Digital Finance, Interbank Market Friction and Credit Channel Transmission of Monetary Policy

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Abstract. At present, China's digital economy is booming, and the digitization of the financial system is gradually changing the internal structure of macroeconomy and finance, which has an impact on the first market of monetary policy transmission, the interbank market, and affects the transmission of monetary policy. Based on the case of inter-bank market friction, this paper constructs an IS-LM-CC model to deeply analyze the micro-effect mechanism of digital finance affecting credit channel transmission. The panel data of China's provincial level from 2011 to 2020 are selected to construct a fixed effect model to empirically test the impact of digital finance on monetary policy through credit channels. Using micro data at the enterprise level, we further test whether the development of digital finance affects the dependence of enterprises on bank credit. The results show that the development of digital finance has alleviated the friction in the interbank market, significantly weakened the transmission effect of monetary policy bank credit, and reduced the dependence of enterprises on bank credit. Therefore, this paper proposes to rationally plan the statistical scope of credit scale and correctly guide the development of digital finance.

1 Introduction

At present, China's economy is facing triple pressures of demand-side contraction, supply shock and expected weakening, and effective monetary policy is urgently needed. The credit channel has long dominated the transmission of monetary policy in China. Although China is currently actively promoting the marketization of interest rates, and China's policy regulation methods are facing a "volume-price transformation," statistics from the National Bureau of Statistics show that the proportion of new bank loans in total social financing in the new era is still 65.34%. It can be seen that the analysis of the changes in the credit channel of monetary policy in the new era has important practical significance for a deeper understanding of the transmission law of monetary policy and a sound monetary policy transmission mechanism.

The essence of monetary policy transmission is the process of dynamic transmission of monetary policy shocks in a specific financial structure. The effective realization of this transmission depends on the operational efficiency of financial institutions located in the transmission channel (Agénor & Montiel, 2015)¹ and the micro-behavioral decisions of a series of economic entities. The interbank market is the first link of monetary policy transmission. The instability of the interbank market will hinder the transmission of monetary policy and even lead to policy failure (Freixas et al, 2011; Acharya et al, 2020)²[3]. Therefore, the prerequisite for the effective transmission of monetary policy is the existence of a stable interbank market. The existing research has reached a consensus that the instability of the interbank market and its impact on monetary policy transmission are mainly caused by the friction mechanism of the interbank market.

On the other hand, in recent years, the integration of China's digital economy and financial industry has promoted the birth and development of digital finance. The digitization of the financial system is gradually changing the internal structure of macroeconomics and finance, affecting the media of monetary policy, and also profoundly changing the behavioral decisions of China's economic entities. Digital finance can improve the financial market structure through competition effect, reduce information asymmetry and alleviate market friction. For the chain of monetary policy transmission interest rate channel transmission, the role of digital finance focuses on the first link of transmission—the interbank market. The development of digital finance directly promotes the development of Internet financial management platforms. Financial management platforms rely on their convenience and high returns to divert a large amount of social savings. Most of these funds have flowed into the interbank market, separated from the supervision of the deposit reserve system, and reduced the regulation of monetary policy on credit. At the same time, the development of the interbank market has provided direct financing channels for residents and enterprises, changed the 'intermediary' role in the bank credit transmission channel, better met the diversified investment and financing needs of enterprises, and made people more and more involved in the financial market. In addition, digital

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finance makes banks develop new financial innovation products to cope with the impact of digital finance through competition effect, which further reduces the controllability and predictability of money supply. Based on this, the impact of digital finance on the transmission efficiency of monetary policy interest rate channels needs to be further studied.

2 Literature Review and Contributions

2.1. Research on the credit channel transmission of monetary policy

Bernanke (1988) [4] argued that it is difficult to explain monetary policy from the perspective of traditional interest rates alone. Financial frictions provide a microeconomic explanation for the existence of monetary policy credit channels. The "credit view" of monetary policy transmission believes that the information asymmetry in the financial market makes the cost of internal financing funds different from the cost of external financing funds. The irreplaceability of assets will directly weaken the investment behavior of borrowing enterprises and ultimately affect the output (Kashyap et al., 1996) [5].

