

## MISESIAN INSIGHTS FOR MODERN MACROECONOMICS

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It comes as a great honor to have been asked to present the Ludwig von Mises Lecture at the 2014 Austrian Economics Research Conference. One of the first books that I read on economics many years ago was his *Theory of Money and Credit* ([1924] 1953). Other works that had a great influence on my view of economics were his *Human Action* (1963), *The Free and Prosperous Commonwealth* (also known as *Liberalism*, 1962), *Omnipotent Government* (1944), and *Theory and History* (1957).

Although von Mises would disapprove of my mathematical and statistical proclivities, his works contain several insights that I think are very relevant to modern economics and should be better known. Today I would like to discuss four of these Misesian insights that pertain to macroeconomic issues.

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The first of these insights is von Mises's concept of the historical transmission of the value of money. An immediate consequence of this is a model of the mechanism by which prices adjust to a change in the money supply.

A second insight, which ultimately also arises from von Mises's historical transmission concept, is that of market equilibrium, as contrasted to the fashionable concept of "rational expectations" equilibrium. Although "rational expectations" (or more accurately, "equilibrium expectations") is a useful exercise for evaluating the internal consistency of policies, it is a completely unrealistic model of how the economy actually works.

The third Misesian insight I wish to discuss is that of heterogeneous, inconvertible capital. This contrasts sharply (and realistically) with the popular homogenous capital assumption of the "neoclassical growth model."

And finally, the fourth Misesian insight I will discuss is the nature of the liquidity effect, and how it relates the so-called "Taylor Rule" to the Quantity Theory of Money.

## 1. THE HISTORICAL TRANSMISSION OF THE VALUE OF MONEY

In the 1924 second edition of *The Theory of Money and Credit* (trans. 1953), von Mises addressed the criticism that his contemporary Karl Helfferich has raised against using marginal utility theory to explain the level of money prices:

Helfferich is of the opinion that there is an insurmountable obstacle in the way of applying the marginal utility theory to the problem of money; for while the marginal-utility theory attempts to base the exchange value of goods on the degree of their [usefulness] to the individual, the degree of [usefulness] of money to the individual quite obviously depends on its exchange-value, since money can have utility only if it has exchange-value, and the degree of [its usefulness] is determined by the level of the exchange-value. Money is valued subjectively according to the amount of consumable goods that can be obtained in exchange for it, or according to what other goods have to be given in order to obtain the money needed for making payments. The marginal utility of money to any individual, i.e., the marginal utility derivable from the goods that can be obtained with the given quantity of money or that must be surrendered for the

required money, presupposes a certain exchange-value of the money; so the latter cannot be derived from the former. ([1924] 1953, pp. 119–120)

In other words, marginal utility theory states that the relative prices are equal to ratios of the corresponding marginal utilities. This works for the relative prices of say good  $i$  and good  $j$  as follows:

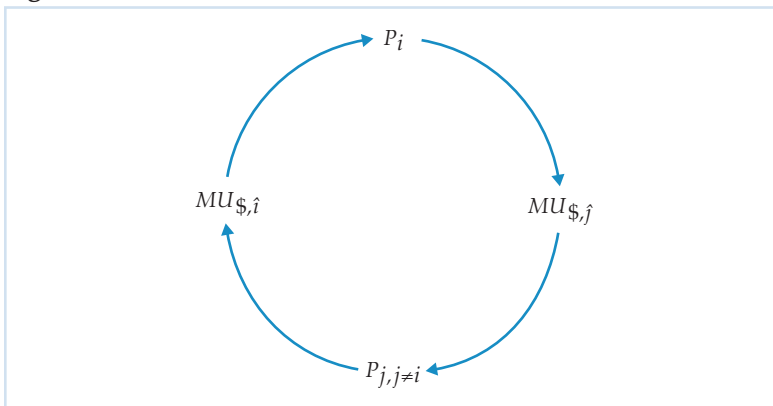
$$P_i/P_j = MU_i/MU_j^1$$

However, Helfferich argued that marginal utility theory is circular for the prices of goods in terms of money, since the nominal price of good  $i$  should be determined by the ratio of good  $i$ 's marginal utility to  $MU_{\$,i}$ , the marginal utility of money to be spent on goods other than  $i$ :

$$P_i = MU_i/MU_{\$,i}$$

Yet  $MU_{\$,i}$  is determined by  $P_j$ ,  $j \neq i$ , while these are determined, in part, by  $P_i$  itself! Figure 1 below illustrates what I call this "Vicious Circle of Helfferich":

