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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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Keywords: Internet banking, bank performance, panel casuality tests.

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 Ciciret 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 ve Singh, 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):

$$y_{it} = \alpha_i + \sum_{k=1}^{K} \gamma_i^{(k)} y_{it-k} + \sum_{k=1}^{K} \beta_i^{(k)} x_{it-k} + \varepsilon_{it} \quad (1)$$

Here, test variables are y_{it} and x_{it}. α_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,…,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	roa	roe	int_bnk
Mean	0.581	8.003	35.337	0.376	5.498	35.148	0.888	11.761	35.620
Median	0.616	10.867	32.000	0.500	9.650	33.000	1.000	12.750	27.000
Maximum	3.500	41.700	87.000	3.500	33.300	84.000	2.700	41.700	87.000
Minimum	-9.500	-169.200	0.000	-9.500	-169.200	0.000	-4.500	-59.600	0.000
Std. Dev.	1.183	17.565	24.295	1.312	20.343	20.826	0.877	11.366	28.828
Skewness	-3.238	-4.893	0.429	-3.312	-4.771	0.442	-2.023	-2.113	0.383
Kurtosis	24.541	43.187	2.100	23.269	36.858	2.356	14.631	16.043	1.699
Jarque-Bera	5691.712	19246.060	17.418	3069.248	8352.664	8.077	682.412	845.879	10.246
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.018]	[0.000]	[0.000]	[0.006]
Observations	270	270	270	162	162	162	108	108	108

Table 2. Panel unit root tests

	int_bnk			roa			roe		
All Countries	Statistic	Prob.*	Lag**	Statistic	Prob.*	Lag**	Statistic	Prob.*	Lag**
Levin, Lin and Chu	-11.6781	0.0000	1	-6.7522	0.0000	1	-7.0407	0.0000	1
Im, Pesaran and Shin	-2.2840	0.0112	1	-1.7209	0.0426	1	-1.4944	0.0675	1
ADF - Fisher	107.8430	0.0001	1	89.8216	0.0076	1	78.1926	0.0574	1
Euro Area Countries									
Levin, Lin and Chu	-11.8418	0.0000	1	-5.2894	0.0000	1	-5.9227	0.0000	1
Im, Pesaran and Shin	-2.9322	0.0017	1	-1.3434	0.0896	1	-1.4932	0.0677	1
ADF - Fisher	74.0485	0.0002	1	53.1759	0.0325	1	50.1906	0.0583	1
Other Countries									
Levin, Lin and Chu	-5.0084	0.0000	1	-4.2151	0.0000	1	-4.0306	0.0000	1
Im, Pesaran and Shin	-0.0159	0.4937	1	-1.0756	0.1410	1	-0.5242	0.3001	1
ADF - Fisher	33.7941	0.0884	1	36.6457	0.0475	1	28.0021	0.2600	1
	Δ(int_bnk)			Δ(roa)			Δ(roe)		
Levin, Lin and Chu	-7.8876	0.0000	1	-9.9279	0.0000	1	-7.8579	0.0000	1
Im, Pesaran and Shin	-3.8055	0.0001	1	-3.3030	0.0005	1	-2.9567	0.0016	1
ADF - Fisher	63.0171	0.0000	1	56.0363	0.0002	1	52.8359	0.0006	1

(*) 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 casuality tests

	All Countries			Euro Area Countries			Other Countries		
Null Hypothesis:	W-Stat.	Zbar-Stat.	Prob.	W-Stat.	Zbar-Stat.	Prob.	W-Stat.	Zbar-Stat.	Prob.
int_bnk $\not\rightarrow$ roa	2.82374	1.3444	0.1788	**3.9850**	**2.0865**	**0.0369**	1.5346	-0.0971	0.9227
roa $\not\rightarrow$ int_bnk	1.78117	0.13304	0.8942	1.8011	0.1210	0.9037	1.8941	0.1671	0.8673
int_bnk $\not\rightarrow$ roe	**3.43543**	**2.05512**	**0.0399**	**4.4348**	**2.4913**	**0.0127**	2.0538	0.2845	0.7760
roe $\not\rightarrow$ int_bnk	1.27794	-0.45166	0.6515	1.1042	-0.5062	0.6127	2.2966	0.4629	0.6434
Lags:	1			1			1		

" $\not\rightarrow$ " 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		
Austria	Germany	Luxembourg
Belgium	Greece	Malta
Cyprus	Ireland	Netherlands
Estonia	Italy	Portugal
Finland	Latvia	Slovenia
France	Lithuania	Slovakia
		Spain
Other Countries		
Bulgaria	Hungary	Romania

Croatia	Iceland*	Sweden
Czech Republic	Norway*	United Kingdom
Denmark	Poland	

(*) This countries are not EU member.

