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A Glimpse into a Potential Influencing Factor of China's Exchange Rate: Social Financing Scale

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ABSTRACT

The indicator of social financing scale (SFS) has become a new intermediate target for China's socioeconomic regulation since 2011, which has a better tracking performance on important economic indicators such as CPI and is also the new intermediate target of monetary policy used by China's central bank to replace M2 at present. So, is there an impact of the social financing scale on another important economic indicator, the RMB exchange rate? This paper conducted an OLS regression analysis of the time series data of social financing scale and the nominal effective exchange rate (NEER) of RMB for a total of 61 months from October 2016 to October 2021 and find that SFS has a significant positive impact on the exchange rate of RMB. This result means that the expansion of SFS will lead to the appreciation of RMB. In addition, the paper fills the research gap on the combination of SFS and RMB exchange rate, and suggests that mechanisms such as monetary policy or domestic interest rates may be responsible for this correlation at the theoretical level.

1. Introduction

In recent years, China's central bank has gradually begun to shift the intermediate target of monetary policy from broad money supply (M2) to the social financing scale (SFS). On the one hand, in the context of China's deepening financial reform and innovation, the coverage of M2 is getting broader and growing rapidly, and its controllability and relevance as an intermediate target are declining significantly. On the other hand, the social financing scale has good tracking and reflection of some important economic indicators. For example, Figure 1 presents the monthly values of China's SFS, M2 growth rate and CPI growth rate from October 2016 to October 2021, respectively, and it is not difficult to find that the current SFS and CPI already possess a strong correlation. Therefore, setting SFS as an intermediate target may have a more direct and reasonable policy effect compared to M2.

Overall, SFS reflects the ability of the real economy to obtain money from the capital market, measures the level of the prevention of financial situation from being distracted from the hypostatic economy to the fictitious economy of capital and can better reflect the prosperity and depletion of the real economy over a certain period of time, and its policy status is increasing gradually. The exchange rate, as the conversion ratio between different currencies, has a significant impact on a country's international trade, cross-border capital flows and so on. In today's world of deepening globalization and improving international supply chains, the exchange rate is a "stabilizer" for domestic

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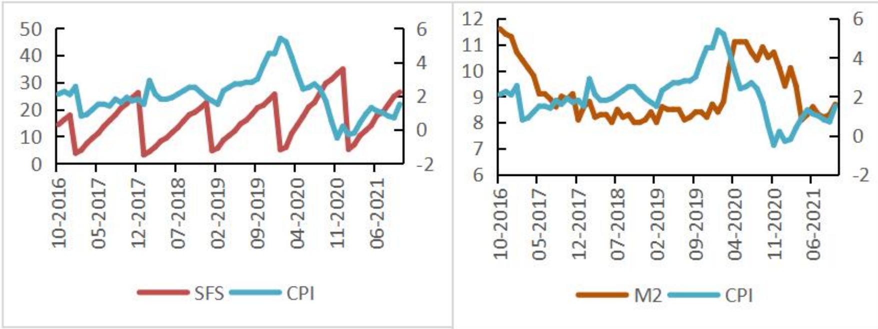

Figure 1. M2, social financing scale of the month value (trillion), and CPI growth rate(%) comparison

and foreign economies.

Consequently, if we can find the inner law of exchange rate fluctuation in the market with very complicated economic relations, it will not only help the policy authorities to formulate fiscal and monetary policies more scientifically, but also help many enterprises and residents to take measures to avoid exchange risks in the setting of the increasing marketization of exchange rates in China. In order to grasp the intrinsic law of exchange rate fluctuations, the first task is to identify which factors will have a significant impact on the exchange rate, the size of the impact and so on.

Rather than traditional studies that focus on basic indicators such as interest rates (Peel and Taylor, 2002) [1] and stock indexes (Ding, 2021) [2], this paper focuses on whether and, if so, how the SFS, a comprehensive indicator, affects the RMB exchange rate. In fact, from the perspective of logical analysis, SFS will definitely be transmitted to the exchange rate. The feasibility of this transmission is reflected in the fact that the caliber of SFS includes new bank loans and direct financing absorbed by the real economy, and we know that the incremental funds obtained by enterprises will inevitably have further impact on their investments, which will eventually be transmitted to outward direct investment, foreign portfolio investment, imports, exports and other subjects directly related to the balance of payments -- a decisive factor in exchange rate formation.

