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# MISINTERMEDIATION AND MACROECONOMIC FLUCTUATIONS

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Individuals plan consumption and production for different points in the future, using interest rates of various maturities as a guide. However, the financial intermediaries individuals work through traditionally do not match the maturity structure of their assets and liabilities. As a result, aggregate production plans and aggregate consumption plans for each period in the future need not coincide. The resulting discrepancy will eventually appear as a recession or boom, involving an unanticipated change in interest rates and production inside the original intertemporal production possibilities frontier. Maturity transformation is therefore not an essential function of financial intermediation, but rather a *mis*function, one which we call 'misintermediation'.

## 1. Introduction

Thrift institutions traditionally 'transform maturities', by borrowing short and lending long. Most economists take it for granted that this is an essential function of financial intermediation, if not *the* essential function.[1] In the present paper, we show that this mismatching of asset and liability maturities is actually a *mis*function, one which is capable of upsetting the macroeconomic equilibrium of the economy. We refer to this traditional mismatching of maturities by financial intermediaries as *misintermediation.*

Thrift institutions do perform many functions that really are essential for economic development. They mobilize savings by acting as wholesale and retail middlemen between ultimate savers and ultimate borrowers. By diversifying default risks, they are able to offer savers safer obligations than any in their own portfolios. Even misintermediation is better than no intermediation at all. Still, we would prefer to see intermediaries perform their truly essential functions without attempting to transform maturities in the process.

We analyze the effect of misintermediation on the economy in a non-monetary model of intertemporal production and consumption. Only one good is produced and consumed, but it may be available at various points in time. Claims on this output at future dates may be discounted and traded for

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[1]See, for example, Lapidus et al. (1974, p. 27).

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current output. All production takes place within the household, so that this borrowing and lending of the single consumption good is the only trade that takes place. In order to make it as easy as possible for the economy to function smoothly, we assume that there is no production uncertainty, and that tastes are dynamically consistent.

We assume that, as in the real world, producers (debtor households) do not borrow directly from savers (creditor households), but rather borrow indirectly through financial intermediaries. This is necessary because the borrowing needs of any particular producer are unlikely to match in size and maturity the lending desires of any particular household.

We assume that producers are able to borrow freely from financial intermediaries in all maturities without government interference with or subsidization of any particular maturity choice. The prices at which they trade claims on future output (purchasing power bonds of various maturities) determine a term structure of real interest rates which is public knowledge.

Creditor households (depositors), on the other hand, are artificially encouraged by government subsidies and regulations to put their savings into short-term deposits such as passbook savings accounts, regardless of when these households plan to dissave. Thrift institutions realize that their passbook customers do not really intend to dissave immediately, but rather plan to leave their money in for perhaps ten or twenty years. They therefore lend these funds back out to finance projects that will produce surplus consumption output only well off in the future. However, they can only guess whether they should be funding ten year projects, twenty year projects, or some other maturity. The necessary information is present in the minds of the depositors, but is lost for the purposes of economic coordination unless the depositors actually commit themselves contractually to one maturity or the other.

Today three major forms of intervention artificially encourage misintermediation. The first form is the subsidization of interest rate speculation by government-backed deposit insurance agencies such as the Federal Savings and Loan Insurance Corporation and the Federal Deposit Insurance Corporation. The fair value of insurance for interest rate risk is miniscule if asset maturities exceed liability maturities by only one or two months. However, in another paper we have calculated that it equals the premium that is actually charged for all types of risk when 8.8 months of maturity transformation are involved, and far exceeds it for the degree of maturity mismatching that is practiced by thrift institutions and even most commercial banks.[2] This subsidy encourages intermediaries to take more

[2]In McCulloch (1981, p. 237), the fair value of insurance is calculated for various types and maturities of assets and various capital–asset ratios. The figure in the text assumes par bond assets and a 7% capital–asset ratio.

interest rate risk than they otherwise would. It also gives misintermediation an artificial competitive advantage over balanced intermediation.[3]

