past few years banks in the EU have made substantial efforts to reshape their business models.

Köhler (2015) shows that business models differ considerably across bank types, with savings and cooperative banks being more retail-oriented and commercial and investment banks being more investment-oriented.

Modern researchers use various approaches based on cluster analysis to identify banks' business models and analyse their changes, including securities and derivatives transactions.

Farnè and Vouldis (2017) use methodology proposed by Vichi and Kiers (2001) that developed the factorial k-means algorithm, where a subspace is defined such that the projected data points on this subspace are closest to the centroids. As the name of the procedure suggests, it involves both factor analysis (reducing dimensionality) and k-means procedure (clustering objects and finding out their centroids in this low-dimensional subspace). Farnè and Vouldis adopt an enhanced version of this clustering approach which combine the two essential features, dimensionality reduction and clustering. In this article is used the Hartigan's statistic to select the number of clusters.

Roengpitya, Tarashev, Tsatsaronis, and Villegas (2017) allocate observations to distinct clusters by applying the agglomerative clustering algorithm of Ward to various subsets of the input variables, i.e., construct different trials and use the F-index as a goodness-of-fit measure for a clustering outcome.

Ayadi and De Groen, (2014) used Ward's procedure to calculate the distance between clusters and Calinski and Harabasz's to diagnose the appropriate number of clusters. The EU Banking Business Models Monitor identifies the business models of 147 banks that cover more than 80% of assets of the EU banking industry.

Mergaerts and Vander Vennet (2016) investigate the effects of bank business models on performance and risk for a sample of 505 banks from 30 European countries over the period from 1998 to 2013. They have graphically documented the continuous nature of business models using multidimensional scaling. This technique approximates the true distances between the banks by a two-dimensional representation as accurately as possible so that similar banks are grouped together.

Considering the research conducted on banking business models and their meaning in scientific papers as strategies that translates into the similar balance sheet and income statement ratios (Roengpitya *et al.*, 2017) in this article, attention will be focused on the study of the engagement of the largest EU banks in the securities and derivatives markets, since the change of approaches to participation in the financial instruments markets is key in the current trends in the modification of banking business models.

3. Research Methodology

In contrast to existing approaches (Roengpitya *et al.*, 2017; Farnè and Vouldis, 2017; Hryckiewicz and Kozłowski, 2017; Ayadi and De Groen, 2014) a feature of this study is the use of a mixed approach for identification of models of banking activities in the securities and derivatives markets, i.e., accounting not only "choice variables"

(with respect to the banking activities and reflected in the composition of the balance sheet), but also "outcome" variables i.e., the results of the "choice" variables.

To identify different models of EU banks concerning investment strategies in the financial market, the main indicators for this type of banking activity are highlighted, namely (low-dimensional context of variables): (1) interest income and preferred stock dividends on securities / total interest income (IS/IT); (2) derivative financial instruments / total assets (DER/A); (3) total financial assets (securities) / total assets (SEC/A).

The following is a cluster analysis of the data set of these indicators for largest EU banks in different time periods (2007, 2014, 2018) in order to determine the modification of banking investment strategies under the influence of various economic and regulatory factors. Groups are identified using the agglomerative hierarchical clustering algorithm of Ward. Calculations are carried out in the R using package NbClust (Charrad, Ghazzali, Boiteau, and Niknafs, 2014). In this research are used the Tau Index (Rohlf, 1974; Milligan and Cooper, 1985) as the criterion for evaluating the optimal number of clusters (i.e., the "stopping rule").

To analyse the role of investment strategies in the activities of the largest EU banks the following additional indicators of banks are also used: (1) return on average assets (ROAA); (2) reverse Repos, securities borrowed and cash collateral/total assets (REPO/A); (3) financial assets (held to maturity)/total assets (HTM/A); (4) investments in associated companies/total assets (AC/A).

