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The Economic Consequences of Loan Maturity Mismatching in the Unhampered Economy

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ABSTRACT: Some economists of the Austrian School contend that business cycles are created when banks use the proceeds of short-term time deposits to create longer-term loans. These authors claim that while loan maturity mismatching of this kind does not create fiduciary media, it nevertheless artificially lowers the market rate of interest and causes forced saving and malinvestment. According to this view, Austrian business cycle theory, which hitherto has assumed forced saving occurs only in the *quantity* dimension as a result of fractional reserve banking, must also consider forced saving in the *time* dimension engendered by loan maturity mismatching. The present paper disputes this and argues that while loan maturity mismatching does affect the rate of interest and alters the production structure, it cannot independently cause forced saving or any systemic discoordination. Hence in the unhampered economy, it is *not* responsible for causing business cycles.

KEYWORDS: business cycles, interest rates, savings and investment, production structure, banking

JEL CLASSIFICATION: E32, E43, E44, E52

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I. INTRODUCTION

In the last few years, there has been a debate among some Austrian economists concerning the economic effects of loan maturity mismatching by commercial banks. A positive yield curve—in which loans having a short term to maturity are associated with a lower interest rate than those with a longer duration—makes it profitable for banks to use the proceeds of their customers' short-term time deposits to create longer-term loans that are issued to borrowers.[1] For any given instance of this practice, even though the bank's liabilities and assets have matching value, the durations of each are *mis*matched intertemporally, making it necessary for the bank to continue to find short-term depositors until the long loan is fully paid off. Thus for example, if depositor A lends bank B the sum of $100 for a period of one year, and B uses this amount to provide borrower C with a *two*-year $100 loan, then at the end of the first year, another depositor A' must be found who is willing to provide a new one-year $100 loan in order that B can fulfill its obligation to A.

Barnett and Block (2009b) argue that while loan maturity mismatching (LMM) of this kind does not involve the creation of fiduciary media or expand the money supply, it nevertheless lowers the market rates of interest and is independently responsible for causing forced saving and malinvestment which generates business cycles. The purpose of the present paper is to demonstrate why this claim is erroneous, and to show that LMM's macroeconomic effects, while not neutral, cannot by themselves cause systemic intertemporal discoordination. It should be noted that in order to determine whether or not LMM is an *independent* source of error, the scope of this discussion is limited to an examination of its effects when it is introduced into the *unhampered* economy. The question of whether or not LMM causes business cycles (or

[1] It should be pointed out there is another kind of LMM possible—the inverse of that described above—where banks use longer-term deposits to create short-term loans. This form of LMM is not controversial and is not discussed in the present paper. Henceforth, the term LMM shall apply only to the case where banks create longer loans from shorter deposits. The term "borrowing short and lending long" or "BSLL" is not used here, as it is possible to confuse the borrowers with the lenders. For example, while the bank borrows from its depositors, and lends this money out, its depositors are also lenders, and those seeking loans from the bank are borrowers.

contributes to them) in an economy where violent intervention is established—i.e., where the government provides bail-out guarantees, or a central bank acts as a lender of last resort, or where fractional reserve banking is permitted—is *not* the focus here.[2]

In Austrian business cycle theory (ABCT), the rates of interest are artificially lowered when commercial banks create fiduciary media by using the proceeds of demand deposits to create loans. Lower interest rates on the producers' loan market falsify the process of economic calculation for entrepreneurs, which, together with the increase in the supply of money, cause the production structure to be lengthened beyond that dictated by the social time preference. Gross investment increases without a corresponding increase in genuine saving, resulting in malinvestment and forced saving. Eventually, the more capital-intensive stages become unsustainable and the initial boom turns to recession. Barnett and Block (henceforth B&B) do *not* claim that LMM increases the quantity of fiduciary media. However, they do assert that it has the same effect in terms of creating the business cycle because, like fractional reserve banking (FRB), it both artificially lowers the market rates of interest and creates forced saving and malinvestment. Indeed, according to these authors, FRB should be viewed merely as a special case of the more general intertemporal carry trade described by LMM, in which the period of saving is artificially increased. In making this claim, they allege that saving and investment have both a quantity *and* a time dimension which "traditional" ABCT ignores. According to this notion, FRB increases the former while LMM increases only the latter, but in both circumstances an increase in forced saving and malinvestment is the result.

Barnett and Block (2009b) provide the following example of how they believe LMM causes forced saving: Suppose saver A deposits

[2] For a discussion on the macroeconomic effect of LMM in an economy of violent intervention—i.e., one that is not free—see Bagus and Howden (2010). The term "violent intervention" is used, following Rothbard (2004), to describe any action that involves an initiation of aggression against a person or their property, i.e. an action that is coercive and contra the natural law. Government actions are thus "violent," because they are non-voluntary and coercive. The position of the author is that fractional reserve banking is also a form of violent intervention, and *contra* the natural law, because it violates property rights. For opposing views on whether or not LMM itself violates the natural law, see Barnett & Block (2009a) and Bagus and Howden (2009).