A second form of regulation that encourages misintermediation is the ceiling structure on the interest rates intermediaries may pay on savings and time deposits. Tobin (1970, p. 10) has noted that the objective of the Federal Home Loan Bank Board in imposing these ceilings on Savings and Loan Associations was to attempt to recoup the capital losses these intermediaries suffered during the interest rate rises of the sixties. The Federal Reserve Board was then under pressure to impose complementary Regulation Q ceilings on commercial bank time deposits, even though commercial banks' maturities are not as severely mismatched as are those of thrift institutions. As it happens, these ceilings backfired by causing the 'disintermediation' crises of 1966 and 1969. Nevertheless, it should be remembered that they reflect the fact that regulators perceive it as their duty to protect misintermediation from its inherent weakness.[4]

A third form of intervention is the hobbling of the retail portion of the certificate of deposit market that has developed since 1961. *CD*'s are the ideal instrument to allow savers to specify exactly when they wish to dissave, and to know what interest they will receive for that period. *CD*'s also let the intermediary know exactly when it can be legally called upon for cash outflows. Negotiability (or even assignability) can allow savers the flexibility to change their plans by rediscounting their certificates, to the extent this is feasible given transaction costs and what other savers and borrowers are doing. However, regulators allow only wholesale denomination *CD*'s to be negotiable. Furthermore, as a typical advertisement for these deposits points out, 'Federal regulations allow withdrawal before maturity provided the rate of interest is reduced to the regular savings account rate back to the day of issue and that three months' interest is forfeited at the regular savings account rates'. This arbitrary penalty, and more recent variations on it, destroy much of the potential attractiveness of retail *CD*'s. On the one hand, the saver is artificially locked in, even if a third party or the intermediary itself stands willing to take possession of the certificate (or some fraction of it) on attractive terms. On the other hand, the intermediary cannot be certain it will not be required to cash the certificate before maturity.

Because thrift institutions are essential for economic progress, and they all happen to misintermediate, governments have taken special measures to protect them from their own fragility. Because they are protected, they are

[3]Kareken and Wallace (1978) argue that governmentally subsidized deposit insurance is unnecessary for its ostensible purpose of guaranteeing bank liabilities against default. The macroeconomic fluctuations we describe are an unnecessary cost this subsidy imposes on society.

[4]Thus, the *dis*intermediation that results from deposit interest ceilings is merely a by-product of the underlying *mis*intermediation problem.

competitively viable against balanced intermediaries. Therefore, all thrift institutions continue to misintermediate, and so forth in perpetuity. Presumably in a world of *laissez-faire* financial markets, intermediaries would be forced by competition for the deposits of risk-averse depositors to match the maturity structures of their assets and liabilities much more closely. However, misintermediation and a regulatory environment encouraging misintermediation have been with us for generations, if not centuries.[5] There is no reason to expect that they will not be with us long into the future. In the meanwhile, we may expect the macroeconomic disturbances that may arise from misintermediation to continue to disturb economic development.

## 2. A Fisherian model of misintermediation fluctuations

In *The Theory of Interest*, Irving Fisher (1930) showed that there is an equilibrium term structure of real interest rates in an economy such as the one we have described that would match the structures of planned consumption and production over time.[6] Essentially his model is one of a Walrasian equilibrium, except that instead of $n$ goods available at one point in time, there is only one good (aggregated consumption output), which can be available at any of $n$ points in time. Instead of $n-1$ independent intercommodity prices, there are $n-1$ independent intertemporal prices or discounting factors, from which the term structure of interest rates can be readily calculated. Only $n-1$ of the $n$ equations setting excess demands equal to zero are necessary to determine the $n-1$ intertemporal prices. By Walras' law, one of these equations is redundant.[7]

If Fisher's equilibrium term structure were to prevail, the economy would develop without business fluctuations. As the economy moved forward in time, there would be no discrepancies between planned production and consumption and no losses in welfare that arose from miscoordination of the efforts of individuals.

However, we maintain that the market does not ordinarily find the Fisherian term structure in a world of misintermediation, because in such a world, only the excess demand for current output is driven toward zero in the current period. In terms of current plans, excess demands for output in future periods may be positive or negative. Budget constraints imply that the present discounted value of these excess demands sum to zero, but not that

[5]De Roover (1963, pp. 100–107) argues that passbook-type savings were necessary at the birth of modern banking in the 14th century, in order to sidestep the medieval Church's strict usury doctrine.

[6]Fisher (1930, part III). Fisher's model provides the basis for Hirshleifer's (1970, pp. 109–113) generalized discrete equilibrium over time.