In recent years, there have been some research results on the relationship between interbank market business and credit channel transmission. The development of interbank business has changed the traditional business model and profit mode of commercial banks, and the mechanism of monetary policy on bank assets and liabilities has changed, which ultimately leads to the change of credit creation mode ((Freixas and Jorge, 2008; Xiao and Krause, 2022) [6] [7]). There are two main aspects of the impact of interbank business on monetary policy. First, the interbank business of banks has expanded the source of bank funding, improved the efficiency of asset utilization, increased the scale of loanable funds, reduced regulatory indicators such as capital adequacy ratio, and promoted the credit supply of commercial banks. However, with the rapid development of interbank business, the sensitivity of bank credit to monetary policy has decreased, and interbank business has weakened the effectiveness of monetary policy transmission (Allen et al., 2009; Varl, 2020) [8] [9]. Second, it improves the degree of competition among banks and weakens the transmission efficiency of credit channels of monetary policy. Some scholars have taken eurozone banks, Asian and Latin American banks as research objects. Studies have shown that bank competition has a positive impact on bank lending, which confirms that financial competition will lead to a weakening of bank lending channels (Fungáková et al., 2014; Olivero et al., 2011; Guillemin and Semenova, 2020) [10] [11] [12].

2.2 The impact of digital finance based on interbank market friction on the transmission of monetary policy credit channels

Based on the perspective of inter-bank market friction, considering the impact of digital finance on the credit channel transmission of monetary policy, there are three main paths: First, it reduces the 'intermediary' role of banks in the credit channel. According to Marcus (1984) [13] 'franchise value hypothesis', the increase in the degree of competition in the deposit market will compress the franchise value of banks, inhibit the ability and willingness of credit supply, and then impact the transmission of monetary policy bank credit channels. Under the condition of imperfect competition, monetary policy can change the bank's reserves through open market operation or changing the deposit reserve ratio, and banks can also obtain financing through inter-bank market borrowing and other ways, so it is easier for banks to control the supply of loans when the market competition is low, and its 'intermediary' role in the transmission of monetary policy credit channel is more significant (Adams and Amel, 2005; Fungáková, 2014) [14] [15]. The development of digital technology has effectively reduced the credit threshold, strengthened market competition, forced commercial banks to collectively carry out innovative transformation, and promoted banks to sell more financial products that do not need to pay deposit reserves. As an important breakthrough, interbank business has shown a rapid development trend, making social funds 'real to virtual'. This process has changed the bank's credit performance, making the 'intermediary' role of the traditional bank-based lending institutions more weakened and unable to respond to the central bank's policies in a timely manner, resulting in the transmission of monetary policy in the credit channel blocked.

Second, it has promoted the development of the Internet wealth management market and increased the difficulty of central bank credit regulation. In addition, the development of digital finance has directly promoted the emergence of various bank financial products, which has increased the difficulty of the central bank's regulation of M2 and weakened its effectiveness in regulating credit volume. Digital financial products have formed a parallel financing system independent of bank credit, expanded the scope of social credit, changed the economic environment of savings decision-making in the household sector and financing decision-making in the enterprise sector, and changed the 'transmission medium' of bank credit channels for monetary policy. Therefore, the transmission effect of bank credit is bound to be weakened (Kaiji & Jue Ren, 2018) [15].

Third, it has eased the friction in the interbank market, promoted the development of interbank business, and changed the bank's credit decisions. The interbank market friction can be defined as the information asymmetry between the two sides of the interbank lending, which changes the bank loan decision and affects the monetary policy transmission. Interbank market frictions can cause instability in the interbank market. When banks are hit by monetary policy tightening, there is information asymmetry between lenders and borrowers due to interbank market frictions, and financial institutions with relatively abundant liquidity are unable to judge the true risk profile of their counterparties. In order to avoid "adverse selection" or "moral hazard" problems, the scale of interbank lending is reduced; this results in a mismatch.
between liquidity demand and supply. (Bucher et al., 2020; Monika et al., 2020) [16] [17]. With its unique advantages of big data, cloud computing, blockchain and other digital technologies, digital finance uses financing, payment, investment and other new financial business models to reduce market information asymmetry, alleviate market friction, ensure the stability of the interbank market, promote the development of the interbank market, and weaken the effectiveness of monetary policy bank credit channels.

