A Kind of Neither Keynesian Nor Neoclassical Model (8): Equilibrium Between Fictitious and Substantial Economy

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Abstract

The fictitious economy and the substantial economy are two unique forms in the macro economy. The balance between the two determines reasonable macro interest rates, normal inflation rates, potential output growth rates, and minimum unemployment rates. Countercyclical monetary policy has also changed the operating state of the economy system while restraining the cyclical fluctuations of the macro economy. In order to get these conclusions, this paper first defines the measurement methods of fictitious economy and substantial economy and their relations in economic operation, then analyses the economic significance of the balance between them and the causes of imbalance, and finally predicts and verifies the changing rules of various macro variables in these two forms. The greatest feature of this paper is that all inferences are verified by statistical data.

Keywords

Cobb-Douglas Function, Fictitious Earning Ratio, Substantial Earning Ratio, Average Earning Ratio, Marginal Earning Ratio

1. Introduction

Whenever the economy enters a recession or is struggling, people will expect the central bank to implement a loose monetary policy while experts are also beginning to predict the extent of interest rate cuts and monetary easing. Although the statistics show that counter-cyclical monetary policy has no effect or even counterproductive, the central bank does not have to bear the burden of economic depression or even worse.

Theories of countercyclical regulation generally come from two aspects. The first is the simple AD-AS model, namely the relationship between aggregate demand and supply. The second further explains how the IS-LM model determines the investment level in aggregate demand, that is, the relationship between the product market and the capital market. In this aspect of theories, the increasing money supply can push the LM curve to the right, where the balanced interest rate falls and the investment increases, so that the AD curve shifts to the right and the corresponding output level rises [1].

However, statistical data tend to be contrary to the speculation of the aggregate demand model: the investment of enterprises is not bigger but smaller when the interest rate is low, and the expenditure of consumers is not more but less when the inflation rate falls. The contradiction generates from the fact that a favorable interest rate for a certain enterprise will enhance its competitiveness, therefore stimulates its enthusiasm for additional investment. However, if all enterprises get the same favorable interest rate, then it is no longer a favorable interest rate.

Although we cannot easily transplant microeconomic theory into macroeconomic field in order to avoid synthetic reasoning fallacies, but the concepts and measurement
methods related to “earning ratio” are consistent in both microeconomics and macroeconomics.

2. Earning Ratio of Different Concepts and Their Changes

Starting from the Cobb-Douglas function \( Y = AK^aL^b \), we use the ratio of output to production factor \( Y/(K+L) \) to measure macroscopic production status [2]. The variables \( K \) and \( L \) are determined by the assumptions \( \partial Y/\partial K = r \) and \( L^\beta = K^\alpha \), respectively. Therefore, as long as there are statistical data of output \( Y \), interest rate \( r \) and distribution parameter \( \alpha \), we can calculate the average output level of macro production in a certain period. Since the factor \( L \) is a function of \( K \), this metric can also be simplified from \( Y/(K+L) \) to \( Y/K \). \( Y/K \) is the reciprocal of the fictitious price earning ratio \( K/Y \) which we named it in our previous paper [3].

The average values of \( Y/(K+L) \) and \( Y/K \) in the United States during 1970-2017 were 0.1858 and 0.1868, respectively. Since there are almost no differences between the two methods of measuring production status, we will replace \( Y/(K+L) \) with \( Y/K \) in the future. As shown in Figure 1, \( Y/K \) has gradually declined from 1981, and it has only stabilized at a lower level since 2012 (the average \( Y/K \) in 2012-2017 is 0.0363).

For convenience, we will call \( Y/K \) the average earning ratio of the fictitious 1 asset \( K \), since \( K \) is derived from the Cobb-Douglas function rather than from statistics. To explain reasons for the decline of the fictitious average earning ratio \( Y/K \) and its impact, it is also necessary to analyze the changes of the fictitious marginal earning ratio \( \alpha Y/K \) and their corresponding substantial average earning ratio \( Y/K_f \) and the substantial marginal earning ratio \( \alpha Y/K_f \).

The fictitious marginal earning ratio \( \alpha Y/K \) is derived from

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1 In the previous paper, we used virtual economics and factual economics to distinguish between different economic forms. According to expert advice, it is best to use the adjectives fictitious and substantial instead of virtual and factual when discussing economic issues.
the partial derivative $\partial Y / \partial K$ of $Y = AK^\alpha L^\beta$. Further calculation of $\alpha Y / K$ also requires $\partial Y / \partial K = r$. The substantial marginal earning ratio $\alpha Y / K_f$ is the ratio of the component return $\alpha Y$ to the fixed assets $K_f$ in the statistic. Since we have corresponding statistics to the allocation parameter $\alpha$, the $Y$ and the fixed assets $K_f$, it is easy to observe changes of the substantial average earning ratio $Y / K_f$ and the substantial marginal earning ratio $\alpha Y / K_f$ in the United States and compare them with $Y / K$ and $\alpha Y / K$ as shown in Figure 2.