[7]This is Hirshleifer's (1970, p. 113) 'redundant conservation relation'.

they individually be zero. When we get to those future periods, these excess demands (or supplies) will then be driven to zero, but in the meanwhile, market participants will have been planning to produce either more or less in future periods than they were planning to consume. These plans will necessarily be disappointed, and it is these disappointments of plans that constitute the macroeconomic fluctuations we explain with our model.

The term structure *would* assume its Fisherian equilibrium shape if each participant in the economy contracted forward all his planned future borrowing and lending plans. At a minimum this would require:

(1) Savers to put their savings into deposits whose maturities correspond to their dissavings plans.
(2) Borrowers to borrow by issuing financial instruments whose maturities correspond to their repayment plans.
(3) Financial intermediaries to match the maturity structures of their assets and liabilities.

Risk aversion in the face of interest rate uncertainty, along the lines described by Stiglitz (1970), provides savers and borrowers with an incentive to meet conditions (1) and (2) (to the extent that this is worthwhile, given actual transactions costs), provided they are free to write retail denomination loan contracts of any maturity. However, misintermediation obviously violates condition (3).

The simplest world in which misintermediation fluctuations are possible is one in which there are only three periods, '$t_0$', '$t_1$', and '$t_2$'.[8] We represent real consumption goods during these three periods (aggregated over both commodities and the relevant time period) by '$c_0$', '$c_1$', and '$c_2$'.[9]

In the loan market which exists at $t_0$, $c_1$ may be traded for $c_0$ at a price $\delta_{001}$, and $c_2$ may be traded for $c_0$ at price $\delta_{002}$. Also, $c_2$ may be traded for $c_1$ at the implicit forward price

$$\delta_{012}=\delta_{002}/\delta_{001}. \tag{1}$$

All these prices are discounting factors ordinarily less than unity. The first

[8]In an $n$-period world, instead of one redundant equation, there are actually $n-2$ degrees of indeterminacy to the set of possible term structures and corresponding planned consumption and production streams. In the 2-period world, clearing of the current market together with Walras' law guarantees clearing of the future market, and no surprises will occur. However, in the 3-period world, clearing of the current market and Walras' law leaves one degree of freedom, and fluctuations become possible. In a 4-period world there will be two degrees of freedom, and so on.

[9]Strictly speaking, for the necessary intertemporal aggregation to be valid, we must hold intraperiod forward rates constant [Liviatan (1966)]. This implies the appearance of discontinuities in the continuous-time discount curve [McCulloch (1971, 1975b)] as we change interperiod forward rates.

subscript represents the time in the market when the price is effective, the second subscript represents the time when the loan is to begin, and the third subscript represents the time when the loan is to be repaid.

From these prices we may compute the term structure of real interest rates in the market at $t_0$:

$$r_{001} = -\ln \delta_{001}/(t_1 - t_0), \tag{2}$$

$$r_{002} = -\ln \delta_{002}/(t_2 - t_0), \tag{3}$$

$$r_{012} = -\ln \delta_{012}/(t_2 - t_1). \tag{4}$$

Because of (1), if we know any two of these interest rates, we may calculate the third by means of the identity

$$(t_2 - t_0)r_{002} = (t_1 - t_0)r_{001} + (t_2 - t_1)r_{012}. \tag{5}$$

Some of the households that are net savers in $t_0$ plan to dissave in $t_1$, some of them plan to dissave in $t_2$, and some of them plan to dissave over both future periods. In order to model misintermediation, we assume that regardless of their dissavings plans, they all are enticed and/or coerced into short-term deposits, which mature in $t_1$ and pay $r_{001}$. In forming their production and consumption plans (and therefore their savings and dissavings plans), however, these savers need to take account both of $r_{001}$ and what they believe $r_{112}$ will be, since the latter determines the terms on which they will be able to roll over their short-term savings to $t_2$.

Even though savers do not participate directly in the market for loans maturing in $t_2$, they still may be taken as acting as if they were using the full $t_0$ term structure $r_{001}$, $r_{002}$ and, implicitly, $r_{012}$ in their $t_0$ decisions, because this term structure is public knowledge, and $r_{012}$ relates closely to the market's concensus expectation of $r_{112}$. In practice the forward rate $r_{012}$ is a little higher than the expected future spot rate $r_{112}$, by the amount of a liquidity premium. However, in another paper [McCulloch (1975a)], the present author has shown that this liquidity premium is negligible when $t_2 - t_1$ is greater than a few years, as it would be in the present context. Savers may therefore be taken as adopting the forward rate as their expectation of the future rate.

