

Regional Financial Development and Regional Economic Growth: An Empirical Analysis of Suzhou City, China

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Abstract: There are many defects in researches on the relationship of the regional financial development (FD) and economic growth of China, such as simply assuming the causality direction, not highlighting financial institution, using incomplete financial indicator, *etc.* This article, taking Suzhou City of Jiangsu Province, China as a case, builds a simple model to study the level of FD from three aspects of financial scale, structure and institution. Three original indicators of PRIVY (private investment/aggregate investment), DEPTH (aggregate loan/GDP) and FDIVG (FDI/GDP) are used to construct the FD economic indicator through Principal Component Analysis approach. Then we use Granger method to analyze the relationship between the FD and the economic growth of Suzhou. Empirical test results show that the FD of Suzhou is the Granger reason of economic growth, while economic growth is not the reason for FD, because the relationship between the FD and the economic growth of Suzhou is just in the “supply-leading” period. In terms of Suzhou experiences, the local government should strengthen the protection of private investment, improve the institutional environment, and establish the reasonable financial structure. So we can conclude that FD could play a great role in promoting economic growth at the economy takeoff stage.

Keywords: financial development; regional economic growth; institution; Granger Causality Analysis

1 Introduction

The relationship between economy and finance has always remained the debate focus among economists. Though no opinions have been generally accepted, to develop finance vigorously has become the common policy selection in many regions of China in practice. Many articles on the research usually divided all provinces of China into three regions: the east, the central and the west, which are defined as the developed region, the developing region and the underdeveloped region, respectively, then compared the financial data of these regions to identify the certain correlation between the economic growth gaps and financial gaps, finally proposed that the financial gaps among provinces should be reduced (Chen *et al.*, 2008; Du, 2008). Other articles, taking Beijing and Hubei as examples, also aimed to figure out how regional financial development (FD) is associated with economic growth, and carried out the empirical analysis on the contribution made by financial assets to economic growth (Liu and Hao, 2007; Xie and

Wang, 2008). These researches had reached some helpful conclusions, which fully recognized the role of finance in economic growth. However, the previous researches ignored the following issues: First, regional FD does correlate with economic growth, but the direction of causality between them still remains obscure. The previous researches just proved the correlation between them without giving specific evidences, or directly assumed that FD represents a factor for economic growth without performing the causality test between them. Second, some researchers have not fully understood the connotation of FD, and financial institutional factors and financial structure factors have not been involved. And third, processing of FD data is not very precise. In general, such factors as the ratio of broad money supply and gross domestic product (M2/GDP) and the financial interrelation ratio (FIR) are employed, which facilitate calculation and processing, but fail to reflect the level of FD completely. In this article, we understand the FD connotation on the basis of economic growth. Specially, we analyze and explain the channels that finance pro-

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notes economic growth, drive the promotion of relevant institutions or instruments in the financial system, meanwhile, pay attention to the coordination between the FD level and the economic development stage.

The research on the relationship between law and FD has been deepening since the important research performed by La *et al.* (1998) and other scholars. To measure the FD needs more quantitative indicators and the connotation of FD should be understood in terms of three dimensions at least. The first dimension is the scale of FD. The demonstration in this regard mainly comes from the researches performed by Mckinnon (2006) and Levine (1999). They have mainly explained FD from the perspective of the scale of financial asset. For example, they have chiefly used financial depth expressed in terms of M2/GDP to measure FD. This indicator is principally used to measure the financial assets scale in a certain region. The second dimension is the relative structures of financial institutions and financial instruments. Different financial structures will lead to different resources allocations, which, in turn, will result in the difference of resources utilization efficiency. Goldsmith (1996) has examined FD from the perspective of the relative structures of financial institutions and financial instruments. This research mainly aimed to analyze the evolution direction of financial system, because relative market strengths of financial institutions and relative quantity of financial instruments will vary against the economic development. The third dimension is the FD institutional foundation. Given the finance aggregate level and structure, the improvement of the financial basic institution will become the guarantee for the sustainable development of the financial system, and also serve as the precondition for the normal financial activities in a region. For example, the law-finance model can analyze the influence of law on FD, while Rajan and Zingales (1998) analyzed FD from the view of the new political economics. These researches interpret the connotation of FD from the angle of the official institution and unofficial institution.

