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The Myth of the Price Premium

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Abstract: A basic proposition of modern economics is the so-called price premium proposed by Irving Fisher (1907, 1922, 1930): the nominal rate of interest is composed of the real rate and a price, or inflation, premium that reflects the change in the value of money. Murray Rothbard offered a critique of Fisher's interest theory, arguing that the price premium is largely nonexistent and proposing in its stead a terms-of-trade premium (Rothbard 2009). In the present article, we argue that Rothbard's critique is fundamentally correct. Fisher's price premium is an incoherent concept that does not correctly reflect monetary and financial reality. Instead we combine Rothbard's terms-of-trade component with Mises's (1953, 1998) understanding of inflation and interest to suggest a Mises-Rothbard premium based on the Cantillon effect as the correct understanding of the relation between money and interest. This approach allows us to explain the experience of persistently low interest rates over recent decades as a result of money creation.

Most explanations of the secular fall in the rate of interest in recent decades look exclusively at real factors on the assumption that monetary factors can have at most a transitory

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effect on the real interest rate. This assumption follows from the universally accepted Fisher effect: that the nominal, or money, rate of interest is composed of the real rate of interest plus a price, or inflation, premium that reflects the change in the value of money. While monetary factors can affect the nominal rate, in the long term, the real rate of interest is independent of any changes from the money side, as these are completely captured in the price premium. This idea was first introduced by Irving Fisher (1907, 1922, 1930) and has since become standard in interest theory and financial theory, with virtually no dissent.

There is an alternative theory: Austrian economists, beginning with Ludwig von Mises, have a much more nuanced theory of the interactions between money and the rate of interest. Although critical of other parts of Fisher's monetary theory, Mises accepted the idea of the price premium (Mises 1953; 1998, 538–42), but as we will argue, his understanding of the underlying dynamics was essentially different (Salerno 1995). Murray N. Rothbard, building on Mises, then offered an explicit refutation of Fisher's inflation premium and argued for replacing it with a "terms-of-trade" component (Rothbard 2009, 792–98).

Although this Mises-Rothbard conception has received virtually no attention in the literature, we will argue that Rothbard's critique of the price premium is correct, as the Fisher effect, even in its most nuanced versions, presupposes a mechanistic relationship between inflation and interest rates. We will develop Rothbard's proposed alternative of a terms-of-trade component and integrate it with Mises's much more nuanced version of the price premium. We thereby hope to get much closer to a correct understanding of the relationship between money and the interest rate. Just as there is no real risk premium in the rate of interest (Hülsmann 2018), there is no price premium. These concepts are, at best, only metaphors for factors influencing entrepreneurial expectations, which are the real drivers of interest rate formation.

More generally, the relationship between money creation, the value of money, and interest rate formation cannot be understood in terms of neutral money and an evenly rising price level—rather, it is only because money is *not* neutral and the effects of money creation are *not* evenly spread across all markets that inflation can have consequences for the interest rate at all. A step-by-step

analysis of money inflows into the economy and their effects on relative prices and the distribution of incomes and wealth—of the so-called Cantillon effect (Sieroń 2019; Baeriswyl 2015)—is the only successful method for understanding the relationship.

This critique and development of the theory of money and interest is not merely a matter of theoretical minutiae or the history of economic thought. The past several decades were a time of falling and low interest rates across most economies, presenting problems for the standard account of interest rate determination. Even a minor positive price premium component meant that the real rate was zero or negative. Central banks have indeed argued that the real rate turned negative and that this was the real reason for the low-interest-rate environment (IMF 2014, chap. 3; Bank of Japan 2016), and economists have developed various models showing why this is so (Del Negro et al. 2019; Lisack, Sajedi, and Thwaites 2021; Cesa-Bianchi, Harrison, and Sajedi 2023).

Ben Bernanke's idea of a savings glut can be said to underlie all these models: real interest rates were low because there was a glut of savings (Bernanke 2005), either caused by Asian savers or by aging populations in developed countries. Since the possibilities for productive investment dried up (Summers 2014), investment demand did not keep up with the increased supply of savings. The result was secular stagnation, and the real and nominal interest rates might even have turned negative had it not been for an increase in government indebtedness (Rachel and Summers 2019; Weizsäcker 2014).

We offer an alternative explanation: the savings glut is really a money glut, and interest rates fell due to the continuous inflow of new money into financial markets, not due to a fall in the natural, or real, rate of interest. This alternative explanation is needed because the secular stagnation hypothesis has been criticized and been shown to be inconsistent with the facts (Mayer and Schnabl 2019; Macovei 2021). The inflow of money causes a decline in productive investment as easy credit loosens market discipline and allows incumbent firms to stay in business without having to innovate or adapt (Aghion et al. 2019). This can also be understood as analogous to a softening of the budget constraint (Kornai 1986): easy credit takes the place of external assistance because firms expect to be able to cover shortfalls in revenue with additional credit.

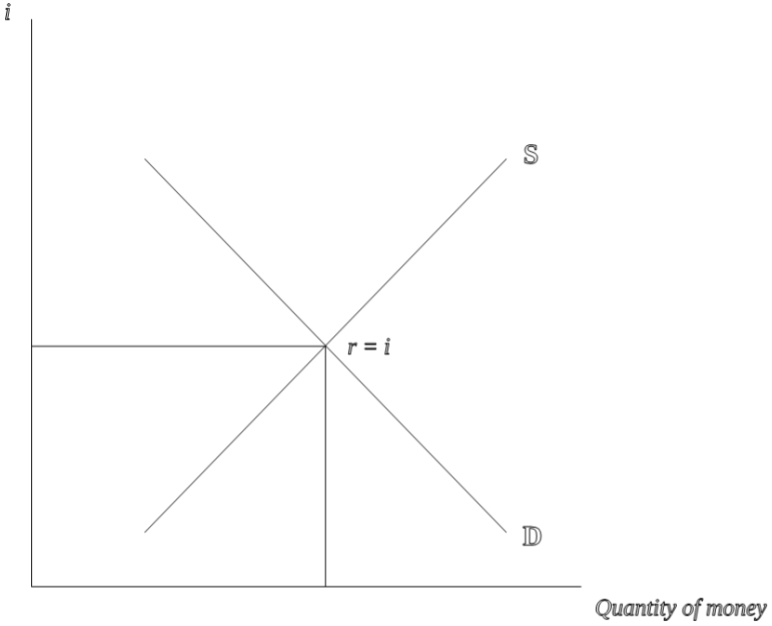
FISHER REVISITED

Irving Fisher (1907, 1922, 1930)[1] was the first to clearly formulate a quantitative relationship between changes in the value of money and the level of the rate of interest. A proponent of the time preference theory of interest, Fisher saw the interest rate as formed in the exchange between future and present goods. However, since these exchanges are measured in terms of money, this introduces a monetary factor into the theory of interest. Only if money were always invariable in value in terms of all other goods would the real rate and the nominal rate of interest coincide; since this is not so, the nominal rate of interest is affected by the standard in which it is expressed (Fisher 1907, 77–78).

If the value of money changes, the effects on contracts and interest rates depend on whether the change is foreseen. If the change is not foreseen, then it has no effect on the rate of interest. Thus, an unforeseen appreciation of money does not affect the interest rate, but it does increase the burden on debtors, who now must repay their loans in appreciated money and thus surrender more real goods than they originally thought. Similarly, an unforeseen fall in the value of money lightens the load on debtors and leads to a real loss for creditors.

[1] There have been no appreciable changes over the decades to the expression Fisher gave to the core idea.

Figure 1: Fisher's loanable funds market



Fisher's theory of interest rate determination can be understood in terms of a simple loanable funds diagram. In figure 1, we have the rate of interest on the vertical axis and the quantity of money changing hands in the loanable funds market on the horizontal axis. Both the supply (*S*) of and the demand (*D*) for present money are determined by time preference. The intersection of the two curves determines the real rate of interest (*r*). If the value of money does not change—or is not expected to change—the real rate will coincide with the nominal rate of interest (*i*).

