**Optimal Interest Rate Rule and Deposit Reserve Rate Policy under Dualistic Credit Supply Structure**

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**Abstract:**
Based on the reality of China, this paper constructs a dynamic stochastic general equilibrium model (DSGE), which includes heterogeneous manufacturers and dual credit supply structures, and uses welfare analysis and impulse response analysis to analyze the choice of interest rate rules and adjust deposit The impact of the rate on the economy. The results show that the Taylor rule, which includes interest rates on the inflation gap, the output gap and the credit gap, can be more effective in suppressing inflation, both in terms of cost shocks and consumption preferences, but also better stabilize output levels and improve The total welfare level of society. Under the same interest rate rule, the low deposit reserve ratio can increase the welfare of the various sectors of the economy, especially the welfare of non-state enterprises, as compared with the high deposit reserve ratio. The above conclusions show that the central bank in the development of monetary policy in addition to considering inflation and output, but also should consider bank credit. While the low deposit reserve ratio policy is of great importance to advancing China's financial market reform and China's economic transformation.

**Key Words:** Interest rate rule; deposit reserve ratio; heterogeneous firm; binary credit supply structure

1. **INTRODUCTION AND LITERATURE REVIEW**

For a long time, China's central bank has been relying on quantitative monetary policy tools to regulate the economy, even in the Chinese market economy reform has been very deep case is also true. For example, after the global financial crisis in 2008, in the case of a decline in foreign demand in order to curb the overall economic recession, the central bank from November 2008 onwards, the implementation of the 4 trillion yuan of economic stimulus, with the further easing of monetary policy China's credit growth is extremely rapid, only in 2009 and 2010, China's new loans as high as 9.6 trillion yuan and 8 trillion yuan. Although the economic stimulus policy to achieve the rapid recovery of China's economy, but also caused the excess liquidity, inflationary pressures rise in the situation, so in the subsequent 2010 to 2011 two years, the central bank on the one hand 12 times The deposit reserve ratio tightened the base currency (during which the deposit reserve ratio of up to 21.5%), on the other hand, through the credit limit control makes M2 and loan growth fell to September 2011 13% and 16% A large number of pre-lock more money, but the result has caused the enterprise financial constraints and economic growth and other issues. Since 2012, in order to solve the problem of financing enterprises, especially small and medium-sized micro-enterprises to stimulate economic growth, the Chinese central bank has begun to adopt a policy to reduce the deposit reserve ratio, and through the differential reserve ratio to promote local financial institutions to support the regional economy Development, as shown in Table 1:

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<th>Table 1. The adjustment of the deposit reserve ratio of the People’s Bank of China after 2012</th>
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Source: Website of the People's Bank of China

It should be noted that at present, China's interest rate market has taken a substantial pace (since July 2013 the People's Bank decided to fully liberalize the lending rate of financial institutions to control the loan interest
rate to achieve full market, October 23, 2015, the central bank also announced that commercial banks and rural cooperative financial institutions are no longer set deposit rate floating ceiling), in this context, should China continue to re-quantify monetary policy instruments to regulate the economy? Obviously, this is a question worthy of study, in fact, the country has long been a lot of scholars. (Such as Hu Zhipeng (2012), Hu Yurong and Fan Conglai (2015), Bian Zhicun and Hu Hengqiang (2015), etc.) argue that the central bank should use more price-based monetary policy tools. However, we must see that although the market-oriented reform of China's economy has been very deep, but due to China's current property rights system, China's economic operation at the same time there are market factors and non-market factors, at the same time, the characteristics of China's current property rights system also cause the unique dual-credit supply structure of the Chinese banking system. This unique dual-credit supply structure makes the operation and transmission of monetary policy instruments in China have a more special and complex micro-foundation, this gives us a big question worthy of further study: What is the interest rate rule that China's central bank should follow if China's central bank uses price-based monetary policy instruments to regulate the macroeconomic system under the current specific property rights system in China? In addition, as China's current deposit reserve ratio is still relatively high, so this article will also discuss in China's current specific property rights system, the deposit reserve ratio changes will give the Chinese economy what kind of impact? This paper argues that the discussion of the above issues can provide a reference for the formulation of monetary policy of the central bank, and thus has important theoretical and practical significance.

Foreign scholars for the interest rate rules of the most classic is Taylor (1993) proposed the Taylor rule, the basic meaning is that the monetary authorities should be based on inflation and output gap changes to adjust the trend of interest rates in order to maintain the real equilibrium interest rate stability. So that the economy with its own potential in the target inflation rate continued to grow steadily, thus achieving the stability of the price and stable growth of the total output of the dual objectives. (Judd and Rudebusch, 1998; Orphanides, 2001; Castelnovo, 2007; Bunzel, 2001), the authors have discussed the Taylor rules at different levels after the Taylor rule has been proposed, and in addition to the reassessment of the rule coefficients using national data And Enders, 2010; Pinkwart, 2013, Dunrongrittikula and Anderson, 2016) argue that interest rate hysteresis should be added on the basis of the Taylor rule origin, since the policy practice of the central bank is always trying to make interest rates can move slowly in the same direction, so as to avoid frequent changes in the direction of interest rates, while the Taylor rule eliminates the central bank interest rate smooth operation, which may cause excessive central bank policy response. (See Clarida et al., 2000; Moura, 2010; Rzhevskyy, 2011) argue that a forward-looking expectation should be introduced in the Taylor rule, and that in the actual decision-making process, the central bank has a greater than the public More information, so that the central bank in the choice of expected variables rather than the actual value of the previous period to set interest rates can be more effective to achieve goal optimization. In addition, the central bank to develop interest rate rules in addition to considering inflation and output should also consider which variables are also deepening the discussion. Some foreign scholars focus on bank credit, asset prices introduced to the Taylor rule in the rationality of the study, the results are not the same. Bernanke and Gertler (2001) and Gilchrist and Leathy (2002) all argue that the reaction of interest rates to asset price volatility is insignificant. Iovino (2005) argues that the introduction of asset prices in the Taylor rule will lead to increased benefits, and Fuhrer and Tootell (2008) and Nutahara (2014, 2015) argue that asset prices can have a direct impact on the economy through monetary policy, Should react to asset prices. Leonardo and Federico (2014) argue that the interest rate rules for inflation and output are no longer valid because of financial frictions, and that the central bank should, when viewed from a financial stability point of view or from a social welfare perspective. In the Taylor rule to add interest rates to the credit deviation of the reaction.

