DSGE Analysis of the Role of Structural Transformation and Innovation in Driving US Sustainable Development

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Abstract. Although the existing DSGE (Dynamic Stochastic General Equilibrium) analysis has made great achievements, there are still economic growth theory behind, and lack of tertiary industry proportion, urbanization, informationization, knowledge-intensive industries, Structural variables such as financial structure, lack of innovative variables such as scientific and technological input, lack of resource and environmental variables such as energy conservation and emission reduction, and thus cannot fully reflect the economic reality of structural transformation, innovation-driven and sustainable development. To this end, this article takes the United States as an example, combines the new theory of economic growth (Synergy Theory), structural transformation theory, innovation-driven theory and related population, resources and environmental economic theory to establish a model group and construct the expected utility function and Lager. The Lange function, in turn, constructs the DSGE model system for economic growth in the United States, and uses econometric methods to determine the a priori values of the parameters, and then uses the Bayesian method for parameter correction, simulation and policy measures to analyze knowledge-intensive The effects of fluctuations in structural variables such as industry and urbanization on the role of US sustainable development and innovation-driven, sustainable development of state variables and control variables, the results of the study are very realistic, and also for countries to promote structural transformation, innovation-driven policy development Provides references and evidence.

Introduction

Structural reform, innovation-driven, financial stability, precise poverty alleviation, energy conservation and emission reduction are important contents of Xi Jinping's socialist thinking with Chinese characteristics in the new era. According to these guiding ideologies, the Chinese economy has maintained an economic growth rate of more than 6.5% in recent years, and the whole the social and ecological environment has progressed comprehensively. Since 1947, the United States has made great achievements in structural reform (industrial structure, urban and rural structure, technology and capital structure, etc.) and accumulated a lot of experience. Based on the theory of co-association of economic growth and the theory of structural reform and the theory of innovation drive, this paper draws on the rational expectations of Lucas et al., the theory of New Keynesianism and the theory of financial stability, and uses the DSGE model for the economic development of the United States since 1947. Research to analyze the role of structural reforms and innovation-driven economic growth.

The DSGE model links CGE to the macroeconomic model[1]. They include "deep parameters" (like the general equilibrium model, which a priori information about the expected values of the parameters, calibration or estimation of the parameters) and standard parameters to be estimated. Peter Ireland combines DSGE with VAR (Vector Autoregressive Model) and uses maximum likelihood estimation to explain the total output and employment volatility of the post-war US economy[2]. Frank Smets et al. estimated the oscillating and frictional forms of the US and European economies from 1974 to 2002 using the DSGE model[3]. Walque and Rabanal used the DSGE model to predict macroeconomic policies in multiple countries[4][5]. Smets and Wouters used the...
New Keynes DSGE model as an extension of labor-enhanced technological advancement to discuss the sources of fluctuations in the US economic cycle and the impact of technological advances on labor time[6]. In terms of optimal monetary policy and fiscal policy choices, Lorenzo Forni et al. used the DSGE model to estimate the impact of European fiscal policy[7]. The result of the estimation is that fiscal policy variables contribute little to the cyclical impact of major macroeconomic variables.

Although DSGE has made great progress, Romer pointed out that the DSGE model is proud of the micro-foundation hypothesis[8], but cannot give a reasonable explanation for the negative TFP impact on a microscopic basis, nor can it provide any correlation. The theoretical basis. The key failure of the DSGE model is its microfoundation. Korinek's critique of the DSGE analysis framework is equally acute[9]. He points out that the constitutional constraints associated with the DSGE analysis framework concept, complex solutions, simulation algorithms, and the resulting bias can hinder economics. development of. Williams argued that the DSGE analysis framework lacked the basis for an analysis of long-term economic issues[10]. Gali also responded strongly to the criticism of the DSGE analysis framework: anyone who opposes the use of the DSGE model will find it difficult to find another alternative to the DSGE model to become a macroeconomic analysis[11].