In summary, some studies have discussed how digital finance affects the transmission effectiveness of monetary policy credit channels. Few scholars consider the friction factors of the interbank market when studying the impact of digital finance on the transmission of monetary policy credit channels. When discussing the mitigation of financial frictions by digital finance, they usually take the entire financial market as the perspective, and few scholars focus on the interbank market. Therefore, convincing conclusions depend on further theoretical and empirical analysis.

3 Theoretical model and research hypothesis

The theoretical part is based on the IS-LM-CC model, and the mathematical analysis of the key variables expanded and added to the hypothesis conditions is carried out. On the basis of considering the inter-bank market friction, the theoretical model of digital finance affecting monetary policy transmission is constructed, and then the corresponding hypothesis is proposed according to the model derivation logic.

The model includes three sectors: banks, residents and manufacturers, involving three markets: commodity market, money market and credit market. The basic assumptions of the model are as follows: first, there is information asymmetry and financial friction in the financial market; second, financial assets include currency, bonds and bank loans. The substitution between bank loans and bonds has strict conditions, and the two cannot be completely replaced.

Based on the previous analysis, this paper adds the following assumptions on the basis of the original assumptions:

(1) Banks need to consider the risk cost other than the loan interest rate when lending to enterprises, such as the risk of business operation and the risk caused by insufficient mortgage capacity.

(2) Corporate investment will be affected by interest rates and the number of corporate loans.

(3) Digital finance mainly affects policy transmission by affecting the interbank market. The smaller the friction in the interbank market, the more the price mechanism can play a role, and digital finance has the function of reducing information asymmetry and alleviating financial friction. Therefore, it is assumed that the sensitivity coefficient of investment or output to loan risk cost factors is negatively correlated with the development level of digital finance.

(4) Assume that the number of currencies in the economy remains unchanged.

3.1 Credit market

The supply and demand sides of the credit market are banks and enterprises. The credit demand of enterprises is mainly related to loan cost and income. Income is positively related to credit transaction, and credit transaction increases with the increase of income. Loan costs are negatively correlated with credit transactions. When loan interest rates increase, loan costs increase, so credit transactions will decrease accordingly. Suppose the credit demand equation is: \( L^d = L[y, r_i, p], \frac{\partial L^d}{\partial y} > 0, \frac{\partial L^d}{\partial r_i} < 0 \), where \( y \) is the income, \( r_i \) is the loan interest rate, and \( p \) is the price level.

The loan supply of banks is mainly affected by loan interest rate, bond interest rate and loan risk cost factors. Banks generally use deposits other than deposit reserves to make loans. Therefore, the loan supply equation of the credit market is: \( L^s = L \left[ \lambda(r_b, \theta) \left(1 - \frac{R}{r}\right) R \right], \frac{\partial L^s}{\partial r_b} > 0, \frac{\partial L^s}{\partial \theta} < 0 \), where \( r_b \) is the bond interest rate, \( \theta \) is the loan risk cost, \( R \) is the deposit reserve, \( r \) is the deposit reserve ratio, then \( R \) represents the total deposit.

When the credit market supply and demand balance, the equilibrium conditions are as follows:

\[
L^s = L(y, r_i, p) = L \left[ \lambda(r_i, r_b, \theta) \left(1 - \frac{R}{r}\right) \right] = L^d
\]

(1)

The linear expression of this equilibrium condition is:

\[
[a_1 r_1 - a_2 r_b - a_3 \theta] (1 - \frac{R}{r}) R = a_4 y - a_5 r_i, \quad a_j > 0, \quad j=1,2,3,4,5
\]

(2)

According to the hypothesis, the digital financial factor is added to the equilibrium condition, and the equilibrium condition formula can be written as:

\[
[a_1 (DF) r_1 - a_2 r_b - a_3 (DF) \theta] (1 - \frac{R}{r}) R = a_4 y - a_5 (DF) r_i, \quad a_j > 0, \quad j=1,2,3,4,5
\]

(3)

According to the hypothesis, because of the function of digital finance to improve the financial market, the sensitivity of the number of loans issued by banks to the cost of loans decreases with the development of digital finance, so \( \frac{\partial a_5}{\partial FD} < 0 \).