Domestic scholars have been very active in empirical research on the choice of interest rate rules in China. Related research can be divided into two stages: the first stage is the 2005 exchange rate reform before the exchange of scholars at this stage (Xie Ping, Luo Xiong, 2002; Army, Zhong Dan, 2003; Bian Zhicun, 2006) Analysis of the applicability of the Taylor rule in China, the amendment to the Taylor rule is mainly reflected in the introduction of interest rate lag and forward-looking, but the main variable is still the inflation gap and output gap, did not introduce the credit gap and asset prices. The second stage is the empirical study of the reform of the RMB exchange rate system (Zhang Yishan, Zhang Daiqiang, 2007; Li Qiong, Wang Zhivei, 2009; Huang Changli and Shang Youfang, 2013), this stage scholars began to gradually introduce bank credit and asset prices and other factors Taylor rules to expand. In recent years, with the rise of the new Keynesian Dynamic Random Equilibrium Model (DSGE) as an important research tool for macroeconomic policy analysis, some scholars have begun to use the DSGE model to study the selection of China's interest rate rules, such as Xi Junyang and He Yunsong (2010) The DSFP model under the new Keynesian framework is used to analyze the welfare loss of China's monetary policy, and it is considered that the welfare loss caused by different interest rate policy rules is not very different under certain conditions. The monetary authorities can proceed from the convenience point of view. Inflation rate and output level to set the current nominal interest rate. Chen, Funke and Paetz (2012) incorporated unconventional policy tools into the new Keynesian DSGE model, comparing the
effects of marketed and non-marketed operational tools on different economic shocks, believing that credit size controls China is a more effective policy tool. Xiao Weiguo (2016) uses the dynamic stochastic general equilibrium model to analyze the coordination problem between macro-prudential policy and monetary policy in the background of deepening the opening degree of capital account in China. It is believed that the formulation of monetary policy in China, while considering stable inflation and output, should pay attention to changes in bank credit.

Through the analysis of the above literature, we find that the empirical research method of interest rate rules for domestic scholars is mainly based on GMM estimation and VAR. It is pointed out that the analytical framework of VAR and GMM estimation belongs to local equilibrium rather than general equilibrium. This unstructured model can easily lead to "Lucas critique". A large number of studies (Clarida et al., 2000; Chen Kenting, Gong et al., 2006; Fan et al., 2012) show that the DSGE model, based on the microeconomic theory, uses the appropriate aggregate technology to obtain the economic The quantitative behavior equation, which fundamentally guarantees the consistency of macroeconomic analysis and microeconomic analysis, so that the model has good overall characteristics. However, the existing DSGE literature in our country uses the method of impulse response analysis when evaluating the effect of monetary policy rules. Although this method can clearly reflect the dynamic response of each stage of output and inflation under exogenous shock, can not compare the overall benefits of different monetary policy rules for all periods, and lack the numerical simulation analysis. In addition, most of China's DSGE literature is based on the Western economic environment to build the model, the lack of specific economic structure of China's analysis and improvement.

Although many domestic scholars have pointed out the heterogeneity of Chinese enterprises and commercial banks on the state-owned, non-state-owned enterprise credit supply asymmetry (this asymmetric feature is also known as the dual credit mismatch feature or two Yuan credit supply structure) two characteristics, but there are some deficiencies. For example, Song et al. (2011) argue that inefficient state-owned enterprises are not eliminated because of the heterogeneity of property rights in China, because state-owned enterprises are more likely to acquire banks than non-state enterprises. So, the asymmetry of state-owned enterprises and non-state enterprises in the acquisition of bank credit funds constitute a basic characteristic of China's currency transmission model. But the article still uses a local equilibrium approach, the lack of the use of macroeconomic mainstream DSGE analysis paradigm. Yu Xuefei and Song Qinghua (2013) argue that China's economy has a dual credit mismatch characteristic because the leverage of state-owned enterprises is significantly lower than that of non-state-owned enterprises because of the scale and policy advantages of state-owned enterprises relative to non-state enterprises. (2015) that although state-owned, non-state-owned enterprises are important economic entities in China, but with different financing costs, mainly for the state-owned enterprises, financing costs lower, rather than state-owned enterprises financing costs are relatively high, And there are financing constraints. Although the above research uses the DSGE analysis paradigm, but only use of impulse response method to study the economic variables in the exogenous impact of the dynamic response, and did not use the welfare analysis paradigm of different monetary policy rules for all periods of the overall welfare analysis. Failed to discuss the optimal selection of interest rate rules in China.

In this paper, based on the research framework of Iacoviello (2005) and the reality of China, this paper establishes a dynamic stochastic general equilibrium model which includes heterogeneous manufacturers and binary credit supply structure. Under the impact of cost, consumption preference and technology, Welfare analysis and impulse effect analysis, from the dynamic response of each major economic variables and the various departments and the overall welfare changes from two angles, a comprehensive analysis of the dual credit supply structure under the interest rate rules to select the problem and adjust the deposit reserve ratio The impact on the economy. Compared with the previous research, the innovation of this paper lies in: First, based on the characteristics of China's property rights system, the heterogeneous manufacturers and dual credit supply structure into the new Keynes dynamic stochastic general equilibrium model framework, better analysis The effect of different interest rate rules and the effect of deposit reserve ratio change; secondly, the welfare loss function is constructed from the micro perspective, and in the analysis of different interest rate rules at the same time, Exogenous set three deposit reserve ratio, study the impact of different shocks, different interest rate rules and deposit reserve ratio of welfare improvement effect.

Based on the above understanding, the following structure is as follows: The second part is the establishment of the model; the third part is the parameter calibration and Bayesian estimation; the fourth part is the empirical analysis; the fifth part gives the main conclusions and policy recommendations.

2. THE ESTABLISHMENT OF THE MODEL

Based on the research of Iacoviello (2005) and Chen et al. (2012), this paper establishes a multi-sectoral stochastic stochastic general equilibrium model that includes heterogeneous firms and binary credit supply structures, which consists of four departments, namely, the family sector, The business sector, the commercial banking sector and the central bank. The main links between these departments are: the family sector will
provide labor for enterprises and obtain wages from the enterprise together with the principal and interest of the deposit together for consumer spending and current deposits. The enterprise sector can be divided into intermediate producers and final producers. Among them, intermediate producers are divided into state-owned enterprises and non-state-owned enterprises according to the characteristics of Chinese property rights system. This is mainly for the later introduction of commercial banks Characteristics of credit supply. Intermediate producers will use their existing capital and the labor force absorbed from the household sector to produce intermediate goods and pay wages to the family sector. And the final producers will buy intermediate goods and produce the final consumer goods sold to the family sector; the commercial banking sector absorbs savings from the household sector and pays the deposit reserve, and the surplus savings and their own capital accumulation are shared with the intermediate producers for wage payments. And bear the risk of loan loss; the central bank is responsible for the implementation of monetary policy.