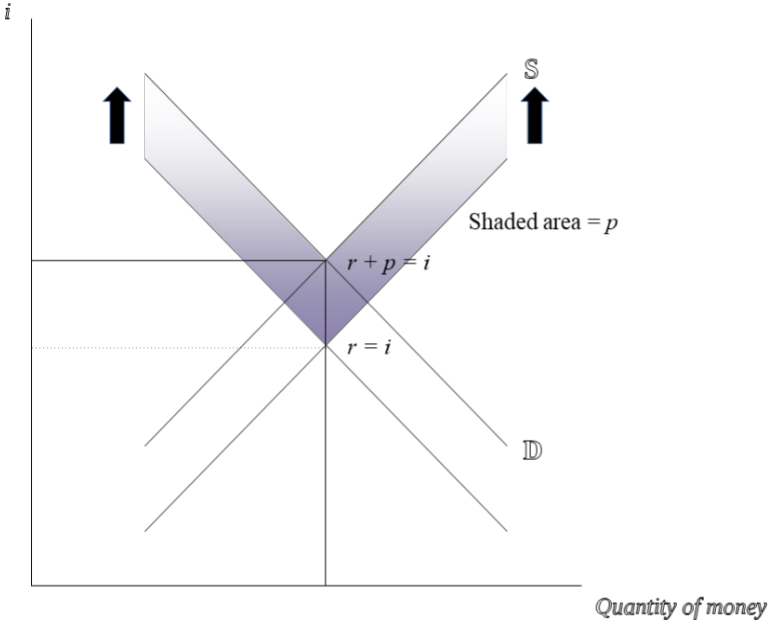
If a change in the monetary standard is foreseen, then the rate of interest adjusts to take the change into account: "To offset a foreseen appreciation, therefore, it would be necessary only that the rate of interest be correspondingly lower, and to offset a foreseen depreciation, that it be correspondingly higher" (Fisher 1930, 38). If money appreciates, this leads to a fall in the rate of interest, making sure that the real amounts paid and received are the same as if there were no change in the value of money. Depreciation of

money similarly leads to a rise in the rate of interest, so the amount of money repaid in the future corresponds to the amount of real goods to be paid were there no change in the value of money. This does not mean that appreciation can drive the monetary rate into negative territory: if the commodity in which interest is calculated is expected to appreciate, entrepreneurs will tend to hoard the commodity in question (wheat, silver, gold, etc.), driving up its present value (40–41).

One key assumption in Fisher's theory is the neutrality of money: changes in the value of money affect all goods markets equally or at least in such a way as to be captured by a change in an index to which entrepreneurs, lenders, and borrowers implicitly refer when a price premium emerges in the rate of interest; and the rate of interest can, at least in theory, meaningfully be decomposed into the real rate and the inflation component. This neutral-money assumption was made explicit in later monetary theory, which virtually unanimously accepted the Fisher effect. It also constitutes a key difference in the alternative Misesian theory of money, as Mises (1998, 535–36) explicitly denied both the coherence and the utility of assuming neutral money.

Figure 2 depicts the relationship between the real rate of interest, the price premium, and the nominal rate of interest. As inflationary expectations develop, a price premium (p) is added to the real rate both on the supply side and on the demand side, shown by the shaded area. We are here dealing with a purely arithmetical operation: lenders and borrowers calculate the price premium based on their expectations, and then simply add this component to the real rate of interest. The result is that changes in the value of money do not have any influence on the time market: the real rate of interest remains the same, and the quantity of money lent doesn't change.

Figure 2: Fisher's price premium



Later economists developed monetary theory and refined Fisher's analysis, but no one seems to have challenged the basic relationship he postulated between the value of money and the rate of interest. Robert Mundell (1963) argues that inflation leads to a fall in the real rate, since the money rate of interest tends to rise by less than the rate of inflation. This Mundell effect, however, can easily be understood in terms of Fisher's (1930, 400) "money illusion": people tend to think of money as constant and unchanging and are therefore slow to adjust their expectations. Central bank policy, focused on steering expectations, implicitly assumes the truth of the Fisher effect, as do such policy prescriptions as the Taylor rule (Taylor 1993). Recent reviews of central bank policies also assume the truth of the Fisher effect (e.g., Bernanke 2020).

Empirical investigations have painted a more complex picture of money and interest rate dynamics. Thus, Mishkin (1992) finds that for the U.S. there was a close fit between movements in short-term rates and fluctuations in expected inflation only in the period

1951–79, but not before and after; for other countries the effect was not visible before 1979 at all. However, Mishkin finds that the Fisher effect holds in the long run, which is consonant with Fisher's focus on expectations as the cause of the inflation premium. Crowder and Hoffman (1996) find considerable support for a tax-adjusted Fisher effect; Anari and Kolari (2019) conclude that the Fisher effect holds when we take Wicksell effects into account; and most recently, Valle e Azevedo, Ritto, and Teles (2022) find an unambiguous, positive, one-to-one relationship between inflation and nominal interest rates. Finance textbooks also accept the Fisher effect without reservation (e.g., Cecchetti and Schoenholtz 2017; Mishkin 2019).

More recently, work on the evolution of the real rate of interest takes the Fisher effect as given, looking entirely on nonmonetary factors as the drivers of persistently low and falling real rates. Thus, the Bank of Japan (2016) estimated the real rate in Japan to be zero or less from 2010, and Rachel and Smith (2017) expected the global real rate to fall to around 1 percent due to an increase in the savings schedule and a fall in desired investment levels. Del Negro et al. (2019) found that the global real rate had been declining since the 1970s, reaching almost zero by 2016. They explained this development as the result of an increase in the demand for safe and liquid assets and of lower economic growth (Del Negro et al. 2019, 261). Population aging or increased longevity has also been proposed as a key driver of falling real interest rates: as the population ages, households hold more wealth to finance longer retirements (Lisack, Sajedi, and Thwaites 2021). Most recently, the Bank of England published a working paper arguing that increased longevity and lower productivity growth were the key causes of the fall in the global real rate of interest (Cesa-Bianchi, Harrison, and Sajedi 2023).

While there are several explanations for why the interest rate declined, they are all agreed that the cause is nonmonetary. The underlying theses that these models develop and apply are Bernanke's (2005) savings glut hypothesis and Summers's (2014) secular stagnation hypothesis. Bernanke explained the U.S. current account deficit as a result of capital export from East Asian countries: from the late 1990s on, high domestic savings in most Asian countries were channeled into Western capital markets as Asian savers increased their demand for safe financial assets (Bernanke et al. 2011). Summers (2014) argued, extending the model of Laubach

and Williams (2003), that the natural rate of interest had fallen to close to zero percent. This development Summers explained as due to several factors: changing technologies and cheaper capital goods reduced investment demand, and declining population growth also led to a declining natural rate of interest. Rachel and Summers (2019) estimated that a shortfall of investment (i.e., secular stagnation) was a key cause, along with excess savings: if not for an increase in government debt, interest rates would have turned negative. Rachel and Smith (2017) also explained low real rates as due to a fall in desired investment and an increase in the savings schedule.

These theories are updated versions of Keynes's (1936) liquidity trap concept and Hansen's (1939) secular stagnation thesis. Hayek (1931) had already refuted these ideas on theoretical grounds. Mayer and Schnabl (2019) have criticized Keynes and Hansen's modern epigones, arguing that their key propositions are flawed. Specifically, Mayer and Schnabl show that the marginal efficiency of capital is stable, not declining, suggesting that there should be no decline in investment demand. Contrary to Summers, they argue that low interest rates due to monetary policy impair productivity growth, rather than low productivity growth leading to lower interest rates. Pointing to Japanese data, Mayer and Schnabl also argue that the empirical link between increased longevity and decreasing interest rates is weak. Nevertheless, even if these specific explanations of low interest rates fail, accepted theory suggests that the cause must be a decline in the real rate of interest. On the standard account of the Fisher effect, it would be absurd to look for a monetary cause, since whatever effect money has on nominal rates, these are in the long run fully captured by the price premium. However, if we discard the Fisher effect, the possibility of a monetary explanation for the global interest rate decline emerges.

ELABORATING ROTHBARD'S CRITIQUE

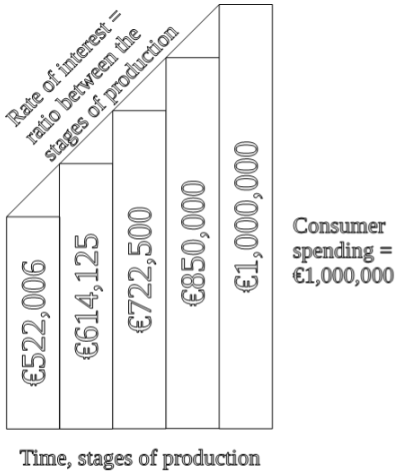
Murray N. Rothbard presented his critique of Fisher's interest theory in his 1962 treatise, *Man, Economy, and State* (Rothbard 2009). Although both Rothbard and Fisher were proponents of a time preference theory of interest, there are central differences between the two. Fisher focused exclusively on the money rate of interest on loans: to him, the loanable funds market is the key time market

and the key interest rate is the rate on loans. It is simply the price of future money in terms of present money (or of future wheat in terms of present wheat).

The main difference between Fisher and Rothbard is this: to Ludwig von Mises, whose theory Rothbard developed, interest is not a price but a ratio of prices: "Originary [i.e., real] interest is the ratio of the value assigned to want-satisfaction in the immediate future and the value assigned to want-satisfaction in remoter periods of the future. . . . It is a ratio of commodity prices, not a price in itself" (Mises 1998, 523). For Mises, interest is the ratio between the prices of consumer goods and services and the prices of goods and services which are inputs into the production of future consumer goods. The rate of interest on money loans is of only secondary importance and purely derivative of the overall time market which permeates the economy.

Rothbard (2009, chap. 6), expanding on Mises's foundations, argues that the interest rate is determined in the market for the factors of production across the production structure as the ratio between the total receipts expected from the sale of the final goods and the total sum paid for the factors of production. While the rate of interest tends toward equality across sectors and businesses in equilibrium, there are thus different rates in different businesses and branches of production, depending on their relative profits (and losses). In the long run, any profits will be eliminated, because in equilibrium only the originary, or real, rate of interest remains. Again, for Rothbard, the loanable funds market is subsidiary and not important for the formation of interest, although it can be and often is important in the processes of adjustment to changes in the economy.