$100 with bank B for one year at 5 percent, and B lends this same money to borrower C for two years at 10 percent. In this scenario, saving is $100–1.0 years and investment is $100–2.0 years. According to B&B, it is clear that *without* B's financial intermediation, the only way A and C could come to an agreement is if they were to meet somewhere in the middle, say with a loan of $100 for one-and-a-half years at 7.5 percent. In this case, total saving and investment would be equal to each other at $100–1.5 years. This means that B's actions must increase investment by $100–0.5 years while reducing voluntary saving to the same degree. Because B creates a situation in which savings and investment are *not* equal to each other, this amount must be *mal*investment accomplished through forced saving. In addition, interest rates have been lowered across the term structure, implying they are below those that would otherwise be dictated by time preference.

The crux of this argument is the unsupported claim that changes in the time dimension of saving and investment can be directly responsible for causing business cycles. It will be demonstrated, however, that the attributes of saving and investment, relevant to ABCT, are the rates of interest and the gross quantities of saving and investment, but not the *period* that individuals save or the length of loans. FRB affects production, resulting in cycles, because disequilibrating forces are set in motion by an artificially lower interest rate *and* by increases the quantity of money invested, without a corresponding increase in the quantity of money voluntarily saved. But changes to loan lengths induced by LMM cannot affect production in the same way. While LMM affects the market interest rate, and does affect the production structure, LMM alone cannot cause business cycles. Section II is a critique of the argument offered by B&B, in particular the notion that an extension of the time dimension of saving is relevant to causing business cycles in the market economy. Section III demonstrates why malinvestment and business cycles are not created by a mismatch of the durations of assets and liabilities. In section IV, an equilibrium construct is introduced to demonstrate how LMM affects the contractual rate of interest in the producers' loan market. The macroeconomic effect of this change on the production structure is discussed in section V. Section VI concludes.

II. CRITICISM OF BARNETT AND BLOCK'S ARGUMENT

B&B claim that LMM is directly responsible for causing business cycles. However, the example they provide between saver A, and borrower C, is not at all helpful in demonstrating this is true. First, ABCT presupposes a market economy where there is competitive exchange, so the mere fact that maturity mismatching gives rise to a certain outcome in a single example of isolated exchange is *not* evidence that LMM causes business cycles. One cannot jump to the conclusion that a particular example of malinvestment represents systematic error in a market economy by focusing on only one example of exchange or only one aspect of the economy.

Second, in ABCT the starting point for the analysis is an intertemporal equilibrium where the internal data—the quantities of gross saving and investment as well as the price ratios per unit of time—are fully resolved to the external datum of time preference. Time preference is assumed to be given, and not changed by the intervention. In "traditional" ABCT, this imagined state of affairs in the absence of FRB is necessary to show how the creation of fiduciary media causes the internal data to be at variance with the underlying time preference, and to determine through a process of logical deduction the effects of the intervention only and not those from other sources.[3] Without the equilibrium as the counterfactual state, it is not possible to demonstrate that the data that follow the event under consideration are cyclical in nature. If there is no reference point around which the data can oscillate, there can be no cycle.[4] Therefore, an intertemporal equilibrium is indispensable in any demonstration that LMM discoordinates the time structure of production and causes a business cycle.[5]

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[3] All praxeological theorems rely for their proof on imaginary constructions. As Mises states, "The method of imaginary constructions is indispensable for praxeology; it is the only method of praxeological and economic inquiry. The main formula for designing of imaginary constructions is to abstract from the operation of some conditions present in actual action. Then we are in a position to grasp the hypothetical consequences of the absence of these conditions and to conceive the effects of their existence." (Mises, 1998, p. 238)

[4] See Hayek (1931) pp. 34–35.

[5] According to Garrison (1991) "The very meaning of disequilibrium in the context of business-cycle theory derives from its being compared to some relevant equilibrium. That is, adopting a suitable equilibrium concept establishes the initial

Consider, however, the counterfactual circumstance when there is only one instance of saving and investment, as presented in B&B's scenario. We are told that without B as the intermediary, A and C would agree on a loan of 1.5 years, which is less than the 2 years that arises under LMM. But what would happen after 1.5 years? Since we are given no further information, we can only conclude that the saving of A would fall to zero. Since C is not a saver, and since there are no other actors present, the time structure would cease to exist. The counterfactual equilibrium disappears. The problem is that when B enters the picture, he extends C's loan beyond the time where there is any possible equilibrium, beyond where there would be any time structure at all. There is certainly malinvestment in this situation, which by virtue of the particular example given is systematic, but it cannot be called a business cycle. Introducing other savers into the scenario, so that the existence of an equilibrium position is no longer in doubt, eliminates this problem, but as will be discussed below, the issue then becomes one where the malinvestment is no longer systematic.

Third, in "traditional" theory, the variables that affect the time structure of production, upon which an exogenous disturbance must impinge if it is to upset the intertemporal equilibrium, are the interest rate and the *quantity* of gross saving and investment, as governed by the social time preference. The claim that LMM causes malinvestment by creating a disparity between saving and investment in the *time* dimension is sometimes true, but only in autarkic economies, or certain situations where the duration of gross saving and investment are assumed to be finite, and only indirectly, by effecting a change in quantity. It is *not* true in the genuine market economy, where gross saving and investment are continuous. In B&B's example, because there is only one saver and one borrower engaged in only one exchange, the quantity of saving and investment are both destined to fall to zero, whether there is LMM or not. However, as a result of LMM, saving ends

conditions and facilitates the analysis of an ensuing disequilibrium caused, say, by the central bank's cheap-credit policy." "It is not necessary for the initial conditions to preclude all kinds of disequilibria but only to preclude systematic intertemporal disequilibrium—the kind of disequilibrium for which the theory itself accounts. This limited equilibrium construct complies fully with both the logic and the spirit of ABCT."

before investment, creating an inequality in their quantities, and hence malinvestment. The inequality is caused not by LMM affecting the quantity directly, as is the case when fiduciary media are created, but rather because the example chosen is one in which the period of saving and investment are finite, such that the duration of one can be extended relative to that of the other. The problem is that business cycles are market phenomena. And in the market economy, *gross* saving and investment do not end. Their time dimension extends indefinitely, and any difference between the period of *individual* saving and investment, caused by LMM, cannot create a disparity in either the duration or the quantity when the market is considered as a whole.

