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On the Function of Gold Standard in Idealism and in Reality

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Abstract

The gold standard system did not function as was expected between the mid-1920s and the early 1930s. This study explores why the system brings about such devastating consequence as the deep worldwide depression. Two main reasons are identified as follows.

First, the income effect caused by product differentiation, which is entirely excluded in the purchasing power parity theory, plays a key role. A depression in overseas territories cannot be canceled out simply by the adjustment of international commodity prices.

Second, people are confident of the intrinsic value of gold in the sense that people rationally expect that gold is always convertible to commodities at some fixed ratio. This implies that gold or fiducial money is non-neutral and that the outflow of gold substantially contracts financial conditions, and thus, economic activities.

These important factors are completely neglected in the traditional ``specie flow" theory, which originated from Hume (1752-b)

1. Introduction

The gold standard was believed to be an ideal cohesive international financial system until the early 1930s. The following adjustment process, which is called the specie flow, works at least in the long run, and affiliated countries are isolated, and thus, protected from international diffusion of business cycle.

The ``specie flow" is a theory which combines the quantity theory of money with the purchasing power parity of money. That is, domestic price levels are assumed to increase proportionately with the quantity of fiducial currency. In other words, the total purchasing power of gold is kept constant. Simultaneously, by arbitrage, the ratio of a country's domestic price level to a foreign country's price level is equal to the nominal exchange rate, which is fixed by the parities of both fiducial currencies.

Consequently, if the home country is a small country in the sense that it cannot affect the economic activities of the foreign country, from the purchasing power parity theory, domestic price level is fixed by the foreign country's price level. By interpreting the quantity theory of money conversely, this implies that permissible amounts of gold or fiducial currency are also endogenously fixed.[1]

Once the hoarding of gold exceeds such amounts, the domestic price level becomes relatively high to that of the foreign country, and thus, the home country temporarily experiences deficits in its balance of payments. This implies that a part of gold stockpiles flows overseas, and thus, the excess gold or fiducial currency are entirely dissolved.

In the opposite case, when business within the foreign country turns up and its goods become expensive, the home country experiences surpluses in the balance of payments and corresponding amounts of gold flow in. Nevertheless, domestic prices also become expensive by such gold inflows. Consequently, the foreign business upturn is entirely absorbed by inflation in the home country, and there is no substantial change in outputs. This is the employment isolation mechanism assumed in the specie flow theory. Such an idealistic function was advanced by advocates of the gold standard during the 1920s.

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[1] Hume (1752-b) is the pioneer of the specie flow theory. He asserts, ``Suppose four-fifths of all the money in GREAT BRITAIN to be annihilated, and the nation reduces to the same condition, with regard to specie, as in the reign of the HARRYS and EDWARDS, what would be the consequence? Must not the price of all labour and commodities sink in proportion, and everything be sold as cheap as they were in those ages? What nation could then dispute with us in any foreign market, or pretend to navigate or to sell manufactures at the same price, which to us would afford sufficient profit? In how little time, therefore, must bring back the money which we had lost, and raise us to the level of all the neighboring nations? Where, after we have arrived, we immediately lose the advantage of the cheapness of labour and commodities; and the farther flowing in of money is stopped by our fullness and repletion. "

However, around the time of the Great Depression in the 1930s, the inherent cruelty of the gold standard was revealed. The synchronization of business cycle under the gold standard all over the world became prominent. Every advanced country fell into a serious slump that originated from the United States. By the middle of the 1930s, most advanced countries had abandoned the gold standard and moved to a flexible exchange rate regime.

This study analyzes why the actual workings of the gold standard were so different to its hypothetical prospect. There are two points of departure between the ideal and actual. First, goods produced by various countries are differentiated, and perfect competition, which the specie flow theory presumes, is never upheld. In such a case, the income effect within reciprocal demand functions cannot be igonored. Thus, the purchasing power parity is violated.

Second, and more important is whether individuals are confident of the value of gold. The specie flow theory assumes that the value of gold decreases proportionately with its quantity. This implies that people disbelieve in the intrinsic value of gold, which is defined by the exchange ratio to goods (i.e., the inverse of the price level), and the value varies with the existing quantity within the country.