Figure 3: The "Austrian" structure of production



This "Austrian" approach to capital and interest can be depicted graphically as a triangle with steps (Hayek 1935; Rothbard 2009; Garrison 2001). We see this in figure 3, where the horizontal axis is time and the vertical axis is the monetary value of the output. Production proceeds in stages from left to right, while money flows from right to left in payment for the products. At each stage, the factors of production receive the discounted marginal value product, and the price spread between stages goes to the capitalist-entrepreneurs (for simplicity's sake, we abstract from payments to original factors). The amount within each rectangle is the expected and realized revenue to that stage of production, based on expected and realized monetary demand for the product of that stage.

In equilibrium, the price ratios between the stages will be equal to each other. Thus, in figure 3, consumers spend €1,000,000 in each period and the rate of interest is roughly 17.6 percent. The capitalists in the lowest stage are therefore willing to pay a total of €850,000 for inputs at the beginning of their production processes to reap revenues of €1,000,000. Similarly, the capitalists in the second stage expect revenues of €850,000 and will therefore pay money costs of

up to €722,500, and so on up the structure of production.[2] Arbitrage across the structure of production ensures a uniform return to capitalists in all the stages, and this uniform return, the rate of interest, is set by the social rate of time preference.

This difference in basic interest theory informs Rothbard's critique of Fisher (Rothbard 2009, 793). For Rothbard (and Mises), any change in the value of money is composed of changes in specific prices. Hence, if the value of money increases, this means that the prices of some specific goods fall. A fall in the prices of (some) consumer goods will lead entrepreneurs to reduce their bids for the factors of production necessary to produce the consumer goods in question, and the prices of these factors of production will therefore fall. Since the rate of interest is the price ratio between the stages of production, this means that a change in the value of money has no consequences for the rate of interest: there is no change in relative prices. The case of appreciation of money is the clearest illustration of the difference between the two approaches. Where Fisher sees hoarding as the only mechanism to prevent negative interest rates in the case of a sharp rise in the value of money, Rothbard argues that simple price changes in the markets for factors of production will fully account for the appreciation of money, leaving the money rate of interest unaffected.

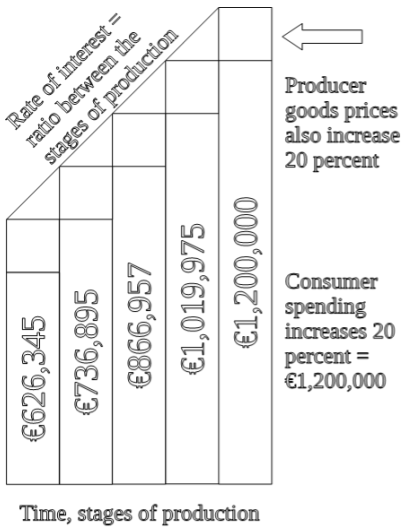
If entrepreneurs expect prices to fall, they will lower their bids for factors of production in the present, and if they expect future prices to rise, they will raise their bids for factors of production in the present. Thus, to the extent that entrepreneurs expect changes in the value of money, these expectations will be reflected in the prices they pay for the factors of production, and the rate of interest (both the loan rate and the price ratio between stages of production) will remain unaffected. Only in the case where entrepreneurs do not predict changes in the value of money will a price premium emerge. Thus, in the case of an unexpected fall in the value of money, profits will be higher than expected across the board, as selling prices are far higher than expected, implying a rise in the rate of interest; and

[2] In our example, there are five stages of production. Capitalists in the fifth stage pay original factors for their inputs. The structure is thus not a triangle but a trapezoid, a point first made by Rothbard (2009, 407–8, 521) and elaborated by Hülsmann (2011). We will return to the importance of this point in the "Further Implications" section.

in the case of an unexpected rise in the value of money, profits will be lower than expected, as selling prices are lower, which is the same as a fall in the market rate of interest.

Two key differences from Fisher's account emerge: (1) only in the case of unanticipated changes in the value of money will there be a price premium; and (2) this premium can in fact be negative if the deflation is large enough (Rothbard 2009, 796–97). Since the loan market is purely derivative, the loan rate will tend to change in the same direction.

Figure 4: The structure of production under inflationary expectations



If we return to the structure of production, Rothbard's critique of Fisher becomes clear. In figure 4 we reproduce figure 3, but now capitalist-entrepreneurs expect inflation—that is, they expect consumers to pay more for consumer goods. Expecting 20 percent inflation, they expect consumers to pay a total of €1,200,000. Capitalists in the lowest stage will therefore pay €1,019,975 for inputs, but no more, and capitalists in the higher stages will increase their bids for inputs proportionately. The result is that producer goods prices generally rise, but the price ratios between the stages of production and therefore the interest rate are not affected.

Rothbard's treatment of the price premium in *Man, Economy, and State* was very concise, and he didn't return to the question in later writings, nor have other economists elaborated it. There is as a consequence some room for improving Rothbard's description of the interaction between the real rate (i.e., the price ratio between the stages of production or the ratio of present to future prices) and the loan rate of interest. Thus, it can be proposed that a positive Rothbardian price premium is unlikely to result in a higher rate on loans—precisely because it is unanticipated, why would anyone bid up the rate of interest? Only when they sell their outputs will entrepreneurs realize that their net money income is higher than they anticipated, but at this point too there is little reason for the loan rate to increase. In the next round of production, entrepreneurs will take into account the higher consumer goods prices and bid up the prices of the factors of production accordingly. The same goes, mutatis mutandis, for a negative Rothbardian price premium.

Thus, the interest rate on loans will not simply mirror the inflation premium, but this does not mean that the loan rate will remain unaffected. In the real world, entrepreneurs are unlikely to remain ignorant of an ongoing change in the value of money. They will gradually realize that prices are changing and adjust their behavior accordingly. In the case of a fall in the value of money, entrepreneurs will likely see or start to suspect a rise in the price of their product even before they sell it. Such a rise is an occasion for extra profits, and entrepreneurs will try to take advantage by expanding their production. They can do this by simply dipping into their cash reserves to fund the purchase of factors of production, in which case the result will be a rise in factor prices and hence a narrowing of the premium. However, entrepreneurs may be unwilling to deplete their cash reserves, or these may be insufficient to fund purchases at higher prices. All other things being equal, therefore, developing inflationary expectations will lead entrepreneurs to enter the market for loanable funds to finance extra expenditures, and this will drive up the loan rate of interest. In this case the price premium will become evident in the loan rate, but it will quickly disappear again as the prices of factors of production are bid up, narrowing the price spread.

Thus, even a Rothbardian price premium is ephemeral—if it exists at all. We turn now to a discussion of the Mises-Rothbard

approach to the question, wherein we will see how the whole idea of different components to the rate of interest is problematic.

THE MISES-ROTHBARD ALTERNATIVE

A reconsideration of Mises's price premium leads to the conclusion that we have here a very different "price premium" from that of the Fisher effect. Mises's approach combined with Rothbard's suggested terms-of-trade component describes a very different relationship between money and the interest rate. The key difference from Fisher and most other economists is that Mises rejects any idea of neutral money and neutral interest rates: "In the changing economy, the rate of interest can never be neutral. In the changing economy, there is no uniform rate of originary [i.e., real] interest; there only prevails a tendency toward the establishment of such uniformity. . . . Where everything is unceasingly in flux, no neutral rate of interest can be established" (Mises 1998, 539).

For Mises, there is thus not a single interest rate in the economy, but rather a range of interest rates, determined by the "originary," or real, rate of interest and a specific entrepreneurial component for each specific production process and loan. This component in turn is the result of the estimates of entrepreneurs and capitalists in their dealings; it expresses their assessment of the risks and potentials of different investment opportunities. Mises's price premium is very similar to the entrepreneurial component. Throughout his discussion of interest in *Human Action*, Mises describes the price premium as the result of entrepreneurs' speculative anticipations—when they expect prices to rise in the future, entrepreneurs will increase their borrowing to adjust their production plans: "The emergence of the price premium is not the product of an arithmetical operation which could provide reliable knowledge and eliminate the uncertainty concerning the future. It is the outcome of the promoters' [entrepreneurs'] understanding of the future and their calculations based on such an understanding" (Mises 1998, 541).

Our change to the Rothbardian price premium suggested above is thus really only an application of this idea. To Mises, the price premium on loans always emerges as a result of speculative anticipations of future prices. It is different from the "normal" entrepreneurial component, since the cause of higher future prices

in this case is cash-induced changes in the money relation (i.e., an increase in the money supply), and it will therefore tend to emerge generally, across many different sectors.

To the entrepreneur, however, it is not evident that changes in the money relation—that is, changes in prices arising from monetary factors—are a real consideration. The driver of entrepreneurial action in the market is expected future prices: when a premium in the interest rate emerges, the entrepreneur simply expects higher prices, meaning that more money will be paid for his output, and he therefore borrows money in order to increase his production. To the entrepreneur, the distinction between changes originating on the goods side and changes in the money relation is not of much use.[3] All changes in the value (purchasing power) of money take the form of changes in the prices of specific goods. A cash-induced change in the money relation is, to the entrepreneur, the same as a cash-induced change (e.g., an increase) in the prices of a range of goods. It is true that expectations about monetary policy can inform entrepreneurial decisions, but such expectations simply concern the factors influencing the specific prices with which the entrepreneur is concerned—they do not fundamentally change the nature of his actions.

