Interaction Between Internet Banking and Bank Performance: The Case of Europe

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Abstract

In this study, the interaction between internet banking and bank performance is investigated by panel causality tests. Banking data of 30 European countries analyzed by Demitrescu - Hurlin panel causality test for the period 2005-2013. ROA and ROE ratios were used as measures of bank performance. Not only whole sample consisting of Euro Area and the others but also Euro Area and the other countries in Europe considered as samples and tested two sub-samples. Results show that a strong relationship through internet banking to the bank performance in the Euro Area countries and for the rest of the Euro Area countries are also not determined causation significantly in both directions. On the other hand, there is also a significant relationship internet banking to performance of the bank considering the whole sample.

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1. Introduction

It is increasingly difficult to go immediately to any branch of the bank for each type of transaction for the bank customers because of active business and contemporary city life. Internet banking and the mobile banking applications that are an extension of Internet banking have virtually eliminated customers' space and time commitment. Most banking transactions can be made seven days-twenty-four hour in anywhere by internet access.

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These advantages are increasing customers' demand for Internet-based banking services every day. On the other hand, the expansion of trade over the internet and secured payment system for shopping in the virtual environment is another factor that increases the demand for internet banking services.

The tendency of banks to the internet banking has three basic factors such as cost advantages, high profitability and low risk. Studies show that the initial setup costs of internet banking investment will be provided and realized profits in the short time if there is enough demand for internet banking. Empirical studies on various countries reveal that internet banking increases performance of the bank. Internet banking provides significant advantages to banks as well as customers’ demand has played a very important role in spreading of internet. However, expected results have not been derived in some less developed and developing countries need both infrastructure investment has not been done enough and customers tendency to traditional branch-based banking in excessively.

In this study, the relations between internet banking and profitability performance of banks was investigated according to causality in 30 European countries. In the application of this study, we used sectoral data because of that can not be accessed internet activity data in some countries. As the method of analysis, the panel causality tests are used.

2. Literature Review

Important part of various studies on the effects internet banking on the performance of banks consider the applications in developed and developing countries. Some of the research has done so far by Sullivan (2000), DeYoung (2001), Hasan (2002), Pigni et al. (2002), Kagan (2005), Alam et al. (2007), Arnaboldi & Claeys (2008), Malhotra & Singh (2006, 2007 ve 2009), Ciciretti et al. (2009), Weigelt & Sarkar (2012), Gutu (2014).

Except for Arnaboldi & Claeys'n (2008), all of the studies listed are related with a single country and its banking system of the country. The Arnaboldi and Claeys compare conventional banking with internet banking in Finland, Spain, Italy and the UK practices. It is showed that internet banking is more contribution to the performance of the bank when compared to traditional branch banking and improve competition in the sector.

Hasan (2002), Pigni et al. (2002) and Ciciretti et al. (2009) works based on Italy banking system gave similar results as Arnaboldi & Claeys (2008). ROA, ROE, commission and fee income and stock returns are affected positively the internet banking activity (Hasan, 2002, was Cicireti et al., 2009). There is a significant relationship between internet banking and operational risks. In addition, internet banking reducing impaired loans of banks and risk of volatility of stock returns (Hassan, 2002). On the other hand, the banks are described as innovative bank, whose costs are below the industry average, which used internet banking and other electronic banking applications (Pigni et al., 2002).

Internet banking and other electronic based banking activities meet and exceed processes based on initial setup costs of other electronic banking is relatively short. This is encouraging electronic banking activities in developing countries. However, it is necessary to broaden the customer base in order to increase the performance of services which contribute to the bank (Sumra et al., 2011).

Alam et al., (2007), Khrawish & Al-Sadi (2011), Hosein (2013) and Gutu’s (2014) studies showed that internet banking of high infrastructure costs in some developing countries, lack of sufficient number of customers adversely affect the profitability of banks. Gutu (2014) even determined that banks position did not changed inspite of depositing on higher advertising budget for internet banking. This shows us that customers still demand the traditional branch-based banking services in these countries. Therefore, the expected cost reduction still could not be provided and profitability of electronic banking services are adversely affected. Internet infrastructure based on relatively old technology can prevent to reach the expected performance for banks in developing countries (Alam et al. 2007, Gut 2014).

It has been observed that internet banking activities has been mostly done by large banks in some developing
countries (Malhotra et al., 2006, 2009). It is also observed that less expenses fulfilled to fixed assets, high deposit
volume and less branches of large-scale private banks tended to internet banking and generally aimed to increase
low market share. On the other hand, banks accelerate to tendency to internet banking when rivals start internet
banking (Malhotra and Singh, 2007).

Internet banking is to make increase the asset quality of banks and affect directly ROA performance (Kagan et
al., 2005). On the other hand, there are also strong indirect effects on profitability through cost. Internet banking and
other electronic banking services decrease average operational costs on banks tolerating physical overhead expenses
(DeYoung, 2001). Here is the great importance of the electronic infrastructure used by banks. The more developed
infrastructure falls cost per transaction and increases profitability. However, it is also been implicated that the level
of education of the customer and the bank's website functionality play a role in the success of internet banking
services. High level educated customer demand is higher than the ordinary bank customers for internet banking
services (Sullivan, 2000). If the number of bank customers using internet and other electronic banking services is
not increased, the costs of such services for the bank profitability will be low.

