Ramsey's Belief and the Plausibility of Keynesian Economics

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Abstract

Ramsey's theory of probability refers to the partial language associated with action. The term "partial language" means that a language that does not describe the causality in question with perfect confidence. The degree of confidence, which is dubbed "belief", or equivalently, probability, is estimated by a person's action. Ramsey assumes that people decide their action depending on the cost of knowing true causality. When such a cost is not dear and they can easily access true causality, they act with deep confidence (i.e. high probability). Using Ramsey's formulation of probability theory, this study considers the plausibility of alternative monetary theories --- Keynesian and monetarism ---, which is defined by the people's confidence in such theories. It is naturally assumed that the more complicated theory entails a dearer cost to understand. Keynesian equilibrium is supported only through belief in the stable intrinsic value of money. Conversely, monetarism requires that laypeople have special difficult knowledge so as to be confident about its assertion; namely, the linear relationship between nominal money supply and price; the actual value of Marshallian k and the volume of nominal money supply. As such, the Keynesian belief is far more prevalent in the actual economy.

1. Introduction

Not only the familiar probability theory, which is established by Kolmogrov relying on the measure theory, but also Ramsey's (1928) theory depend on the frequency theory of probability. The measure theoretic approach is ultimately meaningless without the law of large numbers (i.e. ergodic property) because the exact shapes of the density function and/or cumulative distribution function is unknowable.

Ramsey discards the law of large numbers because everyday samples are usually small in size. Instead, he constructs his theory by relying only on the *subjective* mathematical expectation, which, of course, does not relate to the law of large numbers at all. The subjective probability, p, is defined the ratio of the subjectively expected number of occurrences, m, from the total number of incidences, n. That is,

$$p \equiv \frac{m}{n} \ . \qquad\qquad (1)$$

The most prominent feature of his theory is that he connects the subjective probability with one's *action* towards the proposition in question. He assumes that one can know whether the proposition is right if one pays some investigation cost, $f(d)$, where d denotes the difficulty of knowing the true causality. In addition, he also assumes that whenever one acts in accordance with the belief that the proposition in question is true, his expected subjective gain from such behavior must be equal to the gain obtained by knowing the truth. Unless such a relationship upholds, he surely ceases to act charted by the belief (i.e. subjective probability), and instead, ascertains the true causality at the cost $f(d)$ when having decided on the action. It is natural to assume that f is an increase function of d.

Let the benefit obtained when the proposition is true be denoted as a and as b when it is false $(a > b)$. The subjectively expected gain from the n times trials, π, is

$$\pi = npa + n[1-p]b . \qquad\qquad (2)$$

Else, If one, otherwise, accesses the true causality in each trial, gain, π^T, becomes

$$\pi^T = na - nf(d). \qquad\qquad (3)$$

It is assumed that Equation (2) is equalized to (3); then, taking Equation (1) into consideration, we obtains the subjective probability (i.e. the belief on the validity of the proposition), p, as

$$p = 1 - \frac{f(d)}{a-b}.\tag{4}$$

Equation (4) implies a serous meaning. Along with an increase in the difficulty of understanding and checking the proposition in question, individuals become less confident to it. This is because the more complex the proposition becomes, the more costly the examining its truthfulness becomes when individuals wish. Such kind of tendency is quite prevalent in everyday life.

In relation to economic theory, there is acute difference on the difficultness necessary for understanding between Keynesian theory and monetarism. As Otaki (2007, 2015) shows, Keynesian theory upholds when people merely believe that the value of money, which is defined by the inverse of the price index, is not affected by a change in nominal money supply. In other words, as long as people rationally believe the intrinsic value of money, money becomes non-neutral.

In contrast to such a simple structure of Keynesian economics, as Otaki (2015) shows, monetarism requires much information and complex processing to understand and believe it; every individual is incessantly concerned about the movement of nominal money supply and all must investigate whether the price level is proportionately moves with nominal money supply; and they all must exactly know the value of Marshallian k. To summarize, the value, d, of monetarism can be deemed to be much larger than that of the Keynesian thesis.