The conclusion to be drawn from this is that there is no distinction between a Misesian price premium and the entrepreneurial component inherent in all lending and in all future-oriented action. The entrepreneurial consideration always takes the same form: "I expect prices for my product to be higher than initially estimated. I will therefore borrow more money, even at a higher rate, to secure more of the complementary factors of production." Even in the case when the entrepreneur expects an ongoing inflation (i.e., he has inflationary expectations), he still has to estimate prices for each future production period and base his actions in the present on this estimate.

[3] Israel (2022) has shown the theoretical problems of the money relation, specifically that it is impossible to distinguish between the "inner" and the "outer" exchange value of money. However, we can still distinguish between different sources of changes in prices. As Israel says, the distinction is useful "when it comes to the analysis of exogenous changes, such as an exogenous increase in the money stock (money side) or a natural catastrophe destroying the harvest (goods side), and their implications."

In each period, therefore, the entrepreneur may correctly estimate prices and increase his demand for the factors of production, since they are underpriced given his expectations; if entrepreneurs generally have inflationary expectations, factor prices will rise. Alternatively, he will underestimate prices and thus not adjust his demand for factors of production at the outset, since these factors are, given his (noninflationary) expectations, correctly priced. When the entrepreneur realizes his mistake, he will revise his production plans and acquire more factors. Since the outlays required are unforeseen, he will have to finance them by taking out more loans unless his cash reserves are adequate to cover the extra costs.[4] If entrepreneurs in general have to revise their production plans in this manner, the demand for credit is likely to increase and the rate of interest will also increase transiently, since the entrepreneurs are willing to pay more on additional loans given their expectations of higher revenues.

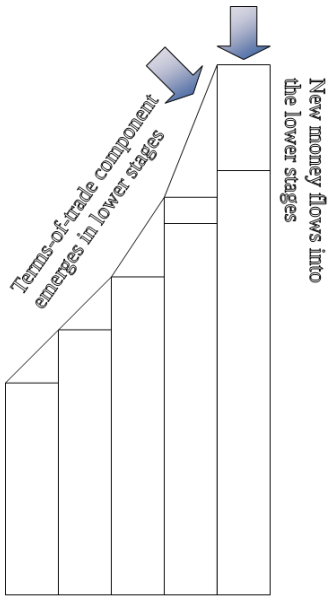
Just like the entrepreneurial component, Mises's price premium is specific to each loan and production process. These specific premia will depend on the level of expected future prices and will thus come about in those sectors where new money first enters the economy and drives up prices. Mises's analysis of the price premium is thus clearly distinct from a simple, arithmetical Fisher effect, despite some Fisherian language in Mises's exposition. It is also very close to Rothbard's concept of a terms-of-trade component in the rate of interest. Rothbard described the terms-of-trade component as the result of how quickly prices adjust to an inflow of money: "Sometimes product prices rise and fall faster than factor prices, sometimes they rise and fall more slowly, and sometimes their behavior is mixed, with some factor prices and some product prices rising more rapidly" (Rothbard 2009, 797).

The inflow of new money into the economy leads to changes in relative prices and in relative incomes that depend on where the new money enters the economy. Rothbard shows how this can also affect the time market. Thus, when the entrepreneur's product prices and his (expected) revenues rise ahead of his factor prices and (expected) monetary costs, the spread between stages of production will widen and a terms-of-trade component will

[4] Entrepreneurs hold cash reserves partly to be able to adjust to such unforeseen developments; cf. Hutt (1956).

emerge in the rate of interest. This component will also be reflected in the rate of interest on the loan market: entrepreneurs facing higher selling prices will naturally tend to try to raise capital in order to expand production, and this will bid up the rate of interest on loans. If factor prices rise ahead of product prices, however, the terms-of-trade component will be negative as the price spreads between the stages of production narrow, and demand for loans will also fall off as entrepreneurs reduce their demand for credit for production processes that now seem unprofitable. Along with such "vertical" shifts in the production structure, there can also be "horizontal" changes: product prices in one branch may rise faster than in other branches, and the entrepreneurs whose terms of trade have improved will naturally expand production while those with worsening terms of trade will contract production.

Figure 5: Price premium in the lower stages



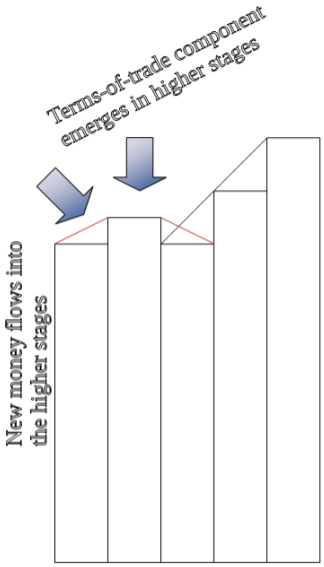
We can again use our structure-of-production diagram to illustrate the point. In figure 5, new money flows into the economy in the lower stages of production. This is indicated by the arrows

at the top showing that the new money is an exogenous factor. It could be a case of government expenditure or welfare payments financed with newly created money lent or given to the government or to individuals. Regardless, the result is that consumer goods prices and factor prices in the lower stages are bid up before factor prices in the higher stages rise, leading to a positive terms-of-trade component in the rate of interest in these stages of production.

As entrepreneurs now recognize the higher returns to be made in the lower stages, the process described above springs into action. Inflationary expectations develop, and the loan rate of interest rises in response to the extra demand from capitalist-entrepreneurs. In this case of "simple inflation" (Mises 1998, 568), a general price premium is likely to emerge across all the stages, and it can therefore look very much like Fisher's price premium. However, the mechanism is clearly different.

We can also describe the emergence of a negative Mises-Rothbard premium, as depicted in figure 6. New money enters the economy in the higher stages, in this example in the two highest stages of production. As a result, factor prices are bid up ahead of product prices. The negative price premium depresses earnings in the third stage below the real rate of interest as the third-stage capitalists suffer general monetary losses, since their input prices have risen to a level above their selling prices.

Figure 6: Price premium in the higher stages



In response to this development, capitalists will shift investment out of the loss-making stages to the higher stages where the terms-of-trade component is positive. This adjustment is not simply a change in nominal values: the real economy will be affected in various ways as capitalists scramble to remain profitable. The business cycle is one phenomenon attendant on inflows of money into the higher stages: so long as the inflow continues, economic calculation is falsified and entrepreneurs are misled to continue and expand investment in the higher stages (Mises 1998, chap. 20; Hülsmann 1998; Huerta de Soto 2012, 347–95). As income to original factors rises, demand for consumer goods also increases, leading to a delayed rise in consumer prices. Original factors now tend to be bid back to the lower stages, and the expansion of the higher stages turns out be unprofitable unless the inflow of money continues. The adjustment of the structure of production, once it becomes apparent that the terms of trade are unsustainable, means that investment projects in the higher stages have to be abandoned, since their value productivity is now too low to maintain them. This is because the complementary factors, conspicuously labor, are not

available at prices that would make further production profitable. Consequently, some fixed capital goods in the higher stages of production have to be abandoned. This can be a longer-term phenomenon beyond the business cycle, a point we will sketch out below in the "Further Implications" section.

The Rothbardian terms-of-trade component is in essence a description of Cantillon effects (Cantillon 2010; Sieroń 2019) in the production structure and the loan market and is thus similar to Baeriswyl's (2015) Mises effect. Once we drop the assumption of neutral money, the real dynamics between money and the rate of interest come to the fore. Unlike the untenable Fisher effect, this Mises-Rothbard premium, or effect, is a real effect on the rate of interest that originates from the side of money. It depends not on considerations of the value of money but rather on the production and direction of new money. Fisher's focus on the value of money, which Mises as we have argued only superficially shared, really sets the analysis off on the wrong foot.

With the Mises-Rothbard effect, depending on the specific data of each case, the premium can be positive, negative, or positive and negative at the same time in different sectors. Both the inflow of money and expectations of future price changes cause premia to emerge. While the premium is a result of inflation (i.e., it is cash induced), it always has to go through individual entrepreneurs' estimates and actions to be effective. And although the terms-of-trade component is ephemeral and will disappear once the rate of money creation slows down, it will nevertheless have led to permanent changes to the structure of production and to a redistribution of incomes and wealth.

A CRITIQUE OF THE SAVINGS GLUT HYPOTHESIS

Rejecting the standard Fisher effect and reformulating the price premium along the lines laid out by Mises and Rothbard allows us to explain the modern phenomenon of low interest rates as caused by monetary factors. The inflow of money into global financial markets resulted in a negative Mises-Rothbard premium across financial markets, leading to lower nominal interest rates since the 1980s. Rather than Bernanke's (2005) savings glut, we are really dealing with a money or liquidity glut.