However, under the regime of the gold standard, people were confident of the value of gold. That is, people are *confident* that gold could be converted to goods at the same rate at that time in the future and independent of the existing quantity[2].

This fact suggests that there is an internal inconsistency in the specie flow theory. That is, the specie flow theory assumes that although the value of gold is disbelieved within the domestic economy, there is confidence internationally and this serves as a reliable store of value. It is natural to assume that people's confidence of or disbelief in the value of gold should not depend on where gold is transacted.[3]

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[2] Keynes (1924) was quite anxious about the collapse of confidence in gold owing to its imbalanced distribution. According to Keynes, ``I hold that gold flows to America because America offers in return for it a greater value in commodities than the gold is worth to the rest of the world. As none know better than Sir Henry Strakosch, gold is freely offered for sale in London every week; America is open to buy unlimited quantities of it at an almost fixed price in terms of goods;……It is not true, therefore, that she ``has secured a free option to acquire goods, services, and securities in exchange for the gold whenever it happens to suit her' , if it means `getting as much as goods for the gold as she originally gave for it'."

Mundell (1997) argues that people are more confident about gold than the US dollar, which is the present key currency. He is also anxious about the inflation caused by the disbelief in the worldwide glut of dollars. Hence, he recommends that gold should play more important role as a foreign reserve to discipline monetary policy, especially in the United States.

[3] Although Hume (1752-a) admits that money stimulates economic activities at least in

To summarize, in reality, the gold standard rests on two economic conditions: (i) the dominance of the income effect relative to the substitution effect caused by a change in the real exchange rate, and (ii) absolute confidence in the value of gold.

The second makes the real exchange rate stable, because the relative prices of goods remain in some narrow ranges and each nominal exchange rate is fixed by parities. Thus, adjustment by price levels is relatively difficult when the balance of payments is in disequilibrium.

The facts (i) and (ii), imply that the imbalance in the balance of payments is adjusted mainly by the flow of gold under some stable price level, once a country experiences a change of business environment. This also implies that, in reality, serious international diffusion of business cycles is unavoidable under the gold standard, because an imbalance in the balance of payments immediately links to a change in the purchasing power of gold within a country. Thus, in contrast to the idealism, the gold standard system is actually an acute transmitter of the international business cycle. This assertion is endorsed by world economic history between the 1920s-1930s.

This paper is organized as follows. In Section 2, we formulate the ``specie flow" model and ascertain the isolation effect from foreign business cycles. Section 3 deals with the model of the gold standard in reality based on Otaki (2007, 2012). In addition, we show that deepened confidence in gold overseas, which brings about deflation, diffuses to the home country, and mitigates the depressive effects of the outflow of gold. In other words, in contrast to the historical conjecture, the imported deflation adjoining the outflow of gold contributes to eliminating the depressive effect of monetary contraction, because it heightens the purchasing power of gold. Section 4 is concluding remarks.

2. The gold standard in idealism: Disbelief in gold

2.1 A model of the specie flow theory and the isolation effect

As depicted in the Introduction, the specie flow theory can be regarded as a combination of the quantity theory of money and the purchasing power parity theory of

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the short run, he asserts ``And no other satisfactory reason can be given, why all prices have not risen to a much more commodities exorbitant height, except that which is derived from a change of customs and manners. Besides that more commodities are produced by additional industry, the same commodities some more to market, after men depart from their ancient simplicity of manners. And though this increase has not been equal to that of money, it has, however been considerable, and has preserved the proportion between coin and commodities nearer the ancient standard." That is, Hume was skeptical about the role of money in the real economy in the long run. However, we regard the stable proportion between money and commodities acutely as indicating that people are confident about money (gold), and suggesting that money is non-neutral even in the long run.

nominal exchange rates. We capture these characteristics in a two period overlapping-generations model in a production economy with an infinite time horizon.

We assume that only one good exists in the world and that the home country is too small to be able to affect economic conditions in the rest of the world. Perfect competition prevails in the good market. That is, the home country behaves as a price taker in the integrated good market.