The current DSGE research has made great progress, but the analysis of economic growth and related problems is not ideal. The main reason is that the economic growth model is old and lacks structural factor variables, lack of innovation factor variables, which leads to the deviation of the DSGE model system. Economic reality, the method of determining the a priori value of the parameter and the error of the logarithmic linearization also need to be solved. To this end, this paper introduces technology and asset structure variables such as information technology equipment, transportation equipment, intellectual property assets, introduces industrial structure variables such as the proportion of tertiary industry and knowledge-intensive industries, and introduces urban and rural population structure variables such as urbanization and urbanization. Introduce financial structure variables such as direct financing and indirect financing, introduce new energy ratios, environmental legislation and other resource and environmental structure variables, and introduce innovative driving variables such as patents, innovation systems, and research and development personnel to fully reflect structural reform, innovation-driven and sustainable development. The economic reality has also greatly expanded the research horizons and conceptual categories of economics, and related to economic growth theory, structural reform theory, innovation-driven theory, fiscal and monetary policy theory, financial stability theory, precise poverty alleviation theory, energy conservation and emission reduction theory, etc. The theoretical content is a new synthesis.

This comprehensive study bridges the relationship between Friedman's monetarism and Keynes's effective demandism, and quantitatively demonstrates the correctness of structural reform theory and innovation-driven theory.

DSGE Model Group Based on the Synergy Theory and the Theory of Supply-side Structure Reform and Innovation-driven Theory

Enterprise-based Structural Reform, Innovation-driven and Economic Growth Module

Economic Growth Model. Liu Wei et al. pointed out that in the value-added (national income), it includes both the income from the investment and the income from the operation and management of these investments. income[12].

The Synergy Theory decomposes the gross domestic product of the United States into compensation of employees and physical capital benefits and synergy benefits, using income value decomposition method to study economic growth.

According to the income decomposition method, GDP can be decomposed into compensation of employees (generalized compensation of employees including wages, social security, related taxes, etc.), physical capital benefits (generalized physical capital benefits include depreciation,
investor-divided profits, interest, related Taxation, etc.), synergy benefits, and so on [13]. In summary, according to the above-mentioned theory, the model of US GDP is established as follows:

\[
Y_t = (E_t \ast L_t \ast L_t)^{0.49}(S_{t-1} \ast D_t)^{0.12} + 0.17K_{t-1} + 0.0198S_{t-2} \ast E_t^2 + 0.0236D_t \ast E_t
\]  

(1)

In formula (1), \(Y_t\) represents gross domestic product, \(L_t\) represents employment, \(S_{t-2}\) represents scientific and technological input, \(K_{t-1}\) represents physical capital stock, \(E_t\) represents the years of employment of employees, and \(D_t\) represents fixed assets investment.

**Technology Input Model of Structural Transformation Perspective.** Information technology itself is highly innovative, let \(\text{INF}_{t-2}\) denote information processing equipment, and \(\text{TCP}_{t-2}\) denote the population of the urban agglomeration with a population of more than 1 million (% of the total population), \(\text{KN}_{t-2}\) indicates a knowledge-intensive industry, \(\text{LO}_{t-2}\) indicates indirect financing (loan), and a technology investment model that constructs a structural transformation perspective:

\[
S_t = 1.85 \ast (100 + \text{INF}_{t-2}) \ast \text{URB}_{t-2} \ast \text{TCP}_{t-2} - 0.0005 \ast \text{KN}_{t-2} \ast \text{KN}_{t-2} + 0.14 \ast \text{TCP}_{t-2} \ast \text{KN}_{t-2} - 5500
\]

(2)

**Model of the Role of Structural Transformation in the Workforce.** With the expansion and extension of the information industry, some new jobs have emerged. Using the data from 1947-2016 US labor force, \(L_t\) ICT development level (\(\text{IND}_{t-2}\)), metropolitanization rate (\(\text{TCP}_{t}\)), population total (\(\text{POP}_t\)), construct structural transformation the role model of labor:

\[
L_t = (1 + \text{INF}_{t-2})^{0.0412} \ast \text{IND}^{0.0412}_{t-2} \ast \text{TCP}^{0.0412}_{t-2} \ast F_E^{0.0412} \ast \text{POP}^{0.89}_{t-2}
\]