Weigelt & Sarkar (2012) showed that the technological innovation stage is gradually increase for companies used
outsourcing, emphasizing the importance of how to improve the efficiency increasing the effectiveness of the
 provision of resources out of the bank for online banking. But, increasing the level of technology coordinates coping
efficiency and adaptability in a dilemma caused trade-off. Banks are required to reflect technological developments
and services with changing customer needs. Also customers accustomed to new technological products takes time.
In this context, it is important to design and present of the product.

3. Methodology

3.1. Research Goal

In this study, the panel causality tests between internet banking applications and bank profitability are being
investigated in developed and emerging economies. In order to determine the causal relationship between variables
partial panel Granger causality test was used. To test the direction of the relationship between instability, the
following dynamic model was used to test avoiding the heterogeneity of cross-sectional units (Hurlin 2004,
Demitrescu & Hurlin, 2012):

\[ y_{it} = \alpha_i + \sum_{k=1}^{K} \gamma_{i}^{(k)} y_{i,t-k} + \sum_{k=1}^{K} \beta_{i}^{(k)} x_{i,t-k} + \epsilon_{it} \]  

(1)

Here, test variables are \( y_{it} \) and \( x_{it} \). \( \alpha_i \) reflects the specific interaction between the individual cross-sections, the
coefficients \( \gamma_{i}^{(k)} \) and \( \beta_{i}^{(k)} \) can be changed each unit or section for \( i \). Hurlin (2004), standard homogeneous panel
Granger combined with the average of the individual test Wald statistic for \( i=1,\ldots,N \) units. Dumitrescu & Hurlin
(2012), has further developed the Granger test for heterogeneous panel data sets. Dumitrescu-Hurlin test is like a
combination of tests that are homogeneous and heterogeneous in relation with non-causal. Two standardized
statistics were described in here. The first of individual Wald statistics based on the exact asymptotic moments of
the individual Wald statistics. Second one based on approximated moments for finite T samples. In this study, the
causality test was investigated by Dumitrescu-Hurlin test.

3.2. Sample and Data Collection

In the study, 30 advanced and emerging European countries are discussed. The names of these countries are
presented in Table A.1 in the appendix of the study. Each cross-section of the panel data set consists of annual data
considered countries for the 2005-2013 period. Internet banking utilization data is per capita rate (%) compiled from
Eurostat, e-Commerce and e-Banking Statistics. The performance data are aggregated banking ROA and ROE ratios
of the countries concerned from the IMF Financial Soundness Indicators.
3.3. Analyses and Results

In this study, descriptive statistics concerning both the whole sample and the all the countries out of Euro Area countries as well as Euro Area countries are considered as two sub-samples and analyzed separately are given in Table 1. The first step in the analysis is that the variables in terms of stationary was investigated by panel unit root tests for both sub-sample and whole sample. In this study, Levin, Lin & Chu (2002) and IM, Pesaran & Shin (2003) tests and in addition to first two tests, ADF – Fisher test which was developed by Pesaran (2007) results are given in Table 2. All samples and the sub-sample covering the Euro Area countries are stationary for all three variables. However, IM, Pesaran & Shin tests are not valid for all of the variables in the countries outside the European members and it was also observed that ROE is not valid for the ADF-Fisher test. Therefore, tests were repeated taking the first differences of the variables. The differenced variables are valid for the level of 1%, ensure the stationary condition that is determined by all 3 tests.

Table 1. Descriptive statistics

|                      | All Countries |  | Euro Area Countries |  | Other Countries |  |
|----------------------|---------------|------------------|---------------------|------------------|------------------|------------------|
|                      | roa           | roe              | int_bnk             | roa              | roe              | int_bnk             |
| Mean                 | 0.581         | 8.003            | 35.337              | 0.376            | 5.498            | 35.148              |
| Median               | 0.616         | 10.867           | 32.000              | 0.500            | 9.650            | 33.000              |
| Maximum              | 3.500         | 41.700           | 87.000              | 3.500            | 33.300           | 84.000              |
| Minimum              | -9.500        | -169.200         | 0.000               | -9.500           | -169.200         | 0.000               |
| Std. Dev.            | 1.183         | 17.565           | 24.295              | 1.312            | 20.343           | 20.826              |
| Skewness             | -3.238        | -4.893           | 0.429               | -3.312           | -4.771           | 0.442               |
| Kurtosis             | 24.541        | 43.187           | 2.100               | 23.269           | 36.858           | 2.356               |
| Jarque-Bera          | 5691.712      | 19246.060        | 17.418              | 3069.248         | 8352.664         | 8.077               |
|                     | [0.000]       | [0.000]          | [0.000]             | [0.000]          | [0.000]          | [0.000]             |
| Observations         | 270           | 270              | 270                 | 162              | 162              | 162                 |