As for the earning ratios analyzed in this paper, they are often classified according to different needs. For example, it may be classified by fictitious earning ratio and substantial earning ratio, or by average earning ratio and marginal earning ratio. The former refers to the fictitious average earning ratio $Y / K$ and fictitious marginal earning ratio $\alpha Y / K_f$, which corresponds to the substantial average earning ratio $Y / K_f$ and the substantial marginal earning ratio $\alpha Y / K_f$. The latter refers to the fictitious average earning ratio $Y / K$ and the substantial average earning ratio $Y / K_f$, which corresponds to the fictitious marginal earning ratio $\alpha Y / K$ and the substantial marginal earning ratio $\alpha Y / K_f$.

**Figure 3.** Comparison of the size of the substantial earning ratio under different statistical calibers of $K_f$. Sources: (1) The data of $K_f$ as "Fixed Assets" is the same as Figure 2. (2) The data of $K_f$ as "Fixed Assets and Consumer Durable Goods" come from http://www.bea.gov: Current-Cost Net Stock of Fixed Assets and Consumer Durable Goods (Last Revised on: September 07, 2016). (3) The rest is the same as Figure 1. (4) The dotted line in the figure is the position of the average of the different variables.

It is noticeable and skeptical that the average US substantial earning ratio $\alpha Y / K_f$ and $Y / K_f$ are as high as 0.1467 and 0.4507 in 1970-2016, which means that the marginal and average earning ratio on fixed assets are 14.67% and 45.07% in statistical data. This is much different from the average market interest rate of 5.87% in the same period. According to our basic assumptions, if we do not consider the impact of the business cycle, the long-term average of the substantial marginal earning ratio $\alpha Y / K_f$ and the market interest rate $r$ should be very close, which $\alpha Y / K_f \approx r$ [5]. We suspect that the statistical data "Private fixed assets" is too small to be considered as $K_f$.

Prior to 2017, the title for statistics of $K_f$ listed by the U.S. Bureau of Economic Analysis (BEA) was "Private fixed assets and consumer durable goods" instead of "Private fixed assets". The former is about 1.45 times the latter. According to "Private fixed assets and consumer durable goods", the average values of the marginal earnings ratio $\alpha Y / K_f$ and the average earning ratio $Y / K_f$ from 1970 to 2016 are 0.0998 and 0.3068 respectively, which are less than the average values of 0.1467 and 0.4507 calculated by "Private fixed assets", respectively, as shown in Figure 3.

As we predicted in the previous paper "A Kind of neither Keynesian nor Neoclassical Model (1): The Fundamental Equation"[5]. In addition to "private fixed assets", $K_f$ consists of many assets that contribute to the output $Y$ in substantial economy but are not countable or difficult to count. If $K_f$ is estimated by $\partial Y / \partial K_f = r$, $K_f$ is approximately 2.65 times the statistical data of "private fixed assets". We recalculate the substantial average earning ratio $Y / K_f$ and the marginal earning ratio $\partial Y / \partial K_f(= \alpha Y / K_f)$ according to $K_f = 2.65 \times$ private fixed assets, and dot the results into Figure 4.

As shown in Figure 4 in the period of 1970-2017, when the fictitious average earning ratio $Y / K$ and the substantial average earning ratio $Y / K_f$ are relatively close, the substantial average earning ratio $Y / K_f$ is relatively large.
3. Relationship Between Fictitious Earning Ratio and Substantial Earning Ratio

3.1. The Change Characteristics of the Average Earning Ratio

As shown in Figure 4, the fictitious average earning ratio $Y/K$ which is under effect of the monetary policy of Federal Reserve may be higher or lower than the substantial average earning ratio $Y/K_f$. If we plot the statistical data of the fictitious average earning ratio $Y/K (= r/a)$ and the substantial average earning ratio $Y/K_f$ as a variable relationship diagram of $Y/K_f$~$K$, then we get Figure 5.

Note that Figure 4 is a time series diagram of statistical data $Y/K_f$ and $Y/K$, and Figure 5 is a variable relationship diagram of statistical data $Y/K_f$ and $Y/K$. When it is necessary to emphasize the difference between them, the former can be recorded as $Y/K_f$~$t$ and $Y/K$~$t$, and the latter as $Y/K_f$~$K$ and $Y/K$~$K$. Their similarity in shape is due to the horizontal axis $K$ in Figure 5 also increasing as time $t$. The relationship between the fictitious average earning ratio $Y/K$~$K$ and the substantial average earning ratio $Y/K_f$~$K$ has the following characteristics:

(1) The fluctuation range of $Y/K$~$K$ is much larger than $Y/K_f$~$K$.

(2) $Y/K$~$K$ has two levels of fluctuations: one is the fluctuation of the $Y/K$~$K$ trend line, and the other is the fluctuation of $Y/K$~$K$ around the $Y/K_f$~$K$ trend line.