Consequently all households, savers and borrowers alike, may be taken as using $r_{001}$ as the effective interest rate linking $t_0$ and $t_1$, and $r_{002}$ as the effective interest rate linking $t_0$ and $t_2$. Therefore each household will use the intertemporal prices $\delta_{001}$ and $\delta_{002}$ when attempting as producers to maximize the present discounted value of planned production, and to

discount future consumption when maximizing utility subject to an intertemporal budget constraint.

Given a linear production technology, the factors (whether original or produced in some earlier period) available to the economy will determine a convex production possibilities set as shown in fig. 1. This set is the set of all combinations of $c_0$, $c_1$, and $c_2$ that are feasible *as of* $t_0$. The production possibilities frontier $P_0P_0P_0$ is the set of production streams that are technologically efficient as of $t_0$.

For any given structure of interest rates at $t_0$, competitive profit maximization will lead factor owners to plan to produce the aggregate output supply vector $S_0$ with maximal present discounted value $w_0$. This

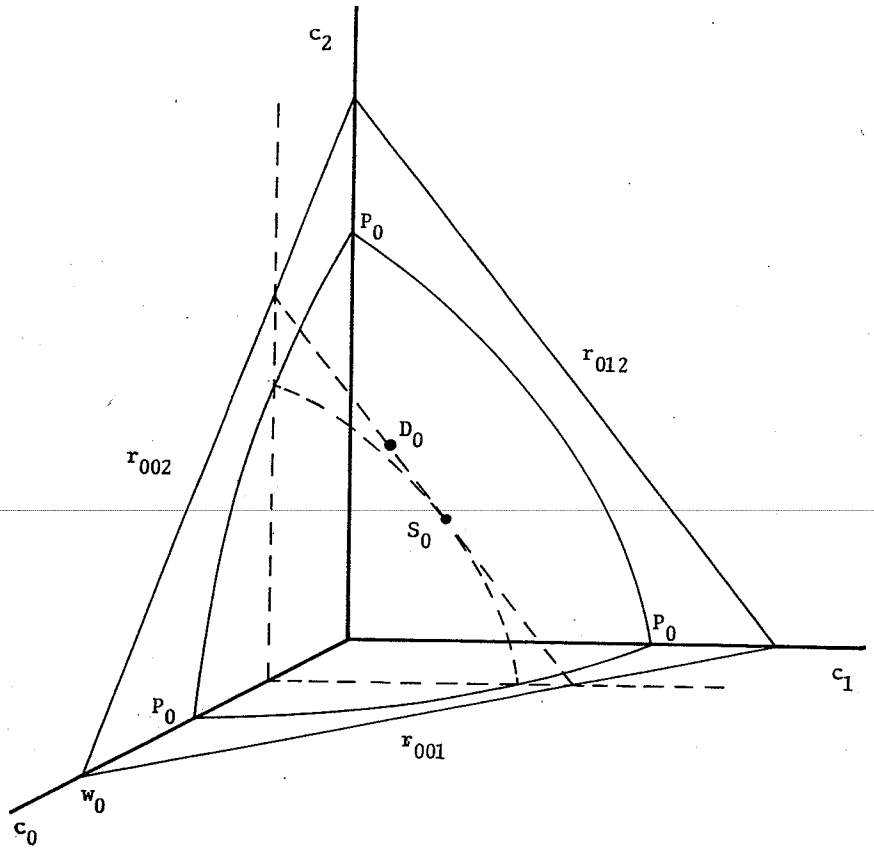


Fig. 1. The economy's budget plane and production plan $S_0$ for a given term structure of interest rates during $t_0$. $P_0P_0P_0$ is the economy's production possibilities frontier as of $t_0$. $D_0$ is a possible location of the economy's $t_0$ consumption plan, corresponding to an impending recession.

period $t_0$ supply vector, together with the budget plane of all consumption streams with this present value is also shown in fig. 1. The traces of this budget plane on the three planes defined by the coordinate system have slopes related to the interest rates indicated. The steeper the slope in absolute value, the higher the corresponding interest rate.