**Figure 1. The Vicious Circle of Helfferich**



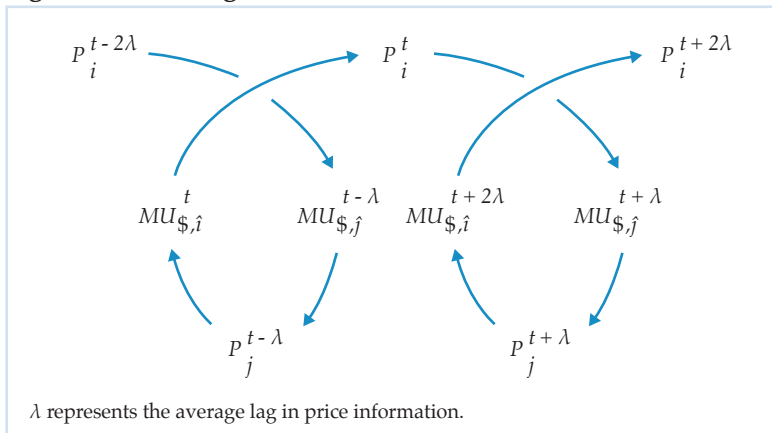
<sup>1</sup> With discretely divisible goods, the Austrian version of utility theory actually admits the possibility of *intrinsically ordinal marginal utilities* which cannot be manipulated arithmetically. However, they will still place quantifiable bounds on marginal rates of substitution and therefore on prices. In this paper we assume that goods are continuously divisible, which in turn implies that utility is *essentially cardinal* and that marginal rates of substitution are exactly determined by ratios of (*essentially cardinal*) marginal utilities. See McCulloch (1977) for further clarification.

Von Mises replied to Helffferich's argument as follows:

Those who have realized the significance of historically transmitted values in the determination of the objective exchange-value of money will not find great difficulty in escaping from this apparently circular argument.... It is true that the subjective valuation of money presupposes an existing objective exchange-value; but the value that has to be presupposed is not the same as the value that has to be explained; what has to be presupposed is yesterday's exchange-value, and it is quite legitimate to use it in an explanation of that of to-day. The objective exchange-value of money which rules in the market to-day is derived from yesterday's under the influence of the subjective valuations of the individuals frequenting the market, just as yesterday's in its turn was derived under the influence of subjective valuations from the objective exchange value possessed by the money the day before yesterday. (120–121)

In other words, von Mises has in effect replaced the "Vicious Circle of Helffferich" with what I call the "Benign Helix of Mises," illustrated in Figure 2 below. Here, the price of good  $i$  at time  $t$ , represented by  $P_i^t$ , is determined not by  $P_j^t$ ,  $j \neq i$ , but by  $P_j^{t-\lambda}$ , where  $\lambda$  is the average lag in price information. This in turn is determined by  $P_i^{t-2\lambda}$ , etc.

**Figure 2. The Benign Helix of Mises**



Von Mises's concept of the historical transmission of the value of money leads immediately to his theory of the adjustment of prices to an increase in the supply of money:

An increase in a community's stock of money always means an increase in the amount of money held by a number of economic agents, whether these are the issuers of fiat or credit money or the producers of the substance of which commodity money is made. For these persons, the ratio between the demand for money and the stock of it is altered; they have a relative superfluity of money and a relative shortage of other economic goods. The immediate consequence of both circumstances is that the marginal utility to them of the monetary unit diminishes. This necessarily influences their behavior in the market. They are in a stronger position as buyers. They will now express in the market their demand for the objects they desire more intensively than before; they are able to offer more money for the commodities that they wish to acquire. It will be the obvious result of this that the prices of the goods concerned will rise, and that the objective exchange value of money will fall in comparison. But this rise of prices will by no means be restricted to the market for those goods that are desired by those who originally have the new money at their disposal. In addition, those who have brought these goods to market will have their incomes and their proportionate stocks of money increased and, in their turn, will be in a position to demand more intensively the goods they want, so that these goods will also rise in price. Thus the increase of prices continues, having a diminishing effect, until all commodities, some to a greater and some to a lesser extent, are reached by it ([1924], 1953, p. 139).