One possible response to this argument might be the following: Suppose consumers on average save for one year in order to buy TVs, but banks use these funds to create ten-year loans that are used by the manufacturers to produce TVs in ten years. At the end of the first year, is this not a situation in which there is a disparity between saving and investment? And is this not true even though time preference is unchanged? As with B&B's example above, the problem with this scenario is that it considers only one group of savers at one particular point in time, and only one aspect of the economy in isolation, which is impermissible in the analysis of business cycles. We must ask, what happens at the end of the first year? Firstly, if these actors' time preferences are truly constant, then, *ceteris paribus*, they must continue to save at the end of year one, for if they do not, then this indicates their time preferences have risen. But secondly, even if these particular savers decide not to renew their loans, then if the *social* time preference does not change—and this is what must be assumed before we can determine whether there is a business cycle—it is necessarily the case that other savers must step into the breach. In which case, *ceteris paribus*, gross saving continues to be constant and equal to gross investment. The issue here is that *gross* saving and investment and the interest rate—the variables of concern in business cycle analysis—are not *directly* tied to the quantity or length of *individual* saving and investment. Rather, in the social context, these variables are governed by the supply and demand schedules for present money in terms of future money. While changes in the period of individual saving or investment can sometimes mean a change in the social time preference, and thus a

change in the supply and demand for present money, it is nevertheless the case that if the social time preference is constant, then this is manifested in supply and demand schedules that are unaltered; in which case the quantities of gross saving and investment must also be constant and equal. This is true *irrespective* of changes to the length of particular loans or investments.[6]

What of the time dimension of gross saving and investment? Even though individual time horizons can change, the period of *gross* investment cannot be extended relative to that of *gross* savings, unless the latter falls to zero, as in the earlier scenarios. But in a market economy where social time preference is assumed constant, gross saving is never zero. Since both are of indefinite duration, individual actors cannot create a disparity in the time dimension in this regard. There is still the question of whether mismatches in the durations of the assets and liabilities of individual banks cause malinvestment. However, as discussed below, any malinvestment that arises cannot be systematic. The following discussion will also serve as the basis of the equilibrium construct, used later, to show how LMM affects the interest rate and the structure of production *without* causing business cycles.

III. DO MISMATCHES IN THE DURATIONS OF ASSETS AND LIABILITIES CAUSE MALINVESTMENT?

According to the pure time preference theory of interest, first elucidated by Fetter, time preference refers to the fact that all actors prefer a given satisfaction sooner rather than the same satisfaction later. The social time preference is manifested in the supply and demand schedules of present money in terms of future money—isolable only in Mises's construction of the evenly rotating economy (ERE)—and expressed, on the one hand, by an underlying uniform pure rate of return that exists throughout the entire time structure of production, including all loan markets, and on the other hand, by the total quantity of present money (in terms of future money)

[6] Even if the social time preference changes, as manifested in an altered supply or demand schedule for present money, the quantities of gross saving and investment must always be equal (even if not necessarily constant) assuming no fiduciary media are created, and this is the case no matter what individual savers and investors do. Put another way, markets always clear, *ceteris paribus*.

supplied/demanded. Abstracting from consumer borrowing, this quantity represents gross saving and investment.

As Rothbard points out, it is important to stress that, with regard to time preference, the suppliers of present money include only those agents who save money by abstaining from consumption, and who then exchange it for either a promise of a greater amount to be delivered in the future—as in the case of credit transactions—or for productive assets that will yield a greater amount of money in the future.[7] To the extent these capitalists retain revenues within a firm, such that this money is reinvested and *not* received as personal income, these actors continue to be suppliers of present money, their value scales having determined that it not be used for consumption. But suppliers of present money do *not* include banks in their intermediary function, because they are not the original savers, or business leaders and managers unless they use their own funds or own an equity stake.

From the Rothbardian perspective, an individual is a demander of present money if he supplies factors of production—either original factors or capital goods—in which case the money is repaid at a later date from the product of the factor services, or if he borrows money for the purpose of consumption, in which case the money is repaid by the borrower himself. Since all capital goods are derived ultimately from land and labor, all demand in the productive sphere resolves into the demand from original factor owners. Banks in their intermediary function are not demanders of present money, because they neither supply factors of production nor borrow the funds for consumption, and borrowers on the producers' loan market are not demanders, for they too are merely intermediaries. (Rothbard, 2004, p. 379)

Rothbard makes clear that the determination of who supplies and demands present money in this regard does not depend on the legal status of the borrower or the lender, or the type of financial instrument involved. Money can be channeled into production using a variety of methods, but the form of the financial instrument is unimportant from the point of view of fundamental analysis. As Rothbard states:

[7] It does not include those engaged in plain saving (cash hoarding). Although it does include those who use previously hoarded cash for investment.