The sample of banks covers the largest EU banks above EUR 200 billion of leverage ratio exposure measure as of end-2018 for which European Banking Authority (2019) requires reporting to identify global systemically important banks (G-SIB). The sample covers 29 banks). From this sample, Financial Stability Board (according to the methodology of the Basel Committee on Banking Supervision) have identified 8 banks from the EU as G-SIB in 2019 (BNP Paribas, Deutsche Bank, Groupe BPCE, Groupe Crédit Agricole, ING Bank, Santander, Société Générale, UniCredit). Financial data of banks are obtained from the BankFocus database.

4. Results

Bank financial data for 2007 allow identifying investment business models of European banks that were formed in the regulatory and economic conditions before the Great Recession. Using 3 indicators of banking activity in this area (during this period, data from 19 banks from the above-described sample were available for calculating indicators), 2 groups of banks were identified based on cluster analysis (using the "stopping rule"), and descriptive statistics for individual groups allow us to determine their specific features in the context of: (1) the dominance of a separate line of activity, (2) level of participation in the derivatives market, (3) banks' sensitivity to market risks, (4) the income of banks.

For the first group (4 banks), the investment model can be defined as active, since the average value of the share of securities in the assets of these institutions is almost 50% (Table 1), and the highest share of interest income on securities (including dividends on preferred shares) in the banking total interest income is observed. For example, at Deutsche Bank, income on securities has provided 2/3 of the bank's total interest income and it has significantly increased the bank's riskiness in terms of a significant dependence of the profitability on investment activities in the financial market.

Table 1. *Key indicators of banking clusters in 2007*

Group of banks	IS/TI	DER/A	SEC/A
Group 1. Active model			
BNP PARIBAS	42,159%	14,094%	48,522%
DEUTSCHE BANK	74,990%	26,336%	47,446%
ING	52,868%	2,760%	44,461%
KBC	40,049%	6,240%	44,292%
mean	*52,517%*	*12,358%*	*46,180%*
max	*74,990%*	*26,336%*	*48,522%*
min	*40,049%*	*2,760%*	*44,292%*
Group 2. Moderate model			
BAYERN LB	16,922%	4,255%	32,638%
CAIXA BANK	28,211%	0,477%	20,701%
CREDIT AGRICOLE	13,744%	12,176%	32,638%
DANSKE BANK	11,561%	6,706%	13,888%
ERSTE GROUP	17,275%	0,974%	21,147%
HANDELSBANKEN	17,625%	3,116%	11,957%
INTESA SANPAOLO	13,981%	4,018%	16,685%
NORDEA	3,827%	8,069%	15,838%
RABOBANK	13,639%	4,573%	17,270%
SABADELL	3,104%	0,791%	7,618%
SANTANDER	8,745%	5,487%	14,463%
SEB	21,069%	3,734%	22,270%
SOCIETE GENERALE	10,041%	14,287%	40,100%
SWEDBANK	3,995%	2,300%	7,562%
UNICREDIT	18,558%	6,472%	19,249%
mean	*13,487%*	*5,162%*	*19,602%*
max	*28,211%*	*14,287%*	*40,100%*
min	*3,104%*	*0,477%*	*7,562%*

Source: *Own elaboration.*

Data about the low share of securities held to maturity (Table 2 – the average value in the cluster is 1,9%) also indicates that the banks are exposed to higher risks of market fluctuations. In addition, two banks from the first cluster have high engagement in the derivatives market among all the banks in the sample. The application of this model has a special dimension because it is typical mainly for some global European banks. The high share of securities in the bank's assets is not evidence of a higher

return on the bank's assets. Thus, the average value of ROAA for both groups is the same.

Table 2. *Average values of additional indicators of banking clusters in 2007*

Group of banks	ROAA	REPO/A	HTM/A	AC/A
Group 1	0,7	2,0	1,9	0,2
Group 2	0,7	3,4	1,1	0,3

Source: Own elaboration.