3.2 Money market

Households’ demand for money is mainly affected by income and bond interest rates. Income is positively correlated with money demand and negatively correlated with bond interest rates. Therefore, the money demand function can be expressed as:

\[
M^d = M[y, r_b], \frac{\partial M^d}{\partial y} > 0, \frac{\partial M^d}{\partial r_b} < 0.
\]
Assume that the amount of money in the economy is constant, so in equilibrium, the demand for deposits in the household sector should be equal to the total deposits supported by the deposit reserve. It can be obtained:

\[ M^2 = \frac{R}{\tau} \]

The equilibrium conditions are as follows:

\[ \frac{R}{\tau} = b_1 y - b_2 r_b \tag{4} \]

### 3.3 Produce market

The product market includes two sectors: family and manufacturer. The condition of market equilibrium is that savings are equal to investment. Corporate investment is mainly affected by interest rates and loan cost factors. According to the assumptions, the number of loans obtained by the enterprise will also affect the interest, so the equilibrium formula of the product market is:

\[ y = y(r_1, r_b, \theta, p) \tag{5} \]

Similarly, by adding digital financial factors to the equilibrium conditions, the equilibrium condition formula can be written as follows:

\[ y = c_4(DF) r_1 - c_6 r_b - c_4(DF) \theta, c_j > 0, j=1,2,3 \tag{6} \]

### 3.4 Equilibrium

The conduction of the credit market is based on the reality of financial market friction. When the market tends to be perfect, the degree of market information asymmetry gradually weakens, and the resulting market risk will also be weakened. The loan risk cost in the model setting comes from the risk caused by information asymmetry, so \( \theta \) is used as the proxy variable of credit channel.

From the formula (3), (4), (6) deformation can be obtained:

\[
\begin{align*}
    r_1 & = \frac{a_2 r_2 + a_3 \cdot DF \cdot \theta}{a_5 + a_4 (1 - \tau) + \frac{R}{\tau}} \\
    r_2 & = \frac{b_1 y - R}{b_2} \\
    r_b & = \frac{b_1 y - R}{b_2}
\end{align*}
\]

By eliminating the endogenous variables \( r_1 \) and \( r_b \), the expression of the equilibrium output is:

\[ y = \frac{1}{A} \left( (a_3 DF + a_1 \cdot c_3 \cdot DF) (1 - \tau) \frac{R}{\tau} + \frac{a_5 \cdot c_1 \cdot DF}{c_1} \right) \]

\[
\begin{align*}
    & + \left( \frac{a_1 \cdot c_2}{c_1} + a_2 \right) (1 - \tau) \frac{R}{\tau} \\
    & + \left( \frac{a_3 c_2}{c_1} \right) \frac{R}{\tau} + \frac{a_5 c_2}{c_1} \tau b_2
\end{align*}
\]

where \( A = \left[ \frac{a_1 \cdot c_2}{c_1} \cdot \frac{a_2}{c_2} \right] (1 - \tau) \frac{R}{\tau} + \frac{a_3 c_2 b_1}{c_1} + \frac{a_5 c_2 b_1}{c_1} \). Let \( B = \left( a_3 DF + \frac{a_1 \cdot c_3 \cdot DF}{c_1} \right) (1 - \tau) \frac{R}{\tau} + \frac{a_5 c_3}{c_1} \). Calculate the first-order partial derivative of output \( y \) with respect to \( \theta \):

\[ \frac{\partial y}{\partial \theta} = -\frac{B}{R} \]

According to the assumptions, \( A \) and \( B \) are greater than zero, then \( \frac{\partial y}{\partial \theta} \leq 0 \). By calculating the second-order partial derivatives of \( y \) with respect to \( \theta \) and \( DF \), we obtain:

\[
\frac{\partial^2 y}{\partial \theta^2} = -\frac{1}{B} \left( \frac{\partial a_3}{\partial DF} + \frac{\partial a_5}{\partial DF} \right) \frac{R}{\tau} + \frac{\partial a_5}{\partial DF} \frac{\partial a_3}{\partial DF} \frac{R}{\tau} \]

Because \( \frac{\partial a_3}{\partial DF} \leq 0, \frac{\partial a_5}{\partial DF} \leq 0, \frac{\partial^2 y}{\partial \theta^2} \leq 0 \). Therefore, the second-order partial derivatives of \( y \) with respect to \( \theta \) and \( DF \) are opposite to the first-order partial derivatives of \( \theta \), indicating that digital finance weakens the transmission of monetary policy credit channels.