However, because the transmission mechanism involves a large number of economic indicators, the difficulty of measuring the offsetting relationship between the current account and capital & financial account makes the verification of this mechanism very hard. In addition, since the SFS indicator itself is influenced by many variables that affect the exchange rate, such as interest rates, GDP growth, etc., and the SFS has further countervailing effects on these variables, this leads to the fact that it would take far more space than a single paper could cover to fully elaborate this transmission mechanism. However, this indeed illustrates the exploratory nature and innovative research perspective of this study. This paper aims to knock on the door of this research direction, point the way for subsequent researchers, and take the first step of the research - to argue that SFS positively affects the exchange rate (RMB appreciation).

The remainder of the paper is organized as follows: Section 2 provides a literature review and theoretical hypothesis, Section 3 presents the empirical design, Section 4 reports the empirical results and analyzes them, Section 5 tests the robustness of the empirical results and Section 6 is the conclusion and research outlook.

2. Literature Review and Theoretical Hypothesis

As a domestic comprehensive amount index in China, SFS measures the financial support for the real economy. To figure out the transmission mechanism from SFS to the exchange rate, we should focus on its economic influence as an intermediate indicator. Songcheng Sheng (2010), the formal director of the statistics department of the People's Bank, pointed out that the social financing scale is an important intermediary indicator of monetary policy, which can demonstrate the level of interest rate liberalization. After the People's Bank of China incorporated the SFS into the statistical framework in 2011, SFS has become an important reference index for monetary authorities to formulate monetary policy.

At present, the research on the intermediate indicator of monetary policy has formed a relevant system. Literature suggests that if the intermediate indicators of monetary policy are closely related to operational tools and ultimate goals, it is feasible to determine the use of operational tools by intermediate indicators (Svensson, 1997) [3]. Monetary policy is a powerful tool in the financial cycle and the intermediary index is an indicator that can be observed before the goal in monetary policy, which is of great importance. (Borio and Lowe, 2002; Borio and White,

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2004) [4,5]. The implementation of mixed monetary policy rules is more realistic in China. In terms of ensuring the smooth operation of the macroeconomy and reducing the welfare loss level, the mixed target is superior to the single price-based or quantitative intermediary target (Li and Liu, 2017) [6]. It can be suggested that the intermediary index plays a role in the formulation and adjustment of monetary policy, influencing its policy intensity and practical effects.

A considerable amount of literature has demonstrated the impact of monetary policy on the exchange rate. The usual view is that an unexpected monetary contraction leads to an immediate appreciation of the currency, so as to create the conditions for a subsequent depreciation at a rate that equals the interest rate differential (Dornbusch 1976) [7]. Some scholars suggest that the exchange rate response differs depending on the effects of monetary policy on people's expectations of the interest rate path and risk premia in the short, medium and long run in specific episodes (Atsush and Barbara, 2019) [8]. Monetary policy has a rising FX impact in the era of ultra-low rates. With monetary policy limited in its ability to stimulate the economy following years of low interest rates, it is natural that central banks have come to rely on the exchange rate channel to an even greater extent (Massimo et al., 2021) [9]. Considering all the above, we are convinced that as an intermediate indicator highly valued by the authorities, the SFS can influence exchange rates by influencing monetary policy and there is a correlation between SFS and exchange rate.

Another link between SFS and exchange rates is the domestic interest rate, especially the bank credit interest rate. According to the data from the People's Bank of China, the annual SFS is 200.75 trillion, 251.31 trillion and 284.83 trillion (RMB) in the year 2018, 2019 and 2020 respectively. In the same period of time, approximately 67%, 60.3% and 60.2% of the SFS are composed of RMB loans to the real economy issued by commercial banks. It can be observed that the amount of SFS highly depends on the scale of bank credit. Since the interest rate is the indirect financing cost of an enterprise, the SFS should be highly relevant to interest rates.

Previous studies have found that Cross-border capital flows are sensitive to changes in interest rates, and there is a negative correlation between them (Calvo et al., 1996; Montiel and Reinhart, 1999; Kim, 2000) [10-12]. The exchange rate is an important transmission channel for the interaction between interest rate and international capital flow (Peel and Taylor, 2002) [13]. Changes in the interest rate differentials between economies are associated with variations in FX volatility and FX volatility to be highly persistent over time (M. Ulm and J. Hambuckers, 2022) [14]. Since interest rates can change exchange rates by influencing international capital flows, and SFS is linked to interest rates. The correlation between SFS and exchange rate is expected.