(3) The closer the $Y/K$~$K$ trend line is to $Y/K_f$~$K$, the larger $Y/K_f$~$K$. The optimal substantial average earning ratio $(Y/K_f)^*$ is the $Y/K_f$ determined by the intersection of $Y/K_f$~$K$ and the trend line of $Y/K$~$K$.

![Figure 4](image-url) Changes in various earning ratio after adjustment according to $2.65 \times K_f$. Source: (1) All data sources are the same as Figure 2. (2) The dotted line is the position of the average value of the variable after adjustment by $2.65 \times K_f$.

![Figure 5](image-url) The relationship between the fictitious average earning ratio $Y/K$ and the substantial average earning ratio $Y/K_f$ in the statistics. Source: Same as Figure 2. Among them, $K_f = 2.65 \times$ Fixed assets.
In the future, we can use the horizontal line of \((y/kf)_t\) as the benchmark to judge the operating state of the economic system by the relative position of the \(y/k\sim k\) trend line and \((y/kf)_t^*\).

3.2. The Fictitious Earning Ratio Is Less Than Substantial Earning Ratio

The fictitious average earning ratio \(y/k\) is indirectly calculated from the marginal state equation \(y/k = r/\alpha\) of the Cobb-Douglas function. According to our previous research, the interest rate \(r\) in the market environment is both a reflection of income growth and a cause of income growth.

This mutual causal relationship has made central banks often use interest rates as an important tool to intervene in the state of economic operations.

However, the most sensitive to low interest rate policy is the value of assets, and the substantial earning ratio does not necessarily respond as positively as the value of assets. On the one hand, the capital market where there is already a bubble does not care about the exogenous income of the speculative carrier, but expect the central bank to lower the interest rate so that the asset can get a greater appreciation opportunity at a lower opportunity cost.

On the other hand, in a super-low interest rate environment, the fictitious average earning ratio \(y/k\) and the substantial average earning ratio \(y/kf\) are both declining, but the income of the substantial asset owner is increased relative to the income of the wage earner. That is, although \(\Delta(y/kf) < 0\), \(\Delta(\alpha y/kf) > 0\). This is reflected in the Cobb-Douglas function \(y = AK^\alpha L^\beta\), which is the supernormal increase in the allocation parameter \(\alpha\) of the element \(K\) (or \(\beta\) reduce super normally). The reality is that the gap between the rich and the poor in society is widening due to low interest rate monetary policy. The meaning of the increase in \(\alpha\) supernormality is that the growth state of \(\alpha/\beta\) is significantly faster than the trend of \(\alpha/\beta \rightarrow 1\) in long-term economic growth [6]. As shown in Figure 6.

Due to the supernormal increase in the allocation parameter \(\alpha\), the relative income \(\alpha y\) of the substantial asset \(k_f\) in the earnings \(y\) (GDP in the statistics) will increase, or the marginal earning ratio \(\alpha y/kf\) of the substantial asset owner will increase, even though the substantial average earning ratio \(y/kf\) is declining. Therefore, if the low interest rate monetary policy causes the fictitious average earning ratio \(y/k\) to be less than the substantial average earning ratio \(y/kf\), it will not only change the overall production status of the economy, but also disadvantage the income distribution in the substantial economy. This may be the economic reason for the “Occupy Wall Street” incident in 2011. After 2013, the growth of \(\alpha\) in Figure 6 has eased.

The problem is that the more serious this situation is, the more people want the monetary authorities to increase the level of stimulation, but under the monetary policy with lower interest rates, the substantial average earning ratio \(y/kf\) will be lower until it falls into the so-called "liquidity trap" state [7]. This may be the reason why Keynes does not believe that monetary policy can prevent the economic recession, although his fiscal policy stimulus seems to be effective only in the early stage of confronting the liquidity trap, and there will be more serious "stagflation” problems later. The true liquidity trap state is a simple reproduction state with \(r = 0\). Although growth is stagnant in this state, people can enjoy certainty of production and life, just like the Japanese economy, which has grown almost zero since the 1990s.
3.3. The Fictitious Earning Ratio Is Greater Than the Substantial Earning Ratio

As shown in Figure 5, if the fictitious average earning ratio $Y/K$ is already above the potential maximum substantial average earning ratio $(Y/K_f)^*,$ a higher $Y/K$ would cause the substantial average earning ratio $Y/K_f$ to be less than its potential earning ratio $(Y/K_f)^*.$

On the one hand, the fictitious average earning ratio $Y/K = r/\alpha,$ where the nominal interest rate $r$ is the sum of the inflation rate $\hat{p}$ and the real interest rate $r_r.$ If the real interest rate $r_r$ does not change much, the higher the inflation rate $\hat{p},$ the larger the nominal interest rate $r$ and the fictitious average earning ratio $Y/K.$ On the other hand, although the nominal earnings $Y = PY_r$ increases as the price level rises, if the nominal value of the physical asset $K_f$ rises faster than the nominal earnings $Y,$ then the substantial average earning ratio $Y/K_f$ is still the substantial average earning ratio $Y/K_f$ or the substantial marginal earning ratio $aY/K_f$ will tend to decline.