> We must conclude that economically and even in basic law, there is no difference between shareholders and productive creditors; both are equally suppliers of capital, both receive interest return as determined on the general time market, both own their proportionate share of the company's assets. The differences between the two are only technical and semantic. It is true that our discussion has so far applied only to the evenly rotating economy, but we shall see that the real world of uncertainty and entrepreneurship, while complicating matters, does not change the essentials of our analysis. (Rothbard, 2004, p. 439)

In short, analytically, there should be no distinction between savers who own equity, stock certificates, bonds, certificates of deposit, savings accounts, or any other kind of loans. They are all capitalists who save and then invest, either directly in production or indirectly through financial markets.[8]

Consider, first, the general equilibrium construct of the ERE, where gross saving and investment are equal to each other and constant. Gross investment consists of the assets of all enterprises—i.e., all goods-in-process, durable capital goods, inventory, finished goods waiting to be shipped, etc. In the ERE, all assets, whatever their form, are renewed or replaced as they are used up in production. On the other side of the economy's balance sheet, gross saving consists of the liabilities and equity of all enterprises, which, abstracting from intermediaries, is held ultimately by the suppliers of present money in the form of stocks, loans and other debt. Suppose an ERE has gross saving and investment that is maintained at $1000M. Savers in the aggregate continue to abstain from consumption insofar as what has already been saved, making no new additions or subtractions to this gross amount; all earnings, except for interest, are retained. Suppose, these savings are held as $500M of stocks and other equity, $250M of 1-year bonds, and $250M of 10-year bonds.[9] Because the economy is

[8] This is *not* to say there are no differences from the perspective of individual investors as to the kind of financial instruments they use. To finance a project, one investor might prefer equity, another bonds, for example; each must consider the various risks and rewards. However, as Rothbard makes clear, from the perspective of *fundamental analysis*, any differentiation between the various types of instruments is not needed in order to deduce the relevant logical relations.

[9] All of these must bear the same interest or dividend rate in the ERE equal to the pure rate.

evenly rotating, the stocks are held indefinitely, the 1-year bonds are renewed every year, and the 10-year bonds are renewed every ten years, so that $1000M of saving and investment continues to be provided over an extended time. In the ERE, the rotation of any dated securities is a necessary implication of the assumption that all preferences, including time preference, are constant. Since all production processes are repeated without end in the ERE, it is clear that the durations of the liabilities do not have to match those of the assets.

Consider, next, an economy where only the social time preference is assumed to be constant. The time preferences of individual actors can change, but gross saving is constant over time, as in the ERE. While the composition of the investment vehicles in which these savings are held need not remain the same, the renewal or replacement of those of finite duration with others of equal value—but not necessarily the same duration—must take place, this being the necessary implication of the quantity of gross saving being maintained. With regard to production, some processes are ongoing, others are newly initiated, and yet others are terminated, but gross saving and investment continue to equal each other in quantity—that is, in money value—as capitalist-entrepreneurs freely compete with one another to supply present money, and original factor owners freely compete to demand it.

Globally, the quantities and the forms of the equity, liabilities and assets can vary, but since time preference is constant, and because the gross money quantities on each side of the economy's balance sheet are always equal and constant, the durations of the assets and liabilities do not have to match as a necessary condition of avoiding malinvestment. Intertemporal discoordination is *not* the inevitable outcome if the quantity ratios or maturity profiles change. Therefore, if banks use consecutive short-term deposits to sustain long-term loans, channeling the latter into production, this will not necessarily create malinvestment. If this activity increased the overall quantity of present money, as in the case of FRB, or if it prevented the liabilities from being renewed, then it would, but LMM does neither of these things. Provided the social time preference stays the same, the deposits continue to be made at the same interest rates, and LMM continues to operate unimpeded without causing intertemporal discoordination.

Consider, finally, an unhampered economy where *no* preferences are assumed to be constant, where the social time preference might rise. Suppose short-term interest rates become higher, such that a bank that previously lent long, when short rates were lower, finds its profits evaporate or becomes insolvent. This would represent malinvestment. However, it merely means the public's value scales have changed, the equilibrium has shifted, and the bank has failed to anticipate it. It only demonstrates that banks are subject to the same kind of non-cyclical and non-systematic error as any other enterprise. It certainly does not give rise to a business cycle. In ABCT, a business cycle occurs because the intervention causes the internal data to diverge from the equilibrium, creating an initial boom, and the cycle is completed, as evidenced by a recession, as market actors attempt to reestablish the equilibrium. But if the social time preference changes, it is the equilibrium itself that shifts, a change that occurs as a result of unrelated exogenous events that are fully in accordance with actors' value scales. There might be error in anticipating it, but this is always the case in the real world where the final equilibrium is never fully known or reached.