Based on the above research, the following hypotheses are proposed:

Hypothesis 1: In the market with friction, digital finance can alleviate friction and divert a large number of residents’ savings through competition effect, so that they can enter the interbank market at market price. As the first market of monetary policy transmission, the inflow of these funds has a profound impact on the overall effect of monetary policy transmission, and has the opposite performance in the interest rate channel and the credit channel. For the credit channel, the lack of regulatory funds has impacted the regulation of the deposit reserve system and has an inhibitory effect on the credit channel of monetary policy.

Hypothesis 2: Digital finance has changed residents’ optimal portfolio decisions with its high returns and convenience, making residents reduce their deposits in banks. Banks will also simultaneously reduce the number of general loans to enterprises, and digital finance will have a debt structure effect on bank balance sheets.

### 4 Empirical model construction and variable selection

#### 4.1 Empirical model construction

This paper examines the impact of digital finance development level on the transmission effect of monetary policy credit channel, and constructs the interaction term of digital finance and monetary policy changes in the empirical model to test its impact on the transmission effect.

Assuming that bank loan supply is a function of monetary policy changes, this paper constructs the following model to test the impact of digital financial development level on the transmission effect of monetary policy credit channel:

\[ \ln Loan_{it} = \beta_0 + \beta_1 DF_t + \beta_2 M2\_rate_t + \beta_3 Controls_{it} + \mu_t + \epsilon_{it} \tag{8} \]

In the above model, \( i \) represents the province, \( t \) represents the year, and \( \epsilon_{it} \) represents the random disturbance term. It mainly focuses on the coefficients of \( DF_t \times M2\_rate_t \) and \( M2\_rate_t \). In theory, if digital
finance strengthens the transmission effect of monetary policy credit channel, the coefficients of $\beta_2$ and $\beta_3$ should be consistent and positive.

According to theoretical inference, digital finance can expand the financing channels of enterprises, so that enterprises no longer have to rely on loans from banks, weakening the bank credit transmission effect of monetary policy. In order to empirically test whether the development of digital finance has weakened the dependence of enterprises on bank credit, the following regression model is constructed:

$$Credit = \omega_0 + \omega_1 Dig_t + \omega_2 M2\_rate_t + \omega_3 Dig_t \times M2\_rate_t + \omega_4 Controls_{st} + \mu_i + \varepsilon_{it}$$

(9)

Among them, the explanatory variable represents the number of loans ($Credit$) that the enterprise obtains from the bank, which is used to indicate the degree of dependence on bank loans. The other control variables selected by are enterprise size ($Size$), financial leverage ($Lev$), ownership structure ($Top10$), management expense ratio ($Mc$), enterprise growth ($Tobing$), enterprise cash flow ($Cf$).

4.2 Variable selection and data processing

(1) Bank loan size (loan)

In order to test the impact of digital financial development on the transmission effect of monetary policy through bank credit channels, this paper selects the loan balance of financial institutions in each province in the year. When implementing loose monetary policy, the larger the value, the better the transmission effect.

(2) Monetary policy variables (MR)

Due to the multi-tool and multi-objective characteristics of policy, the choice of China’s monetary policy indicators is controversial. Some studies choose interbank offered rate as a monetary policy indicator, while others choose M2 as a monetary policy variable. This paper uses M2 growth rate as a monetary policy variable (M2-rate) of credit channel.

(3) Selection and measurement of control variables

In order to ensure the reliability and robustness of the results, this paper refers to the existing literature results, and controls the following variables when studying the transmission effect of digital financial development level on the interest rate channel of monetary policy: macroeconomic development level, interbank market size; when studying the impact on the cost of capital, the following variables are controlled: firm size, return on assets, management expense ratio, and corporate cash flow.