The existing researches are still greatly split on how to measure the level of FD. There still exists a huge gap between the roles finance plays in economic growth and the indicators used in the empirical test. Restricted by the data acquisition, the FD indicators in the empirical analysis can not measure the level of FD in a region completely and accurately. For example, financial depth

may measure the extent of the economic monetization, but it may not be a reliable indicator for measuring the FD level. If FD is measured merely with financial depth, there may exist serious misleading. This can be justified by a prevailing phenomenon observed by Demirguc-Kunt and Maksimovic (1998), i.e., without the support from the macroeconomic fundamentals, the result will be a financial crisis after financial depth quickly rises. To measure the FD level reliably will involve combining the roles of the financial market and the data actually acquired, extracting common factors from multiple initial indicators to create compound indicators capable of reflecting the FD level completely.

The objective of this paper is to measure the level of FD of Suzhou City, China completely and accurately by developing a simply model from three aspects of financial scale, structure and institution, and analyze the causality relationship between FD and economic growth by Granger Causality Test.

2 Models

The institution, official and unofficial, serves as the basic condition that enables FD to influence economic growth. Therefore, the institutional factor should be incorporated in measuring FD, in addition to such quantitative factors as financial depth and structure. We build a model to analyze the relationship between economic growth and FD as follows:

$$Y_k = f_k(X, Z, W) = f_k[g_k(X, Z), W] \quad (1)$$

where Y_k represents the economic growth rate at time k ; f_k , function relationship; X , the quantitative indicator for FD, such as M2/GDP and private credit/GDP, which reflects the scale and structure of FD; Z , the conditional variable for financial function, including the extent of institutions perfection and implementation effect; W , other factors that influence the economic growth; g_k , the function relationship between X and Z . To determine respective weights of the financial depth and conditional variables in the FD indicator system, the contribution rates of these variables to the economic growth are calculated with the following formulas:

$$\frac{\partial Y_k}{\partial X_i} = \sum f_k g_i = \sum \frac{\partial f_k [g_k(X, Z), W]}{\partial g_k} \cdot \frac{\partial g_k(X, Z)}{X_i} \quad (2)$$

$$\frac{\partial Y_k}{\partial Z_j} = \sum f_k g_i = \sum \frac{\partial f_k [g_k(X, Z), W]}{\partial g_k} \cdot \frac{\partial g_k(X, Z)}{Z_j} \quad (3)$$

where X_i is the i th quantitative factor that affect financial asset scale and finance structure; Z_j , the j th institutional factor that impact FD; g_i , the differential relationship between factor i and FD; and g_j , the differential relationship between factor j and FD.

The compound measurement indicator for FD is expressed in terms of the following formula, a near linear expression:

$$FD = a + \sum b_i X_i + \sum c_j Z_j \quad (4)$$

where $b_i = \sum f_k g_i$; $c_j = \sum f_k g_j$; a is constant term, if has.

The analysis above is the optimal analysis route proposed from the theory. We use Suzhou financial and economic data to built financial indicator system in the empirical analysis. And we will employ the Principal Component Analysis to construct the comprehensive indicators for measuring Suzhou FD, and then use the Granger Causality Test to explore the causality relationship between regional FD and economic growth.

3 Financial Development in Suzhou

According to the theoretical analysis mentioned above, three economic and financial indicators of Suzhou in 1985–2008 are selected to create the initial FD indicators: PRIVY (private investment/aggregate investment), DEPTH (aggregate loan/GDP) and FDIVG (FDI/GDP). These indicators reflect the connotation of FD in terms of scale, structure and institution. In detail, DEPTH reflects that indirect financing takes an absolutely dominant position in China, representing the financing scale in Suzhou, and PRIVY is about the financing structure. The larger this indicator is, the higher proportion private investment has. At the same time, this indicator also reflects the stronger protection provided by the government for private property rights; and FDIVG represents the ability of Suzhou to raise money from overseas, and also marks the perfection of the local institution, because only by this, can Suzhou attract more foreign investors. These initial indicators are analyzed with the Principal Component Analysis to reach relatively reasonable compound indicator. All the relevant financial

and economic data cited in this article come from Suzhou Statistics Bureau (2009)^①.

The SPSS13.0 statistics software is used to carry out the Principal Component Analysis on these indicators.

From Table 1, these indicators are strongly correlated, indicating that the information they represent largely overlaps. Then, the eigenvalues and contribution rates are generated according to the matrix of the correlation coefficients (Table 2).