In modern terms, von Mises is describing what is known as a *partial adjustment mechanism* for the price level, with the excess supply of money driving the inflation rate. In McCulloch (1980), I show that under simplifying assumptions, this can be written as

$$(1) \quad \pi = \gamma(\log(M/P) - \log m^D) + \pi^a + \varepsilon$$

Here,  $\pi = \dot{P}/P$  is the inflation rate,  $M$  is the nominal money supply (appropriately measured),  $m^D$  is real money demand,  $\pi^a$  is anticipated inflation reflecting the fact that agents extrapolate past prices for obvious inflation trends when predicting current and future prices of goods not currently being purchased, and  $\varepsilon$  is a white noise error term caused by nonmonetary microeconomic shocks. The adjustment coefficient  $\gamma = \eta m / (\lambda w)$  depends on  $\eta$ , the elasticity of marginal utility with respect to wealth (also known as the relative rate of risk aversion), real money balances  $m$ , real wealth  $w$ , and the average lag in price information  $\lambda$ .

In McCulloch (1980), I call this Mises-inspired equation "the Moderate Quantity Theory of Money." According to what I call the "Extreme Quantity Theory of Money," prices adjust

instantaneously to changes in the money stock, so that inflation simply equals concurrent money growth, net of real income growth, and plus velocity growth and white noise micro shocks. According to the “Moderate Quantity Theory,” however, inflation does not respond at all to concurrent money growth. In fact, if money supply equals money demand, inflation will be driven entirely by inflationary expectations plus micro noise. However, if these non-monetary factors drive prices away from their Quantity Theory equilibrium level, the first term will eventually begin to pull prices back toward their equilibrium level. The long run average inflation rate will therefore ultimately reflect the long run average money growth rate.

This “Moderate Quantity Theory” is a great improvement over the famous “real adjustment” equation of Cagan (1956), which was used by Chow (1966), Goldfeld (1973), and others to estimate the demand for money. According to the real adjustment equation, the rate of change of real money balances is proportionate to the gap between real money demand and real money balances. This turns out to be equivalent to (1), but with the expected inflation term replaced by the rate of money growth. So long as the money supply is constant, this will behave like a price adjustment equation in response to any changes in money demand or microeconomic shocks. However, it unrealistically predicts that the price level will perfectly track any changes in the money supply, just as does the Extreme Quantity Theory.<sup>2</sup>

The “P-star” model of Hallman, Porter and Small (1991) comes very close to the Mises-inspired equation (1). The only difference is that they did not provide micro foundations for their equation, and that they replace anticipated inflation by several lags of actual inflation. In practice it may be that a distributed lag of past inflation is the best available proxy for inflationary expectations, but it is better to make the inflationary expectations explicit, and only then to consider how best to proxy them empirically.<sup>3</sup>

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<sup>2</sup> This insight is due to my Boston College colleague Harold Peterson.

<sup>3</sup> Hallman et al. define their  $P^*$  in terms of the M2 monetary aggregate, though this is not an essential part of their adjustment mechanism. The “nominal adjustment” equation of Goldfeld (1976) makes sense for a small open economy with a fixed exchange rate and an endogenous money supply determined by the specie flow

## 2. MARKET EQUILIBRIUM VERSUS “RATIONAL EXPECTATIONS” EQUILIBRIUM

Von Mises’s theory of the historical transmission of the value of money leads directly to his concept of a Market Equilibrium, in which prices convey sufficient information about other agents’ tastes and endowments that agents’ actions are efficiently coordinated, without central planning or indeed any actual knowledge of other agents’ information. In an “evenly rotating economy” in which tastes and endowments are constant, the market will actually find the Walrasian equilibrium, without the help of a “Walrasian auctioneer” who calls out hypothetical price vectors. If tastes and endowments change over time but with a considerable element of continuity, the market will never perfectly reach the Walrasian equilibrium, but at least will be continually moving in its direction.

This theory of Market Equilibrium stands in sharp contrast to the fashionable “Rational Expectations Equilibrium” concept first proposed by Muth (1961), and elaborated on by Robert Lucas, Thomas Sargent, Neil Wallace, and others. According to this model, every agent knows the tastes, endowments, and production possibilities of every other agent, along with the intentions of policy makers, and then computes the equilibrium of the economy, to within random shocks not known to anyone.