(3)

**The Role of Structural Transformation in Human Capital.** The development of the information technology industry not only raises the level of employment, but also puts higher demands on human capital. Let \(E_t\) represent US human capital. \(\text{IND}_{t-2}\) for service rate, \(\text{TCP}_{t}\) for metropolitanization rate, \(\text{URB}_{t-2}\) for urbanization rate, \(\text{POP}_{t-2}\) represents the total population, \(\text{GI}_t\) represents the Gini coefficient, \(\text{PR}_t\) represents the poverty rate, and the role of structural transformation on human capital.

\[
E_t = 5 + 0.00000582 \ast (100 + \text{INF}_{t-2}) \ast \text{TCP}_{t-2} \ast \frac{\text{URB}_{t-2}}{(\text{GI}_t \ast \text{PR}_t)} + 0.00000172\text{POP}_{t-2} \ast \text{IND}_{t-2} + 10 \ast \text{IND}_{t-2}
\]

(4)

**The Role of Structural Transformation in the Investment of Fixed Assets.** Let \(\text{INF}_{t-2}\) denote the information processing equipment of the previous year, \(\text{IND}_{t-2}\) denotes the proportion of the service industry in the previous year, and \(\text{URB}_{t-2}\) denotes the city of the previous two years. \(\text{TCP}_{t-2}\) indicates the population of the urban agglomeration with a population of more than 1 million (accounting for the total population), \(\text{LO}_{t-2}\) indicates indirect financing for the previous two years, and \(\text{D}\) indicates total domestic fixed investment, \(\text{KN}_{t-2}\) indicates the value added of knowledge-intensive industries in the previous two years, \(\text{BR}\) indicates the interest rate of B-level loans, and \(\text{AGR}_{t-1}\) indicates the agricultural modernization of the previous year, and the role model of structural transformation on fixed assets investment:

\[
D_t = [(100 + \text{INF}_{t-2}) \ast \text{URB}_{t-2} \ast \text{TCP}_{t-2} \ast \text{KN}_{t-2} \ast FE_t/(\text{IND}_{t-2})]^{0.28} \ast [\text{LO}_t/(100 + \text{BR}_t)]^{0.06}
\]

(5)

**Model of the Effect of Structural Transformation on Capital Stock.** \(\text{INF}_{t-2}\) indicates information processing equipment, \(\text{URB}_{t-2}\) indicates urbanization, and \(\text{TCP}_{t-2}\) indicates that the population of the urban agglomeration with a population of more than 1 million accounts for the total population. The percentage, \(\text{DF}_{t-1}\) indicates direct financing, and \(\text{KN}_{t-2}\) indicates knowledge-intensive industries, the following model:

\[
K_{t-1} = 0.582 \ast (100 + \text{INF}_{t-2}) \ast \text{URB}_{t-2} \ast \text{TCP}_{t-2} + 0.014 \ast \text{DF}_{t-1} + 2.96 \ast \text{KN}_{t-2}
\]

(6)

**Infrastructure Investment Modules such as Transportation.** Let \(\text{TR}_{t-2}\) denote transportation equipment, \(\text{IP}_{t-2}\) denotes intellectual property rights, \(\text{HS}_{t-2}\) denotes private housing units,
Representing the population, establishing the following US transportation and urbanization, urbanization models:

$$\frac{TCP_{t-2}}{URB_{t-2}} = (TR_{t-2} \times HS_{t-2} \times POP_{t-2}/IP_{t-2})^{0.0947} \times (IP_{t-2} \times HS_{t-2})^{0.13759}$$

(7)

Continuous Innovation Module

Let $S_{t-2}$ represent the research and development expenditure; $PA_t$ represents the amount of patent authorization; $N_t$ represents the number of scientific and technological personnel, and $SY_t$ represents the innovation system (using the research and development investment of the enterprise to account for all research and development investment) Proportional metric). The relationship between the number of R&D personnel and the investment in research and development, the number of patents, and the innovation system is a typical C-D production function relationship. The following model is available:

$$\log N_t = 0.69 \log S_{t-2} + 0.166 \log PA_t + 0.53 \log SY_t$$

(8)

