

ARTICLES

Arbitrating the Yield Curve: A Free Lunch?

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Banking crises can occur due to the mismatch of assets and liabilities. One of the main assumptions behind maturity mismatching is the incentive to arbitrage the yield curve in the market of loanable funds. Banks borrow at low rates and lend at higher rates to increase their profitability. The equilibrium in the evenly rotating economy (ERE) is a flat yield curve that equals the originary interest rate. This article challenges the notion that banks will always attempt to arbitrage the yield curve in a free market and explores how the price mechanism via interest rates acts as a brake to maturity mismatching. Maturity mismatching is a risky activity that is penalized through a higher cost of funding by different types of lenders. If this is true, it follows that a flat yield curve is not attainable in an uncertain world because financial intermediaries that engage in maturity mismatching will create a further spread between themselves and financial intermediaries that do not engage in this practice in the market of loanable funds. In addition, following Mises, the article discusses how economists should proceed with caution when applying equilibrium constructs, such as the ERE, which can disregard the function and properties, belonging to financial instruments such as debt and equity, of allocating risk in an uncertain world.

Recent research has attempted to relax the common assumption that savings and investments only operate in one intertemporal market within Austrian business cycle theory (Bagus and Howden 2010; Bagus 2010; Davidson 2014). Savings and investments occur in different time frames (or maturities) and at different interest rates. This gives rise to the yield curve, which represents the relationship between maturities and the interest rates of a particular market. The normal yield curve has lower rates for short-term maturities and higher rates for long-term maturities. This implies that a spread exists between the interest rates of short-term and long-term maturities. Reasonably, some economists have taken for granted that this constitutes an incentive to arbitrage the yield curve.

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For example, Rothbard (2009, 448) points out that financial institutions can potentially increase their returns by borrowing short and lending long. This strategy is known as maturity mismatch because it leads to a bank's having assets and liabilities of different maturities. In this sense, maturity-mismatching strategies can be considered risky if short-term liabilities are not rolled over. Under this scenario, banks can be considered illiquid because they do not possess enough funds to pay back their depositors.

Regulators view maturity mismatching as a threat to the financial system's health. Contractual maturity mismatch is considered a monitoring tool under the latest guidelines from the Basel Committee on Banking Supervision (2013). The goal of this tool is to detect if cash outflows are greater than a bank's liquid assets. If that is the case, banks should raise their liquidity buffers to avoid a liquidity crisis. Particular emphasis has been devoted to measuring and controlling liquidity risk in developing the international regulation of the banking system after the Great Recession. The mismatch between long-term government bonds held to maturity and short-term deposits was one of the main causes of the recent collapse of Silicon Valley Bank (Barr 2023).

This article challenges the notion that banks will always try to fully arbitrage the yield curve in a free market by providing three counterarguments. First—to develop and expand on a point made by Howden and Gabriel (2015) on the role of the interest rate acting as a brake to maturity mismatching—arbitraging the yield curve is not a free lunch. Maturity mismatching increases a bank's financial risk, which in turn increases the cost of funding from depositors, investors, lenders, and shareholders. This potentially translates to a reduction of the bank's equity and net interest income. Second, a flat yield curve is not attainable when financial intermediaries engage in maturity mismatching because they create a spread between themselves and those that do not mismatch assets and liabilities. Finally, following Mises (1998, 414), this article demonstrates how equilibrium constructs such as the evenly rotating economy (ERE) can disregard the function and properties of financial instruments like debt and equity to allocate risk in an uncertain world.

The Yield Curve, Arbitrage Incentive, and Equilibrium

In the market of loanable funds, savers supply funds to investors at different maturities. The yield curve results from the interaction between the supply and demand of funds, expressing the relationship between interest rate and maturity.

A normal yield curve slopes upward, which means that interest rates increase with longer maturities due to uncertainty (Bagus and Howden 2010), implying a price differential between the interest rates of shorter maturities and longer maturities. The spread is important for financial institutions such

as banks that borrow funds from depositors and lend them to borrowers. Banks can either match the maturities of their liabilities (deposits) and assets (loans) or they can engage in maturity mismatching. No demand deposits have an a priori contractual maturity—this can only be known a posteriori. Hence, for financial products with no maturity, maturity mismatch can only be known after the fact.

A priori, under a normal yield curve, maturity mismatching can be profitable for banks, given the higher spread between the interest rates of short-term deposits and long-term loans. Consequently, banks would have an incentive to arbitrage this price differential under conditions of uncertainty. According to Bagus and Howden (2010, 73), “As the yield curve is normally rising, there is an incentive for entrepreneurs to arbitrage this price disparity. There is a profit opportunity by borrowing short at low interest rates and investing long at a higher rate. The problem with this strategy is that the short-term loans must be renewed continually until the investment matures.”