Table 1 Matrix of correlation coefficients
(Pearson Correlation) ($n = 24$)

	PRIVY	DEPTH	FDIVG
PRIVY	1.000	0.795	0.689
DEPTH	0.795	1.000	0.854
FDIVG	0.689	0.854	1.000

Note: All correlations are significant at the 0.01 level (2-tailed)

Table 2 Total variance explained

Component	Total	Variance (%)	Cumulative (%)
1	2.561	85.366	85.366
2	0.316	10.538	95.904
3	0.123	4.096	100.000

Note: Extraction method is Principal Component Analysis

According to the Principal Component Analysis, the contribution of the first common factor takes 85.4% of the contribution in all the factors, showing the first common factor reflects 85.4% of the information revealed by various indicators. Then the factor loading matrix is calculated as shown in Table 3.

Table 3 Component matrix

	1	2	3
PRIVY	0.894	0.436	0.103
DEPTH	0.958	-0.075	-0.277
FDIVG	0.919	-0.347	0.189

Note: Extraction method is Principal Component Analysis

Each original indicator highly correlates with the first common factor, signifying that the first common factor can safely be used as the indicator to reflect Suzhou FD. The first common factor is just the factor that can completely represent the level of Suzhou FD. The common factor can be expressed in terms of a linear combination of three variables by the regression method. We arrive at the factor score function:

① Suzhou Statistics Bureau, 2009. Great Changes of Suzhou in 30 Years of Reform and Opening Up Recorded by Numbers

$$FD = 0.349PRIVY + 0.374DEPTH + 0.359FDIVG$$

According above equation, the FD for Suzhou in different years are calculated (Fig. 1).

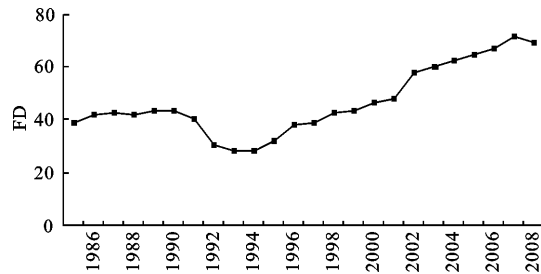


Fig. 1 Financial development (FD) in Suzhou

According to Fig. 1, the FD level in Suzhou kept stable from 1985 to 1990, because during the early period of reform and opening up, the central government confined finance development, and implemented steady money policy. Then it came considerably declined in the early 1990s, the reason behind such change is that the government implemented the macro economy control to curb the high inflation rate. Panic buying and rush to banks happened during this time accompanied by high inflation rate up to 18.5%. To check the serious inflation, the central government implemented the overall treatment and regulation of the national economy by adopting the most serious measures since the reform and opening up. FD was suppressed, and Suzhou was also severely influenced. From 1995 to 2007 the FD in Suzhou maintained an upward trend, but was relatively stable around 1997 due to the Asian financial crisis. The most recent downward trend happened in 2008 as a result of the negative impact from the financial tsunami that originated from America.

4 Granger Analysis between Financial Development and Economic Growth

4.1 Unit root test of data

We adopt the cointegration analysis for the stationarity

test of nonstationary time series and the error correction model to test the influence of FD on economic growth in Suzhou. When making the regression analysis, the time series data selected must be stationary to avoid the spurious regression problem. The stationarity test for the time series data is also called the unit root test. In this article we adopt the Augment Dickey-Fuller (ADF) approach for the unit root test. The test results are shown in Table 4.

Judging from the data in Table 4, the original time series data is still nonstationary at 0.10 significance level, while the time series after the first-order difference is stationary at 0.05 significance level. Therefore, all the original time series are co-integrated at the first order.

4.2 Cointegration test

We adopt the Engle-Granger approach to test the relationship between FD and economic growth in Suzhou. The test uses economic growth as the explained variable, FD as the explaining variable, and the least square method for regression. Then, the unit root test method (ADF approach) is employed for testing the stationarity of the regression residuals. If the residuals are stationary, the variables will be considered to present cointegration relationship, while the vector coefficient of ordinary least squares (OLS) will be the coefficient of the cointegration equation. The results are shown in Table 5.