5 Analysis of empirical results

5.1 Analysis of regression results

Table 1 shows the benchmark regression results of the impact of digital finance on the transmission of bank credit channels of monetary policy. (1) listed the impact of digital finance on bank credit channels; in addition, column (2) (3) shows the impact of the three dimensions of digital finance on the transmission of bank credit channels. From the regression results, the coefficient of monetary policy is significantly positive in the regression equation, indicating that the growth of M2 has a significant role in promoting the scale of financial loans in each province. However, the coefficient of the multiplicative term of digital finance and monetary policy is significantly negative in the four regression models, which is contrary to the symbol of monetary policy, indicating that the development of digital finance hinders the transmission efficiency of monetary policy in bank credit channels, which is consistent with the expectation of proposition 3. The following will further analyze the internal mechanism of monetary policy transmission inhibition.

<table>
<thead>
<tr>
<th>variable</th>
<th>Loan (1)</th>
<th>Loan (2)</th>
<th>Loan (3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>lnDF</td>
<td>0.768***</td>
<td>0.741***</td>
<td>0.730***</td>
</tr>
<tr>
<td></td>
<td>(26.96)</td>
<td>(24.98)</td>
<td>(27.09)</td>
</tr>
<tr>
<td>M2_rate</td>
<td>2.271***</td>
<td>1.154***</td>
<td>1.537***</td>
</tr>
<tr>
<td></td>
<td>(12.86)</td>
<td>(12.13)</td>
<td>(6.46)</td>
</tr>
<tr>
<td>M2_rate * lnDF</td>
<td>-0.424***</td>
<td>-1.131***</td>
<td>(-8.84)</td>
</tr>
<tr>
<td>M2_rate * lnDF</td>
<td>(-5.40)</td>
<td>-0.222***</td>
<td>(-3.62)</td>
</tr>
<tr>
<td>Constant</td>
<td>24.334***</td>
<td>24.434***</td>
<td>24.499***</td>
</tr>
<tr>
<td></td>
<td>(160.85)</td>
<td>(156.16)</td>
<td>(169.99)</td>
</tr>
<tr>
<td>Province</td>
<td>Control</td>
<td>Control</td>
<td>Control</td>
</tr>
<tr>
<td>Year</td>
<td>Control</td>
<td>Control</td>
<td>Control</td>
</tr>
<tr>
<td>N</td>
<td>240</td>
<td>240</td>
<td>240</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.920</td>
<td>0.907</td>
<td>0.906</td>
</tr>
<tr>
<td>Number of Province</td>
<td>30</td>
<td>30</td>
<td>30</td>
</tr>
</tbody>
</table>

Note *, ** and ***indicate significance at the 10%, 5% and 1% respectively.

5.2 Robustness test

This paper makes the following robust test to ensure whether there is endogeneity in the model setting, whether the index selection is reasonable and whether there are missing variables.

Supply of bank loans excluding samples of foreign banks (loan2). Because foreign banks mainly finance through foreign financial markets, they are less affected by China’s credit monetary policy. In particular, if domestic monetary policy is contrary to its business plan, foreign banks usually choose to use international forces to avoid it. For example, when raising the statutory deposit reserve in China, foreign banks usually allocate funds from the international financial market, resulting in an increase in the domestic money supply, which in turn interferes with the effective transmission of monetary
policy. In order to eliminate this interference, foreign banks are removed from the data. The regression results of column (1) in Table 2 show that after excluding the sample of foreign banks, the development of digital finance still weakens the transmission effect of bank credit channels. This is consistent with the previous conclusion.

The development level of digital finance is measured by the third-party payment scale (INF). The third-party payment transaction industry is an important symbol of the digital transformation and upgrading of China’s traditional financial services, and also an important force to promote the development of China’s Internet finance. The scale of third-party payment is also often used as a way to measure the development of digital finance. In order to test whether the regression results are affected by the selection of indicators, this paper takes the scale of digital finance for robustness estimation again. The regression results of column (2) in Table 2 show that the interaction term is still significantly negative, which further indicates that the development of digital banks will weaken the transmission of monetary policy bank credit channels.