The interest rate liberalization can explain this correlation from another perspective. On the one hand, the financing constraints will reduce the financing capacity of enterprises, thereby reducing the SFS. On the other hand, with the deepening of financial liberalization, the firm's investment sensitivity of cash flow to investment is reduced and financing constraints are eased (Koo J, Maeng K, 2005) [15]. Interest rate liberalization has a significant role in easing the financing constraints of small and medium-sized companies but enhances the financing con-

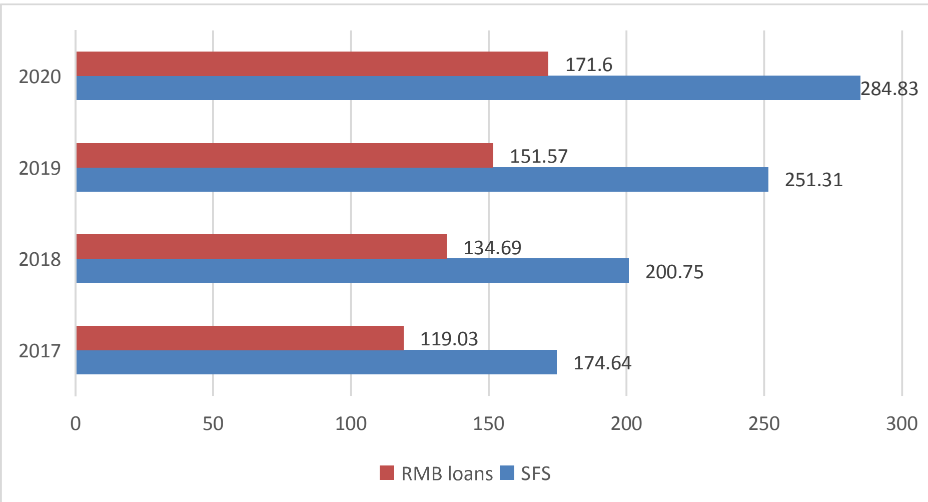

Figure 2. The scale of RMB loans and SFS(trillion RMB)

straints of large companies (Laeven, 2003) [16]. Through the transmission mechanism of financing constraints, SFS can reflect the level of interest rate marketization in China to some extent.

These years, the liberalization of interest rates is also considered an important factor affecting international capital flows. Through the model deductive analysis, a study found that capital flow depends on the marginal productivity of capital and the level of interest rate liberalization (Aoki et al., 2010) [17]. Capital account liberalization will lead to the net outflow of funds in the domestic stock and bond markets, thus providing diversified investment opportunities for domestic investors (Bayoumi and Ohnsorge, 2013) [18]. The relationship between SFS and financing constraints, interest rate marketization and international capital flow offers us another possibility for us to explain the correlation between SFS and exchange rates.

Considering all the literature we mentioned above, we raise our hypothesis as follows.

H1: There is a positive correlation between China's social financing scale and RMB exchange rate.

3. Empirical Design

To investigate whether SFS can effectively affect the RMB exchange rate, this paper selects a total of 61 monthly time series data from October 2016 to October 2021 for regression. The variables involved in the regressions include the nominal effective exchange rate (NEER) of RMB, SFS, treasury bond yields, and the GDP growth rate of China. The specific variables are selected as follows.

(1) Dependent variable

In the basic regression, monthly data on the nominal effective exchange rate (NEER) of RMB are extracted to reflect the RMB exchange rate in this paper. This indicator is chosen mainly because the major economic indicators are basically nominal indicators as they include inflation. Considering the coordination in the subsequent selection of control variables, we adopt NEER to reflect the situation of RMB exchange rate which can tolerate the differences of indicators caused by inflation to a certain extent.

(2) Key explanatory variable

The main research point of this paper is whether SFS has an effect on RMB exchange rate, so the core variable we concentrate on is SFS. In this paper, SFS (current month value) data are employed for the regression.

(3) Control variables

a. Macro control variables

As a comprehensive indicator of currency, the RMB exchange rate is naturally influenced by the macroeconomic performance of China. This paper makes comprehensive reference to Jiang (2018), Huang (2010), and Cheng et al. (2020)'s methods by using macroeconomic indicators such as GDP growth rate, total factor productivity, PPI, international trade balance, and broad money issuance (M2). These indicators can reflect China's economic growth, production efficiency, the balance of payments, monetary policy, etc., and play an important role in influencing the RMB exchange rate decision.