Bernanke's own example of East Asian savers can readily be reinterpreted in this direction: capital inflows of dollars to East Asian economies were countered by central banks' increasing reserves rather than letting their currencies appreciate. Rather than acting as financial intermediaries, in Bernanke's phrase, these governments injected liquidity into dollar markets by recycling dollar inflows into financial markets. The imbalances in capital flows between the U.S. and East Asia, or generally between the dollar and the rest of the world's currencies, are thus baked into the monetary system, a point also made by Eichengreen (2011).

There is a long tradition in monetary theory of highlighting the interrelations between international capital flows and the domestic supply of money and credit. Jacques Rueff (1972) analyzed this phenomenon in the 1950s and 1960s in terms of credit duplication. Friedrich von Hayek (1989) showed how changes in the international demand for money in a system of fractional reserve banking necessarily led to contraction and expansion of the domestic credit structure. On a related note, "global monetarist" theorists have also argued that we should be concerned about the global supply of money and that the money supply of an open economy would respond to changes in the global price level (Mundell 1971; Johnson 1972). Here we are simply extending this analysis and arguing that the flow of newly created money has been mainly into (global financial) dollar markets for decades. This added liquidity drives up the prices of dollar-denominated financial assets, pushing yields steadily lower as the inflow of new money continues.

The result is a negative terms-of-trade, or Mises-Rothbard, premium: bond prices rise ahead of output prices for most enterprises, meaning that the price spreads between the stages of production narrow in general and the rate of interest falls. The increase in liquidity does not necessarily lead to an expansion of production, however (cf. Aghion et al. 2019): Businesses are led to seek additional funding in financial markets, since banks and other financial institutions are able to lend at lower rates of interest. However, the supply of real capital has not changed, leading in the short-term to the disruptions of the business cycle. The new money eventually raises the nominal incomes of entrepreneurs and all factor owners, leading to a ceteris paribus rise in consumer prices. Although entrepreneurs recognize and liquidate malinvestments

and readjust the production structure in the crisis phase of the business cycle, the crisis does not entail a reversal of the expansion of the financial system. While financial contraction is a natural consequence of economic crisis and still occurs to some extent,[5] central banks try to prevent it by further inflows of money. Thus, interest rates across financial markets have been kept low by central bank action. We are thus in a situation where a Mises-Rothbard premium in favor of the banking system persists throughout the business cycle. The long-term consequences of the basic inflationary character of the system are the increasing reliance of nonfinancial businesses on financial markets for funding, a change in the composition of these businesses' balance sheets, and an increase in nominal capital values. The role of the financial system thus gradually expands—a point already recognized and explained by Bagehot (1873) in his classic analysis of the banking system—but the financial system causes no real growth.

When we introduce a properly understood monetary factor, we solve the apparent mystery of low interest rates. Central banks, in a symbiosis with private actors, bid up financial asset prices with newly created money, and the inflow of new money into financial markets causes the "financialization" (Krippner 2012, 27; Palley 2013) of the economy—that is, the growing importance of the financial sector and an increased share of income coming through financial channels. Hülsmann (2023) provides a similar explanation of the role of central banks in driving the growth of the financial system. While the role of the financial sector grows, it does not, in the long term, lead to more capital accumulation or more efficient use of accumulated capital. Thus, in a financialized economy, the standard understanding (cf. Levine 2005) of how financial markets lead to economic growth no longer holds. In fact, driving the interest rate lower if anything lessens people's willingness to save and invest, which in turn leads to erosion of the capital structure of the economy (see the "Further Implications" section below).

The Mises-Rothbard premium is a consequence of money creation by the central bank, but the process is strengthened by other financial actors. Due to the price-inflationary environment, there

[5] Salerno (2012, 37–41) shows how credit contracted after the Great Financial Crisis of 2008 despite the inflow of new money from the Federal Reserve.

is greater demand for financial assets as inflation-safe substitutes for money (Žukauskas and Hülsmann 2019). Financial actors are also able to create money substitutes in a process that has no official connection to central banking: repurchase agreements (repos) of high quality effectively serve as money substitutes, and their issue expands the money supply (Sunderam 2015; Sieroń 2016). Since repos require financial assets for use as collateral, and the same asset can be collateral for multiple repo transactions (Singh 2011), the growth of repos adds extra demand for financial assets over and above the demand for their use as collateral in central bank transactions. The global shadow banking system, where repo financing plays an important role, had an aggregate value of $239.3 trillion at the end of 2021 (FSB 2022). While the central banks of the world are not directly engaged in funding the shadow banks, they (primarily the U.S. Federal Reserve as the sole supplier of dollars) have an important indirect role as "market-makers of last resort" (Giménez Roche and Janson 2019): they ensure that there is always a liquid market for the financial assets underlying repo transactions, thereby enabling the continued use of repos as money substitutes. The creation of money is thus doubly centered on financial markets: central banks buying bonds push up financial asset prices, and private parties issuing repos increase liquidity in international markets (cf. Hülsmann 2023).

One key driver of lower interest rates over recent decades is thus the progressive increase in the negative terms-of-trade component of the rate of interest. Financialization and lower interest rates through money creation are two sides of the same coin. Since the terms of trade worsen for entrepreneurs, profitable investment opportunities become fewer and more risky; therefore financial actors flush with cash turn to various means (repos, etc.) to create money, since this is the most profitable use of their funds. However, this in turn keeps the negative terms-of-trade component in place.

This process is very different from the "classic" working of the monetary system which informed Fisher's and Mises's theories. In the classic system, the Fisher effect seems more reasonable. Banks create money and lend it to businesses. Entrepreneurs use the new money to bid up the prices of the factors of production, and laborers and factor owners then spend their increased income on consumption. Consumer prices increase, and a positive price premium emerges:

> The ensuing boom in the prices of producers' goods may at the beginning outrun the rise in the prices of consumers' goods. It may thus bring about a tendency toward a fall in the originary rate of interest. But with the further progress of the expansionist movement the rise in the prices of the consumers' goods will outstrip the rise in the prices of producers' goods. The rise in wages and salaries and the additional gains of the capitalists, entrepreneurs, and farmers, although a great part of them is merely apparent, intensify the demand for consumers' goods. . . . The gulf between the prices of present goods and those of future goods widens again. A tendency toward a rise in the rate of originary interest is substituted for the tendency toward the opposite which may have come into operation at the earlier stages of the expansion. (Mises 1998, 555)

Banks can continue expanding credit for a time, but the rate of expansion has to increase to keep the market rate of interest below the rate of originary interest and the rising price premium (Mises 1998, 546, 555–56).[6] Thus, eventually, if banks keep credit expansion going, the result will be runaway inflation (Mises 1953, 363–64).

In the present monetary system, the inflationary dynamics are different, including their effect on the market rate of interest. There is greater distance between the inflow of new money in the financial system and increasing income for laborers. The negative price premium can therefore persist for longer before it is, for a time, replaced by a positive, general price premium. The current negative terms-of-trade component is, however, not general. A key conclusion of the Mises-Rothbard approach is that the component has a different size in each particular market. There can thus be plenty of businesses and sectors of the economy operating with a higher rate of interest than the close-to-zero policy rates.

One study showing the divergence in the rates of return between the financial sector and the real economy in the U.S. is Salerno (2017). Salerno uses the rate of return of nonfinancial corporations as an approximation of the originary rate of interest. Citing Osborne and Retus (2016), he shows that the average rate of return to businesses across the U.S. economy was consistently above 6 percent for decades and close to 8 percent from 2009 to 2015. Macovei (2021) expands on Salerno (2017) and finds that the real rate of interest

[6] Thanks to an anonymous referee for these references to *Human Action*. I should add that when Mises here speaks of a price premium, it fits well with our elucidation of the terms-of-trade component.

has consistently remained about 6 percent despite the reduction in central bank policy rates. Even a handsome allowance for an entrepreneurial component would thus leave the originary rate of interest meaningfully different from zero. This difference from the close-to-zero rate of interest on money loans is an example of the negative terms-of-trade component and is a result of money inflows concentrated in the financial sector.

FURTHER IMPLICATIONS

The implications of this approach to the price premium reach beyond the savings glut hypothesis. If the Fisher effect is wrong and needs to be replaced by our proposed Mises-Rothbard premium, then the standard approach to the relationship between inflation and nominal interest rates also needs to be rethought.

Specifically, the equation $i = r + p$ at most approximates reality in one historical episode (the 1970s), when the inflow of money quickly led to a broad rise in consumer prices ahead of factor prices. Yet there is no reason to take this specific case as normative for the general relationship: it held in the 1970s but has not held since then. Mishkin's (1992) results suggests as much, although Mishkin does not reach the same conclusion as we do. If we want to find the real rate of interest in an inflationary environment, we cannot simply subtract "*the* price premium" from the nominal rate of interest. Rather, there is a whole range of price premia, ranging from negative to positive, all depending on where money enters the economy.