We assume that the utility function of each individual U is identical to and additively separable between the lifetime consumption stream and the labor supply. That is,

$$U \equiv u\left(c_{1t}, c_{2t+1}\right) - \delta_t \cdot \alpha , \qquad (1)$$

where c_{it+i-1} is the consumption level of an individual who is born at the beginning of period t and located at the i-th stage of life; α denotes the disutility of labor; and δ_t is a definition function, which takes the value unity when the individual is employed and zero when he is unemployed. We also assume that $u(\cdot)$ is a well-behaved concave and linear homogenous function. Finally, let us assume that labor productivity is unity.

The lifetime budget constraint is

$$p_t c_{1t} + p_{t+1} c_{2t+1} \le w_t + \pi_t , \qquad (2)$$

where $\left(p_t, p_{t+1}\right)$ is the price vector of the good; and w_t and π_t denote the nominal wage and the nominal profits, respectively.

An elementary calculus leads us to the following indirect utility function $h(\cdot)$ concerning lifetime consumption. That is,

$$h\left(p_t, p_{t+1}, w_t\right) \equiv \frac{w_t + \pi_t}{\psi\left(p_t, p_{t+1}\right)} , \qquad (3)$$

where $\psi(\cdot)$ is a linear homogenous function.

Based on Equation (3), the nominal reservation wage can be calculated by the following procedure. The nominal reservation wage is the wage at which an individual is indifferent to whether to work or not, and thus,

$$h-\frac{\pi_t}{\psi\left(p_t, p_{t+1}\right)}=\alpha \Leftrightarrow w_t=\alpha\cdot\psi\left(p_t, p_{t+1}\right) \Leftrightarrow w_t=\alpha\cdot p_t\cdot\psi\left(1, \frac{p_{t+1}}{p_t}\right) \qquad (4)$$

holds.

As long as private firms are sustainable, they must be able to earn non-negative profits. Accordingly, the following inequality must hold.

$$\pi_t \equiv \left[p_t - w_t\right] L_t \geq 0 \Leftrightarrow 1-\alpha\cdot\psi\left(1, \frac{p_{t+1}}{p_t}\right) \geq 0\,, \qquad (5)$$

where L_t is the employment level. Since prices are unchanged in equilibrium where the specie flow ceases, the inflation rate becomes unity, and thus, the non-negative profit condition (5) is transformed into

$$1-\alpha\cdot\psi\left(1,1\right) \geq 0\,. \qquad (6)$$

Whenever α is sufficiently small, Inequality (6) is satisfied. We must note that as long as Equation (6) is upheld as strict inequality, all firms are incentivized to expand their production as much as possible, and hence the economy attains full-employment equilibrium.

Since we have finished describing the economic decisions of individuals and firms and equilibrium condition of the labor market, we turn to equilibrium conditions of the good market. Ahead of the analysis, we make the following assumption of the value of gold or fiducial money. That is,

Assumption 1

People disbelieve in the intrinsic value of money in the sense that the value decreases proportionately with its quantity. That is,

$$M_t = \kappa\cdot p_t \qquad (7)$$

holds. M_t *is the stock of fiducial money during period* t*, and* κ *is some positive constant, which is determined endogenously.*

Since the utility function $u\left(\cdot\right)$ is linear homogenous, the aggregate consumption function of young individuals C_t becomes

$$C_t \equiv c\left(\frac{p_{t+1}}{p_t}\right)\cdot y_t = c(1)\cdot y_t, \tag{8}$$

where y_t is the real GDP in terms of the current goods.

Then, we obtain the following equilibrium condition for the goods market. That is,

$$y^f = c(1)\cdot y^f + \frac{M_{t-1}}{p_t} + \left[\frac{M_t}{p_t} - \frac{M_{t-1}}{p_t}\right], \tag{9}$$

where y^f is GDP in full employment. The second term of the right-hand side of

Equation (9) $\frac{M_{t-1}}{p_t}$ denotes the aggregate consumption demand of old individuals, the

Third term $\frac{M_t}{p_t} - \frac{M_{t-1}}{p_t}$ corresponds to the surplus of the balance of payment.

Rearranging the terms and substituting Equation (7) into Equation (9),we obtain

$$y^f = \frac{\kappa}{1-c(1)}. \tag{10}$$

If κ is determined to satisfy Equation (10), the macroeconomic equilibrium is a rational expectation equilibrium (REE) under the expectation (7). [4]

Thus, it is clear that the imbalance in the balance of payment never affects the domestic economy and unemployment prevails as long as κ is sufficiently small. That is, we obtain the following theorem.