Financial, Monetary, and Financial Modules

Average Tax Rate Model. Let $ART_t$ denote the average tax rate trend of the year, $ART_{t-1}$ denotes the average tax rate of the previous period; $P_t$ denotes the price; $CU_t$ denotes the capacity utilization rate. $GI_t$ indicates the Gini coefficient, and $PR_t$ indicates the poverty rate. The following model can be established:

$$ART_t = 0.023 - 0.032P_t \times P_t \times GI_t \times PR_t + 0.00257CU_t \times P_t$$

(9)

Where $ART_t = AR_t - 0.92AR_{t-1}$, $ART_t$ indicates the dynamic trend of the tax rate.

Debt Model

Let $GB_t$ denote total debt, $DR_t$ denote two-tier government deficit rate, $DG_t$ denote government debt to government income ratio, $NG_t$ indicates net export, $IND_{t-2}$ indicates the proportion of the tertiary industry, and establishes a debt analysis model:

$$\frac{GB_t}{Y_t} = -0.19DG_t + 0.116DG_t + \frac{0.656NG_t}{Y_t} + 2.11IND_{t-2}$$

(10)

Interest Rate Model. Let $BR_t/BR$ denote the actual value of the B-level loan interest rate ratio trend value, $P_t/P$ denote the actual value of the price ratio trend value, $Y_t/Y$ denote the actual value ratio trend value of GDP, $M2_t/M$ The actual value of M2 is greater than the trend value, $CU_t/CU$ represents the actual value of the capacity ratio trend value, according to the monetary policy rules (Taylor rule), the following model is established,

$$\frac{BRT_t}{BRT} = 1.7 + 0.74\left(\frac{M2_t}{M_t}\right) + 0.04(P_t/P)/(CU_t/CU)$$

(11)

Among them, $BRT_t = BR_t - 0.92BR_{t-1}$, $ART_t$ indicates the dynamic trend of interest rates.

Indirect Financial Total Model. Let $LO_t$ denote the total indirect financial amount (the number of loans), $BRT_t$ denotes the Baa-level loan interest rate ratio trend value, $CPI_t$ denotes the enterprise after-tax profit, $Y$ denotes the gross national product, $M2_t$ stands for Currency circulation, establish the following model:

$$LO_t = -90 + \frac{1.363M2_t}{BRT_t} + 0.000473(CPT_t + FPT_t)Y_t$$

(12)

Enterprise Performance Module. According to the structure-behavior-performance theory in industrial economics, $VA_t$ indicates the rate of increase, and $FPT_t$ indicates the ratio of added value of GDP to non-financial enterprises, $KN_{t-2}$ The proportion of high-end (knowledge-intensive) industries, $IND_{t-2}$ indicates the proportion of service industry, $S_{t-2}$
indicates research and development, and the following value-added rate analysis model is established:

\[ VA_t = -1.32 FPT_t \times KN_{t-2} + 1.582 FPT_t + 0.18 KN_{t-2} \times IND_{t-2} + 0.012 S_{t-2} / Y_t \]  

(13)

Resident Module

**Consumption Model.** From the perspective of industrial chain and final demand, combined with the growth effect of the industry, on the basis of subdividing 46 industries, according to the four main needs of “food and clothing”, “residence”, “travel” and “study”, Let \( C_t \) denote consumption, \( UM_t \) denote unemployment rate, \( L_t \times E_t \) denote human capital, and \( L_t \) denote employment number. Then you can build the following consumption model:

\[ C_t = 0.0215 PS_t \times (100 + UM_t) + 382.3303 TR_t + 100 + UM_t + 3.9404 L_t \times E_t - 0.0358 L_t \]  

(14)

**Residents' Income Distribution Model.** Let \( TS_t \) denote tax, \( M_2_t \) represents currency circulation, and \( GB_t \) represents all department debts, then the following model can be established:

\[ \begin{align*} 
& 0.172 K_t^{-1} + 0.000537 L_t \times E_t \times 0.517 S_{t-2} \times D_{t-2} - TS_t - 0.75 C_t - D_t - FD_t = \\
& 267 M_{2_t} / P_t + 0.146 GB_t - 0.00000571 GB_t \times GB_t \end{align*} \]  