As indicated above, this interest rate dynamic is a special application of the Cantillon effect (Sieroń 2019). The change in relative prices from the inflow of money is precisely what brings about price premia. Thus, insofar as the equation is true, there is a different equation $i = r + p$ for each financial market instead of a general premium across all markets. A crucial difference is that p now measures the relative price effect of an inflow of money in this specific market rather than changes in the price level. Unlike in the standard Fisher effect, there is no limit preventing p from being negative to the point that the nominal rate of interest—again, in this specific market or sector of the economy—also turns negative. The equation can also be employed ex ante as an estimate of the consequences of an inflow of money: For economic calculation

it is useful to distinguish between profits emerging from money creation and those from other causes. While all profit opportunities are ephemeral, the entrepreneur is likely to be misled if he mistakes an inflow of money for a permanent change in demand or supply. Alertness to the inflationary origins of profits through estimates of the Mises-Rothbard price premium could help avoid this miscalculation.

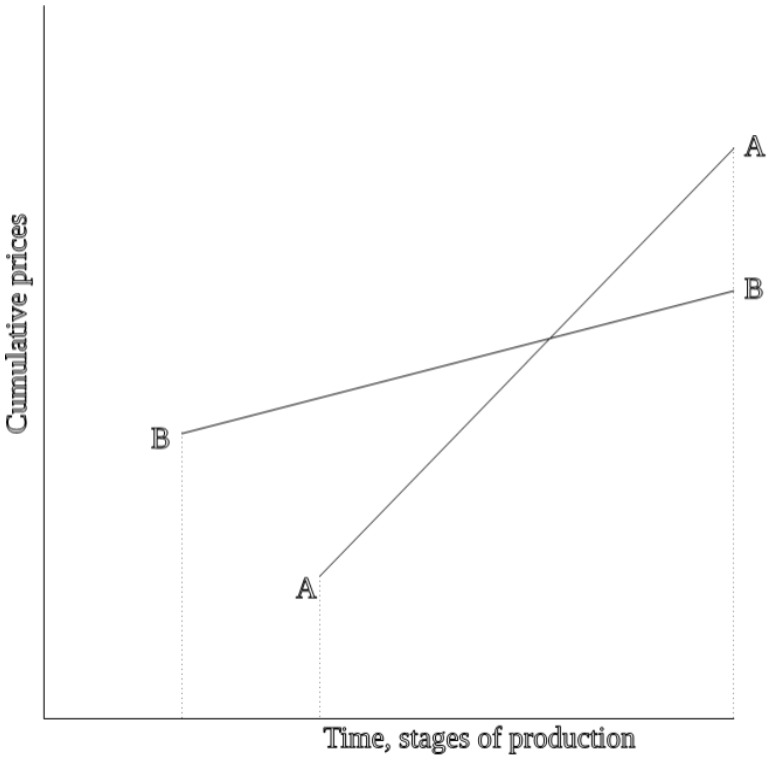
An important result of rethinking inflation dynamics in terms of the structure of production is that we can see serious long-term consequences of money creation—specifically, we can here see why and how finance begins to hamper economic development. Financial intermediation has been seen as key to economic development in the modern literature (McKinnon 1973; Levine 1997), but more recent studies have suggested that "too much" finance hampers economic growth. As mentioned above, Aghion et al. (2019) argue in Schumpeterian terms that easy credit allows incumbent firms to stay in business, leading to less innovation and hence lower productivity growth. The financial sector can also "cannibalize" the real economy, as highly productive and innovative laborers shift to work in finance during a boom (Cecchetti and Kharroubi 2015).

While these mechanisms should not be underestimated, if we turn to our structure-of-production view, we can see how financialization hollows out the structure of production while financial asset prices are booming. Money creation is a key activity of the financial sector, and financialization is the long-term consequence of money creation directed into financial markets and the higher stages of the structure of production.

Let us return to the structure of production. Rothbard (2009, 521) first introduced its depiction as a trapezoid rather than a triangle. On the horizontal axis we have time and the number of stages, while the vertical axis shows the cumulative prices of the factors of production and of the final products. Figure 7 depicts two structures of production with the lines *AA* and *BB*. *AA* is a shorter structure of production, and the interest rate is higher, as indicated by the slope of the line. *BB* is longer, and the interest rate is lower. The change from *AA* to *BB* comes about due to savings and capital accumulation, which in the standard "Austrian" and classical accounts leads to economic development. The areas under lines *AA* and *BB* can thus be seen to represent the amount of savings

in the economy (the cumulative money prices of all the stages of production), giving us the trapezoidal shape.

Figure 7: The structure of production



Hülsmann (2011) developed the use of the trapezoid and its underlying theories in capital theory. The debate over capital theory and the relationship between aggregate savings, the rate of interest, and the length of the structure of production that he sparked is beyond the scope of this article; for present purposes, it suffices that the shape of the structure of production is trapezoidal, not triangular.[7]

[7] On the debate in capital theory see, among others, Fillieule (2007), Hülsmann (2008), Newman (2014), Hülsmann (2011), Méra (2011), and Granot (2019).

A continuous inflow of money into the higher stages of production is a central feature of the financialization of the economy. Such an inflow leads to permanent changes in the structure of production. In the short and medium term, the result is the business cycle described above: a boom concentrated in the higher stages of production leading to malinvestment and capital consumption. In the long term the capitalists, faced with lower returns in the higher stages and with less real capital available, will tend to shift their investments to the lower stages of production. As higher-stage factors are sold, their prices will fall, and as demand for factors expands in the lower stages, the nonspecific factors will tend to move down the structure. Specific factors in the higher stages will be less utilized or completely abandoned. This will lead to a fall in productivity, ceteris paribus, since fewer inputs from the higher stages are now available.

At the same time, so long as the inflow of money continues, there will be a tendency for the nominal interest rate to fall across the economy due to a negative Mises-Rothbard premium. Faced with a lower rate of interest on savings, people will save less of their income and consume more than otherwise. Although the monetary value of capital will increase, the amount of real savings will fall due to the ongoing capital consumption. However, the money rate of interest will also continue to decline. The economy is now characterized by higher nominal savings, since the market value of assets has increased, a lower rate of interest due to the inflow of money, and a shorter structure of production, since capital has been consumed. The shorter structure of production also indicates the fall in real savings. The decline in real savings is likely to take place in the form of the classical business cycle and its concomitant malinvestment and overconsumption.[8] What we have sketched in this paragraph is the long-run outcome of the process of financialization.

The processes of money creation and financialization thus lead to a hollowing out of the capital structure of the economy. This is hidden by the fall in the rate of interest, the rise in nominal wealth, and the expansion of the financial sector. However, wealth is increasingly in the form of lower-stage durable assets, especially housing, rather than capital invested in the higher stages, as well as

[8] I owe this point to an anonymous referee.

in the form of financial assets. There is thus an increasing disconnect between what individuals see as the sources of their wealth and the production structure of the economy as a whole. The growing importance of income from financial sources, the defining characteristic of financialization (Krippner 2012, 27; cf. Palley 2013, 5), thus indicates a turn away from real productive activity toward money creation as the source of income and wealth. This is ironic since larger financial incomes and the growth of a rentier class could otherwise (i.e., in a nonfinancialized economy) be seen as indications of capital accumulation and thus of real wealth.

Figure 8: The structure under continuous money inflow

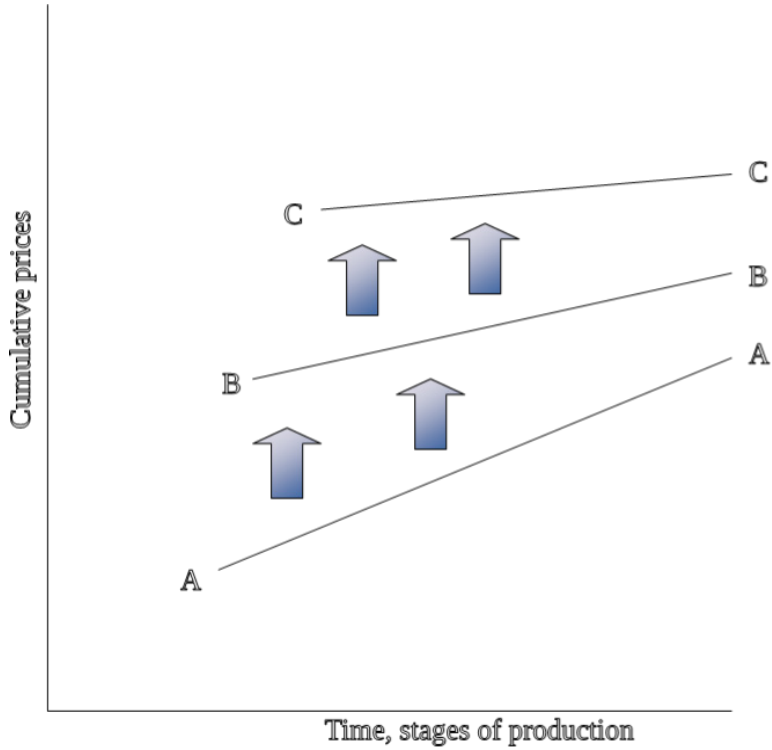


Figure 8 summarizes these conclusions. The production structure continuously shifts from line *AA* to *BB* to *CC*. Interest rates keep

falling, as indicated by the slope of the lines; the production structure shortens, indicated by the shorter lines; and the nominal value of capital increases as the area under the line expands. The rising of the lines indicates that there is also (low-level) consumer price inflation.