IV. THE EFFECT OF LMM ON THE MARKET RATES OF INTEREST, SAVING AND INVESTMENT

In the real world, where uncertainty is always present, the rate of return throughout the time market includes other components—either increments or decrements—that arise because the data are always changing. Rothbard refers to these real-world returns as natural rates, and uses the word "capitalist-entrepreneur," instead of just capitalist or entrepreneur, to highlight the fact that the person who earns the natural return always earns the pure return in conjunction with these other components, the latter being determined through competition in a process that involves entrepreneurial understanding and judgment. The contractual rates in the producers' loan market are a subset of the natural rates found in production and are therefore determined, firstly, by the pure rate of interest, as governed by all agents within the time structure who supply and demand present money, and, secondly, by the entrepreneurial premiums, arrived at through competition, by actors in the loan market. Since uncertainty regarding future

price movements generally becomes greater the further into the future any given assessment lies, long-term contractual rates tend to have higher added premiums and therefore higher interest rates than shorter ones. Underlying all of them, however, is the uniform pure rate governed solely by social time preference.[10]

In order to isolate the effects, if any, of LMM on interest rates, it is necessary to consider an imaginary economy, initially in equilibrium, in which market actors' value scales with regard to time preference are assumed not to change. For a yield curve to exist, the judgments of the actors in the construct must differ between the alternative forms of saving, but these judgments are assumed to be given and constant over time. This latter element is necessary because it must be assumed that in the *absence* of LMM the yield curve does not change. Only then can it be said that *ceteris paribus* LMM causes X, Y, Z etc., or, in other words, that alterations to the endogenous data—i.e., quantities and prices (including interest rates)—follow as a result of LMM and not from some other cause.

Thus, according to the terms of this construct, the supply and demand schedules of present money in terms of future money, as dictated by the pure time preference of non-bank actors, are assumed not to change. The underlying pure rate is uniform. On the loan market, the non-bank actors' supply and demand schedules with respect to individual financial instruments are also assumed to be invariant, for while they include, in addition, premiums arising from uncertainty, and while these components obviously differ depending on the type of security involved, the judgments of any given actor with regard to these uncertainties

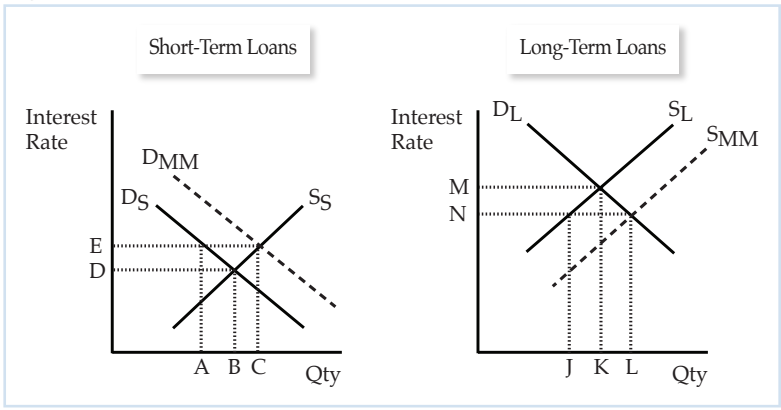
[10] With regard to the loan market, there are three empirical observations related to yield curves. First, they are usually positively sloped; second, when interest rates rise and fall, rates across the whole term structure tend to move together; and third, long-term rates are relatively more stable than shorter-term ones. Various theories have been proposed to explain these phenomena (Cwik, 2005). However, praxeology cannot furnish definite answers as to their cause. All that can be said is that if actors have certain expectations and *if* they act upon them in a certain way, then a certain kind of yield curve will be the result, but it cannot be deduced *a priori* from the axiom of action that given a specific expectation, an actor *will* act in a specific way. Nor is it possible to deduce apodictic propositions that certain events lead to specific kinds of expectations. There may be good empirical evidence to argue in favor of certain causes, but such explanations lie outside the realm of praxeology.

are assumed to be unchanging. The time market is assumed to be evenly rotating in that loans are renewed as they expire. This is *not* to say that once LMM is initiated the market interest rates or the quantities demanded of individual instruments are unchanging; indeed, variations in these data are precisely what needs to be examined. However, the other constraints ensure that changes in these rates and quantities arise only from LMM and not from some other exogenous cause.

With no creation of fiduciary media, LMM cannot increase the supply of present money and create an inequality between the quantities of gross saving and investment. And since time preference is assumed to be constant, these quantities are invariant. Therefore, if LMM alters the proportions of various types of loans, any increase in the quantity of one type is offset by a reduction in the quantity of another type. Any that remain continue to be renewed as their terms expire, *ceteris paribus*, this being the necessary implication of constant gross saving and investment.

Let the diagrammatic exposition in Figure 1 represent a simplified producers' loan market, in which there are two kinds of loans, short-term and long-term.

Figure 1.



The vertical axis represents the market interest rate, and the horizontal axis represents the quantity of money demanded/supplied

in the particular instrument. The solid curves represent the supply and demand schedules of the *non-bank public*. As mentioned above, these schedules are assumed to be invariant over time. S_S and S_L reflect the supply schedules of capitalist-entrepreneurs who lend present money for productive purposes, the difference between S_S and S_L arising from the greater uncertainty-premiums attached to lending money when the duration of the loan is longer. D_S and D_L represent the demand schedules of those who borrow present money to invest in the production structure. While theirs is partly a derived demand—the time-preference aspect being ultimately determined by original factor owners—the borrowers' schedules differ between short- and long-term loans as a result of their entrepreneurial function, and because uncertainty for borrowers is higher on shorter loans. As a result of the relative positions of the supply and demand curves, the long loans generally have a higher interest rate than the short ones; i.e., there is a positive yield curve. *Without* LMM—i.e., in the initial equilibrium—the quantity of savings demanded by the borrowing public is equal to the quantity supplied by the lending public with respect to any particular length of loan. For short-term loans, this quantity is B at an interest rate of D, and for long-term loans, the quantity is K at an interest rate of M.[11]

When banks engage in LMM, they increase the overall demand on the short-term market and increase the supply on the long-term market. The total demand and supply schedules that arise as a result of maturity mismatching are shown by the dashed curves, D_{MM} and S_{MM}. On the short market, the interest rate rises to E. At this rate, the quantity supplied by the public increases to C, and the quantity demanded by the public decreases to A, creating a difference of AC. This quantity is transferred by the banks to the long market, where the added supply gives rise to the total supply curve S_{MM}. Here, the interest rate falls to N. At this rate, the quantity supplied by the public decreases to J, the quantity demanded by the public increases to L, and the difference JL equals AC.