In Figure 5, as the US fictitious average earning ratio $Y/K$ in the 1970s climbed above the substantial average earning ratio $Y/K_f,$ the $Y/K_f$ fell from 0.20 in the opposite direction to around 0.16 in the late 70s. When the inflation rate $\hat{p}$ fell from 0.096 in the early 1980s to around 0.025 in the mid-1990s, $Y/K_f$ gradually rose back to the optimal $(Y/K_f)^*.$ This shows that the excessive inflation rate is an important reason for the substantial average earning ratio $Y/K_f$ to deviate from its optimal average earning ratio $(Y/K_f)^*.$

The above empirical analysis shows that the average earnings ratio $Y/K_f$ in the substantial economy has a maximum or relatively good state, and the condition is that the fictitious economy and the substantial economy are balanced or that the value of the fictitious asset value $K$ and the substantial asset value $K_f$ are equal. This conclusion has extraordinary theoretical significance, although it is not a rigorous proof of mathematics. Based on this, we can get many important inferences and reflect the reliability and rationality of this theory from these inferences.

3.4. Relationship Between Fictitious Earning Ratio, Carrier (Speculative) Earning Ratio and Substantial Earning Ratio

When we analyze the causes of the financial crisis, we believe that in the long run, the fictitious P/E ratio $K/Y$ and the carrier (speculative) P/E ratio $K_i/Y_i$ are determined by the entity P/E ratio $K_f/Y$ [3]. Since the reciprocal of the P/E ratio is the earning ratio on assets, we can now look at the relationship between the fictitious earning ratio determined by the central bank, the carrier (speculative) earning ratio in the capital market (where the reciprocal of the S&P 500 P/E ratio is used) and the substantial earning ratio reflecting the operation of the substantial economy.

The $Y_i$ obtained from the asset (capital) $K_i$ of the carrier P/E ratio $K_i/Y_i$ is the net income that enterprises have paid for the production cost (including employee compensation). This is relative to the earnings $aY$ of the macro fictitious asset $K$ and the substantial asset $K_f,$ but not the earnings $Y.$ Therefore, the carrier earning ratio $K_i/Y_i$ is the same type of variable as the fictitious marginal earning ratio $aY/K$ and the substantial marginal earning ratio $aY/K_f.$

However, as we mentioned above, since monetary policy will cause $\alpha$ change in the return $aY$ of the asset, the increase in the substantial marginal earning ratio $aY/K_f$ under the low interest rate policy will cause the substantial average earning ratio $Y/K_f$ to decrease. Therefore, in order to observe the effect of monetary policy, the substantial earning ratio in Figure 7 lists the substantial average earning ratio $Y/K_f$ instead of the substantial marginal earning ratio $aY/K_f.$

As shown in Figure 7, the S&P 500 earning ratio $Y_i/K_i$ is generally consistent with the fictitious earning ratio $aY/K$ (interest rate $r$) affected by monetary policy, although there is a phase difference in the fluctuation pattern. This shows that the higher or lower fictitious marginal earning ratio $aY/K$ can bring higher or lower carrier earning ratio $Y_i/K_i,$ but higher substantial average earning ratio $Y/K_f$ can only occur under not high or not low fictitious marginal earning ratio $aY/K.$ The relationship between $aY/K,$ $Y_i/K_i$ and $Y/K_f$ during the period 1994-2000 is indicated by the shading in the figure.

For speculators in the capital market, what they expect after holding assets is the cut of interest rate by the government, which means that the fictitious marginal earning ratio $aY/K$ falls, or the value of asset $K$ increases under the established $aY.$ In this way, speculators (such as stock holders) can get the benefits of asset appreciation from the capital market.

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2 If we assume that there is a value function $F = F(K, K_f)$ similar to the Cobb-Douglas function between $K$ and $K_f,$ the method in the paper A Kind of Neither Keynesian Nor Neoclassical Model (5): The Path of Economic Growth can be used to prove that when $K = K_f,$ $2Y/(K + K_f)$ or $Y/K_f$ will reach the maximum [2].
4. Optimal State of Economic Operation

4.1. Balanced Interest Rate $r^*$

The central bank’s counter-cyclical monetary policy mainly affects the operating state of the economy from two aspects: on the one hand, it has an impact on the fictitious marginal earning ratio $aY/K$. $\partial Y/\partial Y = r$ is the basic assumption that we use the Cobb-Douglas function $Y = AK^aL^b$ to analyze macro economical problems, where $\partial K/\partial Y = aY/K$. In the graph $aY/K \sim r$ of relationship between the fictitious marginal earning ratio $aY/K$ and the interest rate $r$, we can draw a bisector of $aY/K = r$: the fictitious marginal earning ratio $aY/K$ is as high as or as low as the interest rate $r$ controlled by the government, as shown in Figure 8. On the other hand, the lower the interest rate $r$ of the countercyclical monetary policy, the higher the substantial marginal earning ratio $Y/K_f$. This is because, although the low interest rate does not necessarily lead to an increase in the substantial output $Y$, the increase in $a$ causes $K_f$ to share more of the earnings $aY$, so the trend line of $aY/K_f \sim r$ is a negative slope in Figure 8.