As of $t_0$, market participants think they can purchase any point on this budget plane. However, it will be immediately apparent, i.e., during $t_0$, if they demand a different quantity of $c_0$ than is being supplied. Therefore the $c_0$ components of the $t_0$ supply vector $S_0$ and $t_0$ demand vector $D_0$ will coincide, so that $D_0$ must lie in the plane of points having the same $c_0$ components as $S_0$, indicated by the broken lines in fig. 1. There are three possible locations of $D_0$ relative to $S_0$.

First, the $t_0$ term structure of interest rates might just by accident happen to have its Fisherian equilibrium shape, in which case $D_0$ and $S_0$ will coincide in all three components. We will represent these equilibrium interest rates by $r^e_{001}$, $r^e_{002}$, and $r^e_{012}$. In this case, as time moves forward to $t_1$, participants will find that they were together planning to produce exactly as much $c_1$ as they were planning to consume. There will be no unanticipated change in interest rates necessary to clear the market in $t_1$. Unless there is a change in tastes or an unforeseen technological development, $r_{112}$ will just equal $r_{012}$ (here equal to $r^e_{012}$).

Note that we have no a priori presumption about the shape of this equilibrium term structure.[10] The forward rate $r^e_{012}$ may be higher or lower than the short-term spot rate $r^e_{001}$. Both are ordinarily positive, but since the marginal consumption wants and production activities are in general different in the three periods, there is no reason for the interest rates bridging these periods to be equal. In continuous time, forward rates are probably a smooth function of maturity, but otherwise the equilibrium forward curve can take on any shape: upward sloping, downward sloping, or oscillating. Therefore equilibrium development may require a substantial change in yields to maturity. However, this change will have been fully anticipated in forward interest rates.

The second possibility is that the forward rate $r_{012}$ may be higher than its equilibrium value, in which case $D_0$ will have a lower $c_1$ component and a higher $c_2$ component than $S_0$, as illustrated in fig. 1. This is the case of an impending recession. There is, in the minds of participants at $t_0$, an excess supply of $c_1$ and a corresponding excess demand for $c_2$. Walras' law requires that they be equal in present ($t_0$) value, but not that they individually be zero. As time moves forward to $t_1$, a recession will appear in the sense that an excess supply of current output in general becomes apparent in the market. A value of $r_{112}$, necessarily lower than $r_{012}$ and probably even lower

[10]See Fisher (1930, pp. 313–314).

than $r^e_{012}$ will be found that eliminates the excess supply. Therefore a recession will be associated with an unanticipated fall in interest rates.

And third, the forward rate $r_{012}$ may be lower than $r^e_{012}$, in which case $D_0$ will have a higher $c_1$ component and a lower $c_2$ component than $S_0$, so as to lie southeast of $S_0$ in fig. 1. This is the case of an impending boom. As time moves forward to $t_1$, an excess demand for current output will become apparent which will drive $r_{112}$ up above $r_{012}$, and probably even higher than $r^e_{012}$. Thus a disequilibrium boom is associated with an unanticipated rise in interest rates.[11]

If business fluctuations are associated with unanticipated changes in interest rates, rational expectations imply that these fluctuations cannot exhibit regular cycles, but rather must be random in nature. However, our same Irving Fisher (1925, p. 191) long ago maintained that this is precisely the case. In another paper [McCulloch (1975c)] we have tested this hypothesis and not found any strong evidence to the contrary. Therefore the non-cyclic nature of the fluctuations we have described is in conformity with the observed business 'cycle' rather than in conflict with it.

In terms of financial arrangements, an impending recession means that during $t_0$ market participants are planning as a whole to produce more $c_1$ than they are planning to consume and to lend the proceeds from selling this output at the forward rate $r_{012}$ in order to finance additional consumption of $c_2$ above and beyond their production of $c_2$. However, their plans are doomed to fail, since no one is planning to borrow the surplus $c_1$ from them. During an impending boom, on the other hand, participants are planning (during $t_0$) to borrow during $t_1$ in order to finance additional consumption of $c_1$ beyond their own production, and to repay these loans during $t_2$ out of their surplus production. In this case the inconsistency is that no one is planning to lend them this $c_1$. If all planned future borrowing and lending, whether by ultimate borrowers, by ultimate savers, or by financial intermediaries, were precontracted during $t_0$, this kind of inconsistency could not arise.