Theorem 1

A disturbance of business overseas never diffuses to the home country under the idealistic gold standard.

2.2 The specie flow

In conjunction with this theorem, we consider how the imbalance in the balance of payments is adjusted: the mechanism of specie flow. First, by measuring the unit of good properly, we can set the nominal exchange rate at unity. Second, since purchasing power parity is assumed to be upheld, we obtain the following equation.

[4] The procedure for determining REE is essentially the same with as that of Lucas (1972).

$$p^* = p_t . \qquad (11)$$

When business turns up overseas and p^* rises, *ceteris paribus*, goods are exported from the home country because the home good is cheaper relative to the good overseas. Thus, gold or fiducial money is imported to the home country. As such, the domestic price rises because people are in disbelief about the value of money as expressed in Equation (7).

The total imported amounts of gold are calculated by differentiating Equations (7) and (11). That is,

$$\frac{dp^*}{p^*} = \frac{dp}{p} = \frac{dM_t}{M_t} . \qquad (12)$$

Thus, the total increase rate of money $\frac{dM_t}{M_t}$ is equal to the temporary inflation rate overseas $\frac{dp^*}{p^*}$ around the vicinity of the equilibrium.

3. Gold standard in reality: Confidence in gold

3.1 Confidence in the intrinsic value of gold

Whenever the intrinsic value of gold is in *disbelief* and Equation (7) holds, the gold standard functions as a cohesive international financial settlement system. Nonetheless, there is an internal inconsistency within the specie flow theory. That is, although there is disbelief in gold domestically, the theory also assumes that all affiliate countries are *confident* of that intrinsic value internationally.

In other words, people in every affiliate country, that experiences a surpluses in its balance of payments, are ready to receive gold, despite the fact that the inflows of gold never benefits that country's economy and only serves to cause inflation. It is natural to assume that gold should be either in confidence or disbelief, independently of where it is exchanged.

Hence, we hereafter assume that every individual is confident of the intrinsic value of gold independent of where it is exchanged. That is, instead of Assumption 1, we presume that

Assumption 2

Every individual is confident of the intrinsic value of gold and rationally expects that

gold is exchanged for goods independently of its quantity. That is,

$$\frac{dp_t}{dM_t} = 0 \qquad (13)$$

holds.

3.2 The gold standard in reality: Business cycles diffuse internationally

As touched on the Introduction, it is natural to regard goods that are traded internationally as being differentiated. This implies that the income effect to tradable goods cannot be neglected, and we shall reformat the model along this line.

Let us assume that there are two kinds of goods; *a* and *b*. The home country specializes in the production of good *a* and the rest of the world produces good *b*. The consumption bundle in the utility function (1) c_{it+i-1} becomes

$$c_{it+i-1} \equiv \left[a_{it+i-1}\right]^{\beta} \cdot \left[b_{it+i-1}\right]^{1-\beta}, 0 < \beta < 1, \qquad (14)$$

where a_{it+i-1} and b_{it+i-1} are the consumption levels of good *a* and *b* by those who are born in period *t* during the *i*-th stage of their lives, respectively.

Since $u(\cdot)$ is linear homogenous, we obtain the following indirect utility function h^1:

$$h^1 \equiv \frac{w_t + \pi_t}{\psi\left(\left[p_t^a\right]^{\beta}\left[p_t^b\right]^{1-\beta}, \left[p_{t+1}^a\right]^{\beta}\left[p_t^b\right]^{1-\beta}\right)}, \qquad (15)$$

where $\left(p_{t+j}^a, p_{t+j}^b\right)$ are the prices of good *a* and *b* during period $t+j$, respectively. In addition, we take the value of the nominal exchange rate unity without loss of generality. Because we have assumed that people have confidence in the intrinsic value of gold and Equation (13) holds, the equilibrium price level is constant over time except for the case in which the price level of goods produced overseas, p_t^b, changes.