For the second group, the investment strategy in the securities and derivatives market can be defined as moderate, since the average values of the main indicators used for cluster analysis are significantly lower compared to the banks of the first group. However, not all banks in this cluster have homogeneous main indicators. In the second group, there are two banks (Caixa Bank, SEB) for which securities provided more than 20% of interest income, as well as a subgroup of banks where securities in assets accounted for more than 20% (5 banks). Almost all banks of the second group (apart from two G-SIB banks – Société Générale and Credit Agricole) are characterized by a strategy of low participation in the derivatives market.

The data show that not all G-SIBS in the EU had active investment policy parameters (as for the first group). Thus, Credit Agricole and Société Générale are characterized by higher values (than the average in the second group) of SEC/A and DER/A, but significantly lower value of the IS/TI, which does not allow them to be attributed to the first group of banks.

Cluster dataset in 2007 does not confirm the presence of certain regional features of banking investment strategies. Also, the engagement of banks from both groups in investment activities in associated companies is rather weak.

The global financial crisis has played a significant role in modifying the investment activities of EU banks. The key was an increase in the variety of models of banks' activity in the securities and derivatives market, which was reflected in the growth of the number of identified clusters from 2 to 4.

Analysis of banks' financial dataset for 2014 (the sample already includes all 27 major EU banks) allows determining whether the European debt crisis and the strengthening of regulatory requirements to improve the financial stability of banking institutions have had an impact on changing investment strategies of banks (table 3).

Deutsche Bank has had significantly higher values of all indicators, which caused it to be singled out as a separate cluster. In comparison with 2007, due to the negative impact of the crisis in financial markets, the role of securities in the assets of this bank, as well as income from these financial instruments, has significantly decreased, but in comparison with other banks, the values of these indicators were still high. For

this banking institution, financial market activity can be described as a model of a highly active investment strategy in the securities and derivatives markets.

The second group (8 banks) with an active investment strategy in the securities market (the average value of SEC/A was about 25%) and a significant role of securities income in the total interest income of banks (the average value was almost 30%) is characterized by a decrease in the average values of the main indicators. In 2014 the balance sheets of these banks in terms of investment activity in the securities market did not reflect the possible negative impact of the European debt crisis (2010-2012), but on the contrary, indicated an increase the share of interest income from securities transactions (in comparison with 2010).

Table 3. *Key indicators of banking clusters in 2014*

Group of banks	IS/TI	DER/A	SEC/A
Group 1. Model of highly active investment strategy			
DEUTSCHE BANK	44,97%	37,13%	22,08%
Group 2. Model of active investment strategy in the securities market			
BANQUE POSTALE	26,19%	0,97%	23,86%
BPCE	26,35%	7,58%	21,32%
CAIXA BANK	33,99%	1,97%	17,05%
CREDIT MUTUEL	21,74%	1,79%	29,43%
ERSTE GROUP	22,39%	5,12%	21,89%
ING	42,39%	5,14%	19,21%
INTESA SANPAOLO	22,90%	7,12%	28,85%
KBC	36,78%	4,11%	34,96%
mean	*29,09%*	*4,22%*	*24,57%*
max	*42,39%*	*7,58%*	*34,96%*
min	*21,74%*	*0,97%*	*17,05%*
Group 3. Model of active investment strategy in the securities and derivative market			
BNP PARIBAS	18,55%	21,07%	31,88%
CREDIT AGRICOLE	21,05%	13,24%	31,81%
SOCIETE GENERALE	13,04%	17,78%	35,84%
mean	*17,55%*	*17,36%*	*33,18%*
max	*21,05%*	*21,07%*	*35,84%*
min	*13,04%*	*13,24%*	*31,81%*
Group 4. Model of moderate investment strategy			
BAYERN LB	6,51%	10,36%	15,84%
ABN AMRO	0,55%	6,54%	13,05%
BBVA	14,71%	8,66%	18,53%
COMMERZBANK	19,49%	16,87%	23,48%
DANSKE BANK	19,73%	11,86%	19,23%
DZ BANK	6,48%	7,01%	20,59%
HANDELSBANKEN	3,41%	4,13%	6,69%
NORDEA	7,28%	15,74%	18,95%
NYKREDIT	4,70%	2,28%	7,97%
RABOBANK	6,86%	8,29%	7,10%
SABADELL	17,88%	1,53%	14,87%