(15)

**Money Supply and Price Model.** Let \( Y_t \) denote GDP, \( M_2_t \) denotes currency issuance, \( CU_t \) denote capacity utilization rate, \( UM_t \) denotes unemployment rate, \( OP_t \) denotes oil price, and the following model is established:

\[ M_2_t \times Y_t \times P_i = 0.000761 - 0.000064 \times CU_t \times 100 + UM_t + 0.000000901 \times \frac{P_t}{OP_t} \]  

(16)

**Energy Saving and Emission Reduction Module**

**Energy Consumption Rate Model.** Let \( EC_t \) represent Primary Energy Consumption, \( HE_t \) indicates High energy-consuming industry, \( INF_{t-2} \) indicates information processing equipment for the first two years, \( TCP_t \) indicates the percentage of the population in the urban agglomeration with a population of more than 1 million, \( IND_{t-2} \) indicates the proportion of the service industry, \( URB_{t-2} \) indicates urbanization, \( RE_t \) stands for Renewable energy ratio, \( S_{t-2} \) stands for R&D expenditure, \( E_t \) indicates Number of environmental regulations, and the following models are available:

\[ \begin{align*} 
& EC_t = 18.9908 - 0.064555 \times ER_t + 561.0683 \times HE_t \times S_{t-2} \times INF_{t-2} \times TCP_{t-2} \times IND_{t-2} \times URB_{t-2} \times ER_t \\
& - 0.0000205 \times \frac{S_{t-2} \times INF_{t-2} \times TCP_{t-2} \times IND_{t-2} \times URB_{t-2} \times ER_t}{Y_t} \\
& \times \frac{Y_t}{S_{t-2} \times INF_{t-2} \times TCP_{t-2} \times IND_{t-2} \times URB_{t-2} \times ER_t} \end{align*} \]  

(17)

**Carbon Emission Model.** \( CE_t \) indicates carbon emissions, \( EC_t \) stands for energy consumption, \( S_{t-2} \) indicates R&D expenditure, \( INF_{t-2} \) indicates information processing equipment for the previous two years, \( IND_{t-2} \) indicates the proportion of the service industry in the previous two years, \( ER_t \) indicates the number of environmental regulations, and \( TCP_{t-2} \) indicates the population of the urban agglomeration with a population of more than 1 million (% of the total population), \( URB_{t-2} \) indicates the urbanization ratio, and \( RE_t \) represents the proportion of renewable energy. The following models are available:

\[ CE_t = 775.7368 + 0.054559 \times EC_t - 0.000177 \times S_{t-2} \times INF_{t-2} \times IND_{t-2} \times ER_t \times TCP_{t-2} \times URB_{t-2} \times ER_t \]  

(18)

**Pollutant Emission Model.** Let \( PE_t \) represent the pollutant discharge index, \( EC_t \) for energy consumption, \( S_{t-2} \) for research and development input, \( CE_t \) for carbon emission, \( INF_{t-2} \) for information processing equipment, \( KN_{t-2} \) indicates knowledge-intensive industries, \( TCP_{t-2} \) indicates the percentage of the population in the urban agglomeration with a population of more than 1 million, and \( URB_{t-2} \) For urbanization, there are the following models:
Model Solving and Parameter Estimation

Objective Function of the Entire Economic System

Different from the previous objective function form of DSGE, this paper establishes the objective function of the whole economic system as follows:

\[
E_0 \sum_{t=0}^{\infty} \beta^t \left[ \frac{C^\mu}{1-\mu} \cdot \frac{L_t^{1-\xi}}{1-\xi} + \frac{\lambda \cdot P_{t-1} \cdot M_2 \cdot FIN_t \cdot (1 + CAE_t) \cdot CU_t \cdot Y_t}{P_t^2 \cdot TCP_t^2 \cdot RAB_t \cdot LO_t \cdot AR_t \cdot GB_t \cdot OP_t} \right]
\]

(20)

In this objective function, \( E_0 \) represents the expectation and \( \beta^t \) is the discount factor. \( M_t, FIN_t, CAE_{t-2}, CU_t, P_t, TOP_t, RAB_t, LO_t, AR_t, GB_t, OP_t \) represents money supply, financial total, capital adequacy ratio, capacity utilization rate, interest rate difference between Class B loans and Class A loans, indirect financial total, average tax rate, ratio of debt to GDP in all sectors, oil price, \( \lambda_t \) is a coefficient.