Considering that the time level of this paper is monthly data, the use of variable indicators such as current month value or month-on-month growth rate can be more scientific for our empirical analysis. In this paper, GDP growth rate, PPI growth rate, international trade balance, total factor productivity (TFP) rate of change and M2 growth rate are used as proxy variables for the above macroeconomic indicators. It should be noted that since China does not release monthly GDP data, this paper uses the weighted-average method to calculate the monthly GDP growth rate, which can reflect the GDP growth rate of the corresponding month more accurately. Plus, we refer to Huang (2010)'s way of choosing productivity level to represent TFP, but unlike that, this paper uses the ratio of CPI growth rate to PPI growth rate as the measure of the dynamic TFP change in China.

b. Capital market control variables

The RMB exchange rate is also affected by the capital market, especially the movements of the stock market and interest rates. Referring to Jiang (2018)'s method, we use the difference between the Shanghai Stock Exchange (SSE) Composite Index (monthly average) and the yield to maturity of US and Chinese 1-year Treasuries (monthly average) to refer to the stock and interest rate markets, respectively.

(4) Model construction

In order to investigate whether there is an effective effect of China's SFS on the RMB exchange rate, the following time series regression formula is constructed:

$$NEER_t = \alpha + \beta SFS_t + \delta Controls_t + \mu_t + \varepsilon \tag{1}$$

In this formula, t represents the time series and the unit is one month, samples are selected from October 2016 to October 2021. The dependent variable NEER is used to measure the exchange rate of RMB, and the indicator used is the monthly value of the NEER of the RMB provided by the Bank for International Settlements (BIS) database, whose rising value indicates an overall appreciation of RMB. SFS is the core explain variable whose data come from Wind database's social financing scale for the month. In addition, to alleviate problems such as biased estimates due to omitted variables, this paper also introduces a se-

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ries of macroeconomic control variables group and capital market control variables group in the regression. denotes the season fixed effects, which are incorporated for the reason that both SFS and the RMB real effective exchange rate have significant seasonal trends. Table 1 presents the signs of all the variables and how they are constructed.

(5) Data sources and descriptive statistics

Data employed in this paper are mainly obtained from Wind and BIS databases. Specifically, NEER of RMB is obtained from the BIS database, and the monthly value of SFS as well as the control variables are obtained from the Wind database.

Table 1. List of variable symbols and their meanings

Type	Symbol	Variable name	Definition
Dependent variable	NEER	Nominal effective exchange rate of RMB	Monthly nominal effective exchange rate of RMB
Core explanatory variable	SFS	Social financing scale	Social financing scale for the month
Control variables	GDP	GDP growth rate	Monthly GDP growth rate
	TFP	Total factor productivity	CPI monthly growth rate /PPI monthly growth rate
	TD	International trade balance	Exports for the month - Imports for the month
	CNMUS	Difference between U.S. and Chinese one-year Treasury bond yields	China 1-Year Treasury Maturity Yield - U.S. 1-Year Treasury Maturity Yield (Monthly Average)
	M2	China's broad money supply growth rate	Monthly M2 growth
	Stock	China Stock Index	Monthly average of SSE Composite Index

Table 2. Descriptive statistics of main regression variables

Variable	Observations	Average	SD	Max	Min
NEER	61	117.77	2.72	125.59	113.58
SFS	61	15.87	7.92	34.86	3.14
GDP	61	6.09	7.81	18.3	–6.8
TFP	61	1.42	8.34	54	–13
TD	61	386.41	221.03	845.4	–619.92
PPI	61	2.93	3.94	13.5	–3.7
CNMUS	61	1.42	0.87	2.77	–0.29
M2	61	9.13	1.09	11.6	8
Stock	61	3141.01	280.73	3627.21	2558.43

4. Empirical Results

In this paper, a series of time series data such as NEER and SFS are used to regress model (1) with OLS method, and the empirical results are presented in Table 3. The coefficients and significance of the core explanatory variable SFS are our main focus, while macroeconomic and capital market control variables are incorporated in the regressions stage by stage. Column 1 to 3 show that SFS is significantly positively related to the NEER of RMB, which confirms our hypothesis H1. Specifically, when only macro control variables are introduced, the results in column 2 indicate that for every 1 unit increase in the size of SFS, the NEER of RMB rises by 0.175 units on average and is significant at the 1% level. And after further introducing capital market control variables, column 3 indicates that for every 1 unit increase in SFS, the NEER of RMB increases by 0.135 units on average and is significant at the 5% level. In addition, the rise in R-squared is significant with the incorporation of the control variables group, which indicates that the selection and incorporation of control variables in this paper are reasonable and necessary.

Table 3. Basic regression results of NEER and SFS

Dependent variable	(1)	(2)	(3)
	NEER	**NEER**	**NEER**
SFS	0.129* (1.86)	0.175*** (3.03)	0.135** (2.14)
GDP		0.311*** (5.39)	0.155* (2.00)
TFP		–0.055** (–2.01)	–0.057** (–2.32)
TD		0.004* (1.94)	0.003** (2.43)
M2		–0.063 (–1.88)	0.085 (0.29)
CNMUS			–2.196*** (–3.29)
Stock			0.009*** (5.14)
Constant	117.351*** (193.43)	115.301*** (42.73)	88.970*** (13.95)
Observations	61	61	61
R-squared	0.072	0.416	0.622
Season fixed effects	Yes	Yes	Yes

5. Robustness

For the sake of testing the robustness of our regressions, the paper employs methods like covariance and stability tests, and replacement of some variables and fixed effects.