This implies that, *ceteris paribus*, Keynesian economics becomes more confident among laypeople than monetarism. As such, if people behave in accordance with their confidence in a theory, the economy in reality becomes to possess the properties of Keynesian economics.

The rest of this paper is organized as follows. Section 2 constructs a model based on Otaki (2007, 2015) with Ramsey's (1928) concept of belief and shows the plausibility of Keynesian economics being superior to monetarism. Section 3 is the brief concluding remarks.

2. Plausibility of Keynesian Economics

2.1 Two Alternative Models

A two-period overlapping-generations model with infinite time horizon is considered, as in Otaki (2007, 2015). There is no population growth and every individual has an identical utility function:

$$U_t \equiv \left[c_{1t}\right]^\alpha \left[c_{2t}\right]^{1-\alpha} - \delta_t \cdot \beta, 0 < \alpha < 1, c_{it} \equiv \left[\int_0^1 \left[c_{it}(\omega)\right]^{1-\eta^{-1}}\right]^{\frac{1}{1-\eta^{-1}}} \tag{5}$$

where $c_{it}(\omega)$ is the consumption level of good ω of an individual, who is born at the beginning of period t, during his i-th stage of life. δ_t is a definition function the value of which takes unity when the individual is employed and zero when unemployed. β is the disutility of labor supply.

For simplicity, it is assumed that the marginal productivity of labor is unity and that there is no fixed cost. All firms are price takers, and thus, earned profits become zero in equilibrium. In addition, this model assumes that the labor market is in interior equilibrium where some individuals are always unemployed, and the equilibrium nominal wage stacks at the nominal reservation wage. These assumptions yield the following equation:

$$p_t(\omega) = W_t^R, \tag{6}$$

where $p_t(\omega)$ is the price of good ω and W_t^R is the nominal reservation wage during period t. From the property of the indirect utility function, which corresponds to Equation (5), the nominal reservation wage becomes

$$W_t^R = \beta\gamma P_t^\alpha P_{t+1}^{1-\alpha}, P_t \equiv \left[\int_0^1 \left[p_t(\omega)\right]^{1-\eta} d\omega\right]^{\frac{1}{1-\eta}}, \gamma \equiv \alpha^\alpha \left[1-\alpha\right]^{1-\alpha}. \tag{7}$$

Combining Equations (6) and (7), the equilibrium inflation rate, π^*, is determined as $\left[\beta\gamma\right]^{-\frac{1}{1-\alpha}}$. Furthermore, an elementary calculus gives us the following aggregate consumption function of the young generation, C_t:

$$C_t \equiv \alpha \cdot \frac{W_t^R}{P_t} L_t = \alpha \cdot y_t, \tag{8}$$

where y_t is the real GDP in terms of the current goods. Consequently, one obtains the goods market equilibrium condition as

$$y_t = \alpha \cdot y_t + \frac{M_t}{P_t}, \tag{9}$$

where M_t is the nominal money supply at the beginning of period t. The second term of the right-hand side of Equation (9) is the real total expenditure of the old generation,

$\dfrac{M_{t-1}}{P_t}$, and the government expenditure financed by printing money, $\dfrac{M_t - M_{t-1}}{P_t}$. It is assumed that the economy is located at the stationary state after period t, and hence the monetary authority keeps the real money supply constant. That is, the growth rate of money is fixed at π^*.

Equation (9) contains two undetermined endogenous variables; real GDP y_t; the initial price level P_t. This means that the structure of an economy essentially depends on how individuals evaluate the value of money. If they believe that the intrinsic value of money is independent of nominal money supply, the initial price level remains intact even after a change in the nominal money supply under rational expectations equilibrium, and money becomes non-neutral (the Keynesian proposition).

