Financial Innovation, Non-interest Income and Bank Profitability - An Empirical Research Based on Listed Banks in China

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Abstract: Taking 18 listed commercial banks in China from 2013 to 2018 as samples, and from the perspective of non-interest income intermediation, this paper explores the impact on the profitability of commercial banks from four aspects: bank financial product innovation, service management innovation, technological level innovation and organizational structure innovation. The results show that: financial product innovation, service management innovation, technological level innovation and bank profitability are significantly negatively correlated. There is a significant positive correlation between bank financial product innovation, service management innovation, technological level innovation and non-interest income. The indirect effect of non-interest income between service management innovation and bank profitability is not significant, but there is a significant indirect effect between financial product innovation and technological level innovation, which is embodied as "suppressing effects".

1. Introduction

The People's Bank of China put forward in 2017 that financial innovation has become an important means for commercial banks to continuously improve their independent innovation ability and risk management ability, thus effectively improving their core competitiveness and profitability [1]. The content of financial innovation in commercial banks is changing with each passing day. As for the innovation in different ways, especially in the "era of artificial intelligence", how the introduction and innovation of financial science and technology to the banking industry will affect its profitability remains to be thoroughly understood. The internal mechanism of how different innovative ways influence bank income and thus reflect changes in its profitability has not yet been explored. How commercial banks deal with the impact of the intellectual age on the financial industry still needs to be clear. Based on the above considerations, from the perspective of the intermediary role of non-interest income of banks, this paper probes into the internal mechanism of the influence of the four aspects of financial product innovation, service management innovation, technological level innovation and organizational structure innovation of commercial banks, providing a new and important perspective for understanding the relationship between the financial innovation content and profitability of China's banking industry.

2. Research Hypothesis

2.1 Financial Innovation and Bank Profitability

Financial innovation is an important part of commercial banks' sustainable development strategy and an important means to enhance their core competitiveness. Acharya et al (2013) [2] believed that financial innovations such as asset securitization have not transferred risks from banking institutions to investors, but have worsened the instability of banks and reduced their profitability. Williams and Barry (2016) [3] concluded that excessive financial innovation of commercial banks, including their deposit and loan products with different risks, may increase bankruptcy risks and reduce their profitability. In addition, with the rise and development of cloud computing, mobile Internet, big data mining and other technologies, commercial banks need not only to increase the cost input but also to take strict supervision and prevention measures on security problems caused by new technologies while carrying out exploratory innovation using new technologies of artificial intelligence, which inevitably led to some unnecessary waste of resources. Therefore, the profitability of banks will not necessarily increase with the introduction and development of new technologies in the short term.

Based on this, this research puts forward the following assumptions regarding the development of China's banking industry in recent years:

H1: The innovation of financial products of commercial banks reduces the profitability of banks;

H2: The innovation in service management of commercial banks reduces the profitability of banks;

H3: The innovation of technical level of commercial banks reduces the profitability of banks;

H4: The innovation of the organizational structure of commercial banks reduces the profitability of banks.

2.2 Financial Innovation and Non-interest Business Income

In recent years, China's financial institutions and financial markets have achieved rapid development, with various new types of business changing with each passing day and emerging one after another. At the same time, innovative businesses and modes of derivative development are continuously formed, and the potential risks brought by them cannot be ignored. Ankrah (2012) [4] explained why financial technology will completely change the function of banks and the way they provide services from the perspective of reducing costs and eliminating uncertainties. The rapid development of information and communication technology has brought the world closer together, enabling banks to provide service platforms in new ways and provide new intermediary functions for banks. In addition, the research and development talents with innovative ability are also the basic conditions for commercial banks to develop new non-interest businesses.

Based on this, the research puts forward the following hypothesis:

H5: Financial product innovation has a positive impact on commercial banks' non-interest business income.

H6: Service management innovation has a positive impact on commercial banks' non-interest business income.

H7: Technological level innovation has a positive impact on commercial banks' non-interest business income.

H8: Organizational structure innovation has a positive impact on commercial banks’ non-interest business income.

2.3 The Intermediary Role of Bank's Non-interest Business Income

In recent years, financial innovation has enriched the types of commercial banks' sales, making the traditional model change to diversification and deriving non-interest income business with emerging intermediary role. It has become the consensus of commercial banks in China to vigorously develop non-interest business. Non-interest business plays an increasingly important role in the income structure of banks. From the perspective of income diversification and bank risk measurement, Yao Zhigang et al (2016) [5] found that diversification of bank income sources can effectively enhance the profitability of banks. Financial innovation boosts the development of bank's non-interest income business, that is, the indirect path of financial innovation affecting bank's profitability through non-interest income may adversely affect the direct effect of financial innovation on bank's profitability. Based on this, this research believes that the mechanism of non-interest business income between financial innovation and bank profitability shows "suppressing effects". Therefore, the following hypothesis are put forward:

H9: The intermediary effect of bank non-interest business income between financial innovation and profitability is shown as "suppressing effects". That is, the indirect effect of financial innovation on bank profitability through non-interest income is positive, while the direct effect of financial innovation and bank profitability is negative.