SANTANDER	13,26%	6,79%	16,35%
SEB	10,48%	10,36%	13,21%
SWEDBANK	5,54%	5,87%	8,51%
UNICREDIT	14,55%	9,04%	20,01%
mean	*10,09%*	*8,35%*	*14,96%*
max	*19,73%*	*16,87%*	*23,48%*
min	*0,55%*	*1,53%*	*6,69%*

Source: *Own elaboration.*

The third cluster of banks is characterized by quite significant investments in both the securities and derivatives markets, but securities transactions generate interest income at a lower level compared to the previous groups. The strategy of these banks can be defined as a model of an active mix-investment strategy in the securities and derivatives markets. A special feature of this group is that it includes only G-SIBs.

Indicators of the fourth group of banks (15 banks) show the implementation of a moderate investment strategy (like the second group in 2007), i.e. investments in the securities and derivatives play a minor role in banking asset management.

The average value of return on assets of banks of all groups (except Deutsche Bank) has decreased, which can be explained by a possible declining in income from credit provision. Other indicators have not changed significantly (Table 4).

Table 4. *Average values of additional indicators of banking clusters in 2014*

Group of banks	ROAA	REPO/A	HTM/A	AC/A
Group 1	0,10	2,55		0,24
Group 2	0,16	1,17	5,48	0,35
Group 3	0,19	1,47	0,81	0,27
Group 4	0,34	1,77	0,79	0,33

Source: *Own elaboration.*

The data analysis in 2018 shows that there are significant modifications in the investment strategies of banks (Table 5), which can be explained to some extent by the introduction of certain additional regulations to ensure the financial soundness of banking institutions at the EU level, as well as by the changes in the national legislation of individual EU countries concerning the banking proprietary trading in the securities and derivatives markets.

The strategy of Deutsche Bank has still provided assets management on the basis of significant investments in securities and derivatives, which distinguishes this institution in comparison with other banks in the EU.

The strategy of active investment in the securities market with a high share of income from these instruments in the total interest income of banks (the second group) is typical only for 4 banks (in 2014 – 8 banks) and the average values of the main indicators of institutions in this cluster decreased.

There has been a significant change in the approaches to the investment of global banks, which in 2014 were classified as a separate group and whose activities were covered by the concept of a mix-investment strategy in the derivatives and securities markets. These banking institutions have significantly reduced the share of derivatives and securities in their balance sheets, which also reflected a significant reduction in the share of income in securities in total interest income.

Financial data for 2018 have caused the changes in the composition of the third and fourth clusters and in the identifying strategies for banks in these groups. For banks in the third cluster, their investment strategy can be defined as moderate. Group has already included global banks, which formed a separate cluster in 2014.

Table 5. *Key indicators of banking clusters in 2018*

Group of banks	IS/TI	DER/A	SEC/A
Group 1. Model of highly active investment strategy			
DEUTSCHE BANK	36,297%	23,965%	22,969%
Group 2. Model of income investment strategy			
BPCE	24,718%	4,671%	17,781%
CAIXA BANK	28,016%	0,784%	17,678%
CREDIT MUTUEL	22,298%	1,023%	7,492%
INTESA SANPAOLO	21,314%	3,684%	12,115%
mean	*24,087%*	*2,541%*	*13,766%*
max	*28,016%*	*4,671%*	*17,781%*
min	*21,314%*	*0,784%*	*7,492%*
Group 3. Model of moderate investment strategy			
BANQUE POSTALE	18,068%	0,693%	20,285%
BBVA	14,733%	4,937%	21,114%
BNP PARIBAS	4,644%	12,029%	21,400%
COMMERZBANK	13,230%	8,591%	20,680%
CREDIT AGRICOLE	19,864%	6,322%	33,676%
DANSKE BANK	14,469%	6,826%	12,518%
ING	9,821%	2,793%	19,640%
NORDEA	5,915%	6,745%	30,140%
SABADELL	7,553%	0,935%	12,040%
SANTANDER	11,834%	4,498%	15,870%
SOCIETE GENERALE	6,297%	10,327%	23,264%
UNICREDIT	12,379%	4,723%	21,179%
mean	*11,567%*	*5,785%*	*20,984%*
max	*19,864%*	*12,029%*	*33,676%*
min	*4,644%*	*0,693%*	*12,040%*
Group 4. Model of conservative investment strategy			
BAYERN LB	0,423%	3,986%	13,521%
ABN AMRO	0,524%	1,623%	11,400%
DZ BANK	-0,633%	3,187%	13,383%
HANDELSBANKEN	2,436%	1,950%	6,273%
NYKREDIT	1,555%	1,335%	7,184%
RABOBANK	4,134%	3,838%	5,027%
SEB	0,757%	4,500%	11,934%
SWEDBANK	0,334%	1,856%	10,292%