2.1. family sector
Assume that the family is a continuous, infinite individual, by choosing consumption $C_t$ and labor supply $L_t$ to maximize its desired utility:

$$E_0 \sum_{t=0}^{\infty} \{ \beta_h^t \nu^c_t \left[ (C^h_t)^{1-\sigma_h} / (1-\sigma_h) - L^{1+\varphi}_t / (1+\varphi) \right] \}$$

(1)

Where $E_0$ is the expected operator, $0 < \beta_h < 1$ the discount factor for the family sector, $\nu_t^c$ the marginal utility of the household's consumption, $\sigma_h$ the reciprocal of the intertemporal elasticity of household consumption, $\varphi$ the reciprocal of elasticity of labor supply. Assuming that the current income of the household sector is the wage income $w_tL_t$ plus the discounted principal and interest $(1+i_{t-1}^d)D_{t-1} / \pi_t$ of the previous deposit, the expenditure is consumption and the current savings, the household sector budget constraint can be expressed as:

$$w_tL_t + (1+i_{t-1}^d)D_{t-1} / \pi_t = C^h_t + D_t$$

(2)

Where $\pi_t$ is the inflation rate and $i_{t-1}^d$ is the deposit rate. The optimal Euler equation and the optimal labor supply equation for the first-order condition can be expressed by (3) and (4), respectively, by solving the objective function and the formula (2):

$$(1+i_{t-1}^d)\beta_h E \left[ (C^h_{t+1} / C^h_t)^{-\sigma_h} \nu_{t+1}^{\varphi} / \pi_{t+1} \nu_t \right] = 1$$

(3)

$$w_t = (C^h_t)^{\sigma_h} L_t^{\varphi}$$

(4)

(3) Euler equation shows that the household sector consumption and deposit interest rates are positively related to the decline in deposit interest rates will reduce the level of future consumption. While (4) shows that the higher the wages, the family sector is willing to increase the supply of labor more.

2.2. the business sector
In the model, we divide the enterprise into intermediate producers and final producers, and the intermediate firms are divided into state-owned enterprises ($G$) and non-state enterprises ($F$). The discount factor $\beta_e$ of the corporate sector is less than the discount factor of the household sector $\beta_h$ because the corporate sector is more willing to invest in financial markets than the consumption and deposits of the household sector.

(1) the final product manufacturer
Since the products produced by the final manufacturer are completely homogeneous and are perfectly competitive. Therefore, for the final product manufacturer, it is assumed that it purchases the intermediate product $Y_t(j)$ produced by the intermediate producer at the price of $P_t(j)$, and the final product produced by the final product producer in the form of CES:

$$Y_t = \left[ \int_0^1 [Y_t(j)]^{(\theta-1)/\theta} dj \right]^{\theta/(\theta-1)}$$

(5)

Where $\theta$ is the alternative elasticity of the intermediate product. If the final product manufacturer sells at $P_t$ the price, the final product manufacturer chooses the demand for intermediate goods $Y_t(j)$ and the price
The price of the intermediate product manufacturer according to the profit maximization principle:

\[ Y_i(j) = \arg \max P_j \left[ \int_0^t \left[ Y_i(j)^{\alpha(1-\theta)} \Delta f_{i} \right]^{1/(1-\theta)} \right] - \int_0^t P_j \Delta Y_i(j) dj \]  

(6)

Solving (6) yields \( Y_i(j) = \left( \frac{P_j}{P_i} \right)^{-\theta} Y_i \). So you can get the price of the final product \( P_i \):

\[ P_i = \left[ \int_0^t \left( \frac{P_j}{P_i} \right)^{-\theta} \right]^{1/(1-\theta)} \]  

(7)

(2) Intermediate product manufacturer

This article assumes that there is a continuum of intermediate producers (ie \( j = G, F \in [0,1] \)), each intermediate product manufacturer produces intermediate goods that are different from those produced by other intermediate producers, so it can be reasonable to assume that the intermediate product manufacturer is Pricing ability. \( j = G, F \) is faced with different social average production techniques \( A_i \) (the production technology of state-owned enterprises will lag behind the production technology of non-state-owned enterprises, ie \( A_0 < A_i \)), put into labor \( L_i(j) \) and capital \( K_i(j) \) production of intermediate goods \( Y_i(j) \), whose production function is assumed to be a Cocker Douglas function form:

\[ Y_i(j) = A_i[K_i(j)]^\alpha[L_i(j)]^{1-\alpha} \]  

(8)

The intermediate product manufacturer acquires the financing from the commercial bank in the current period by selling the intermediate goods to the final product manufacturer for the current consumption, the labor payment, the capital payment and the payment of the principal and interest of the previous period. The objective function of the firm is:

\[ E_0 \sum_{t=0}^{\infty} \beta_w^t \nu_i^t \left( C_i^t \right)^{1-\gamma} / (1-\sigma_w) \]  

(9)

The intermediate producer’s budget constraint is:

\[ C_i^t + w_i^t L_i(j) + r_i^t K_i(j) + (1+i_{t-1})B_{t-1}^i / \pi_t = Y_i(j) / X_i + B_i^t \]  

(10)

\( r_i^t \) and \( w_i^t \) respectively represent the capital price and the labor price, \( C_i^t \) means the consumption of the enterprise, \( 1/X_i \) the price ratio of the intermediate product and the final product, and \( B_i^t \) the loan for the commercial bank. The first-order condition for solving the optimization problem of (9)(10)

\[ w_i^t = (1-\alpha)Y_i(j) / X_i L_i(j) \]  

(11)

\[ r_i^t = \alpha Y_i(j) / X_i K_i(j) \]  

(12)

\[ (1-\alpha) / \alpha = w_i^t L_i(j) / r_i^t K_i(j) \]  

(13)

\[ 1/(1+i_{t-1}^b) = \beta_w^t [\nu_i^{t+1}(C_{i+1}^t / C_i^t)^{-\gamma} / \nu_i^t \pi_{t+1}] \]  

(14)

(11) is the decision equation of the wage, (12) is the decision equation of the capital price, and (13) is the Euler equation of the consumption demand of the intermediate producer. (11) and (12) are substituted into the production function, we can get the labor demand equation and the capital demand equation of the intermediate product manufacturer:

\[ L_i(j) = Y_i(j) \left[ r_i^t (1-\alpha) / \alpha w_i^t \right]^a / A_i^j \]  

(15)

\[ K_i(j) = Y_i(j) \left[ r_i^t (1-\alpha) / \alpha w_i^t \right]^{a-1} / A_i^j \]  

(16)

Therefore, the total cost of the intermediate product manufacturer’s production \( Y_i(j) \) quantity intermediate goods is:

\[ TC_i^t = r_i^t K_i(j) + w_j L_i(j) = w_j \left[ r_j (1-\alpha) / w_j \alpha \right]^{a} Y_i(j) / (1-\alpha) A_i^j \]  

(17)

You can find the corresponding marginal cost:

\[ MC_i^t = w_j \left[ r_j (1-\alpha) / w_j \alpha \right]^{a} / (1-\alpha) A_i^j \]  

(18)

The economic meaning of equation (18) has the following two points: First, the marginal cost of the same type of intermediate producer is the same in the t period, independent of the single intermediate producer \( j \). Second, the marginal cost is positively related to the financing cost \( r_j \), which is negatively related to the
production efficiency $A^j$. In other words, the higher the cost of financing, the higher the marginal cost; the higher the production efficiency of the enterprise, the lower the marginal cost.