Now, equations (1) through (19) form the DSGE model framework for the US economic system.

Where \( P_t \) is the state variable,

\[
[Y_t, S_{t-2}, L_t, E_t, D_t, K_{t-1}, AR_t, GB_t, BR_t, N_t, EC_t, CE_t, PE_t, LO_t, C_t, VA_t, TS_t, M2_t, TCP_{t-2}]
\]

are the control variable,

\[
[URB_{t-2}, KN_{t-2}, INF_{t-2}, IND_{t-2}, POP_t, I_t, G_t, FE_t, DF_t, CU_t, PR_t, DR_t, DG_t, NG_t, PA_t, SY_t, ER_t, HE_t, RE_t, CPT_t, PFT_t, UM_t, HS_t, FPG_t, OP_t, TR_t, HSS_t, TTR_t]
\]

are random variables.

Based on this, the following Lagrangian function is established:

\[
L = E_0 \sum_{t=0}^{\infty} \beta^t \left[ \frac{C^\mu}{1-\mu} \cdot \frac{L_t^{1-\xi}}{1-\xi} + \frac{\lambda \cdot P_{t-1} \cdot M_2 \cdot FIN_t \cdot (1 + CAE_t) \cdot CU_t \cdot Y_t}{P_t^2 \cdot TCP_t^2 \cdot RAB_t \cdot LO_t \cdot AR_t \cdot GB_t \cdot OP_t} \right] + \eta_t (0.172K_{t-1} + 0.00537L_t^{0.34} + 0.517S_t^{0.2} - D_t - TS_t - 0.75C_t - D_t - FD_t + \frac{267M2_t}{P_t} + 0.146GB_t - 0.0000571GB_t \times GB_t)
\]

(21)

Solving the Model

According to the above Lagrangian function, the consumer derivative is obtained as follows

\[
\frac{\partial L}{\partial C} \cdot 0.75 \cdot \eta_t = C^{-\mu}
\]

(22)

Then ask for the price and get the following formula

\[
0 = -2E \cdot \lambda_t \cdot P_{t-1} \cdot FIN_t \cdot (1 + CAE_t) \cdot CU_t \cdot Y_t \cdot (TOP_t^2 \cdot P_t^2 \cdot RAB_t \cdot LO_t \cdot AR_t \cdot GB_t \cdot OP_t)
\]

(23)

\[
0 = E256 \cdot \frac{C^\mu}{P_t^2} + \lambda_{t+1} \cdot (1 + CAE_{t+1}) \cdot CU_{t+1} \cdot Y_{t+1} / (TOP_{t+1}^2 \cdot P_{t+1}^2 \cdot RAB_{t+1} \cdot LO_{t+1} \cdot AR_{t+1} \cdot GB_{t+1} \cdot OP_{t+1})
\]

Equations (1) through (19), plus equation (24), and various random variable forms the DSGE model framework for US economic growth. This is a set of nonlinear models that are not easy to solve directly. Harald Uhlig proposed a relatively simple logarithmic linearization method. Consider the general variable \( X_t \), defining \( X_t = X(1 + x_t) \). The uppercase letter \( X \) without the subscript indicates the trend value of \( X_t \), and \( x_t \) indicates the deviation of the fluctuation component of the variable from the trend value \( X \). Since \( x_t \) is close to 0, \( e^{x_t} = 1 + x_t \). The convenience of the Uhlig method is that no explicit derivative is needed. It is ok to do variable substitution directly, and this variable substitution is easy to mechanize. The result obtained using
Variance Decomposition and Simulation