Several observations can be made. First, in this new situation, in which banks establish LMM, the quantity JL must equal AC.

[11] In practice, banks add a premium for their intermediation services—an agency fee—but since this is unrelated to LMM, it is not necessary to consider that here.

This must be true because, unlike the case of fractional reserve lending, LMM alters only the duration of the new loans, but the money-amount of savings in the new loans in the aggregate is the same as that of the loans from which they are derived. Second, it is important to stress there can be no suggestion that LMM alters the social time preference in some way because, as with ABCT, the purpose of the analysis is to determine if LMM causes a situation that is at variance with the underlying time preference which is assumed to be static. And, as discussed previously, LMM must be assumed *not* to alter the public's assessments of risk and other premiums associated with any given type of investment. Therefore, the loan market supply and demand *schedules* of the public remain unaltered. Third, even though the *quantities* supplied and demanded change, and even though their market interest rates change, the loans that remain are renewed when they expire. This is a necessary implication of time preference, and hence gross saving and investment, being constant, *ceteris paribus*. Fourth, the quantities AB, BC, JK and KL do not necessarily equal each other since the exact amounts depend on the shape of the supply and demand curves. However, AB + BC = JK + KL; i.e., the decrease of savings demanded in shorts plus the increase supplied in shorts equals the decrease supplied in longs plus the increase demanded in longs. Finally, as a result of LMM, the interest rate rises at the short end of the yield curve, and falls at the long end. The degree of this yield-curve flattening is determined by the propensity of the banks to engage in LMM. Any differences in the degree to which the market interest rates rise and fall at the opposite ends of the term structure are determined by the shape of the supply and demand curves.

Below is a summary of the effects of LMM on saving and investment and the interest rate.

	Short-Term Loans	Long-Term Loans
Qty. of savings supplied by lenders (to banks)	Increase	Decrease
Qty. demanded by borrowers (from banks)	Decrease	Increase
Interest Rate	Increase	Decrease

The aggregate *saving* on the producers' loan market is the total quantity of present money supplied by the lenders, both short and long term. Even though the quantity of savings supplied by the shorts increases, and the quantity of savings supplied by the longs decreases, there is no systematic increase or decrease overall. Shorts are being renewed as before, but with a greater amount, and longs are being rolled over as before, but with a lesser amount. The aggregate *investment* in the productive structure, originating from the producers' loan market, is the total money-quantity of savings demanded by borrowers from both the shorts and the longs. Under LMM, there is no systematic increase in gross investment because, even though there is greater quantity demanded by borrowers in the long market and a lesser amount in shorts, all of these loans are being renewed, given the fact that the value scales of the public are assumed not to change. It is clear, therefore, that since both the aggregate savings and the aggregate investment are essentially unchanged, there is *no* excess of investment over saving and hence no forced saving.

Finally, the interest rate rises at the short end and falls at the long end. Because the amount of present money channeled into production by borrowers of short-term loans falls, while that channeled by borrowers of long-term loans rises, interest rates in the productive structure tend to be lower overall than they would be in the absence of LMM. However, this situation occurs *without* an increase in forced saving. For this reason, the effect of LMM on the productive structure is very different than that caused by FRB.

V. THE EFFECT ON THE STRUCTURE OF PRODUCTION

Before analyzing how a fall in interest rates, unaccompanied by an increase in present money, affects the production structure, a short digression into the shortcomings of the Hayekian triangle is necessary.[12] In Austrian capital theory, most authors consider only changes in the *supply* of present money, and disregard the potential for variations in *demand* when analyzing the effects of

[12] While only one problematical aspect of the Hayekian triangle is addressed here, Barnett & Block (2006) provide an excellent and very comprehensive analysis of numerous other deficiencies.

changes in time preference on the production structure. From this limited viewpoint, there are only two possibilities in the unhampered economy: Either the supply increases, which implies that consumption falls, gross saving rises, and the interest rate falls; or the supply decreases, which implies consumption rises, gross saving falls, and the interest rate rises. The pedagogical device most often used to explicate this state of affairs is the Hayekian triangle. One reason a triangle is reasonably successful in this regard is that when only changes in the supply of present money are considered, there is a correspondence between the logical relations governing consumption, gross saving, and interest, on the one hand, and the geometric properties of the right-angled triangle, on the other.