We introduce the price stickiness according to the Calvo (1983) staggered pricing principle, assuming that for the intermediate product manufacturer, in the period $t$, once the price is determined, $\rho$ the probability to remain unchanged to $t+1$ period, $1-\rho$ the probability of $t+1$ re-profit maximization pricing. Thus, in the $t$ period, those firms that can be repriced are optimized by choosing $P^*_t(j)$ the following:

$$P^*_t(j) = \arg \max E_i \sum_{t=0}^{\infty} \beta^t \rho^t[P^*_t(j)Y_{rt}(j) - P^*_t(j)MC_{r,t}Y_{rt}(j)]$$

s.t. $Y_{rt}(j) = Y_{rt}(P^*_t(j))^{\theta}$

Solving the above optimization problem can get the optimal pricing $P^*_t(j)$:

$$P^*_t(j) = \theta E_i \sum_{t=0}^{\infty} \beta^t \rho^t[P^*_t(j)MC_{r,t}Y_{rt}(j)] / (\theta - 1) E_i \sum_{t=0}^{\infty} \beta^t \rho^t Y_{rt}(j)$$

Combined with the Calvo pricing rules, the price level evolved as follows:

$$P_t = [\rho P^*_{t-1} + (1 - \rho) P^*_t(j)^{1-\theta}]^{(1-\theta)}$$

### 2.3 the commercial banking sector

Commercial banks' different forms of credit supply to state-owned enterprises and non-state-owned enterprises are unique dual-credit supply structures in China's economy. Specifically, China's state-owned enterprises are more vulnerable to government policies than non-state enterprises in the financing process.

Compared to non-state enterprises, commercial banks will give priority to meet the credit needs of state-owned enterprises. With reference to Chen et al. (2012) and Wang et al. (2015), this paper describes the structure of this binary credit supply as follows:

(1) Credit decision-making of state-owned enterprises: commercial banks from the family sector to absorb deposits $D$, part of which as a deposit reserve, the remaining part of the priority to meet the credit needs of state-owned enterprises, assuming commercial banks on state- tung, the objective function of commercial banks to state-owned enterprise credit is:

$$E_0 \sum_{t=0}^{\infty} \beta^t \rho^t [B^G_t - i^d_t D^G_t + \chi t^d_t D^G_t - u_b^G (B^G_t)^2 / 2]$$

$B^G_t$ is the credit for the commercial banks on state-owned enterprises, $\chi$ is for the statutory deposit reserve ratio, $i^d_t$ is the deposit interest rate, the deposit reserve rate is $i_t^d$, $u_b^G (B^G_t)^2 / 2$ is the commercial bank loans to state-owned enterprises management costs, it is about $B^G_t$ of the quadratic function. The budget constraints faced by commercial banks are:

$$B^G_t = (1 - \chi_t) D^G_t$$

We obtain (23) and (24) the optimization problem can be obtained by the commercial banks on the state-owned enterprise loan interest rate to be satisfied (25)

$$i^b_{t,G} = (i_t^d - \chi_t i_t^d) / (1 - \chi_t) + u_b^G B^G_t$$

(2) Credit decision-making for non-state sector: commercial banks to meet the needs of state-owned enterprises after the loans, non-state-owned enterprises to make loans to make decisions, assuming $i^b_{t,s}$ for commercial banks on non-state enterprises lending rates, The objective function of banks to nonstate enterprises is as follows:

$$E_0 \sum_{t=0}^{\infty} \beta^t \rho^t [i^b_{t,s} B^f_t - i^d_t D^f_t + \chi t^d_t D^f_t - \phi(B_t - B^f_t)^2 / 2 Y_t - u_b^f (B^f_t)^2 / 2]$$

among them, $B_t$ for the total credit of commercial banks, $B^GB_t$ for the central bank loan size control...
for commercial banks to scale the amount of excessive penalties, \( u_i^f (B_i^f)^2 / 2 \) for commercial banks on non-state enterprises loan management costs. The budget constraint of a commercial bank to a non-state part is:

\[
B_i^f \leq (1 - \chi_i)D_i^f \\
B_i = B_i^f + B_i^d, \quad D_i = D_i^f + D_i^d
\]

(27)

(28)

We can solve the optimization problems of (26), (27) and (28), and obtain the loan interest rate of non-state enterprises by commercial banks as follows:

\[
i_{t,F}^b = (i_{t-1}^d - \chi_i i_t^d) / (1 - \chi_i) + \phi (B_i - B_i^{CB}) / Y_t + u_b^F B_i^F
\]

(29)

(25) and (29) show that commercial banks' lending rates to nonstate enterprises will be higher relative to state-owned enterprises and will increase as the central banks increase penalties for credit supply to commercial banks.

2.4 The central bank

In this paper, the central bank is responsible for the implementation of monetary policy, we consider three monetary policy rules, if the main objective of monetary policy is to control inflation and economic growth, then set the central bank to follow the following Taylor rules (hereinafter referred to as "interest rate rules I") to develop Monetary Policy:

\[
i_t^d = (i_{t-1}^d)^{\lambda_d} [\tilde{T}^d (\pi_t / \tilde{T})^{\lambda_a} (Y_t / \tilde{Y})^{\lambda_y} (B_t / \tilde{B})^{\lambda_b} ]^{1-\lambda_d}
\]

(30)

The above formula shows that policy interest rates are affected by the previous interest rate, while the central bank adjusts policy rates based on inflation and output gaps. Wherein, \( \tilde{T} \) and \( \tilde{Y} \) represent steady state inflation and output, \( \lambda_d \) a smoothing factor for the interest rate, \( \lambda_a \) and \( \lambda_y \) respectively, the central bank preference factor for inflation and the output gap of the gap. In addition, in recent years, many scholars (such as Fan Cong and Sheng Tianxiang (2012), Ozkan and Unsal (2012), Xiao Weiguo (2016), etc.) that the central bank in the formulation of monetary policy should also take into account the maintenance of finance (Hereafter referred to as "interest rate rule II" and "interest rate rule III"), as in (31) and (32), the two types of Taylor rules (hereinafter referred to as "interest rate rule II" and "interest rate rule III") are added to the interest rate rule I. As shown:

\[
i_t^d = (i_{t-1}^d)^{\lambda_d} [\tilde{T}^d (\pi_t / \tilde{T})^{\lambda_a} (Y_t / \tilde{Y})^{\lambda_y} (B_t / \tilde{B})^{\lambda_b} ]^{1-\lambda_d}
\]

(31)

\[
i_t^d = (i_{t-1}^d)^{\lambda_d} [\tilde{T}^d (\pi_t / \tilde{T})^{\lambda_a} (Y_t / \tilde{Y})^{\lambda_y} (Q_t / \tilde{Q})^{\lambda_q} ]^{1-\lambda_d}
\]

(32)

Among them, \( \tilde{B} \) and \( \tilde{Q} \) represent the steady value of credit level and asset price, \( \lambda_b \) and \( \lambda_q \) respectively indicate the central bank's response to credit gaps and asset price deviations. Since we introduced the asset price in the interest rate rule, we need to increase the decision equation of the asset price for the closed model. Suppose \( \delta_{t+1} \) is the stochastic discount factor from \( t \) to \( T \), then the current price of a nominal random variable \( X_t \) is: \( Q_t = E_t(\delta_{t+1} X_{t+1}) \), and we have \( 1 = E_t(\delta_{t+1} X_{t+1}) \). Since \( Q_t \) can be understood as the price of the \( t+1 \) period at the beginning of the period \( t \), we have \( Q_t = E_t(\delta_{t+1} X_{t+1}) \), so we can get: \( Q_t = 1 / i_t^d \).