Uhlig describes the degree to which the fluctuation component of the variable deviates from its trend value. Thus, based on the US data from 1947 to 2016, using Bayesian estimation and econometric methods to estimate parameters, equations (1) and (18) can be linearized into the following model system:

(1) \( 0 = -y_t + 0.56l_t + 0.47e_t + 0.14s_{t-2} + 0.12d_t + 0.27k_{t-1} \)
(2) \( 0 = -s_{t-2} + 0.042o_{t-2} + 0.015inf_{t-2} + 1.1kn_{t-2} + 1.65tcp_t \)
(3) \( 0 = -l_t + 0.0022inf_{t-2} - 0.9tcp_t + 0.958pop_t + 0.22fe_t \)
(4) \( 0 = -e_t + 0.079 \ast (ind_{t-2} + tcp_t + ub_{t-2} + kn_{t-2} + ip_t - 2gi_t - y_t) + 0.35pop_t \)
(5) \( 0 = -d_t + 0.33inf_{t-2} - 0.15br_{t-2} + 0.15lo_{t-2} + 0.33(tcp_t + ub_{t-2} + kn_{t-2} - ind_{t-2} - fe_t) \)
(6) \( 0 = -k_{t-1} + 0.06(tcp_{t-2} + ub_{t-2}) + 0.03(inf_{t-2} + tcp_{t-2} + ub_{t-2}) + 0.0175df_{t-1} + 0.73kn_{t-2} \)
(7) \( 0 = -art_t - 0.18(gi_t + pr_t) + 0.31cu_t \)
(8) \( 0 = -ad_t - 0.014dr_t + 0.26dg_t - 0.02ng_t + 0.02y_t + 1.38ind_{t-2} \)
(9) \( 0 = -bri_t - 0.14cu_t - 0.74y_t + 0.74m2_t \)
(10) \( 0 = -lo_t + 1.14m2_t - 0.01br_t + 0.03cpt_t + 0.05y_t + 0.02fpt_t \)
(11) \( 0 = -vo_t - 1.01kn_{t-2} + 0.84fpg_t + 0.11ind_{t-2} + 0.05(s_{t-2} - y_t) \)
(12) \( 0 = -(ub_{t-2} + 2tcp_t) + 0.095(tr_t + hs_t + pop_t - ip_t) + 0.138(ip_t + hs_t) \)
(13) \( 0 = -nt_{t-2} + 0.69s_{t-2} + 0.166pa_{t-2} + 0.53sy_{t-2} \)
(14) \( 0 = -ec_t + y_t + 0.476er_t - 0.037he_t - 0.0767s_t - 0.0767inf_{t-2} - 0.0767tcp_t - 0.0767ind_{t-2} - 0.0767ub_{t-2} \)
(15) \( 0 = -ce_t + 0.9ec_t - 0.0094(s_{t-2} + inf_{t-2} + ind_{t-2} + er_t + tcp_t + ub_{t-2}) - 0.1re_t \)
(16) \( 0 = -pc_t + 2.477ec_t - 0.09(s_{t-2} + inf_{t-2} + tcp_t + ub_{t-2} + kn_{t-2}) - 3.05ec_t \)
(17) \( 0 = -c_t + 0.476hs_t + 0.17tr_t - 0.15um_t + 1.666e_t - 0.43l_t \)
(18) \( 0 = -ts_t + 1.15k_{t-1} + 0.98l_t + 0.49e_t + 0.24s_{t-2} + 0.85d_t - 1.345c_t - 0.73(m2_t - p_t) - 0.017gb_t \)

Variance Decomposition and Simulation

HP Filter Analysis

The simulated value refers to the result of simulation analysis using the built DSGE model. The closer the Kydland-Prescott variance ratio (the ratio of the simulated value of the standard deviation to the actual value) is, the more accurate the analysis of the variable is. According to the simulation results, the accuracy of y, d, k, va simulations is 100%, which can accurately and fully reflect the fluctuation of these variables. The accuracy of the simulation of fluctuations in consumption is 94%, and the accuracy of the simulation of fluctuations in R&D personnel is 88%. The average accuracy of the simulation of all control variables was 72%, reaching a "quite accurate" level.