As was pointed out by the Austrian economist Fritz Machlup, in an unpublished note written shortly before his death, the term “Rational Expectations” is an abuse of terminology, since “rational” simply means using one’s own information in a logical manner, and does not imply knowledge of other agents’ information, let alone the computationally impossible task of coordinating all this information.

“Equilibrium Expectations” would be a far more appropriate, and far less misleading, term for what Muth called “Rational

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mechanism. However, it makes little sense when the money supply is exogenous or determined by seigniorage considerations. Carr and Darby (1978) propose an equation like (1), but with expected inflation replaced by expected money growth. This term would only make sense in an “Extreme Quantity Theory” context in which inflation was driven contemporaneously by money growth.

Expectations." As such, "Equilibrium Expectations" is a very useful exercise for evaluating the long-run implications of policies such as inflationary finance or monetary stimulation through the Phillips Curve, even if it is an entirely unrealistic model of how the economy actually works.

Proponents of "Rational Expectations" often make the fallacious argument that if economists believe that agents are rational, then they must accept that agents' expectations are "Rational." This is the logical fallacy of assigning one term two definitions, and then equating the two definitions. Some even accuse those who deny this equation of irrationality on their own part.

Today, even some of the early proponents of "Rational Expectations" are admitting that it imposes unrealistic informational assumptions on agents, and now instead propose what they call "Bounded Rationality" (e.g. Sargent, 1993). But this itself is yet another misleading misnomer: If a person is only 30 percent rational, then that person is 70 percent mentally incompetent. But if a person is only 30 percent omniscient, then he or she is 70 percent human. "Bounded Omniscience" would therefore be a better term for what these economists really have in mind than "Bounded Rationality."

### 3. HETEROGENEOUS, INCONVERTIBLE CAPITAL

Mainstream macroeconomics typically treats "capital" as a homogeneous good whose structure, if any, is only relevant for microeconomic questions. Thus, the popular "neoclassical growth model" typically contains an equation according to which consumption plus investment equals output net of depreciation:

$$C + \Delta K = f(K, L) - \delta K$$

The Austrian economists Ludwig von Mises and F.A. Hayek instead stressed that capital ("the produced means of production" as Böhm-Bawerk put it) is to a great extent specific to the intended ultimate product, and thus is both heterogenous and inconvertible. In their "Austrian" theory of the business cycle, they emphasized that goods available at different points in time are economically different goods. Following Böhm-Bawerk, the "more roundabout means of production" are generally more



productive, in part because they permit the use of technologies that involve types of capital that would not have time to be constructed for less roundabout production plans. The inconvertibility of this horizon-specific capital plays a central role in the Austrian business cycle theory.

Von Mises himself made no attempt to quantify this concept, either mathematically or graphically. In his *Pure Theory of Capital*, Hayek (1975) attempted to illustrate it graphically, but as he confined himself to unrealistically simplistic technologies, he was not very successful.

In fact, this Misesian concept is easily illustrated in terms of the “Production Possibility Frontier” (PPF) of the early marginalist F.Y. Edgeworth. This tool was adapted to intertemporal production by Irving Fisher in his very Böhm-Bawerkian *Theory of Interest* (1930).<sup>4</sup>

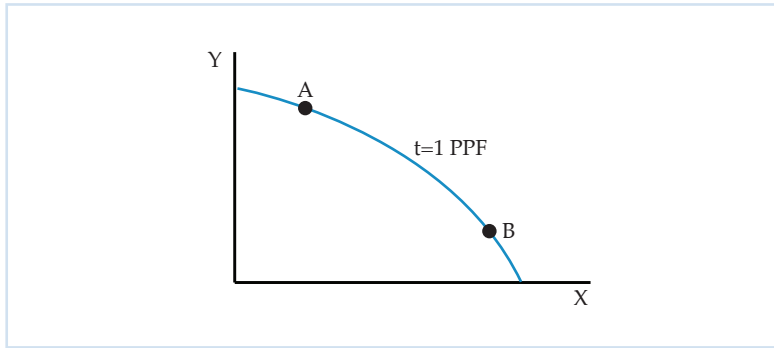
Figure 3 below shows a typical PPF for the case of two outputs, X and Y. Points A and B on the PPF represent two output combinations that are feasible given the available inputs. In the elementary exposition of this PPF, there are two inputs, homogeneous capital K and labor L, and two concave, constant returns to scale production functions with differing factor intensities. The resulting PPF bends away from the origin as illustrated.<sup>5</sup>

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<sup>4</sup> Fisher in fact dedicated his 1930 book to Böhm-Bawerk and to Böhm-Bawerk’s precursor John Rae.