Table 2. Panel unit root tests

|                      | All Countries |  | Euro Area Countries |  | Other Countries |  |
|----------------------|---------------|------------------|---------------------|------------------|------------------|------------------|
|                      | int_bnk       | roa              | roe                 | roa              | roe              |
| Levin, Lin and Chu   | -11.6781      | -6.7522          | -7.0407             | -7.0407          |
| Im, Pesaran and Shin | -2.2840       | -1.7209          | -1.4944             | -1.4944          |
| ADF - Fisher         | 107.8430      | 89.8216          | 78.1926             | 78.1926          |
| Euro Area Countries  |               |                  |                     |                  |
| Levin, Lin and Chu   | -11.8418      | -5.2894          | -5.9227             | -5.9227          |
| Im, Pesaran and Shin | -2.9322       | -1.3434          | -1.4932             | -1.4932          |
| ADF - Fisher         | 74.0485       | 53.1759          | 50.1906             | 50.1906          |
| Other Countries      |               |                  |                     |                  |
| Levin, Lin and Chu   | -5.0084       | -4.2151          | -4.0306             | -4.0306          |
| Im, Pesaran and Shin | -0.0159       | -1.0756          | -0.5242             | -0.5242          |
| ADF - Fisher         | 33.7941       | 36.6457          | 28.0021             | 28.0021          |

(*) Probabilities for Fisher tests are computed using asymptotic Chi-square distribution. All other tests assume asymptotic normality. (**) Lag length selection based on Schwarz criterion.
Table 2. in the perspective of Panel Unit Root Tests, causality tests applied to the stationary variables directly and it were also causality tests applied to the non-stationary variables after evaluated first differences. The results are presented in Table 3. Dumitrescu-Hurlin tests shows that internet banking only significant causal relationship ROE (5% level) to be valid that is considered the whole sample. The same test is applied to the Euro Area countries, both ROA and ROE was identified as a significant causal relations at the level of 5% in the internet banking. None of significant causal relationship could not be realized for the countries outside the Euro Area. Internet banking application in Euro Area countries illustrate the performance of the bank strongly and it is determined that the only significant relation is valid for the whole sample under the influence of the Euro Area countries. There is no interaction between profitability and internet banking because of various reasons in European countries outside the Euro Area. Relative development differences, lack of electronic banking infrastructure and preferences of customers to traditional banking channels such as reasons may have an impact on the results. Because, European countries, in which outside the Euro Area, that the development levels is below the European average except the UK, Sweden and Norway. In addition, monetary policy and banking systems are directed in coordination in the countries of the Euro Area.

Table 3. Dumitrescu – Hurlin panel causality tests

| Null Hypothesis: | All Countries | Euro Area Countries | Other Countries |
|------------------|---------------|---------------------|----------------|
| int_bnk → roa    | 2.852, 1.3444, 0.1788 | **3.9850, 2.0865, 0.0369** | 1.5346, -0.0971, 0.9227 |
| roa → int_bnk    | 1.8011, 0.1210, 0.9037 | 1.8941, 0.1671, 0.8673 |
| int_bnk → roe    | **4.4348, 2.4913, 0.0127** | 2.0538, 0.2845, 0.7760 |
| roe → int_bnk    | 1.27794, -0.45166, 0.6515 | 1.1042, -0.5062, 0.6127 |

Lags: 1

“→” is null hypothesis that is does not homogeneously cause. Significant values are indicated in bold.

4. Conclusion

In this study, a member of the European Union and non-European of 30 countries, the interactions between bank profitability performance with internet banking was investigated by Demitrescu-Hurlin panel causality tests. The whole sample is taken as 3 samples which are included Euro and non-Euro Area, Euro and non-Euro countries. In Euro Area countries, causality from Internet banking to bank profitability are determined accurately strong and unidirectional. In countries outside the Euro Area, significant causality relationships could not be determined between variables. Therefore, the only significant causal relationship determined for all samples also concluded that is occured under the influence of the Euro Area countries. The more advanced internet banking practices in European countries illustrate the more performance of the strongest banks. But relatively less developed European countries in such a relationship could not be determined. This is cause to thought that the level of development, lack of infrastructure and such as customer habits are considered effective factors. Bank customers demand for services through traditional channels (branches, ATMs, etc.) is the result of being undeveloped internet banking technology in countries outside the Euro Area.

A.1. Countries considered in the analysis

| Euro Area Countries          | Germany | Luxembourg |
|------------------------------|---------|------------|
| Austria                      | Germany | Luxembourg |
| Belgium                      | Greece  | Malta      |
| Cyprus                       | Ireland | Netherlands|
| Estonia                      | Italy   | Portugal   |
| Finland                      | Latvia  | Slovenia   |
| France                       | Lithuania| Slovakia   |
| Spain                        |         | Spain      |

| Other Countries              | Hungary | Romania   |
|------------------------------|---------|-----------|
| Bulgaria                     | Hungary | Romania   |
Croatia
Czech Republic
Denmark
Iceland*
Norway*
Poland
Sweden
United Kingdom

(*) This countries are not EU member.

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