mean	*1,191%*	*2,784%*	*9,877%*
max	*4,134%*	*4,500%*	*13,521%*
min	*-0,633%*	*1,335%*	*5,027%*

Source: *Own elaboration.*

The fourth cluster of banks is characterized by the lowest average values of the main indicators, i.e. these financial institutions use a conservative investment strategy of a weak presence in the securities and derivatives markets. The impact of securities income on banks' total interest income is also minimal.

Although the share of securities income in the total interest income of most banks has decreased, the return on assets in groups with different strategies has increased significantly (apart from Deutsche Bank), so it can be assumed that other types of banking activities generate high income in comparison with investments in the securities and derivatives markets.

Table 6. *Average values of additional indicators of banking clusters in 2018*

Group of banks	ROAA	REPO/A	HTM/A	AC/A
Group 1	0,02	0,9	0,4	0,1
Group 2	0,5	1,0	3,1	0,2
Group 3	0,4	1,2	3,9	0,3
Group 4	0,6	1,0	0,3	0,1

Source: *Own elaboration.*

Stowell (2017) include Deutsche Bank to the group of global investment banks, and BNP Paribas and Société Générale to large regional investment banks. However, the results of the analysis for 2018 indicate that only Deutsche Bank can be considered as an investment bank.

5. Conclusions

The cluster analysis of the activity of the largest EU banks in the financial instruments market indicates the modification of their business models in this sector of financial activity over the period from 2007 to 2018 (based on 3 indicators: the share of securities in assets, the share of derivatives in assets, the share of interest income and preferred stock dividends on securities in total interest income).

Before the crisis it was possible to clearly identify two clusters, one of which reflected the high engagement of a number of banks in the securities and derivatives market, then after the Great Recession, can be distinguished four main models (2014). The data analysis in 2018 shows that there are significant modifications in the investment strategies of banks, which can be explained to some extent by the introduction of certain additional regulations to ensure the financial soundness of banking institutions at the EU level, as well as by the changes in the national legislation of individual EU countries concerning the banking proprietary trading in the securities and derivatives markets. The model with an active mix-investment

strategy in the securities and derivatives markets is modified into a moderate model, and there is also a group of banks that is characterized by a conservative model with low engagement in operations in the financial instruments market.

Additional indicators used in the analysis confirm for all banks in the sample the low role of reverse repos, securities borrowed and cash collateral, investments in financial instruments held to maturity or in associated companies.

The analysis also shows the absence of a separate model that is unique to European G-SIBs and these institutions is present in all clusters. Data in selected clusters also do not confirm the presence of certain regional features of banking investment strategies.

In general, the models of functioning of the largest EU banks evolve in the direction of reducing the focus of their investment strategies in securities and derivatives due to the impact of increasing regulatory requirements.

Further research in this aspect shall focus on the impact of changes in the functioning of banking institutions on the activity of the securities and derivatives markets, and on the development of proposals for regulatory authorities in the direction of modifying regulatory requirements to ensure the effective functioning of both the financial market and financial institutions.

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