<sup>5</sup> The Austro-Hungarian mathematician John von Neumann provided a very Menger-like proof of both diminishing marginal products and of the general convexity of the production possibility set for a very general constrained technology, as discussed in Gale (1960). In each stage of production, there is a nonnegative vector  $x$  of inputs, a nonnegative vector  $y$  of production activities, and a vector  $z$  of outputs. Activities are constrained by the vector inequality  $Ay \leq x$ , where  $A$  is a matrix of nonnegative input requirements, while outputs one period later are given by  $x = By$ , where  $B$  is a matrix of nonnegative output coefficients. The Production Possibilities Set is then convex. Its PPF is piecewise linear in the case of two outputs, but in a complex economy with a vast number of inputs and activities, will be nearly smooth as in the illustrations. Two inputs are *complements* in Menger’s sense when they are both required by a single activity. Two inputs are *substitutes* when they are required by different activities that produce the same output. Complements tend to increase one another’s marginal product, while substitutes tend to decrease the other’s marginal product, so that two inputs may be said to be *net complements* or *net substitutes* depending on their net effect on one another’s marginal product. Outputs are *joint* if they are produced by the same activity or activities. This very Mengerian von Neumann model is differentiated

**Figure 3. A Production Possibility Frontier (PPF) with Two Outputs, X and Y**



But suppose now that instead of being pre-existing and homogeneous, capital must be produced, and that the types of capital tools and equipment that one would ideally use to produce X are different from those that would be used to produce Y. Production now has at least two stages and involve three points in time: At time  $t=1$ , the initial endowment of resources is used to produce specialized tools and equipment that will become available at time  $t=2$ . Then at time  $t=2$ , these produced means of production are combined with non-produced factors like land and labor to produce X and/or Y at time  $t=3$ .

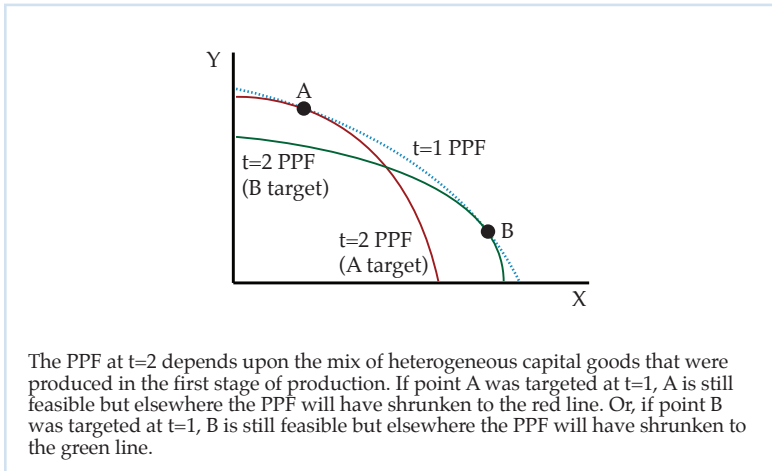
The  $t=1$  PPF over X and Y will still be convex as in Figure 3, but now the  $t=2$  PPF will depend on which combination of X and Y was targeted back at  $t=1$ . If point A was targeted at  $t=1$ , A will still be feasible at  $t=2$ . However, point A will be the only point on the original PPF that is still feasible. Elsewhere, the new  $t=2$  PPF will lie strictly *inside* the original PPF, as illustrated by the red curve in Figure 3. In particular, point B will no longer be attainable. On the other hand, if point B was targeted back at  $t=1$ , only B will still be attainable at  $t=2$ , as illustrated by the blue curve in figure 3. In mathematical terms, the *elasticity of transformation* of

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from the oversimplified Input/Output model of Leontief by the separation of outputs from inputs and the passage of time. In the Leontief I/O model, for example, a chicken could be used to lay the very egg from which it itself hatches, while this is impossible in the von Neumann model. I have no direct knowledge that von Neumann was inspired by Menger, but it seems very likely that he was.

the PPF declines as time passes and production is committed to a particular point on the original PPF. (The *elasticity of transformation* is the negative of the elasticity of substitution, defined along a PPF instead of an isoquant or indifference curve.)