In Figure 8, we call $r^*$ which is determined by the equation $aY/K_f = aY/K$ related to the interest rate $r$ as the equilibrium interest rate, and we can also call the corresponding $aY/K$ and $aY/K_f$ as the balanced fictitious marginal earning ratio and the balance substantial marginal earning ratio. More importantly, we can deduce from here that when $r = r^*$, then $Y/K = Y/K_f$, since $aY/K = aY/K_f$. where $a > 0$. If the $Y/K_f$ here is equal to the potential substantial average earning ratio $(Y/K_f)^*$ in Figure 5, then the equilibrium interest rate $r^*$ becomes the important condition of $(Y/K_f)^*$. Figure 9, which correlates $r$, $Y/K_f$ and $aY/K_f$ in the statistics, verifies this speculation.

In our previous paper, we believe that the interest rate $r$ reflects the operational efficiency of the macro economy, and analyzes the changes of other macro variables with $r$ as the core. If $Y/K_f$ is optimal, the interest rate $r$, which reflects the efficiency of economic operations, will also be optimal when the market mechanism is fully functional. Since these figures are both schematic and empirical, we can read the equilibrium interest rate $r^*$ directly from the horizontal axis of Figure 9(c) or 9(d).

The statistics of the United States in 1970-2017 statistics show that the equilibrium interest rate $r^*$ is about 0.056, and the corresponding maximum substantial average earning ratio $(Y/K_f)^*$ is 0.181. Since $(aY/K_f)^* = r^*$, 0.056 is also the marginal earnings of the substantial asset $K_f$. At this time, the capital-output ratio $K_f/Y$ is about 5.525 ($=1/0.181$).

Note that in Figure 9(c), the $Y/K_f \sim r$ to the left of $r^*$ corresponds to the $Y/K_f \sim K$ to the right of the maximum value $(Y/K_f)^*$ in Figure 9(a). Because when the interest rate $r$ is
small, the fictitious average earning ratio $Y/K$ is smaller than the substantial average earning ratio $Y/K_f$. In Figure 9 (a), only the maximum value $(Y/K_f)^*$ will be $Y/K < Y/K_f$ in the right region, and vice versa. In Figure 9(b), when the interest rate drops, that is, the fictitious marginal earning ratio $\alpha Y/K$ decreases, the rise of the substantial marginal earning ratio $\alpha Y/K_f$ is due to the supernormal increase of $\alpha$ (as shown in Figure 6), which causes the capital owner's earnings $\alpha Y$ to increase. This is not inconsistent with the decline in the substantial average earning ratio $Y/K_f$ during the same period.

![Figure 9](image_url)

Figure 9. The decision to balance the interest rate $r^*$. Source: same as Figure 8.

### 4.2. Balanced Inflation Rate $\dot{P}^*$

Since the nominal interest rate $r$ is the sum of the inflation rate $\dot{P}$ and the real interest rate $r_r: r = \dot{P} + r_r$, and the statistics show that in the same business cycle, the inflation rate $\dot{P}$ is similar to the fluctuation pattern of the nominal interest rate $r$ [8]. Therefore, the statistical trend line of fictitious and substantial of earning ratio corresponding with inflation rate may be similar to Figures 9(c) and 9(d). This is confirmed in Figure 10. The trend line of substantial earning ratio $Y/K_f\sim\dot{P}$ and $\alpha Y/K_f\sim\dot{P}$ corresponding with the inflation rate $\dot{P}$ are negative slopes, and the trend line of fictitious earning ratio $Y/K\sim\dot{P}$ and $\alpha Y/K\sim\dot{P}$ corresponding with the inflation rate $\dot{P}$ are positive slopes. From this, the equilibrium inflation rate $\dot{P}^*$ corresponding to the equilibrium interest rate $r^*$ can be obtained.

Although the trend lines of the fictitious earning ratio $Y/K\sim r$ and $\alpha Y/K\sim r$ corresponding with the interest rate $r$ and the fictitious earning ratio $Y/K\sim\dot{P}$ and $\alpha Y/K\sim\dot{P}$ corresponding with inflation rate $\dot{P}$ are positive slopes, the points of $Y/K\sim\dot{P}$ and $\alpha Y/K\sim\dot{P}$ just fall on their trend lines are very few. This means that the inflation rate $\dot{P}$ fluctuates more, especially when the inflation rate $\dot{P}$ is higher than the equilibrium inflation rate $\dot{P}^*$. The fluctuation of the fictitious earning ratio $Y/K\sim\dot{P}$ and $\alpha Y/K\sim\dot{P}$ is reflected in the capital market, that is, the change of the fictitious asset value $K$ relative to the substantial earnings $Y$ is not so certain. The positive slope of the trend lines of the earning ratio $Y/K\sim\dot{P}$ and $\alpha Y/K\sim\dot{P}$ means that the higher the price level, the lower the fictitious P/E ratio (P/E ratio is the reciprocal of earning ratio $Y/K$), which is not conducive to asset appreciation, but assets will not necessarily depreciate in short-term, because many points in the graph are not on the trend line. Therefore, the long-term impact of the positive slope of the fictitious earning ratio $Y/K\sim\dot{P}$ trend line on the capital market is negative, but in the short-term, the stock index may fall or rise (this is related to the difference in the path of $\dot{P}$ rising or falling, the next paper will be further analyzed).
Figures 10. The decision to balance the inflation rate $\hat{\rho}^*$. Source: Inflation rate $\hat{\rho} = dP/P = \Delta P/P$. The price index $P$ is calculated from the nominal GDP and real GDP by the deflator. The nominal GDP source is the same as Figure 2. The real GDP comes from http://www.bea.gov/: Real Gross Domestic Product (Last Revised on: June 28, 2018). The rest is the same as Figure 8.