Thus, by the linear homogeneity of $\psi(\cdot)$, Equation (15) can be transformed into

$$h^1 \equiv \frac{w_t + \pi_t}{p_t^a \psi\left(\left[e\right]^{1-\beta}, \left[\frac{p_{t+1}^a}{p_t^a}\right]^{\beta}\left[e\right]^{1-\beta}\right)} = \frac{w_t + \pi_t}{p_t^a \left[e\right]^{1-\beta}\psi(1,1)}, \qquad (16)$$

where $e\left(\equiv \frac{p_t^b}{p_t^a}\right)$ is the real exchange rate. From Equations (1) and (16), we can calculate the nominal reservation wage as

$$w_t = \alpha p_t^a \left[e\right]^{1-\beta} \psi\left(1,1\right). \tag{17}$$

Henceforth, we make the following assumption.

Assumption 3

The economy of the home country is always located at an interior equilibrium. That is, there are some individuals who are unemployed in equilibrium.

As will be clarified later, if the stockpile fiducial money is small enough, such equilibrium surely exists.

By Assumption 3, the nominal reservation wage corresponds to the nominal equilibrium wage. Furthermore, the zero-profit condition of firms also requires

$$\pi_t \equiv p_t^a \left[1-\alpha e^{1-\beta}\psi\left(1,1\right)\right] = 0 \Leftrightarrow e^* = \frac{1}{\sqrt[1-\beta]{\alpha \cdot \psi\left(1,1\right)}}. \tag{18}$$

Thus, the equilibrium real exchange rate, e^*, takes a constant value independent of the balance of payments. So does the domestic equilibrium price level p^{a*}.

Since the utility function $u\left(\cdot\right)$ is assumed to be linear homogenous, the aggregate consumption function of young individuals C_t is

$$C_t \equiv c\left(1\right) \cdot y_t .$$

Then, similar to Equation (9), we obtain the equilibrium condition of the good *a* market as

$$y_t = c\left(1\right) \cdot y_t + \frac{M_t}{p^{a*}}. \tag{19}$$

Besides the equilibrium condition of the good market, we must consider the specie flow in conjunction with the imbalance in the balance of payments. Since incomes are concentrated within the young generation, financial transactions are unfeasible between the same generations. Hence, the supply of fiducial money is limited to the sum

of the imports of the members of the old generation who reside overseas. This amounts to $\beta\left[1-c(1)\right]e\cdot y^b$, where y^b is the real GDP of the rest of the world. The demand is savings of the fiducial money of the young generation in the home country to prepare for consumption after their retirement. This amounts to $\left[1-\beta\right]\left[1-c(1)\right]y_t$. The difference between these two values is the total amount of inflows of the fiducial money, and thus, we obtain

$$\frac{M_t - M_{t-1}}{p^{a^*}} = \left[1-c(1)\right]\left[\beta e^* y^b - \left[1-\beta\right]y_t\right]. \tag{20}$$

Equations (19) and (20) describe the dynamics of this model under REE. Solving (19) on y_t, we obtain

$$y_t = \frac{1}{1-c(1)}\cdot\frac{M_t}{p^{a^*}}, \tag{21}$$

Substituting (21) into (20), we find the following dynamics of the stock of the fiducial money. That is,

$$\frac{M_t}{p^{a^*}} = \frac{1}{2-\beta}\frac{M_{t-1}}{p^{a^*}} + \frac{1-c(1)}{2-\beta}\beta e^* y^b. \tag{22}$$

Figure 1 illustrates the adjustment process. It is clear the long-run equilibrium (Point *E*), where the flow of the fiducial money equilibrates, is unique and stable. If the initial stock exceeds the long-run equilibrium, imports are boosted since the business in the home country turns up. However, the circulated fiducial money gradually decreases because the country experiences deficits on the balance of payments. Thus, the temporarily boosted economy converges to the long-run equilibrium.

Figure 2 illustrates how the business cycle diffuses internationally. Whenever the world economy stagnates and the value of y^b decreases, the line which represents Equation (22) shifts downward from *II* to *I'I'*. The long-run equilibrium moves from E_1 to E_2. Since exports from the home country are curtailed, there is deficit in the balance of payments and circulated money decreases. This triggers a financial contraction, and thus, the home country cannot be immune from the business downturn. Thus, we have the following theorem.