On the other hand, when people believe that the value of money is not absolute but relative, this assertion is summarized by the following equilibrium price function (the monetarism proposition):

$$P_t = \kappa^{-1} \cdot M_t \qquad\qquad (10)$$

One must note both resulting equilibria are self-fulfilling. From Equations (9) and (10), it is clear that the equilibrium GDP earned under Keynesian proposition, y^k, is larger than that earned under monetarism, y^m, as long as the initial price level is sufficiently low and the value of money is high enough. Henceforth, let be assumed that $y^k > y^m$. In addition, the corresponding Marshallian k s are denoted as κ^k, κ^m, respectively ($\kappa^k > \kappa^m$)[1].

2.2. Ramsey's belief and Keynesian Economics

This subsection applies the Ramsey's formula (4) to examine which of the two above mentioned macroeconomic theses is plausible. Before undertaking the analysis, one must clarify what kind of knowledge is needed for a layperson in economics to understand each theory.

(i) For the Keynesian theory, the layperson must be able to confirm that the current price level is unchanged despite a change in the nominal money supply.

(ii) For monetarism (a) the layperson must be able to confirm that the current price

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[1] Note that knowing the resulting benefits empirically does not necessarily mean that all individuals are informed of the whole structure of the economy.

level changes proportionately with the nominal supply, (b) he must be conversant with the linear function to understand the relationship in (a), and (c) he must know the value of the proportional constant κ (Marshallian k) and the exact quantity of nominal money supply.

As such, it is evident that the monetarist thesis is far more difficult and laborious to understand than the Keynesian theory. Accordingly the value of d in Equation (4) is thought to be much larger in the case of monetarism.

In addition, whenever the true proposition is the Keynesian thesis, it is assumed that the subjective distribution when the proposition is false is uniform within the interval $\kappa^k > \kappa \geq \kappa^m$. Thus, the difference in gains between the action based on the correct proposition and that based on the wrong one, which corresponds to $a - b$ in Equation (4), is $\dfrac{y^k - y^m}{2}$. Similarly, whenever the true proposition is monetarism, the probability distribution of such proposition being false is uniform within $\kappa^k \geq \kappa > \kappa^m$. Accordingly, such a difference also becomes $y^m - \left[y^m - \dfrac{1}{2}\left[y^k - y^m \right] \right] = \dfrac{y^k - y^m}{2}$..

Hence, the denominators in Equation (4) are the same value independent of whether the true proposition is Keynesian or monetarism[2]. This implies, therefore, that the belief in Keynesian thesis, p^k, is much higher than that in monetarism, p^m. If people behave in accordance with proposition more confident about, such behavior becomes self-enforcing, and the economy moves as predicted by Keynesian economics. This study defines this property as the plausibility of Keynesian economics.

3. Concluding Remarks

This study develops the concept of plausibility in alternative monetary theories with the key concept being Ramsey's (1928) belief. This theory assumes that belief (subjective probability; confidence) can be measured by human's action with regard to alternative proposition depending on the cost incurred to know the truth. When such a cost is not dear, people are more confident about the true proposition because they can approach the truth more easily if they wish.

While Keynesian economic is upheld only by the belief in the stable value of money in terms of goods, monetarism is not sustained until laypeople in economics understand not only the exact linear relationship between the nominal money supply and the price

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[2] Note that there is no economic surplus in this simplified setting. However, as Otaki (2007, 2015) shows, if the equilibrium concept of goods markets is interchanged with monopolistic competition instead of perfect competition, there emerges an economic surplus that is proportional to the real GDP.

index but also macroeconomic statistics with which they are almost unconcerned in everyday life. Consequently, the cost for knowing the truth is much cheaper in the Keynesian thesis. This implies that Keynesian economics is more plausible than monetarism although both theories possess the self-fulfilling property. In this sense, Ramsey's theory can be regarded as an effective equilibrium selection procedure.

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