Similar to the effect of lower interest rates $r$ on the substantial marginal earning ratio $\alpha Y/K_f$, the lower inflation rate $\hat{\rho}$ is beneficial to asset holders in the sharing of macro wealth. On the contrary, a higher inflation rate $\hat{\rho}$ is good for the working class.

A certain degree of inflation is favorable to lowering the fictitious P/E ratios $K/Y$ and $K/\alpha Y$, but excessively high inflation $\hat{\rho}$ will cause the unbalance between the fictitious economy and the substantial economy ($Y/K > Y/K_f$), thus it is not favorable to a better operating state of the substantial economy. The equilibrium inflation rate $\hat{\rho}^*$ determined by Figures 10(c) or 10(d) is about 0.028, which is roughly half of the equilibrium interest rate $r^* 0.056$ determined in Figure 9(d) or 9(c). This is no coincidence. One of the reasons is that when $\hat{\rho} = 0$ or $\hat{\rho} = r_f$, that is, $\hat{\rho} = r/2$, changes in nominal and real variables are easily coordinated [9]. More reasons will be explained in the analysis of fiscal policies. Inflation is not just a monetary phenomenon.

4.3. Potential Output Growth Rate $\hat{Y}^*$

According to the fictitious and substantial earning ratio balance analysis method, we can obtain $\hat{Y}^*$ corresponding to $(Y/K_f)^*$ as we correspond the fictitious and substantial earning ratio to the variable $Y$. Since $(Y/K_f)^*$ is a relatively good state in which the operating efficiency of the economy is relatively good for a certain period of time, $\hat{Y}^*$ is also a relatively good output growth rate or potential output growth rate in the same period.

When $Y/K_f = (Y/K_f)^*$, $r = r^*$, the potential output growth rate $\hat{Y}$ corresponds to the equilibrium interest rate $r^*$. As shown in Figure 11, the trend lines of the fictitious earning ratio $Y/K \sim \hat{Y}$ and $\alpha Y/K \sim \hat{Y}$ related to the variable $Y$ are all positive slopes, but the fluctuations of $Y/K \sim \hat{Y}$ and $\alpha Y/K \sim \hat{Y}$ are large. The main reason is that the output growth rate $\hat{Y}$ and the interest rate $r$ that determines $Y/K$ and $\alpha Y/K$ has a large phase difference in the periodic variation [4].

As shown in Figures 11(c) and 11(d), the lower output growth rate $\hat{Y}$ corresponds to the lower fictitious earning ratio $Y/K \sim \hat{Y}$ and $\alpha Y/K \sim \hat{Y}$. At the same time, as shown in Figures 11(a) and 11(b), the lower fictitious earning ratio $Y/K \sim \hat{Y}$ and $\alpha Y/K \sim \hat{Y}$ correspond to the lower interest rate $r$, so the low
interest rate policy when \( r < r^* \) is not conducive to the increase of output growth rate. In the years with low interest rates since 2008, the fictitious earning ratio \( Y/K^* \) and \( aY/K^* \) are concentrated in the partial enlarged view in Figure 11. They are characterized by their fictitious earning ratio \( Y/K^* \) and \( aY/K^* \) are respectively smaller than the substantial earning ratio \( \hat{Y}/K^* \) and \( aY/K^* \) : It is this operating state that causes the economic system's output growth rate \( \hat{Y} \) to be less than the potential output growth rate \( \hat{Y}^* \). These points in the partial enlargement map correspond to low interest rate \( r \) as well as low inflation rate \( \hat{P} \).

The higher the inflation rate \( \hat{P} \), the higher the nominal output growth rate \( \hat{Y} \) is, but the \( \hat{Y} \) is not the higher the better. If \( \hat{Y} \) exceeds \( \hat{Y}^* \), then the inflation rate \( \hat{P} \) in \( \hat{Y} \) is higher, the average value of the actual output growth rate \( \hat{Y}_e \) will decrease, and the substantial earning ratio \( \bar{Y}/K^* \) corresponding to the high \( \hat{Y} \) will be less than optimal \( (\bar{Y}/K^*)^* \).