References

Alam, S. S., Khatibi, A., Santhapparaj, A. S., & Talha, M. (2007). Development and prospects of internet banking Bangladesh. Competitive Review: An International Business Journal, 17(1/2), 56-66.

Arnaboldi, F., & Claeys, P. (2008). Internet banking in Europe: a comparative analysis. Research Institute of Applied Economics Working Papers, No. 2008/11.

Ciciretti, R., Hasan, I., & Zazzara, C. (2009). Do Internet activities add value? Evidence from the traditional banks. Journal of Financial Services Research, 35(1), 81-98.

Dumitrescu, E. I., & Hurlin, C. (2012). Testing for Granger non-causality in heterogeneous panels. Economic Modelling, 29(4), 1450-1460.

DeYoung, R. (2001). The financial performance of pure play Internet banks. Federal Reserve Bank of Chicago, Economic Perspectives, Issue Q1, 60-75.

Gutu, L. M. (2014). The impact of internet technology on the Romanian banks performance. 12th Internetional Academic Conference, Prague, 1 September 2014.

Hasan, I. (2002). Do Internet activities add value? The Italian bank experience. Fondo Interbancario Di Tutela Dei Depositi, Essays, No. 2, July.

Hosein, S. S. M. (2013). Consideration the effect of e-banking on bank profitability; Case study selected Asian countries. Journal of Economics and Sustainable Development, 4(11), 112-117.

Hurlin, C. (2004). Testing Granger causality in heterogeneous panel data models with fixed coefficients. Mimeo, University Paris IX.

Im, K. S., Pesaran, M. H. & Shin, Y. (2003). Testing for unit roots in heterogeneous panels. Journal of Econometrics, 115(1), 53–74.

Kagan, A., Acharya, R. N., Rao, L.S., & Kodepaka, V. (2005). Does Internet banking affect the performance of community banks? American Agricultural Economics Association Annual Meeting, July 24-27, 2005, Providence, Rhode Island.

Khrawish, H. A., & Al-Sa'di, N. M. (2011). The impact of e-banking on bank profitability: Evidence from Jordan. Middle Eastern Finance and Economics, Issue 13, 142-158.

Levin, A., Lin, C. F., & Chu, C.S. J. (2002). Unit root tests in panel data: Asymptotic and finite-sample properties. Journal of Econometrics, 108(1), 1–24.

Malhotra, P., & Singh, B. (2006). The impact of Internet banking on bank's performance: The Indian experience. South Asian Journal of Management, 13(4), 25-54.

Malhotra, P., & Singh, B. (2007). Determinants of Internet banking adoption by banks in India. Internet Research, 17(3), 323-339.

Malhotra, P., and Singh, B. (2009). The impact of Internet banking on bank performance and risk: The Indian experience. Eurasian Journal of Business and Economics, 2(4), 43-62.

Pesaran, H. M. (2007). A simple panel unit root test in the presence of cross-section dependence. Journal of Applied Econometrics, 22(2), 265-312.

Pigni, F., Ravarini, A., Tagliavini, M., & Vitari, C. (2002). Bank strategies and the Internet: An interpretation of the banking industry on the Italian retail market. Journal of Information Technology Case and Application Research, 4(3), 8-37.

Sullivan, R. J. (2000). How has the adoption of Internet banking affected performance and risk in banks? Federal Reserve Bank of Kansas City, Financial Industry Perspectives, 1-16.

Weigelt, C., & Sarkar, M.B. (2012). Performance implications of outsourcing for technological innovations: Managing the efficiency and adaptability trade-off. Strategic Management Journal, 33, 189-216.