Theorem 2

As long as people are confident of the intrinsic value of gold, the isolation effect becomes imperfect and business cycles diffuse among countries.

3.3 Perturbation in the *confidence* of the intrinsic value of gold

In reality, business downturns under the gold standard often deepen confidence in the value of gold. This might be due to a psychological propensity that everyone heavily relies on gold for precautionary savings for their unforeseeable future. We analyze how the deepened confidence in gold worldwide affects the home country's economy.

By differentiating Equation (18), we obtain

$$-\frac{dp^{a*}}{p^{a*}} = -\frac{dp^{b*}}{p^{b*}}. \tag{23}$$

This implies that the deepened confidence overseas entirely diffuses into the home country. In other words, temporary deflation overseas is transmitted to the home country under the gold standard.

Since this increases the real value of the existing fiducial money $\frac{M_{t-1}}{p^{a*}}$, the transmitted deflation mitigates the contractionary pressure caused by the stagnation overseas. More formally,

Theorem 3

The sequences of the equilibrium real GDP with and without deflation are $\left\{\bar{y}^{*}_{t+j}\right\}_{j=0}^{+\infty}$ *and* $\left\{y^{*}_{t+j}\right\}_{j=0}^{+\infty}$*, respectively. Then,*

$$y^{*}_{t+j} < \bar{y}^{*}_{t+j}, \forall j \tag{24}$$

holds.

Proof

Assume that the initial nominal stock of the fiducial money M_{t-1} is the same in both cases. Then, by the difference equation (22), the real cash balance $\frac{M_{t+j}}{p^{a*}}$ with deflation is larger than that without deflation for all *j*. Since it is apparent from Equation (21) that real GDP increases proportionately with the real cash balance, Equation (24) holds.

Thus, deflation in conjunction with severe recession overseas discussed in 3.2 mitigates damage from the recession. This is because the imported deflation raises the real cash balance, and thus contributes to moderating the financial contraction owing to outflows of gold.

4. Conclusions

The function of the gold standard was analyzed in reality, in which people are confident of the intrinsic value of gold. Results obtained are as follows.

First, the gold standard in idealism, which is called the specie flow theory and originated from Hume (1752-b), can be regarded as the combination of the quantity theory of money and purchasing power parity concerning the nominal exchange rate. There is no economic factor other than commodity prices that would transmit the business cycle between countries. We have found that full-employment equilibrium is always achieved and changes in the overseas economic environment never affect the domestic economy. That is, the employment-isolation effect is perfect under the idealistic gold standard, although this runs counter to the historical evidence.

Second, although the specie flow theory presumes disbelief in the intrinsic value of gold, people were confident of that value in the sense that they rationally expected that unit of gold would always be convertible to commodities at some fixed ratio. Based on such a reality, we have revealed that a downturn of business overseas reduces exports of the home country, and hence gold/fiducial money flows out. This triggers a financial contraction and makes the domestic economy slump. As such, the gold standard in reality is a transmitter of international business cycle diffusion.

Finally, the coexistence of deflation with stagnation overseas mitigates the depressive effect. This is because deflation raises the existing real cash balance and partly moderates the financial contraction owing to deficits in the balance of payments.