CONCLUSION

We have here tried to reformulate the theory of the price premium. Fisher's classic statement must be rejected as fundamentally flawed and replaced with the Misesian theory. Although Mises's formulation is similar to Fisher's on the surface, it points in a different direction for understanding the dynamics of money and interest.

A combination of Mises's price premium with Rothbard's terms-of-trade premium as we have here presented it is the best description of inflation and interest dynamics. It is not the rate of inflation—understood as the rate of change in the price level or value of money—that causes the price premium, but rather the direction of the flow of new money into the economy. Changes in the value of money, however measured, are not the cause of, and cannot explain, the price premium. Rather, the Mises-Rothbard price premium is the Cantillon effect in action across the structure of production—that is, Baeriswyl's (2015) Mises effect. The main task for research into how money affects the rate of interest is thus not determining how to measure changes in the value of money, but analyzing the institutions and processes of money creation and the rate and direction of money inflows.

We have also tried to show briefly how the Mises-Rothbard premium explains the experience of the very low interest rates of the preceding decades. If the explanation is correct, we can conclude that there is nothing new under the sun in the sphere of money and banking. The natural, or real, rate of interest is not negative, but continuous money inflows into the higher stages of production cause a negative price premium. This has important effects for the real economy, as the capital structure tends to be hollowed out under pressure from ever-lower interest rates. The real relationship between money, the rate of interest, and the structure of production thus leads to the conclusion that inflows of money or lowering of interest rates, far from boosting economic development, causes capital consumption and thereby a long-term lowering of living standards.

REFERENCES

Aghion, Philippe, Antonin Bergeaud, Gilbert Cette, Rémy Lecat, and Hélène Maghin. 2019. "Coase Lecture—the Inverted-U Relationship between Credit Access and Productivity Growth." *Economica* 86, no. 341 (January): 1–31. https://doi.org/10.1111/ecca.12297.

Anari, Ali, and James Kolari. 2019. "The Fisher Puzzle, Real Rate Anomaly, and Wicksell Effect." *Journal of Empirical Finance* 52 (June): 128–48. https://doi.org/10.1016/j.jempfin.2019.03.003.

Baeriswyl, Romain. 2015. "Intertemporal Discoordination in the 100% Reserve Banking System." *Procesos de mercado: Revista europea de economía política* 12, no. 2 (Fall): 43–80. https://doi.org/10.52195/pm.v12i2.136.

Bagehot, Walter. 1873. *Lombard Street: A Description of the Money Market. London*: Henry S. King. https://oll.libertyfund.org/title/bagehot-lombard-street-a-description-of-the-money-market.

Bank of Japan. 2016. *Comprehensive Assessment: Developments in Economic Activity and Prices as well as Policy Effects since the Introduction of Quantitative and Qualitative Monetary Easing (QQE): The Background*. September 21, 2016. https://www.boj.or.jp/en/mopo/mpmdeci/mpr_2016/k160921b.pdf.

Bernanke, Ben S. 2005. "The Global Saving Glut and the U.S. Current Account Deficit." Sandridge Lecture, Virginia Association of Economists, Richmond, Virginia, March 10, 2005. https://www.federalreserve.gov/boarddocs/speeches/2005/200503102/.

———. 2020. "The New Tools of Monetary Policy." American Economic Review 110, no. 4 (April): 943–83. https://doi.org/10.1257/aer.110.4.943.

Bernanke, Ben S., Carol Bertaut, Laurie Pounder DeMarco, and Steven Kamin. 2011. "International Capital Flows and the Return to Safe Assets in the United States, 2003–2007." International Finance Discussion Papers 1014, Board of Governors of the Federal Reserve System, Washington, D.C., February 2011. https://www.federalreserve.gov/pubs/ifdp/2011/1014/ifdp1014.htm.

Cantillon, Richard. 2010. *An Essay on Economic Theory*. Edited by Mark Thornton. Translated by Chantal Saucier. Auburn, Ala.: Ludwig von Mises Institute. French original published 1755. https://mises.org/library/essay-economic-theory-0.

Cecchetti, Stephen G., and Enisse Kharroubi. 2015. "Why Does Financial Sector Growth Crowd Out Real Economic Growth?" BIS Working Paper No. 490, Monetary and Economic Department, Bank for International Settlements, Basel, Switzerland, February 2015. https://www.bis.org/publ/work490.htm.

Cecchetti, Stephen G., and Kermit L. Schoenholtz. 2017. *Money, Banking, and Financial Markets*. 5th ed. Dubuque, Ill.: McGraw-Hill Education.

Cesa-Bianchi, Ambrogio, Richard Harrison, and Rana Sajedi. 2023. "Global R*." Staff Working Paper No. 990, Bank of England, London, U.K., October 2023. https://www.bankofengland.co.uk/working-paper/2022/decomposing-the-drivers-of-global-r-star.

Crowder, William J., and Dennis L. Hoffman. 1996. "The Long-Run Relationship between Nominal Interest Rates and Inflation: The Fisher Equation Revisited." *Journal of Money, Credit and Banking* 28, no. 1 (February): 102–18. https://doi.org/10.2307/2077969.

Del Negro, Marco, Domenico Giannone, Marc P. Giannoni, and Andrea Tambalotti. 2019. "Global Trends in Interest Rates." *Journal of International Economics* 118 (May): 248–62. https://doi.org/10.1016/j.jinteco.2019.01.010.

Eichengreen, Barry J. 2011. *Exorbitant Privilege: The Rise and Fall of the Dollar and the Future of the International Monetary System*. New York: Oxford University Press.

Fillieule, Renaud. 2007. "A Formal Model in Hayekian Macroeconomics: The Proportional Goods-in-Process Structure of Production." *Quarterly Journal of Austrian Economics* 10, no. 3 (September): 193–208. https://mises.org/library/formal-model-hayekian-macroeconomics-proportional-goods-process-structure-production.

Fisher, Irving. 1907. *The Rate of Interest: Its Nature, Determination and Relation to Economic Phenomena*. New York: Macmillan.

———. 1922. *The Purchasing Power of Money: Its Determination and Relation to Credit Interest and Crises*. 2nd ed. New York: Macmillan.

———. 1930. *The Theory of Interest as Determined by Impatience to Spend Income and Opportunity to Invest It*. New York: Macmillan.

FSB (Financial Stability Board). 2022. *Global Monitoring Report on Non-bank Financial Intermediation 2022*. Basel, Switz.: Financial Stability Board. https://www.fsb.org/2022/12/global-monitoring-report-on-non-bank-financial-intermediation-2022/.

Garrison, Roger W. 2001. *Time and Money: The Macroeconomics of Capital Structure*. New York: Routledge.

Giménez Roche, Gabriel A., and Nathalie Janson. 2019. "From Conventional to Unconventional Monetary Policies: The Failure of the Market-Maker of Last Resort." *World Economy* 42, no. 1 (January): 296–317. https://doi.org/10.1111/twec.12659.

Granot, Er'el. 2019. "An Overlooked Scenario of 'Reswitching' in the Austrian Structure of Production." *Quarterly Journal of Austrian Economics* 22, no. 4 (Winter): 509–32. https://mises.org/library/overlooked-scenario-reswitching-austrian-structure-production.

Hansen, Alvin. 1939. "Economic Progress and Declining Population Growth." *American Economic Review* 29, no. 1 (March): 1–15. https://www.jstor.org/stable/1806983.

Hayek, Friedrich August von. 1931. "The 'Paradox' of Saving." *Economica*, no. 32 (May): 125–69. http://www.jstor.org/stable/2547921.

———. 1935. *Prices and Production*. 2nd rev. ed. New York: Augustus M. Kelley.

———. 1989. *Monetary Nationalism and International Stability*. Reprint, London: Longmans, Green. First published 1937.

Huerta de Soto, Jesús. 2012. *Money, Bank Credit, and Economic Cycles*. Translated by Melinda A. Stroup. 3rd ed. Auburn, Ala.: Ludwig von Mises Institute.

Hülsmann, Jörg Guido. 1998. "Toward a General Theory of Error Cycles." *Quarterly Journal of Austrian Economics* 1, no. 4 (Winter): 1–23. https://mises.org/library/toward-general-theory-error-cycles.

———. 2008. "Time Preference and Investment Expenditure." *Procesos de mercado: Revista europea de economía política* 5, no. 2 (Fall): 13–33. https://www.procesosdemercado.com/index.php/inicio/article/view/306.

———. 2011. "The Structure of Production Reconsidered." Document de Travail du GRANEM 2011–09–034, Groupe de Recherche ANgevin en Économie et Management, Université d'Angers, Angers, France, December 2011. http://granem.univ-angers.fr/_resources/Cahiers/2011/DT_GRANEM_08_034.pdf.

———. 2018. "The Myth of the Risk Premium." In *The Economic Theory of Costs: Foundations and New Directions*, edited by Matthew McCaffrey, 133–46. New York: Routledge, Taylor and Francis Group.

———. 2023. "Financial Markets and the Production of Law." In *Money and the Market Process*. Vol. 1 of *The Emergence of a Tradition: Essays in Honor of Jesús Huerta de Soto*, edited by David Howden and Philipp Bagus, 191–207. Cham, Switz.: Palgrave Macmillan.