Since \( \hat{Y}^* \) corresponds to \( (\bar{Y}/K^*)^* \), \( (\bar{Y}/K^*)^* \) corresponds to \( r^* \), so the potential output growth rate \( \hat{Y}^* \) is equal to the equilibrium interest rate \( r^* \). This is another way to verify our inference in the paper “A Kind of N Key Keyness Key Neo Neoclassical Model (1): The Fundamental Equation”: although the output growth rate \( \hat{Y} \) and the interest rate \( r \) have a phase difference in the fluctuation period., but their trends and long-term averages are the same [4]. In Figure 11, \( \hat{Y}^* \approx r^* \approx 0.056 \). From this it can be further inferred that since the actual output growth rate \( \hat{Y}_e = \hat{Y} - \hat{P} \); \( \hat{Y}_e = \hat{Y}^* - \hat{P}^* \approx 0.028 \).

**Figure 11.** The decision to potential output growth rate \( \hat{Y}^* \). Source: Same as Figure 8.

### 4.4. Minimum Unemployment Rate \( R_U^* \)

Compared with the interest rate \( r \) and the inflation rate \( \hat{P} \), the government is more concerned about the change in the political-related unemployment rate \( R_U \), so the interest rate \( r \) and the inflation rate \( \hat{P} \) are often used as tools to promote employment. Keynes's demand determinism and the famous Phillips curve are probably the theoretical basis. Now, we can use the balance between fictitious and substantial earning ratio to analyze the relationship between the inflation rate \( \hat{P} \) and the unemployment rate \( R_U \).
In our previous paper "A Kind of Neither Keynesian Nor Neoclassical Model (4): The nature of Philips Curve", We believe that the substitution relationship between unemployment rate $R_U$ and the inflation rate $\dot{P}$ is due to the fact that both unemployment rate $R_U$ and the inflation rate $\dot{P}$ are affected by interest rate $r$ [9].

![Diagram](image)

**Figure 12.** The decision of the minimum unemployment rate $R_U^*$. Source: Unemployment rate $R_U$ from http://www.bls.gov/cps/cpsaat01.htm (last modified date: February, 2017). The rest is the same as Figure 8.

Since the balance between the fictitious and substantial earning ratio determines the equilibrium interest rate $r^*$, the unemployment rate $R_U$ affected by interest rate $r$ is likely to have an equilibrium or optimal (minimum) unemployment rate $R_U^*$ corresponding to equilibrium interest rate $r^*$. Figure 12 confirms our speculation.

The reverse or co-direction relationship between inflation rate $\dot{P}$ and unemployment rate $R_U$ in Phillips curve is subordinate to the cyclical and trend change of interest rate $r$: when the trend change is small, the reverse relationship between unemployment rate $R_U$ and inflation rate $\dot{P}$ appears, and when the trend change range of interest rate $r$ is larger than the cyclical fluctuation range, they may change in the same direction.

From Figure 12, it is also clear that the conversion conditions of the reverse change and the same change between unemployment rate $R_U$ and inflation $\dot{P}$ are: when $\dot{P}$ is less than its equilibrium inflation rate $\dot{P}^*$, the trend of the reverse change between unemployment rate $R_U$ and inflation $\dot{P}$ will not offset the reverse fluctuation of the periodic nature of the disappearance rate $R_U$ and inflation $\dot{P}$ (as Phillips curve shown); when $\dot{P}$ is greater than its equilibrium inflation rate $\dot{P}^*$, $R_U$ and $\dot{P}$ change in the same direction. At this time, if $\dot{P}$ changes greatly in trend, it will offset the reverse fluctuation of $R_U$ and $\dot{P}$ in cycle and change in the same direction.

From the figure, during the period 1970-2017, $R_U^* \approx 0.049$. Since the minimum unemployment rate $R_U^*$ is determined by the trend line of the change of the unemployment rate $R_U$, the unemployment rate $R_U$ affected by the business cycle may be larger or smaller than that of $R_U^*$ when $r = r^*$ or $\dot{P} = \dot{P}^*$.

Figure 12, which is both theoretical and empirical, also tells us that when $Y/K_f$ is higher than $\left(\frac{Y}{K_f}\right)^*$, that is, when $\dot{P} > \dot{P}^*$, the deviation of the unemployment rate $R_U$ from its trend line will increase, just like the inflation rate $\dot{P}$. The unemployment rate fluctuates relatively little when the inflation rate is small. However, at very low interest rates and inflation rates, the unemployment rate $R_U$ may be low or high, as shown in the statistics for the elliptical regions in Figures.
This is related to other initial conditions in the process of falling interest rates or inflation rates. Therefore, we cannot regard the low unemployment rate \( A \) that occurs under the low interest rate or the low inflation rate \( \dot{P} \) as a rule.