However, as described by Hülsmann (2008, 2011), a major defect of the triangle is that it cannot take into account the fact that the productive *demand* for present money can also change. It must be stressed here that Hülsmann is *not* alluding to changes in the demand to *hold* money or changes in the demand for fiduciary media, which some authors such as Selgin and White (1996) have cited, contrary to the arguments presented here, as a reason why credit expansion does not lead to business cycles. Rather, Hülsmann is referring to changes in the demand schedule for present money in terms of future money, which was alluded to earlier. Hülsmann cites several reasons why this demand might vary, such as a greater or lesser willingness to work, changes in immigration, and the discovery of new resources, etc. In the construct considered in the previous section, where both the demand and the supply of present money are assumed to be invariant, we abstract from these effects in addition to time preference. However, in the real world, because the demand can change, and do so independently of the supply, certain variations in gross saving and interest are possible in addition to those mentioned in the standard Austrian analysis of the capital structure. The possible variations are shown below:

	Supply of Present Money		
Demand for Present Money	Increase	Neutral	Decrease
Increase	I↕ S↑	I↑ S↑	I↑ S↕
Neutral	I↓ S↑		I↑ S↓
Decrease	I↓ S↕	I↓ S↓	I↕ S↓

With this insight, it can be seen that interest on the one hand, and gross saving and investment on the other, are not always inversely related in the unhampered economy. It is readily apparent that a triangle is incapable of graphically representing this kind of information. However, as discussed by Hülsmann, there is no such problem with a trapezoid. As with the triangle, the slope of the trapezoid represents the interest rate, the horizontal axis represents the stages of production,[13] the major height represents the value of consumer goods, and the area approximates gross saving and investment.[14] But in the trapezoid, the slope (interest) and the area (savings) are free to change independently, given that the horizontal distance (stages of production) is not tied to both of these variables. As a pedagogical device, the Hayekian triangle places limits on the relationship between the real-world variables it purportedly represents, which the trapezoid, though certainly not perfect, largely overcomes.[15]

Even though LMM causes a reduction in the market rates of interest, below those which would otherwise exist, it does so without a corresponding increase in forced saving or reduction in voluntary saving. Saving continues to correspond to the level of consumption, and saving and investment remain equal to each other. The rates of interest, while lower, arise *not* from any increase in the supply of present money, but rather from a reduction in the entrepreneurial risk premiums on a proportion of loans. The Hayekian triangle cannot depict the lower interest rate unless investment increases. Thus, if the triangle is used, a superficial analysis might conclude that the inevitable consequence of LMM is an unsustainable lengthening of the production structure and a

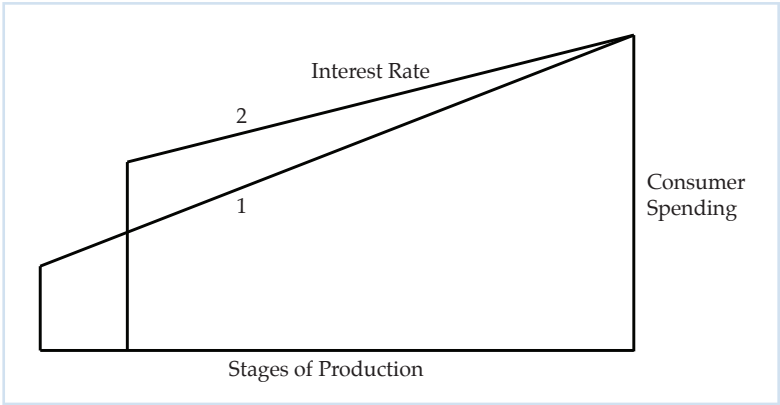
[13] The interest rate is conceptual since in reality it consists of multiple different natural rates. The stages can be represented as existing simultaneously with respect to a stationary economy, or as proceeding in time.

[14] The area only approximates gross saving since, in praxeology, units are not infinitely divisible, and therefore not amenable to integration. Production is carried on discrete stages. Moreover, this presupposes a stationary economy.

[15] It is no coincidence the trapezoid can represent this information. Hülsmann (2011) provides mathematical simulations of spending in various scenarios (as, for example, Huerta de Soto [2009] does for the triangle) to demonstrate that a trapezoid does indeed more faithfully represent the real-world relationship between interest, saving, and the length of the production structure.

business cycle. But these conclusions are unwarranted, for in the unhampered economy savings and investment *can* remain constant when interest rates fall, because the production structure shortens, as shown in Figure 2.

Figure 2.



Overall, the production structure is altered, but since consumption, saving and investment remain aligned, there is none of the intertemporal discoordination or malinvestment that occurs under ABCT. Because gross investment is unchanged, and because the reduction in the number of stages is counteracted by a broadening of the earlier stages relative to the later ones, there is no growth or contraction overall. The following conclusions can be drawn:

Where LMM operates in an unhampered economy, it is certainly possible for the non-bank public to err in their assessments of risk and uncertainty, and be too conservative, such that the spread on interest rates in the loan market is wider than needed. If this is the case, then bank intermediation in the form of LMM can be seen as a correcting force, which flattens the yield curve to a level commensurate with the actual risk, the difference in premiums inuring to the banks as entrepreneurial profit. The proof, of course, is in the pudding. If the non-bank public is correct all along, then a bank could suffer losses. For example, if a bank underestimates the number of

borrower defaults, or if short-term interest rates subsequently rise, such that they can no longer be used to finance existing longer-dated securities without a loss, then the bank could become insolvent. The danger of insolvency leads to an optimal level of LMM in the unhampered economy because, like any other business, banks that are consistently wrong must eventually cease to operate.