Hutt, William H. 1956. "The Yield from Money Held." In *On Freedom and Free Enterprise: Essays in Honor of Ludwig von Mises*, edited by Mary Sennholz, 196–216. Irvington-on-Hudson, N.Y.: Foundation for Economic Education.

IMF (International Monetary Fund). 2014. "Perspectives on Global Real Interest Rates." In *World Economic Outlook: Recovery Strengthens, Remains Uneven*, 1–32. April 2014. Washington, D.C.: International Monetary Fund. https://www.imf.org/en/Publications/WEO/Issues/2016/12/31/Recovery-Strengthens-Remains-Uneven.

Israel, Karl-Friedrich. 2022. "The Monetary Theories of Carl Menger and Friedrich von Wieser: A Comparative Study." In "Carl Menger's Modernity." Special issue, *European Journal of the History of Economic Thought* 29, no. 5 (September): 855–76. https://doi.org/10.1080/09672567.2022.2113813.

Johnson, Harry G. 1972. "The Monetary Approach to Balance-of-Payments Theory." *Journal of Financial and Quantitative Analysis* 7, no. 2 (March): 1555–72. https://doi.org/10.2307/2329935.

Keynes, John Maynard. 1936. *The General Theory of Employment, Interest, and Money*. New York: Harcourt, Brace.

Kornai, János. 1986. "The Soft Budget Constraint." *Kyklos* 39, no. 1 (February): 3–30. https://doi.org/10.1111/j.1467-6435.1986.tb01252.x.

Krippner, Greta R. 2012. *Capitalizing on Crisis: The Political Origins of the Rise of Finance*. Cambridge, Mass.: Harvard University Press.

Laubach, Thomas, and John C. Williams. 2003. "Measuring the Natural Rate of Interest." *Review of Economics and Statistics* 85, no. 4 (November): 1063–70. https://doi.org/10.1162/003465303772815934.

Levine, Ross. 1997. "Financial Development and Economic Growth: Views and Agenda." *Journal of Economic Literature* 35, no. 2 (June): 688–726. http://www.jstor.org/stable/2729790.

———. 2005. "Finance and Growth: Theory and Evidence." In *Handbook of Economic Growth*, edited by Philippe Aghion and Steven Durlauf, 1: 865–934. New York: Elsevier.

Lisack, Noëmie, Rana Sajedi, and Gregory Thwaites. 2021. "Population Aging and the Macroeconomy." *International Journal of Central Banking* 17, no. 2 (June): 43–80. https://www.ijcb.org/journal/ijcb21q2a2.htm.

Macovei, Mihai. 2021. "The Case against the New 'Secular Stagnation Hypothesis.'" *Quarterly Journal of Austrian Economics* 24, no. 2 (Summer): 219–53. https://doi.org/10.35297/qjae.010099.

Mayer, Thomas, and Gunther Schnabl. 2019. "Reasons for the Demise of Interest: Savings Glut and Secular Stagnation or Central Bank Policy?" CESifo Working Paper No. 7954, CESifo, Munich, Germany, November 2019. https://www.cesifo.org/en/publications/2019/working-paper/reasons-demise-interest-savings-glut-and-secular-stagnation-or.

McKinnon, Ronald I. 1973. *Money and Capital in Economic Development*. Washington, D.C.: Brookings Institution.

Méra, Xavier. 2011. "Time Preference and Investment Expenditure: Comment on Hülsmann." *Procesos de mercado: Revista europea de economía política* 8, no. 2 (Fall): 291–304. https://doi.org/10.52195/pm.v8i2.254.

Mises, Ludwig von. 1953. *The Theory of Money and Credit*. Translated by H. E. Batson. New Haven, Conn.: Yale University Press.

———. 1998. *Human Action: A Treatise on Economics*. Scholar's ed. Auburn, Ala.: Ludwig von Mises Institute. First published 1949. https://mises.org/library/human-action-0.

Mishkin, Frederic S. 1992. "Is the Fisher Effect for Real?: A Reexamination of the Relationship between Inflation and Interest Rates." *Journal of Monetary Economics* 30, no. 2 (November): 195–215. https://doi.org/10.1016/0304-3932(92)90060-F.

———. 2019. *The Economics of Money, Banking and Financial Markets*. Global ed., 12th ed. Harlow, U.K.: Pearson Education.

Mundell, Robert A. 1963. "Inflation and Real Interest." *Journal of Political Economy* 71, no. 3 (June): 280–83. https://doi.org/10.1086/258771.

———. 1971. *Monetary Theory: Inflation, Interest, and Growth in the World Economy*. Pacific Palisades, Calif.: Goodyear.

Newman, Patrick. 2014. "Rothbard's Time Market and the Demand for Present Goods." *Quarterly Journal of Austrian Economics* 17, no. 1 (Spring): 46–66. https://mises.org/library/rothbards-time-market-and-demand-present-goods.

Osborne, Sarah, and Bonnie A. Retus. 2016. "Returns for Domestic Nonfinancial Business." *Survey of Current Business* 96, no. 12 (December). https://apps.bea.gov/scb/issues/2016/scb-2016-december.pdf.

Palley, Thomas I. 2013. *Financialization: The Economics of Finance Capital Domination*. London: Palgrave Macmillan UK. https://doi.org/10.1057/9781137265821.

Rachel, Lukasz, and Lawrence H. Summers. 2019. "On Falling Neutral Real Rates, Fiscal Policy, and the Risk of Secular Stagnation." *Brookings Papers on Economic Activity*, Spring 2019. https://www.brookings.edu/bpea-articles/on-falling-neutral-real-rates-fiscal-policy-and-the-risk-of-secular-stagnation/.

Rachel, Lukasz, and Thomas D. Smith. 2017. "Are Low Real Interest Rates Here to Stay?" *International Journal of Central Banking* 13, no. 3 (September): 1–42. https://www.ijcb.org/journal/ijcb17q3a1.htm.

Rothbard, Murray N. 2009. *Man, Economy, and State with Power and Market*. Scholar's ed., 2nd ed. Auburn, Ala.: Ludwig von Mises Institute. *Man, Economy, and State* first published 1962 and *Power and Market* first published 1970. https://mises.org/library/man-economy-and-state-power-and-market.

Rueff, Jacques. 1972. *The Monetary Sin of the West*. Translated by Roger Glémet. New York: Macmillan.

Salerno, Joseph T. 1995. "Ludwig von Mises on Inflation and Expectations." In *Advances in Austrian Economics*, edited by Peter J. Boettke and Mario J. Rizzo, 2B:297–325. New York: Elsevier. https://doi.org/10.1016/S1529-2134(95)02005-5.

———. 2012. "A Reformulation of Austrian Business Cycle Theory in Light of the Financial Crisis." *Quarterly Journal of Austrian Economics* 15, no. 1 (Spring): 3–44. https://mises.org/library/reformulation-austrian-business-cycle-theory-light-financial-crisis-0.

———. 2017. "Yes, the Fed Really Is Holding Down Interest Rates." *Mises Wire*, June 22, 2017. https://mises.org/wire/yes-fed-really-holding-down-interest-rates.

Sieroń, Arkadiusz. 2016. "The Role of Shadow Banking in the Business Cycle." *Quarterly Journal of Austrian Economics* 19, no. 4 (Winter): 309–29. https://mises.org/library/role-shadow-banking-business-cycle.

———. 2019. *Money, Inflation and Business Cycles: The Cantillon Effect and the Economy*. Translated by Martin Turnau. New York: Routledge, Taylor and Francis Group.

Singh, Manmohan. 2011. "Velocity of Pledged Collateral: Analysis and Implications." IMF Working Paper No. 2011/256, International Monetary Fund, Washington, D.C., November 2011. https://www.imf.org/en/Publications/WP/Issues/2016/12/31/Velocity-of-Pledged-Collateral-Analysis-and-Implications-25332.

Summers, Lawrence H. 2014. "U.S. Economic Prospects: Secular Stagnation, Hysteresis, and the Zero Lower Bound." *Business Economics* 49, no. 2 (April): 65–73. https://doi.org/10.1057/be.2014.13.

Sunderam, Adi. 2015. "Money Creation and the Shadow Banking System." *Review of Financial Studies* 28, no. 4 (April): 939–77. https://doi.org/10.1093/rfs/hhu083.

Taylor, John B. 1993. "Discretion versus Policy Rules in Practice." *Carnegie-Rochester Conference Series on Public Policy* 39 (December): 195–214. https://doi.org/10.1016/0167-2231(93)90009-L.

Valle e Azevedo, João, João Ritto, and Pedro Teles. 2022. "The Neutrality of Nominal Rates: How Long Is the Long Run?" *International Economic Review* 63, no. 4 (November): 1745–77. https://doi.org/10.1111/iere.12584.

Weizsäcker, Carl Christian von. 2014. "Public Debt and Price Stability." *German Economic Review* 15, no. 1 (February): 42–61. https://doi.org/10.1111/geer.12030.

Žukauskas, Vytautas, and Jörg Guido Hülsmann. 2019. "Financial Asset Valuations: The Total Demand Approach." *Quarterly Review of Economics and Finance* 72 (May): 123–31. https://doi.org/10.1016/j.qref.2018.11.004.