Different from other literature, this paper externally set the deposit reserve ratio, which is mainly to take into account the deposit reserve ratio adjustment is still a non-market-oriented behavior, can not accurately use a regular equation to express it. In fact, the central bank governor Zhou Xiaochuan (2010) once pointed out that "the deposit reserve ratio increase or decrease is mainly to adjust the market liquidity. In recent years, the use of deposit reserve ratio instruments is mainly related to the hedging requirements arising from the increase or decrease in foreign exchange reserves, so the adjustment of the deposit reserve ratio in most cases does not indicate that monetary policy is loose or tight. "That is, for the time being, we are more likely to consider keeping the deposit reserve ratio at what level rather than fine-tuning the real economy as a monetary policy tool. But in recent years as the central bank to adjust the deposit reserve rate is getting higher and higher, so this paper hopes to examine the different deposit reserve ratio policy on the welfare level and the impact of the real economy, we exogenous set three deposit reserve ratio: High deposit reserve ratio (\( \chi_i = 20\% \)), medium deposit reserve ratio (\( \chi_i = 15\% \)), low deposit reserve ratio (\( \chi_i = 10\% \)). But in order to simplify the analysis, we did not consider the difference reserve ratio, all commercial banks have the same deposit reserve ratio.
2.5 Exogenous shocks and market equilibrium

When the market is cleared, the system is balanced: \( Y_t = C_t^b + C_t^j \) (\( j = G, F \)). In order to examine the impact of random shock on macroeconomic and the regulation of the three types of interest rate rules under this dual credit supply structure. According to China's current economic and financial development characteristics, the forward impact of cost and consumption preferences can respectively correspond to China's macroeconomic cost-push inflation and demand-driven inflation, and technological progress in stimulating China's economic growth role is more obvious. The \( \varepsilon_t^a \), cost shock \( \varepsilon_t^W \) and consumer preference shock \( \varepsilon_t^\tau \) are subject to the AR (1) process and are defined as follows:

\[
\hat{m}_t = \omega_m \hat{m}_{t-1} + \varepsilon_t^w
\]

Where \( \hat{m}_t = \hat{a}_t, \hat{\psi}_t \) and \( \hat{r}_t \), \( \omega_m \) denote the lag coefficient of the variable \( \hat{m}_t \) affected by the previous period, and \( \varepsilon_t^w \) the random impact of the variable in the current period.

At this point, the economic entities are in their respective budget constraints to achieve their maximum utility, while the central bank monetary policy rules and market conditions clear constraints, the formation of a large system of equations.

2.6. Model solution

The solution model is divided into three steps: First, the steady state of the model is obtained according to the first-order condition and the equilibrium condition, and most of the parameter values when the steady-state are calibrated. Second, using the logarithmic linearization method\(^1\); Third, the model is solved by using the observable data, and the other parameters are obtained by Bayesian estimation. The third-order model is used to solve the model value.

3. Parameter calibration and Bayesian estimation

In this paper, calibration and Bayesian estimation are used to set the parameters of the model. All parameters are calibrated and estimated at the quarterly frequency. Since this paper focuses on three interest rate rules, the Bayesian estimate of the parameters is mainly placed on the interest rate rules, and the other parameter values are used to calibrate the parameters.

3.1 Parameter calibration

In general, parametric calibration of a dynamic stochastic general equilibrium model system should be carried out in a stable sample range, but there are some difficulties in actual operation based on China's current national conditions. This is mainly because China is still a developing country in the economic transition period, the Chinese economy in the past few decades are constantly being adjusted, and the various parts of the reform process is not unified lead to part of the variable sample range There will be some structural mutations. Since the validation of parameters is not the focus of this paper, we will refer directly to the existing study for the calibration of certain parameters below. It is necessary to make it clear that for the sake of simplicity, we refer to Liu Bin (2008) to harmonize the intertemporal substitution elasticity of consumption, which means \( \sigma_b = \sigma_e \). Table 2 provides the specific calibration values for the parameters at steady state, meaning and reference.

<table>
<thead>
<tr>
<th>meaning</th>
<th>parameter</th>
<th>Value</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Family subjective discount rate</td>
<td>( \beta_h )</td>
<td>0.9950</td>
<td>Liu Bin(2008)</td>
</tr>
<tr>
<td>State - owned enterprise discount rate</td>
<td>( \beta_{eG} )</td>
<td>0.9642</td>
<td>Wang Qu Fei(2015)</td>
</tr>
<tr>
<td>Non - state enterprise discount rate</td>
<td>( \beta_{eF} )</td>
<td>0.9539</td>
<td>Wang Qu Fei(2015)</td>
</tr>
<tr>
<td>The degree of contribution to consumption</td>
<td>( \psi )</td>
<td>1</td>
<td>Wang Qu Fei(2015)</td>
</tr>
<tr>
<td>Consumption of intertemporal substitution elastic reciprocal</td>
<td>( \sigma_b, \sigma_e )</td>
<td>2</td>
<td>Ma Li(2015)</td>
</tr>
</tbody>
</table>

\(^1\) In order to save space, logarithmic linearization results are not listed.
3.2 Bayesian estimates

For the remaining parameters, we use the Bayesian estimation method. According to the Bayesian estimation rule, the number of observed variables is less than or equal to the number of exogenous shocks. The model established in this paper contains three kinds of exogenous shocks: technical shock, cost shock and consumption preference. So use the following three observed variables under Bayesian estimates: Output, inflation, and interest rates to build the measurement equations. The data source is the National Bureau of Statistics website, the database and the wind database, since the central bank from 1995 onwards under the leadership of the State Council to implement an independent monetary policy, and data from 2000 to be more complete, so the sample selected from (1) Output gap: the quarterly average of GDP is used to get the actual value, we use the seasonal adjustment, and then use the HP filter method on the (2) the inflation gap: the CPI growth rate to remove the average to get the inflation gap; (3) the inflation rate of the growth rate of the CPI, Base interest rate: the average of interbank interest rates. We use Li Songhua (2010) research results, the use of its monetary policy Bayesian estimated posterior mean as the expected parameters of the prior record, which depicts the monetary policy rules interest rate adjustment inertia parameter value of 0.8, depicting monetary policy In the rule, the parameter of interest rate to inflation elasticity is 1.7, and the parameter of interest rate to output elasticity in monetary policy is 0.3. Bayesian estimates are shown in Table 3.