It should be noted that the constraints placed on banks in this situation, and the feedback mechanism that operates, are very different from those which occur under FRB. Under FRB, the lower interest rate is accompanied by an increase of fiduciary media, which gives rise to the illusion of profits and creates an initial boom. As a result, the ensuing malinvestment is manifested only after a delay. By increasing the supply of present money, FRB lowers the market rate as though time preference and the underlying pure rate are lower, when they are not. But this cannot persist, because the economy must return to the initial equilibrium that is dictated by the underlying time preference, whereupon systematic error is revealed. In contrast, LMM lowers the market rate by adjusting the entrepreneurial risk and uncertainty premiums. An individual bank can certainly err by being overly aggressive and by narrowing its spread too much. But this error is not systematic. In a similar vein—indeed one that is precisely analogous—an individual producer might underestimate the risks associated with its production processes, or take on too many short-term liabilities relative to its long-term assets, and find that its natural rate of return is not high enough. But in either case, there is no *systematic* malinvestment, no boom or bust and no cycle.

The main focus in this paper is on LMM's macroeconomic effects in the unhampered economy. However, it must be mentioned that the situation is very different in an economy in which the risks associated with loan maturity mismatching are eliminated by some form of violent intervention. As Bagus (2010) and Bagus and Howden (2010) have rightly pointed out, the threat of insolvency for banks is considerably reduced when there is a central bank lender-of-last-resort, or when there are explicit bailout guarantees by the government. In these cases, the moral hazards created by these interventions permit banks to engage in what Bagus and Howden refer to as "excessive LMM," a situation in which banks do not have to face any economic sanctions, at least for a while. Unlike in the

unhampered economy, there can be no doubt this causes systemic malinvestment because it encourages banks to reduce interest rate spreads more than would otherwise be the case, and to do so in concert. Moreover, it causes rates overall to fall below the equilibrium rates that exist when LMM is conducted absent these interventions. When banks begin to fail *en masse* as a result of spreads that are too narrow, any subsequent expansion of the money supply deployed to keep them solvent creates a disparity between voluntary saving and investment, which, in conjunction with the below-equilibrium rates, extends and exacerbates the malinvestment and the cycle. However, none of this applies in the absence of the moral hazard or the monetary inflation that arises from the intervention. As this paper has made clear, LMM does not result in systematic error or cause business cycles in the unhampered economy.

VI. SUMMARY AND CONCLUSION

If, hypothetically, the time structure of production involved only two participants—a saver and an investor—and only one exchange, then the period of saving would have to match the period of investment and production, lest there be discoordination. And if an intermediary created a mismatch in these durations, there would also be malinvestment. But a business cycle requires the presence of a market economy and competitive exchange. Moreover, to demonstrate praxeologically the existence of a cycle one must posit an intertemporal equilibrium into which LMM is introduced, and then show how the internal data oscillate. Time preference in this construct must be assumed to be given. Because LMM does not create fiduciary media, the *quantity* dimension of gross saving and investment in the construct is not affected. And since the social time preference is manifested in the supply and demand schedules of present money and is expressed only in the pure rate of interest and the quantity demanded of present money, the *time* dimension cannot change either. Because gross saving and investment are indefinite in time, no individual change in saving-investment maturities caused by LMM can logically have an effect in altering them.

The forms of the financial instruments used to channel individual savings into production, and their associated durations, are unimportant. Individuals might buy bonds with only limited durations,

but at any given time it is the money-quantities of these, in the aggregate, in conjunction with the interest rate, that are relevant. In the unhampered economy, saving and investment continue to equal each other in quantity and there is no intertemporal discoordination. For any particular bank, the duration of its liabilities does *not* have to match the duration of its assets as a necessary condition of avoiding discoordination or malinvestment. If commercial banks create long-term loans from consecutive short-term deposits, and channels these into production, this practice does not create systemic malinvestment, *ceteris paribus*.

When banks initiate loan maturity mismatching, even though the quantity of savings in the form of long-term loans demanded by borrowers increases, the opposite is true with regard to short-term loans. And even though the quantity of savings in the form of short-term loans supplied by lenders increases, the opposite is again true with respect to long-term loans. All of which means there is no systematic increase or decrease in lending or borrowing, *ceteris paribus*; that is, no systematic increase in gross investment or necessarily implied reduction in voluntary saving; in short, no forced saving. Since short-term interest rates rise and long-term rates fall, borrowed money that is invested in production tends to have a lower interest rate overall than it would have in the absence of LMM. But unlike FRB, which increases the supply of present money and causes changes to the internal data as a result of the artificially lowered interest rates—as if this is all brought about by a reduced time preference—LMM lowers the market rate in response to risk and uncertainty components that are perceived as incorrect, and returns the data toward an equilibrium state. FRB deceives entrepreneurs by falsifying the data intertemporally, while LMM tends to correct entrepreneurial error by reducing the spreads, and at the same time lowering the overall rate to an appropriate level. In the unhampered economy, there is no reason to believe, as the Hayekian triangle might imply, that this lower interest rate represents malinvestment or engenders a business cycle.

If certain banks fail to predict future events and underestimate the risks associated with their loans by being overly aggressive with regard to LMM, they will be forced out of business in the free market, but this cannot cause a business cycle any more than when individual producers err in their forecasting predictions.

While there are negative consequences for having an inadequate "understanding" of the future, there is no necessarily implied *systematic* error. Unlike the case of FRB, which causes business cycles with or without government intervention, LMM is benign when conducted in an unhampered economy. In the free market, LMM does not cause business cycles.

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