**Figure 4.**

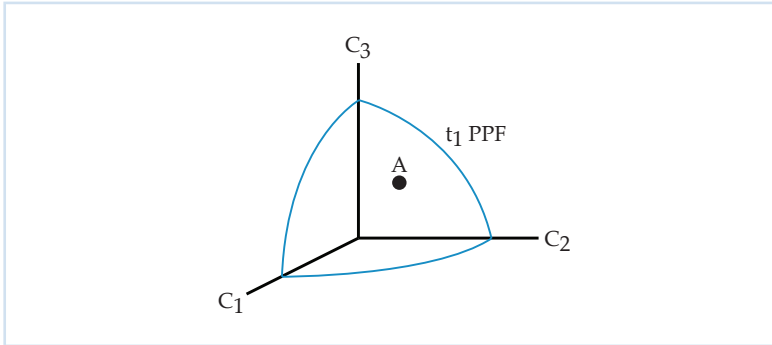


The situation illustrated in Figures 3 and 4 is basically a micro-economic problem, and not a macroeconomic one: If at  $t=1$  one builds umbrella factories instead of sunscreen factories, but at  $t=2$  if it is realized that the demand will be for sunscreen instead of umbrellas, one will have lost the capability to produce as much sunscreen as would have been feasible *ex ante*. However, there is not too much or too little demand for goods as a whole, just too much or too little demand for umbrellas versus sunscreen.

In an intertemporal context, however, it is possible to have too much or too little demand for *present goods* as a whole relative to *future goods*, their relative price being governed by the real interest rate. In order for malinvestment to be an issue, there must have been a third, earlier period when horizon-specific capital investments were made. Figure 5 below illustrates a general PPF for aggregate consumption possibilities  $C_1, C_2,$  and  $C_3$  in a world with three periods  $t_1, t_2,$  and  $t_3$ . At time  $t_1$ , producers will target an output stream like point A that

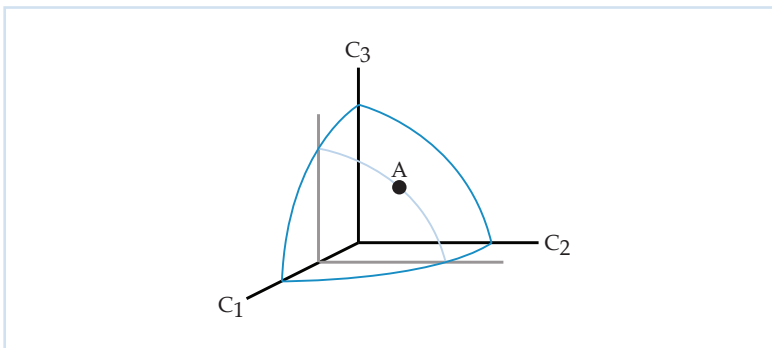
maximizes the present discounted value of future output, given the real interest rates that are then current.

**Figure 5. A Three-Period Intertemporal PPF**

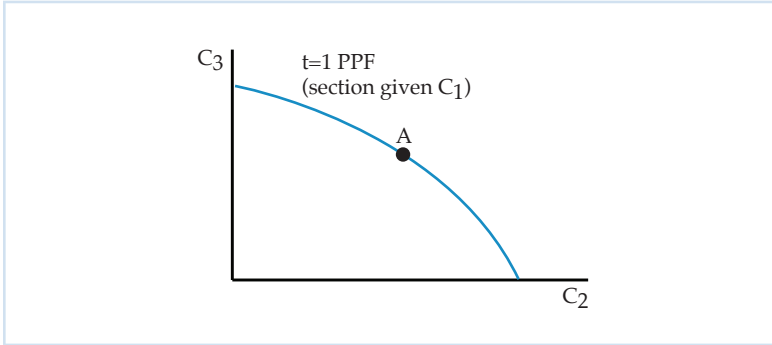


During the second period  $t_2$ , the chosen value of  $C_1$  will have already been produced and consumed, so that it can no longer be changed. Figure 6 below shows the section through Figure 5 corresponding to the  $C_1$  value of point A. Figure 7 shows this section by itself without the  $C_1$  axis.