3. Empirical Process and Analysis

3.1 Variable definition and measurement

3.1.1 Explanatory variable: bank financial innovation

According to the existing research of scholars (Li Jian and Lin Wenhao, 2017 [6]), in this paper, bank financial innovation is divided into: financial product innovation (ProInn, the amount of financial products issued by banks, the amount of funds and asset management plan products, and the cumulative amount of credit cards issued); service management innovation (SerInn, liquidity ratio, cost-income ratio, capital adequacy ratio, personal financial business income); financial technological innovation (TecInn, number of personal online banking customers, number of mobile banking customers, number of self-service equipment, number of smart counters); organizational structure innovation (OrgInn, the proportion of integrated marketing services and tellers, risk and compliance management personnel, and information technology-related personnel).

3.1.2 Explained variable: bank profitability

This paper chooses ROA, which is the ratio of net profit to total assets of a bank, which reflects the centralized embodiment of the bank's profitability from all its funds. The higher the ROA is, the higher the bank's asset utilization rate will be, and the more profits it generates from its assets, the stronger the bank's profitability will be.

3.1.3 Intermediate variables

According to the research of Lepetit et al. (2008) [7] and Li Minhui (2014) [8], this paper uses non-interest income/total income as the intermediary variable of non-interest income. From the perspective of income structure, it can reflect the development level of non-interest business and the degree of diversification of banking business.

3.1.4 Control variables

Referring Lepetit et al. (2008) [7], Nguyen (2012) [9] et al, this paper selects GDP growth rate, bank lnSize and bank owner state as control variables for empirical research.

3.2 Empirical research results

3.2.1 Descriptive statistical characteristics of sample variables

The main descriptive statistics and correlation coefficient statistical results of the variables studied in this paper are shown in Table 1. The standard deviation of the bank's technological level innovation is 0.3037, which indicates that China's commercial banks generally have a relatively low technological level innovation. At present, the world's technological level has entered a stage of rapid intelligent development, but China's banking industry needs to pay attention to the introduction of intelligent innovation technology. In addition, the correlation between independent variables is relatively low, which indicates that the overlap of influence between explanatory variables is relatively low, and the multicollinearity problem is not serious, so it is suitable for further empirical analysis.

Table 1. Descriptive Statistical Characteristics and Correlation Coefficient Statistics of Variables

	Average value	Standard deviation	1	2	3	4	5	6	7	8
ROA	1.0717	0.2220	1.0000							
NIIR	25.3595	7.9140	-0.0240	1.0000						
ProInn	0.4240	0.2745	-0.440**	0.4520**	1.0000					

SerInn	0.4648	0.2475	-0.2280*	0.3870**	0.5540	1.0000				
TecInn	0.4106	0.3037	-0.3950**	0.4960**	0.7970	0.7490**	1.0000			
OrgInn	0.4679	0.1920	-0.1540	0.1260	0.3650**	0.3820	0.3660	1.0000		
lnSize	10.4705	1.1965	0.1260	0.3780**	0.1490	0.2260*	0.2150*	0.0080	1.0000	
GDP	0.0921	0.0376	0.0060	0.1470	0.1420	0.0550	0.2470*	0.1760	-0.0040	1.0000

N=108, *, ** and *** shows respectively the correlation coefficient is significant at 10%, 5% and 1% (double-tailed).

3.2.2 Regression analysis

According to the previous ideas and model design, this paper uses SPSS21.0 to test the regression model. The linear regression results are shown in Table 2.

Table 2. Regression Analysis Results of Relationship between Financial Innovation and Bank Non-interest Income and Profitability

Variable	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12
Intercept	0.9890***	1.1640***	0.8330***	1.3080***	-26.5970***	-29.3420***	-22.4950***	-33.7870***	1.1530***	1.2500***	0.9610***	1.3410***
	(0.2540)	(0.2720)	(0.2690)	(0.2740)	(8.0590)	(8.1240)	(8.4270)	(8.3540)	(0.2640)	(0.2890)	(0.2750)	(0.2960)
NIIR									0.0060**	0.0030	0.0060**	0.0010
									(0.0030)	(0.0030)	(0.0030)	(0.0030)
ProInn	-0.3670***				8.5510***				-0.4200***			
	(0.0740)				(2.3490)				(0.0780)			
SerInn		-0.2130**				7.6270***				-0.2350**		
		(0.0870)				(2.6080)				(0.0910)		
TecInn			-0.3300***				8.0510***				-0.3760***	
			(0.0720)				(2.2640)				(0.0760)	
OrgInn				-0.1670				2.7810				-0.1700
				(0.1110)				(3.3900)				(0.1120)
lnSize	0.0180	-0.0030	0.0290	-0.0200	4.6090***	4.8490***	4.2980***	5.5100***	-0.0110	-0.0180	0.0040	-0.0260
	(0.0260)	(0.0270)	(0.0270)	(0.0270)	(0.8110)	(0.8210)	(0.8480)	(0.8150)	(0.0290)	(0.0320)	(0.0300)	(0.0320)
GDP	0.4190	0.1120	0.6980	0.1840	22.7580	28.8990*	15.5160	29.2180*	0.2780	0.0270	0.6100	0.1550
	(0.5130)	(0.5490)	(0.5340)	(0.5670)	(16.2400)	(16.4150)	(16.7270)	(17.2710)	(0.5100)	(0.5580)	(0.5310)	(0.5770)
State	0.0700	0.1390**	0.0490	0.1670**	-9.0850***	-10.2370***	-8.4720***	-11.4060***	0.1260	0.1690**	0.0980	0.1780**
	(0.073	(0.077	(0.076	(0.077	(2.3040	(2.2920	(2.3720	(2.3380	(0.077	(0.084	(0.079	(0.086