Table 5 indicates that the residuals are all stationary during the regression of Suzhou FD and growth variables. This shows that a stable long-term relationship does exist between FD and economic growth. And the coefficient of FD is positive. The standardized cointegration equation is as follows:

$$G = 3.10 + 0.46FD$$

where G denotes economic growth.

According to the cointegration equation, the growth of FD by one percentage point will give rise to an economic growth by 0.46 percentage points from 1985 to 2008 in Suzhou.

Table 4 Results of unit root test

Test variable	ADF test value	Test type (c, t, k)	Critical value (Significance level 0.05)	Critical value (Significance level 0.10)	Conclusion
FD	1.53	(0, 0, 1)	-1.97	-1.63	Nonstationary
$DLN FD$	-3.41	($c, 0, 1$)	-3.05	-2.67	Stationary
$GROWTH$	3.25	(0, 0, 1)	-1.97	-1.63	Nonstationary
$DLN GROWTH$	-3.76	($c, 0, 1$)	-3.69	-3.29	Stationary

Note: c and t represent constant item and trend item respectively, k means the lag phrase; DLN means the first-order difference

Table 5 Results of Engle-Granger cointegration test

Explaining variable	Coefficient	Standard error	<i>T</i> value	<i>P</i> value	ADF value and test type of residuals	Residuals stationarity
Constant	3.0991	0.0713	43.4676	0.0000	-2.57	Yes
FD	0.4589	0.0271	16.9239	0.0000	-2.57	Yes

Note: ADF test lag phrase is 1

4.3 Causality test

The cointegration test does verify the positive relationship between the FD and the economic growth in Suzhou. However, a causality test will be necessary to prove the direction of such causality relationship. The famous causality relationship test suggested by Granger (1969) provided a solution for this problem. In briefly, assuming that FD is the Granger cause of G, and G is not the Granger cause of FD, the past values of FD will help forecast the future values of G, but the past values of G can not help forecast the FD values. This principle may be used to test the direction of the causality relationship between FD and economic growth in Suzhou. When performing the Granger Causality Test, the direction of the causality relationship is very sensitive to the selection of the lag phase. So, a few lag phases should be selected for the test. The results of the causality test are shown in Table 6.

According to Table 6, when the lag phase chooses 2 and 3, FD is indeed the cause for economic growth, while the opposite conclusion is very hard to be established. FD and economic growth in Suzhou both present a positive relationship of promotion, and also prove the existence of the Granger causality relationship. In addition, the FD has an evident promotion influence on the economic growth in Suzhou.

5 Discussion and Conclusions

The FD in Suzhou apparently promotes the economic growth, but the economic growth does not obviously

drive up the FD. This may be explained by the fact that the relationship between FD and the economic growth still remains at the "supply-leading" stage, and has not entered the "demand-following" stage. According to the research of Patrick (1966), the relationship of these two variables depends on the economic development stage. At the economy takeoff period, FD will precede the financial service demand of the real economics, and the financial sector will actively mobilize the resources in the traditional sectors into the modern sectors that propel the economic growth. FD featuring such active resources allocation belongs to the "supply-leading" stage, and is chiefly reflected by the positive driving effect of FD on economic growth. Suzhou currently stays at this stage. The financial system help to accumulate financial capital, optimize financial resources allocation, expand the savings scale and increase the investing efficiency. When economic development enters the mature stage, whether the financial system will promote economic growth will largely depend on how financial scale and structure adapt to market changes. Under this stage, it is evident that the real economy will drive up FD.

Inspired by Suzhou experiences, policymakers should assemble financial resources, including the internal financing accumulation and direct investment at home and abroad, boost the aggregate scale of financial assets at the early time of economy growth. Local government should properly guide the fund flow direction, adjust the financial structure, develop direct financing through various channels, such as private equity investment, build the sound investing and financing system, protect

Table 6 Results of causality test

Lag phase	Zero assumption	<i>F</i> value	<i>P</i> value	Conclusion
2	FD is the Granger cause of G	6.31112	0.01112	
2	G is not the Granger cause of FD	0.18138	0.83605	FD is the Granger cause
3	FD is the Granger cause of G	3.32050	0.06055	of G, not vice versa
3	G is not the Granger cause of FD	1.10373	0.38877	

Note: FD is financial development; G is economic growth

the legitimate rights and interests of investors, and lay a solid institutional foundation for FD. The development of Suzhou provides the useful experience for the economic growth of other regions of China.

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