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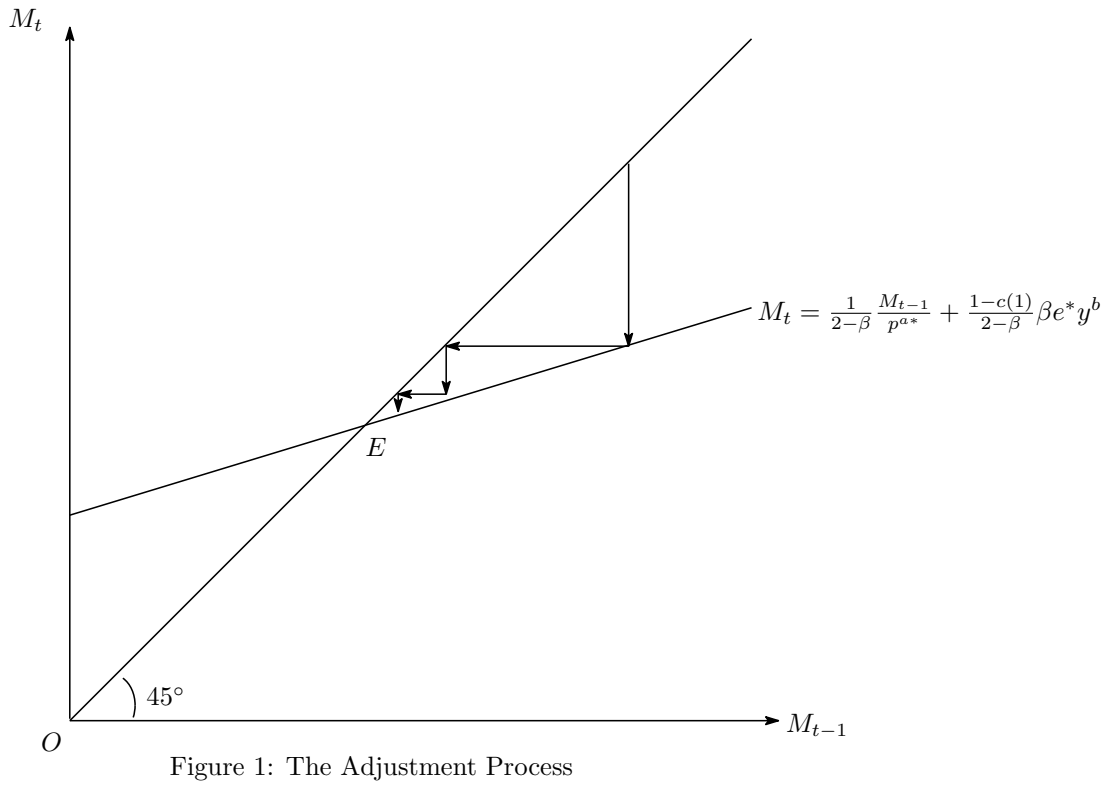

Figure 1: The Adjustment Process

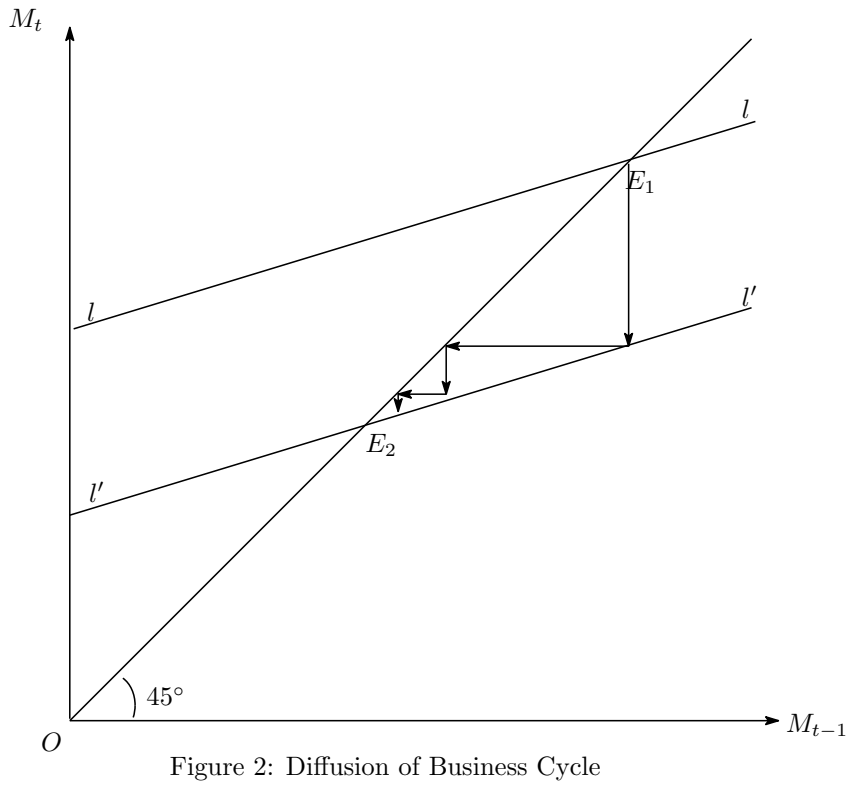

Figure 2: Diffusion of Business Cycle