	0)	0)	0)	0)	)	)	)	)	0)	0)	0)	0)
R^2	0.2440	0.1140	0.2210	0.0830	0.4020	0.3770	0.3990	0.3300	0.2730	0.1210	0.2460	0.0840
AdjustR^2	0.2140	0.0800	0.1910	0.0480	0.3790	0.3530	0.3760	0.3040	0.2370	0.0780	0.2090	0.0390
VIF	<3	<3	<3	<3	<3	<3	<3	<3	<4	<4	<4	<4
Fvalue	8.2900***	3.3220**	7.2990***	2.3370**	17.3360***	15.5960***	17.1110***	12.676***	7.6430***	2.8110**	6.6390***	1.8710

In can be seen in Table 2 that Models 1-4 respectively examines the impact of the innovation bank financial products, service management, technological level and internal organizational structure on its profitability. Among them, the impact of financial product innovation, service management innovation and technological level innovation on bank profitability is significantly negatively correlated. All the models have passed the F test, indicating that the overall linear fit of the models is significant. In Model 4, the innovation of the bank internal organizational structure has no significant impact on the bank profitability, so Hypothesis 1, 2 and 3 have been verified, and Hypothesis 4 has not been verified.

Models 5-8 examine the impact of innovation in bank financial products, service management, technical level and internal organizational structure on non-interest business income respectively. Among them, innovation in financial products, service management and technical level all show significant positive impact on non-interest business income. All of them have passed the F test, indicating that the overall linear fit of the model is significant. The fitting degree of Model 5 is the highest, R^2=0.4020 and adjusted R^2=0.3790. In Model 8, the innovation of the bank internal organizational structure has no significant impact on non-interest income, so Hypothesis 5, 6 and 7 have been verified, and Hypothesis 8 has not been verified.

Models 9-12 examine the intermediary role of non-interest business income in the relationship between bank financial innovation and profitability. It can be seen that after the least square regression, the first three models all passed the F test, which shows that the overall linear fitting of the models is significant. VIF is less than 4, so the multicollinearity problem of the model is not serious. Among them, Model 9 and Model 11 have significantly positive correlation in the performance of intermediary variables after adding non-interest business income as intermediary variables, which shows that the indirect effect of non-interest business income on the relationship between financial product innovation and technological level innovation on bank profitability is established. The above is the second step of the test. After the introduction of bank non-interest income, the impact of financial product innovation and technological level innovation on bank profitability in Model 9 and Model 11 is still significant, both of which are negatively correlated, i.e. the direct effect of testing intermediary is significant.

In the final step of the intermediary function test, the independent variable to intermediary variable coefficient and the independent variable to dependent variable equation need to be introduced into the intermediary variable. The product of the intermediary variable coefficient and the sign of the independent variable coefficient in the introduced intermediary variable equation are compared. The result of this test is different. Therefore, the bank's non-interest income shows a suppressing effects in the path of financial innovation affecting the bank profitability, Hypothesis 9 has been verified. In addition, the ratio of indirect effect to direct effect in this mediation is 0.1222 and 0.1285 respectively.

4. Summary

This paper takes 18 listed commercial banks from 2013 to 2018 as samples, empirically analyzes the impact of financial innovation of commercial banks on non-interest income and bank profitability, and studies the intermediary role of non-interest income in this relationship. The research draws the following conclusions: financial product innovation, service management innovation and technological level innovation can negatively affect the profitability of banks.

Whether it is the innovation of banking financial products, service management or technical level, it is helpful to improve the income of its non-interest business. From the perspective of income diversification, the improvement of bank non-interest business income has an important impact on its profitability. In addition, this research confirms that the indirect effect of financial product innovation and technological level innovation on bank profitability through non-interest business income is significant, and this indirect effect is shown as a "suppressing effects". It can be seen that there is still a larger negative mechanism between financial innovation and bank profitability that has not been brought into the research field, which provides a new direction for the future research on the relationship between financial innovation and bank profitability.

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