<table>
<thead>
<tr>
<th>meaning</th>
<th>parameter</th>
<th>Prior distribution</th>
<th>Posterior mean</th>
<th>95% confidence interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monetary policy interest rate smoothing coefficient</td>
<td>( \lambda_i )</td>
<td>([0.8, 0.1])</td>
<td>0.78</td>
<td>(0.41, 1.05)</td>
</tr>
<tr>
<td>Monetary policy inflation preference</td>
<td>( \lambda_z )</td>
<td>([1.7, 0.5])</td>
<td>2.25</td>
<td>(1.89, 2.61)</td>
</tr>
<tr>
<td>Monetary policy output gap preference</td>
<td>( \lambda_Y )</td>
<td>([0.3, 0.2])</td>
<td>0.13</td>
<td>(0.05, 0.21)</td>
</tr>
</tbody>
</table>

Note: Indicates the Beta distribution, representing the Gamma distribution

From Table 3, we can see that the response coefficient of interest rate to inflation in monetary policy is 2.25, and the response coefficient to output is 0.13, which indicates that the central bank places more emphasis on price stability.
3.3 Empirical analysis

Based on the above-mentioned dynamic stochastic general equilibrium model construction, parameter calibration and Bayesian estimation, this paper examines the welfare losses of each department under three kinds of exogenous shocks, different deposit reserve ratio and three interest rate rules. The Impulsive Effect of Macroeconomic Variables.

3.3.1 Welfare Loss

In this paper, we use the welfare loss function to compare the control effect of different monetary policy rules. We refer to the consumption equivalence ideas of Leonardo and Federico (2013). From the micro perspective,

The utility of consumption of households and businesses (state $G$, non-state $F$) is used as a measure of welfare. Because the family, state-owned enterprises and non-state enterprises have different discount factors, we consider their welfare functions separately. Under the given rules $R$ ($R =$ interest rate rules I, II, III), the welfare function is defined as follows:

$$W_{0,R}^n = E_0 \sum_{t=0}^{\infty} \{ \beta^n \mathbb{E}_t \left[ (C_t^n)^{1-\sigma_n} / (1-\sigma_n) - L_t^{1+\phi} / (1+\phi) \right] \}$$

(34)

$$W_{0,R}^G = E_0 \sum_{t=0}^{\infty} (\beta^n e)^t \left[ (C^n_t)^{1-\sigma} / (1-\sigma) \right]$$

(35)

$$W_{0,R}^F = E_0 \sum_{t=0}^{\infty} (\beta^n e)^t \left[ (C^n_t)^{1-\sigma} / (1-\sigma) \right]$$

(36)

For the agent $n$, the welfare loss can be expressed as the difference between the welfare level $W_0$ and the welfare level $\tilde{W}_0$ under another policy $\Delta$. Then $\Delta$ should satisfy ($n = h, G, F$):

$$W_{0,\Delta}^n = E_0 \left[ \sum_{t=0}^{\infty} \beta^n U((1+\Delta_n)C^n_t) \right] = \tilde{W}_0^n$$

(37)

We calculated the optimal rule according to the method of Schmitt-Grohe and Uribe (2007). Specifically, we have a second-order solution to the above equation $\Delta$, this measurement is between the different rules is no change. So it is suitable for two different types of policy rules, you can get:

$$\Delta_n = \exp[\left(\tilde{W}_0^n - W_0^n\right)(1-\beta^n)] - 1$$

(38)

According to (38), we compare the loss of benefits under different interest rate rules under the impact of technology, cost shock and consumer preference.

Table 4 shows the loss of benefits for each sector of the three interest rate rules (interest rate rules I, II, III) at different deposit reserve ratios ($\chi$) when the economy is subjected to three exogenous shocks.

We take the interest rate rule I under the high deposit reserve ratio ($\chi = 20\%$) as the benchmark model (interest rate rule I (1)). And then the deposit reserve ratio was reduced to 15% (interest rate rules I (2)) and 10% (interest rate rules I (3)) with the comparative analysis, compared with the interest rate rule II and interest rate rules III.

Analysis Table 4 We can get the following three conclusions: First, no matter what kind of impact in which interest rate rules, compared with the high deposit reserve ratio, low deposit reserve ratio will bring benefits to families, state-owned enterprises and non-state enterprises to increase. The increase in the benefits to non-state-owned enterprises is the largest (in the case of interest rate rule I, for example, the deposit reserve ratio is reduced from 20% to 10%, which can increase the welfare of non-state enterprises by 20%). This shows that in China’s current dual credit supply structure, reduce the deposit reserve ratio is conducive to improving the overall social welfare, especially for the development of non-state enterprises. This may be due to lower deposit reserve ratio can make commercial banks to increase the loanable funds to ease the financing of enterprises, especially non-state-owned enterprises, financing expensive, So as to reduce the asymmetry of the credit supply of commercial banks to state-owned enterprises and non-state-owned enterprises, so as to ensure that the price transmission mechanism of monetary policy is more smooth and effective. Second, the comparison of technology under the impact of interest rate rules (1) interest rate rules II (1) and interest rate rules III (1) can be found, in addition to the output gap and inflation gap response, Increasing the response of the policy interest rate to the credit gap can improve the welfare of the various sectors, but increasing the response of the policy interest rate to the asset price does not bring about an increase in welfare.
Table 4. Benefits of different interest rate rules under exogenous shocks