Variance Decomposition

For the model system in which the parameter value estimated by econometric method is a priori value and then the Bayesian method is used to linearize the parameter estimation, the DYNARE software based on MATLAB is used to perform variance decomposition, and the random variables are used for state variables and control. The degree of influence of the fluctuation value of the variable on the deviation of the trend value is analyzed. From the decomposition of variance, it can be clearly seen that knowledge-intensive industries play the first role in promoting US economic growth. The tax rate is mainly determined by the capacity utilization rate (economic growth rate). The main factors of debt growth include: real estate consumption, government debt, and information technology investment. The price of oil has an important impact on the economic growth of the United States. Oil prices directly affect the price index, which affects interest rates and currency issuance and financing. Transportation equipment and services have a great impact on US employment, technology and debt. The US economy still has a certain impact, with a 25% impact on consumption, 39% on government spending, and 32% on debt. After the United States in 1970, the
decline in pollutant emissions and the weakening of energy and carbon emissions, the main driving force is the transformation of industrial structure (the rapid development of knowledge-intensive industries driven by information technology) and environmental protection laws and regulations. Formulation and implementation, energy structure changes, etc.

**Simulation Analysis**

In the decades of structural transformation and innovation driven by the United States, the power driven by innovation is greater than the power driven by investment, and the new kinetic energy is greater than the old kinetic energy.

According to the above strategic ideas, the simulation is carried out to analyze the influence of random variable combination shock on state variables and control variables, and to study the random shock, state variables and control variables of all random variables in response to this impact. In such a combined shock situation, state variables and control variables such as CPI, fiscal revenue, employment, investment, GDP, etc., all produce positive fluctuation responses at the beginning of the period, especially in 2-3 years, and then gradually stabilize. State, see Figure 4.

**Conclusion**

1. This article is a comprehensive study of various theories, including the macroeconomics, structural reform theory (urbanization, urbanization, informationization, the proportion of the tertiary industry, the proportion of knowledge-intensive industries), and the innovation economy. (research input, human capital, patents, innovation systems, R&D personnel), environmental economics (energy consumption, carbon emissions, pollutant emissions). This paper introduces asset structure variables such as information technology equipment, transportation equipment and intellectual property assets, introduces industrial structure variables such as proportion of tertiary industry and knowledge-intensive industries, introduces urban and rural population structure variables such as urbanization and urbanization, and introduces direct financing and indirect. Financial structure variables such as financing, introduction of new energy ratios, environmental legislation and other resource and environmental structure variables, introduction of innovation drivers such as patents, innovation systems, research and development personnel, etc., to fully reflect structural transformation[14], innovation-driven and sustainable development of the economy in fact, it has greatly expanded the research horizon and concept category of economics. It is a new theory for economic growth, structural reform theory, innovation-driven theory, fiscal theory, financial stability theory, precision poverty alleviation theory, energy conservation and emission reduction theory. Comprehensive.

2. Knowledge-intensive industries play the first role in promoting US economic growth.
3. The effects of informatization on the US labor force, domestic fixed asset investment, all partial debt-to-GDP ratio, pollutant emissions, and taxation are 28%, 72%, 19%, 14%, and 26%, respectively;
4. The tax rate is mainly determined by the capacity utilization rate (economic growth rate);
5. The main factors of debt growth include: real estate consumption, government debt, and information technology investment;
6. Oil prices have an important impact on US economic growth. Oil prices directly affect the price index, which affects interest rates and currency issuance and financing;
7. Transportation equipment and services have a great impact on US employment, technology and debt;
8. Real estate consumption still has a certain impact on the US economy, with a 72% impact on consumption, 47% on government spending, and 38% on debt;
9. This paper constructs the financial stability index as an important optimization target. This index contains many factors, so it can identify the financial crisis;
10. After the United States in 1970, the decline in pollutant emissions and the weakening trend of energy and carbon emissions, the main driving force is the transformation of industrial structure (information industry, the rapid development of knowledge-intensive industries), energy structure...
Structural changes such as transformation and technological innovation, especially the formulation and implementation of environmental protection laws and regulations.

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