(1) Covariance and stability tests

In order to satisfy the classical hypothesis, this paper tests whether there exists a co-linearity between the explanatory variables by using the method of variance inflation factor analysis. The results in Table 4 show that the VIF values of all variables are well below 10, so it can be concluded that there is no co-linearity between the explanatory variables involved in our regressions.

Table 4. VIF test for explanatory variables

Variable	VIF	1/VIF
SFS	2.14	0.47
GDP	1.96	0.57
TD	2.00	0.82
TFP	1.39	0.86
CNMUS	5.27	0.20
Stock	4.30	0.24
M2	2.11	0.47

Besides, this paper also employs Engle–Granger two step method to test the stability of our time series model. Tests show that the residuals obtained from the OLS test of model (1) do not have a unit root at the 1% level in the second step of the ADF test, in which case there is a cointegration relationship between the regressing variables and there does not exist a "pseudo-regression" problem due to the non-stationary time series.

(2) Replace the representative variable of RMB exchange rate and fixed effects

For one thing, to test whether the selection of the RMB exchange rate indicator in this paper has an impact on the results (pseudo-significant), we choose the real effective exchange rate (REER) of the RMB (also from BIS), which excludes the effect of inflation of national currencies, to replace NEER in the basic regression formula (1) for the robustness test of the selection of the dependent variable. Column 1 of Table 5 shows that the coefficient of SFS remains positive and significant at the 1% level when the same set of macroeconomic and capital market control variables are incorporated, and season fixed effects are controlled as well. This result strongly argues that the selection of explanatory variables of this paper is robust.

For another, to test whether the choice of fixed effects affects the regression results, we further replace the season fixed effects with month fixed effects. Column 2 to 3 of Table 5 indicate that regardless of whether the dependent variables are selected as NEER or REER, the coefficients of SFS are significantly positive at least at the 10% level. Also, their value is similar to the coefficients in the basic regressions. Therefore, the choice of fixed effects in this

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paper can be considered reasonable.

Table 5. Replace the representative variable of RMB exchange rate and fixed effects

Dependent variable	(1)	(2)	(3)
	REER	**REER**	**NEER**
SFS	0.264*** (3.48)	0.353*** (3.11)	0.154* (1.70)
GDP	0.038 (0.35)	0.087 (0.64)	0.164* (1.70)
TFP	–0.051 (–1.43)	–0.044 (–1.15)	–0.051** (–2.11)
TD	0.216 (0.61)	0.002 (1.04)	0.004* (1.95)
M2	0.216 (0.61)	0.209 (0.48)	0.064 (0.18)
CNMUS	–2.242** (–2.62)	–2.090** (–2.15)	–2.148*** (–2.72)
Stock	0.009*** (4.71)	0.008*** (3.63)	0.009*** (4.49)
Constant	94.112*** (13.72)	96.779*** (11.59)	89.562*** (12.26)
Observations	61	61	61
R-squared	0.599	0.654	0.6395
Season fixed effects	Yes	No	No
Month fixed effects	No	Yes	Yes

6. Conclusions and Research Outlook

In this paper, through a time-series OLS regression of monthly data on China's social financing scale (SFS) and NEER of RMB from October 2016 to October 2021, we find that the expansion of SFS can significantly improve the NEER of RMB (RMB appreciation). With a series of tests, we prove that this enhancement effect is robust. This finding provides a new potential tool for China's central bank to view SFS as an intermediate target for monetary policy in the future because SFS can be used as a tool for guiding the China's exchange rate, and also opens up a new research area of correlation between SFS and RMB exchange rate.

In addition, there are certain shortcomings in this paper. Since it fails to investigate how SFS specifically acts on the RMB exchange rate, we do not clearly explain how the transmission mechanism works. At the same time, as an exploratory analytical paper, a lack of reference theoretical models is hard to be avoided, which leads to the relatively simple empirical model in this paper. Also, there is still room to improve the explanatory power as we fail to test more robustness and heterogeneity due to the data sources. Therefore, in the subsequent research, we hope that other scholars can do further exploration based on the research theories and ideas in this paper to enrich the research on the interaction between social financing scale and RMB exchange rate.

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