<table>
<thead>
<tr>
<th>Impact type</th>
<th>Policy type</th>
<th>Policy parameters</th>
<th>Changes in welfare of all sectors and changes in total welfare</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>( (\hat{\lambda}_1, \hat{\lambda}_2, \hat{\lambda}_3, \hat{\lambda}_4, \hat{\lambda}_5, \hat{\lambda}_6) )</td>
<td>family</td>
</tr>
<tr>
<td>Technical impact</td>
<td>Interest rate rules I</td>
<td>( (0.78, 2.25, 0.13, ---, 0.20) )</td>
<td>0.064</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( (0.78, 2.25, 0.13, ---, 0.15) )</td>
<td>0.075</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( (0.78, 2.25, 0.13, ---, 0.10) )</td>
<td>0.097</td>
</tr>
<tr>
<td></td>
<td>Interest rate rules II</td>
<td>( (0.78, 2.25, 0.13, 0.24, 0.20) )</td>
<td>0.024</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( (0.78, 2.25, 0.13, 0.24, 0.15) )</td>
<td>0.056</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( (0.78, 2.25, 0.13, 0.24, 0.10) )</td>
<td>0.097</td>
</tr>
<tr>
<td></td>
<td>Interest rate rules III</td>
<td>( (0.78, 2.25, 0.13, 1.14, 0.20) )</td>
<td>0.007</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( (0.78, 2.25, 0.13, 1.14, 0.15) )</td>
<td>0.035</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( (0.78, 2.25, 0.13, 1.14, 0.10) )</td>
<td>0.056</td>
</tr>
<tr>
<td>Cost impact</td>
<td>Interest rate rules I</td>
<td>( (0.78, 2.25, 0.13, ---, 0.20) )</td>
<td>( --- )</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( (0.78, 2.25, 0.13, ---, 0.15) )</td>
<td>0.045</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( (0.78, 2.25, 0.13, ---, 0.10) )</td>
<td>0.068</td>
</tr>
<tr>
<td></td>
<td>Interest rate rules II</td>
<td>( (0.78, 2.25, 0.13, 0.24, 0.20) )</td>
<td>0.012</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( (0.78, 2.25, 0.13, 0.24, 0.15) )</td>
<td>0.021</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( (0.78, 2.25, 0.13, 0.24, 0.10) )</td>
<td>0.042</td>
</tr>
<tr>
<td></td>
<td>Interest rate rules III</td>
<td>( (0.78, 2.25, 0.13, 1.14, 0.20) )</td>
<td>-0.010</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( (0.78, 2.25, 0.13, 1.14, 0.15) )</td>
<td>0.015</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( (0.78, 2.25, 0.13, 1.14, 0.10) )</td>
<td>0.043</td>
</tr>
<tr>
<td>Consumer preference shocks</td>
<td>Interest rate rules I</td>
<td>( (0.78, 2.25, 0.13, ---, 0.20) )</td>
<td>( --- )</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( (0.78, 2.25, 0.13, ---, 0.15) )</td>
<td>0.048</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( (0.78, 2.25, 0.13, ---, 0.10) )</td>
<td>0.075</td>
</tr>
<tr>
<td></td>
<td>Interest rate rules II</td>
<td>( (0.78, 2.25, 0.13, 0.24, 0.20) )</td>
<td>0.020</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( (0.78, 2.25, 0.13, 0.24, 0.15) )</td>
<td>0.042</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( (0.78, 2.25, 0.13, 0.24, 0.10) )</td>
<td>0.091</td>
</tr>
<tr>
<td></td>
<td>Interest rate rules III</td>
<td>( (0.78, 2.25, 0.13, 1.14, 0.20) )</td>
<td>-0.001</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( (0.78, 2.25, 0.13, 1.14, 0.15) )</td>
<td>0.025</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( (0.78, 2.25, 0.13, 1.14, 0.10) )</td>
<td>0.049</td>
</tr>
</tbody>
</table>

This may be because the policy interest rate response to the credit gap is due to financial stability considerations, to avoid the volatility of credit under the external volatility, to ensure that commercial banks to meet the needs of state-owned enterprises on the basis of loans can also have spare money to supply non-state enterprises, and thus to a large extent to avoid greater fluctuations in output, So that the increase in social welfare, and asset price fluctuations may be more subject to market expectations of the market and external...
factors, and in recent years, China’s monetary policy, the main target is stable prices and security growth, So the interest rate on the asset price response is not obvious. Third, compare the three interest rates under the impact of the rules II found that compared to the benchmark model, the impact of technology than the impact of cost and consumption preferences to bring the benefits of more benefits, This shows that technological progress led to industrial upgrading makes the whole society more rational allocation of resources, thereby promoting economic growth and improve the total social welfare.

3.3.2 impulse response analysis

Through the method of welfare analysis, we have not only got the welfare changes of various departments (families, state enterprises, non-state enterprises) in the economy, but also got the change of the total welfare of the whole society, but did not give the main economic variables (This paper mainly considers the total output, inflation, total consumption, commercial banks on state-owned enterprise credit and commercial banks on non-state-owned enterprise credit) under different interest rates on the impact of each period of dynamic changes. Taking into account the current characteristics of China’s monetary policy and the future development of monetary policy trends, we first give the deposit reserve ratio of 15% (ie \( \gamma = 15\% \)), different interest rates under the major economic variables on the impact of cost and consumption preferences Impact of the impulse response diagram, and then examine the central bank to implement the interest rate rule II, the different deposit reserve ratio, the major economic variables on the technical impact of the pulse effect map. The abscissa of the graph indicates the number of periods of economic adjustment, in quarters, and the ordinate indicates the percentage of economic variables deviating from steady state.

(1) cost impact

Positive cost shocks can be understood as cost-driven inflation, and the central bank encounters a dilemma in the face of cost shocks: if tight monetary policy is used to curb inflation, it may result in a decline in employment and an insufficient supply, leading to economic Growth rate decline; and expansionary monetary policy is bound to exacerbate inflation. Therefore, the preferred monetary policy rules should be able to minimize the decline in output.

Figure 1 shows a unit of positive cost shocks caused by total output, inflation, total consumption, commercial banks on state-owned enterprise credit and commercial banks on non-state enterprises credit volume from the steady state percentage. It is not difficult to find that, compared to interest rate rules I and III, interest rate rules that affect interest rate credit response II can reduce the decline in total output as shown in Figure 1 (a). This is mainly due to the impact of cost, tight monetary policy will raise the policy interest rate, the model shows that the improvement of policy interest rates will inevitably increase the level of commercial banks credit interest rates, under the three interest rate rules, credit interest rates will be reduced The financing needs of state-owned enterprises, as shown in Figure 1 (d). However, under interest rate rule II, the credit supply of commercial banks does not change much due to the reaction of interest rate to credit gap, so commercial banks under interest rate rule II can have more funds to lend to financing constraints Of non-state enterprises, so the actual level of credit for non-state enterprises in commercial banks is higher than in the interest rate rules I and III, and even higher than before the impact, as shown in Figure 1 (e). Since the efficiency of state-owned enterprises is lower than that of non-state enterprises, it also means that the increase in the actual credit level of non-state enterprises can increase the overall economic efficiency and offset the negative impact of tightening monetary policy on total output Impact. Therefore, overall, interest rate rules II are effective in suppressing inflation and stabilizing output levels in the face of cost shocks, as compared to interest rate rules I and III.

![Figure 1. Impulse response of economic variables to cost shocks under three interest rate rules](image-url)
(2) consumer preferences impact

The impact of consumer preferences is the impact of the household sector and the business sector suddenly changing the impact of current consumption levels on the economy. Positive consumption preferences may lead to demand-driven inflation and rapid expansion of output, triggering the problem of overheating. So the impact of consumer preferences, the better monetary policy should be able to maximize the prevention of overheating.