It would undeniably be desirable if somehow intermediaries could enable producers to embark on long-term investment projects, while guaranteeing to consumers as a whole the option of consuming their wealth as soon as they wish. However, this is technologically impossible. In terms of fig. 1, $S_0$ is the only point on the $t_0$ budget plane that is actually possible to produce. No financial institution, however ingenious, is capable of allowing the economy to consume a point such as $w_0$ on the $c_0$ axis. Even though this point is the sum of points that each individual is capable of consuming, this ability is contingent on not everyone doing so at once.

[11]Note that the excess supply or demand for $c_1$ does not actually appear during $t_1$, but only has reality in terms of the plans for the future people had during $t_0$. As Milton Friedman (1953, p. 251) once noted: 'Inflationary Gap is never of the past or the present; it is always in the future.'

## 3. The Austrian capital problem

Misintermediation fluctuations would involve no technological inefficiency and no welfare loss, except possibly for that arising from a small discrepancy between $c_0$ output and its ideal level, were it not for the contraction of the production possibilities frontier between $t_0$ and $t_1$. At $t_0$, the economy can produce any point on $P_0P_0P_0$ in fig. 1, or on its cross-section $P_0P_0$ in fig. 2 corresponding to the broken lines in fig. 1. To produce any particular output

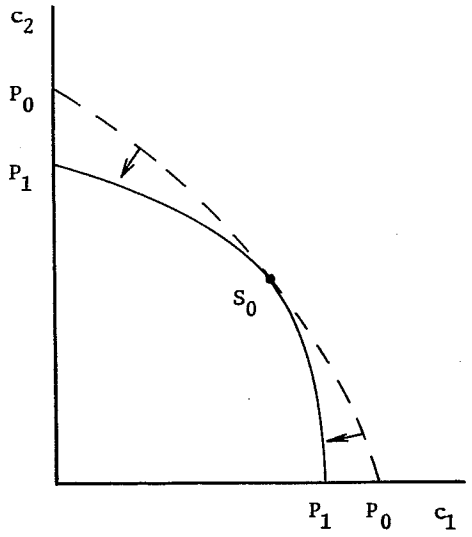


Fig. 2. The Austrian capital problem. As time moves forward from $t_0$ to $t_1$, the transformation curve between $c_1$ and $c_2$ contracts from $P_0P_0$ to $P_1P_1$, so that $S_0$ is the only point on the original production possibilities frontier that is still feasible.

vector, certain productive activities will be necessary during $t_0$, $t_1$, and $t_2$. In general, these activity vectors will be different for every different output vector. In particular, the $t_0$ activities appropriate to the point $S_0$ will be appropriate to that point *and to no other point* on the $t_0$ production possibilities frontier. Therefore during $t_1$ the production possibilities set over $c_1$ and $c_2$ is not the set of points under $P_0P_0$, but only a proper subset of that set. The $c_1$ and $c_2$ components of $S_0$ will still be feasible, but since it is too late to go back and change the activities conducted during $t_0$, elsewhere the production possibilities frontier will have shrunk, to $P_1P_1$ as shown in fig. 2. $P_0P_0$ and $P_1P_1$ will just touch at $S_0$, but $P_1P_1$ will have a lower transformation elasticity than $P_0P_0$ in a neighborhood of $S_0$[12] and so will

[12]It is not actually necessary that $P_1P_1$ have a lower transformation elasticity than $P_0P_0$ at $S_0$ itself, but only in a deleted neighborhood of $S_0$.

fall away from $P_0P_0$ as we move away from $S_0$. Phrased differently, the long-run transformation curve's cross-section $P_0P_0$ in fig. 2 will be the envelope of short-run curves like $P_1P_1$ corresponding to different production decisions made in $t_0$.

This problem of vanishing intertemporal production possibilities due to the inconvertibility of capital has long been emphasized by the Austrian economists von Mises and Hayek.[13] The reason for its occurrence is that the quantities of the various types of capital goods produced during $t_0$ for later use are in general inappropriate to any point on the $t_0$ transformation surface except $S_0$. We cannot say that there were too many or too few capital goods produced during $t_0$, but only the wrong mix. This is the reason why Austrian writers place such great emphasis on the heterogeneity of capital goods, and speak of *mal*investment, rather than of over- or underinvestment. A model with homogeneous capital hardly begins to deal with the problem of intertemporal plans, since according to it, the only decision to be made in $t_0$ is between $c_0$ and the future, without reference to how output is to be allocated *over* the future.