<table>
<thead>
<tr>
<th>Table 2. Robustness test regression results</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
</tr>
<tr>
<td>lnDF</td>
</tr>
<tr>
<td>M2_rate</td>
</tr>
<tr>
<td>M2_rate * lnDF</td>
</tr>
<tr>
<td>INF</td>
</tr>
<tr>
<td>M2_rate * INF</td>
</tr>
<tr>
<td>Constant</td>
</tr>
<tr>
<td>Province</td>
</tr>
<tr>
<td>Year</td>
</tr>
<tr>
<td>N</td>
</tr>
<tr>
<td>R-squared</td>
</tr>
</tbody>
</table>

5.3 Mechanism research

In order to empirically test whether the development of digital finance has weakened the dependence of enterprises on bank credit, Model (9) is constructed. If the hypothesis of this paper is established, digital finance reduces the dependence of enterprises on bank credit, that is, the development of digital finance reduces the sensitivity of real enterprises to monetary policy.

<table>
<thead>
<tr>
<th>Table 3. The internal mechanism of digital finance affecting the credit channel of monetary policy</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
</tr>
<tr>
<td>lnDF</td>
</tr>
<tr>
<td>M2_rate</td>
</tr>
<tr>
<td>INF</td>
</tr>
<tr>
<td>Year</td>
</tr>
<tr>
<td>N</td>
</tr>
<tr>
<td>R-squared</td>
</tr>
</tbody>
</table>

It can be seen from the regression results that Column (1) reports that the number of loans obtained by enterprises from banks changes inversely with the interaction term (M2_rate * lnDF), and the coefficient of the interaction term is significantly negative, indicating that the development of digital finance reduces the dependence of enterprises on bank credit. Columns (2), (3) and (4) used different control variables for regression, and the interaction coefficient was significantly negative and did not change very little. Analyzing the reasons, there may be the following aspects. First, the development of digital finance enables physical enterprises to obtain credit through other financing channels, and support them to alleviate the ‘urgent need’; second, the development of digital finance has promoted more innovation activities in the market. Digital finance has enriched corporate financing channels and innovated financing paths. In this case, the dependence and sensitivity of enterprises on bank loans have been significantly reduced.

6. Research conclusions

This paper constructs the IS-LM-CC model under the condition of interbank market friction, analyzes the overall effect of digital finance on the transmission of monetary policy credit channel from the macro level, and expounds the micro effect mechanism of digital finance affecting interest rate transmission. On the basis of theoretical analysis, this paper empirically tests the impact of digital finance on the effectiveness of monetary policy transmission in credit channels. By selecting the panel data of China’s provincial level from 2011 to 2020 to construct a fixed effect model for empirical research, the following conclusions are drawn:

The main intermediary path of digital finance affecting monetary policy transmission is the first market of monetary policy transmission-interbank market. The development of digital finance directly promotes the vigorous development of Internet financial management platforms. Digital financial products absorb a large amount of social idle funds with their convenience and high returns, diverting bank savings deposits. These large deposit sectors have flowed into the interbank market, are no longer controlled by the traditional regulatory system, and are out of the scope of deposit reserve policy
regulation, making the means of monetary policy to regulate bank credit scale no longer have the original effect. With its technical advantages, digital finance has reduced information asymmetry and eased friction in the interbank market, further promoted the development of the interbank market, and inhibited the credit channels of monetary policy.

Through empirical analysis, there are two main reasons for the inhibition. First, the development of digital finance has promoted the healthy market competition in the financial market, allowing physical enterprises to obtain credit through other financing channels and support to alleviate the 'urgent need'; second, the development of digital finance has promoted more investment or innovation activities in the market. Digital finance has enriched corporate financing channels and innovated financing paths. In this case, the dependence and sensitivity of enterprises on bank loans have been significantly reduced.

Based on the above conclusions, the following recommendations are made. First, rationally plan the statistical scope of credit scale. The amount of digital financial platform has not been included in the credit creation system, and the role and status of traditional commercial banks have also been weakened by the rise of the digital financial industry. It is very difficult for regulators to monitor the money supply in the unique form of digital finance. The central bank needs to clearly define the concept and statistical caliber of money supply, dynamically adjust the level and statistical scope of money supply, and enhance the central bank’s ability to monitor and control money supply. The second is to guide the positive utility of digital finance. The regulatory authorities should study the characteristics of digital finance and formulate regulatory standards for digital finance, so as to ensure the effective development of digital financial supervision, so that digital finance can carry out financial innovation in a legal and compliant environment. Actively and rationally use scientific and technological means to improve the supervision mode, and use digital supervision to cope with the digital financial wave.

**References**