Figure 2 shows the total output, inflation, total consumption, the credit rate of the commercial banks to the state-owned enterprises and the percentage of the commercial banks 'non-state-owned enterprises’ credit from the steady state. It can be found that the interest rate rule II, which includes the interest rate reaction to the credit bias, is more effective than the interest rate rules I and III, as shown in Figure 2 (a). Because the positive impact of consumer preferences means that the consumption tendency of households and enterprises increases and the propensity to save decreases. The increase of market demand will increase the production of state-owned enterprises and increase the financing demand of state-owned enterprises. Although the increase of policy interest rate will raise the financing cost, To a certain extent, to reduce the financing needs of state-owned enterprises, but this does not completely offset the positive impact on the impact of rising demand for financing, so overall the financing needs of state-owned enterprises is still increased, as shown in Figure 2 D). The increase in policy interest rates means an increase in the credit supply of commercial banks, which, in contrast to the Taylor rule that does not include interest rates on the credit gap, (interest rate rules I and III) are more favorable than interest rate rules that include interest rates on credit deficits. The credit supply of commercial banks increases more, so we find that there is no credit supply to commercial banks at the initial time of interest rate rule II, as shown in Figure 2 (e). So this can produce a degree of tightening to some extent, thereby alleviating the problem of overheating. But it is worth noting that, compared to the case of cost shocks, the consumer interest rate under the impact of interest rate rules II than the interest rate rules I and III in the suppression of economic overheating advantage is not obvious. In fact, the three interest rate rules in the economic overheating when the control effect is general. This may be because the three interest rate rules are interest rate adjustment, although the interest rate increase can reduce the residents’ willingness to consume and increase their willingness to save, but in general can not reduce the commercial banks to the enterprise credit supply, that is, three interest rates Rules can only inhibit the economy from the demand side of the overheating, and can not suppress the economy from the supply side of the economy overheating. Therefore, the monetary authorities at this time on the basis of the implementation of interest rate rules can also be considered by raising the deposit reserve ratio, reduce the bank's credit supply, from the supply side and demand side to suppress the economy overheating.

![Figure 2](image)

Figure 2. Impulse response of economic variables to consumption preferences under three interest rate rules

(3) the utility of the change in the deposit reserve ratio

As mentioned earlier, this paper externally sets three deposit reserve ratios: high deposit reserve ratio ($\chi = 20\%$), medium deposit rate ($\chi = 15\%$), low deposit reserve ratio ($\chi = 10\%$). In order to examine the impact of the change in deposit reserve ratio on the economy under the dual-credit supply structure established in this paper, Figure 3 shows the interest rate rule II, when ($\chi$) takes 20%, 15% and 10% The impact of a standard deviation on the major economic variables.
It is not difficult to find that, under the impact of positive technology, the total output, although the total consumption increases, inflation is reduced, but compared to the three different deposit reserve ratio fluctuations in economic variables, we can find, low deposits The total output under the reserve ratio increased more. As shown in Figures 3 (a), (b) and (c). The impact of technological shocks at different deposit reserve ratios on commercial banks on state-owned enterprises has not changed much, as shown in Figure 3 (d). The impact of technological shocks on commercial banks on non-state-owned enterprise credit under different deposit reserve ratios is different. As shown in Figure 3 (e). This is mainly because the positive impact of the technology will make the marginal cost of production to reduce, thereby increasing the credit needs of enterprises, but because interest rates have not changed, so the state-owned enterprises credit demand and credit will not happen much change. Under the dual credit supply structure, commercial banks will still meet the credit demand of state-owned enterprises first. Therefore, if the central bank reduces the liquidity of the deposit reserve and increases the bank's loanable funds, it means that banks can give non-state enterprises more credit, that is, commercial banks to non-state-owned enterprises to increase the amount of credit, thereby increasing the proportion of non-state-owned enterprises output, thereby enhancing the economic efficiency of society as a whole.

![Figure 3](image-url)

Figure 3. Impulse response of economic variables to technical shocks at different deposit reserve ratios

This shows that under the dualistic credit economic structure with Chinese characteristics, the reduction of the deposit reserve ratio is not only a loose control means, but more precisely it should be a kind of financial market reform measures. This is because the high deposit reserve ratio will lead to a substantial reduction in the loanable funds of commercial banks, resulting in financial constraints and rising financing costs and other issues, and in the case of reduced loan funds, commercial banks and often only credit To the monopolistic state-owned enterprises in the market, resulting in non-state-owned enterprises caused “crowding out.” Overall, the central bank's excessive deposit reserve ratio has had little impact on state-owned enterprises, but has had a serious impact on nonstate enterprises because it has further increased the difficulty of financing non-state enterprises and even led to State-owned enterprise capital chain breaks or even brink of bankruptcy. This will not only exacerbate China's unemployment pressure, but also hinder China's current economic growth model conversion and economic restructuring and thus affect the entire financial market. Therefore, with the continuous progress of China's financial market reform process, reducing the deposit reserve ratio can not only stimulate the market vitality and stabilize economic growth, But also plays a vital role in the process of "turning the way" in China's economy at present.

4. CONCLUSIONS AND RECOMMENDATIONS

Based on the characteristics of China's property rights system, this paper establishes a dynamic stochastic general equilibrium model which includes heterogeneous manufacturers and dual credit supply structure. Based on this, this paper analyzes the three interest rate rules (interest rate Rules I, II, III) and the impact of the deposit reserve ratio on different economic entities. According to the results of this study, we can get the following conclusions: First, whether it is the impact of cost or consumption preferences, compared to interest rates only on the inflation gap and output gap rate of interest rules I and interest rates on the inflation gap Interest rate rules for gap and asset prices III, interest rate rules that include interest rates on the inflation gap, the output gap and the credit gap II can be more effective in curbing inflation, better stabilizing the output level, and improving the overall welfare of society Level. Second, under the same interest rate rule, the low deposit
reserve ratio can increase the welfare of the various sectors of the economy, especially the increase in the welfare of nonstate enterprises, as compared to the high deposit reserve ratio.

The main contribution of this paper is to introduce the characteristics of China’s property right system and the characteristics of the dual - credit supply structure determined by the dynamic stochastic equilibrium of the existing literatures in China. This paper makes a micro-level supplement on the study of the selection of China’s interest rate rules, which focuses on the macro-level welfare analysis, and makes a positive exploration of the deposit reserve policy in the current economic transition stage. In conjunction with the above findings, we propose two policy recommendations: First, the central bank in the development of interest rate rules, the need to combine China’s own financial development characteristics and the current stage of economic development, in addition to considering the inflation gap and output gap, but also need to consider financial stability, such as bank credit gap and other factors; Second, taking into account the current downward pressure on China's economy, the central bank should further reduce the deposit reserve ratio, the implementation of low deposit reserve policy to increase the commercial banks of the loanable funds, Which is conducive to promoting the commercialization of commercial banks and increase the supply of non-state-owned enterprises, which will not only promote the financial market-oriented reform, But also to improve the proportion of non-state-owned enterprises output, which will help promote the transformation of China’s economic growth and economic restructuring, to ensure long-term sustained growth of China's economy.

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