**Figure 6. Time  $t_1$  PPF with Section at Level of  $C_1$  Corresponding to Point A**

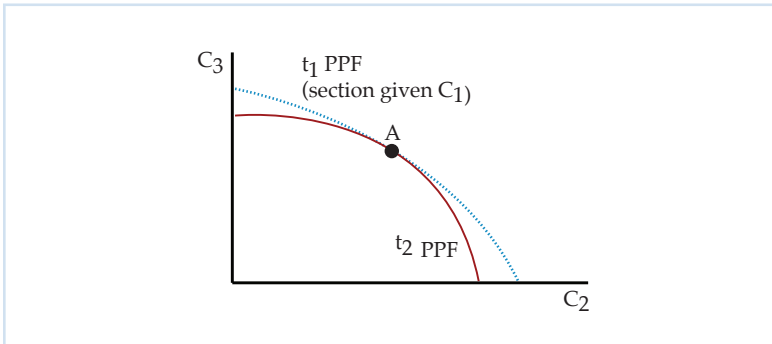


**Figure 7. Section of  $t_1$  PPF Shown in Figure 6, Without  $C_1$  Axis**



Although any point on the  $t_1$  PPF section shown in Figure 7 could have been produced if one had begun back in  $t_1$ , by  $t_2$  it is too late to produce any point on it but A. It is not necessary to follow through with A itself, but any other combination of  $C_2$  and  $C_3$  will be inside the original PPF, as shown in Figure 8 below.

**Figure 8. The “Austrian Capital Effect”**



This “Austrian Capital Effect” was first illustrated in this manner in my 1981 article, “Misintermediation and Macroeconomic Fluctuations.” This diagram shows how intertemporal malinvestment imposes real costs on the economy. The problem is not overinvestment or underinvestment per se, since the level of  $C_1$  is not necessarily incorrect. Rather it is that producers have invested in

the wrong structure of capital, given consumers' preferences over  $C_2$  and  $C_3$ .<sup>6</sup>

It should be noted that the interest rate that most directly affects the  $t_1$  choice of  $C_2$  relative to  $C_3$  is the  $t_1$  *forward interest rate* linking these two points in time, and not the  $t_1$  *general level* of interest rates per se. Unfortunately, Mises and Hayek did not take the term structure of interest rates into account, as is required to make this nuanced point.

#### 4. THE LIQUIDITY EFFECT

A popular misconception in the mainstream macroeconomic literature is that the "Liquidity Effect" of a monetary expansion is the reduction in real and nominal interest rates required to induce agents to *hold* the new money, given the received price level and a real money demand function that has some interest-elasticity.

In fact, Mises would be the first to point out that the immediate effect of an injection of money through the banking system is the reduction in real (and therefore nominal) interest rates required to induce agents to *borrow* the new money from the banks with the primary intention of *spending* it, on consumption or investment. As Mises pointed out above, a disequilibrium excess supply of money will persist for some time after the monetary injection, and hence the disequilibrium liquidity effect will persist for the same length of time.

This correspondence between the excess supply of money and the disequilibrium liquidity effect can help us understand how the "Taylor Rule" can, at least in principle, be used to regulate inflation in a fiat money economy like the United States since 1968: If the central bank knows the demand for real money balances, it can use the nominal money supply and the Quantity Theory of Money to regulate the price level and hence inflation. On the other hand, if it knows the equilibrium real interest rate but has no trust in the stability of the money demand function, it can, in principle,

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<sup>6</sup> Guo and McCulloch (2013) illustrate the Austrian capital effect with a simple agricultural economy that can choose between using labor to plant crops immediately or to build plows that will increase future productivity but delay consumption.

still regulate the excess supply of money and hence inflation by manipulating interest rates along the lines of the “Taylor Rule.”

## CONCLUSION

Ludwig von Mises’s writings contain many insights that are very relevant for mainstream macroeconomics. These insights can and should be accepted even by those economists who do not share Mises’s strong policy recommendations on the inevitable counter-productivity of intervention, the gold standard, and the precise nature of the business cycle.

At the same time, Austrian economists should strive to integrate these insights into mainstream economics, rather than isolating themselves from it.

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