Because of this Austrian 'structure of production' problem, it is essential for technological efficiency that production follow through with output stream $S_0$. This will occur if $r_{112}$ equals $r_{012}$, but not otherwise. The unanticipated change in interest rates necessary to bring the $t_1$ demand point $D_1$ into coincidence with the $t_1$ supply point $S_1$ will require that $S_1$ lie *inside* $P_0P_0$, as shown in fig. 3 in the case of a recession. Therefore misintermediation fluctuations, whether booms or recessions, ordinarily entail technological inefficiency and wasted resources.

Although $S_0$ is technologically efficient in terms of the production possibilities available at $t_0$, and is still technologically feasible at $t_1$, it is economically *in*efficient, since it does not represent a Pareto optimum. Given the mistakes of the past, Pareto optimality during the recession or boom period $t_1$ requires abandoning the technologically efficient point $S_0$, and moving to the technologically inefficient point $S_1$. It would have been even better not to have had the fluctuation in the first place, but by $t_1$ it is too late to prevent it.

A boom involves the same sort of inefficiency and consequent welfare loss as does a recession. The only difference is that the $S_1=D_1$ point lies southeast of $S_0$ along $P_1P_1$, rather than northwest of it as in fig. 3, and that the $r_{112}$ line is steeper than the $r_{012}$ line, rather than flatter. We therefore

[13]See von Mises (1924, pp. 357–366 and 1933). Indeed, the present theory grew out of an attempt to reformulate Mises' theory of business fluctuations in terms of Fisher's Böhm-Bawerkian model of interest rate determination. Note, however, that in our theory, the recession is associated with an unanticipated *fall* in real interest rates rather than a *rise*, as in the Mises–Hayek theory, and that our theory does not require incorporation of the money-creating function of banks.

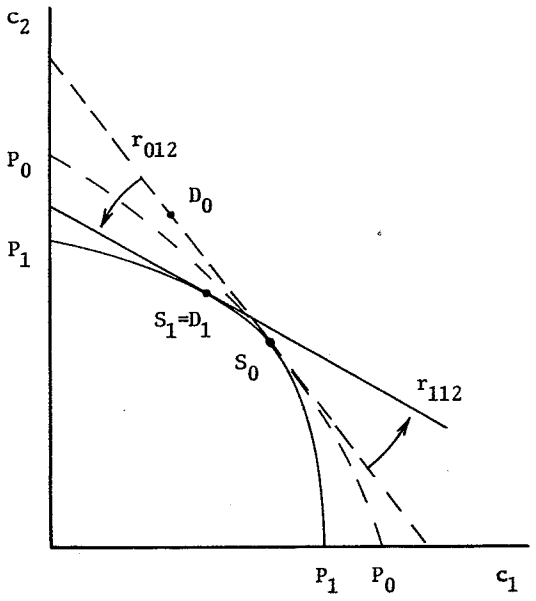


Fig. 3. The unanticipated fall in interest rates associated with a recession. Production moves to a point $S_1$ inside the original production possibilities frontier, in order to match consumption and production plans for $c_1$.

arrive at the odd conclusion that a boom can be just as bad as a recession. It is true that as producers participants are pleasantly surprised by the briskness of demand. However, this benefit is more than offset by the deterioration of the terms on which they as consumers can buy that output. The financial side of this situation is that during $t_0$, representative participants were planning to borrow at a low interest rate to finance additional consumption of $c_1$. When they get to $t_1$, they find that no one was planning to lend them this purchasing power, and the interest rate must go up sufficiently high above $r_{012}$ to discourage them from borrowing.

## 4. Conclusion

We have shown that misintermediation, the traditional mismatching of asset and liability maturities by financial intermediaries, is a potential source of macroeconomic disequilibrium. Rather than protecting economic participants from interest rate uncertainty, it actually subjects the economy to additional, unnecessary interest rate uncertainty, and to inefficiency in the intertemporal production process. Far from being an essential function of financial intermediaries, maturity transformation is actually a *mis*function.

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