If we combine the bowline unemployment trend line in Figures 12(c) and 12(d) with the interest rate trend line in Figures 10(a) and 10(b), the monetary policy of low interest rate below the equilibrium interest rate \( r^* \) not conducive to reducing the unemployment rate \( R_U \). When \( r > r^* \), the higher the inflation rate \( \dot{P} \) the increase in the unemployment rate \( A \) is. Therefore, monetary policy above or below the equilibrium interest rate \( r^* \) or the equilibrium inflation rate \( \dot{P}^* \) is not conducive to reducing the unemployment rate \( R_U \).

5. The Ideal State of Macroeconomic Operation

The Cobb-Douglas function is one of the characteristics of our series of papers. However, because of the complexity of reality, we are somewhat uneasy about the applicability of the Cobb-Douglas function in macroeconomy. As in this paper, we can see that the marginal equation \( aY/K = r \) of Cobb-Douglas function always approaches to or deviates from substantial economy in the form of fictitious economy, which affects the productivity of substantial economy. Without the function discovered by Cobb, C. W. and Douglas, P. H. 90 years ago [9], there would be no graphs that could describe the state of virtual and real economic change and the relationship between these graphs and various variables.

The key to a correct understanding of macroeconomic changes lies in two aspects: one is the distinction and connection between fictitious economy and substantial economy, the other is the distinction and connection between the trend change and the cyclical change. Only by combining these two aspects can we see the law of change implied in the chaotic fluctuations: the condition of the higher average substantial earning ratio \( Y/K_f \) and the lowest unemployment rate \( R_U \) is that the fictitious earning ratio \( Y/K \) and \( aY/K \) on the trend line are equal to the substantial earning ratio \( Y/K_f \) and \( aY/K_f \). In the 48 years from 1970 to 2017, the United States happened to be close to this state in the period of the fictitious earnings trend line change from 1994 to 2000.

Eliminating the business cycle is a long-standing dream of people, but the endogenous fluctuation of the economy is the internal driving force of market competition, or a mechanism of eliminating inefficiency. Although the government can use various interventions to mitigate or even eliminate volatility, it will pay the price of efficiency decline in a long or short period of time. The central bank can rescue bankrupts in the market competition from the political and social point of view with the role of lender of last lender, but it should not try to eliminate this endogenous market competition mechanism unless it prefers a stable state of inefficiency rather than a growth potential accompanied by the business cycle.

The decrease in efficiency is reflected in above graphs of variable relationship or time series, which show the unbalance between the fictitious and the substantial earning ratio. Without various interventions of the government, the trend line of the earning ratio or rate of change for macro variables should be a horizontal line with a slope of 0. In the long term, the substantial earning ratio \( Y/K_f \) may fluctuate under the influence of external conditions, but the range of fluctuation is far less than that of other variables, since the substantial asset \( K_f \) is less affected by the fluctuation of interest rate.

![Figure 13](image)

**Figure 13.** The periodic variation, trend line and optimal value of variables in ideal state. Description: to illustrate the phase difference of the variable fluctuations, the zebra stripes are used as the assumed 4 cycles. The horizontal dashed line is the hypothetical trend line for each variable. The balance or optimal value of each variable is determined by the US 1970-2017 statistics according to the balance method of the fictitious and substantial earning ratio, see Figure 9- Figure 12.
We have also reached the same conclusion in the previous analysis of the Phillips curve, and plotted the schematic diagram of Figure 13 [10]. At that time we can only use the multi-year average to mark the position of the trend line, now we can use the theoretical optimal value instead of the average. It can be seen from Figure 13 that even if the economy is operating in a better state, due to the periodic fluctuation of the variables, $r^*, \hat{P}^*, \hat{Y}^*$ and $R^*_0$, at a certain point in time are often larger or smaller than $r^*, \hat{P}^*, \hat{Y}^*$ and $R^*_0$.

6. Conclusion

It is not difficult to use statistical data to falsify many conclusions or inferences of traditional macroeconomic theory, but the problem is that the empirical results of various non-mainstream theories are even worse than traditional theories. The equilibrium analysis method of fictitious economy and substantial economic in this paper not only tries to replace the aggregate supply and aggregate demand analysis method to link various macro variables, but also quantitatively analyzes the optimal values of various variables according to statistical data, especially the so-called potential output levels and optimal employment rates. From an empirical point of view, it is a new and more explanatory theory.

Since 2000, the trend line of fictitious ratio in the United States has been below the trend line of substantial ratio, which is the result of the Fed's monetary easing policy for more than a decade. The low interest rate policy not only restrains the economic fluctuation, but also makes the fictitious economy deviate from the substantial economy, triggering a financial crisis like that in 2008 [3]. This may cause the macroeconomy to suffer from inefficient chronic diseases.

Although the empirical analysis of the balance between fictitious and substantial economic is based on statistical data from the United States, it should be applicable to the analysis and evaluation of other economies. The requirements are: (1) the allocation of resources in substantial economy is determined by the market rather than by the government. (2) There are corresponding statistics. (3) The interest rate must be determined by market transactions, even if the macro interest rate is affected by the central bank's discount rate, because at the specified interest rate, the marginal state equation $\alpha \bar{Y}/K = r$ has no meaning.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References