What would happen in equilibrium? Rothbard (2009) postulates that in an ERE, where no uncertainty exists and arbitrage opportunities have been exhausted, the yield curve should be flat, representing an unvarying interest rate across different maturities. In Rothbard’s (2009, 448) words, “Set up an irresistible arbitrage movement from shorts to longs, with the rate of interest in the former thereby rising from the sales of loans on the market, and the rate of interest in longs falling, until the rate of interest is uniform throughout the time structure.”

So far, maturity mismatching potentially presents a parallelism with price differentials in the market of goods, where an arbitrage opportunity provides an incentive to entrepreneurs to buy low and sell high to maximize profits. As more entrepreneurs buy low and sell high, prices start to converge. In equilibrium, no more arbitrage opportunity exists, and the price remains the same for each good (Kirzner 1997).

Arbitraging the Yield Curve: A Free Lunch?

Maturity mismatching is not entirely analogous to the arbitrage of price differentials of goods. In goods markets, an intermediary can connect and lock demand (bid price) and supply (ask price), while the entrepreneur profits from this arbitrage opportunity without any risk (Kirzner 1997). In the case of maturity mismatching, the financial intermediaries put themselves in a riskier financial position when engaging in this activity, and the market can punish them through different mechanisms.

Bagus and Howden (2010) explain how a free market can restrict maturity mismatching by reducing or stopping the rolling over of short-term loans. Depositors, for example, can withdraw their deposits from banks. Howden

and Gabriel (2015) point out the role of the interest rate as a brake on maturity mismatching. This section seeks to complement and expand this argument.

Arbitraging the yield curve is not a free lunch. It is a risky activity that increases the financial intermediary's cost of funding due to the higher risk of illiquidity and insolvency. Debt holders, shareholders, and investors, for example, can penalize banks, via stock prices and interest rates, for exposing them to more financial risk.

This risk can be studied using the Misesian analysis of interest rates. Mises (1998) postulates three components of the gross market rate of interest: time preference, the price premium, and an entrepreneurial component. Time preference (also described as the originary interest rate) is “the discount of future goods as against present goods” (521), the price premium reflects the adjustment in anticipation of future changes in the purchasing power of money, and the entrepreneurial component of the interest rate includes “the premium for risk bearing” (379). According to Mises, the factors that influence the entrepreneurial component can be grouped under market risk, credit risk, and liquidity risk (see Uyemura and van Deventer 1992; Van Deventer, Imai, and Mesler 2013). These definitions can be used to study maturity mismatching strategies under uncertainty.

Market Risk

Market risk is defined by the financial losses that adverse movements in market prices can generate. Among the most important prices for the banking system are interest rates. Their movements directly affect the value of financial instruments—especially fixed-income securities with a nonadjustable rate—which in turn affects the bank's capital position and net interest income.

For example, suppose that a financial intermediary, such as a bank, mismatches its assets and liabilities by borrowing short and lending long at a nonadjustable rate. If interest rates suddenly increase on the market, the value of the bank's assets will drop disproportionately because long-term investments are more sensitive than liabilities to changes in interest rates. The bank's capitalization would then be lower than if the bank had not followed a mismatch strategy.

The bank's position is also weak on the side of net interest income. In a maturity mismatch scenario, the bank's borrowing rates (deposits) adjust faster to variations in the interest rate; therefore, the bank's spread would decrease if the interest rate increased, and the bank would have to wait for the maturity of its assets to adjust its spread. A bank that mismatches the maturities of its assets and liabilities is more vulnerable to market risk.

Credit Risk

Credit risk is the probability of default on a financial obligation. The risk profile of a firm that has borrowed from a bank has a higher chance of changing over the long term. The financial health of companies that have been granted corporate loans can deteriorate, especially if the analysis of the bank's credit-risk department becomes outdated. Banks try to mitigate the risk by requiring collateral, but the market value of the collateral can also change over the long term. In addition, longer-term investments—which have lower present values because cash flows are further off in the future—will have a definite effect on the bank's solvency because assets are more prone to lose value than liabilities. Consequently, a long-term loan has a higher probability of default than a short-term loan: “There is a tendency that counterparty risk increases with maturity. Due to uncertainty, longer-term loans have a higher chance of not being paid back than shorter-termed loans. Savers prefer therefore to grant shorter loans” (Bagus and Howden 2010, 73). In fact, studies have empirically shown that maturity structure is an important driver of loss rates in the banking sector (Mommel, Gündüz, and Raupach 2015).

Finally, long-term assets are more exposed to the business cycle. Key drivers of credit risk, such as unemployment and leverage, fluctuate along the economic cycle, providing incentives to take on excessive credit risk during the boom phase and leading to heavy losses during the bust phase (Chaibi and Fiti 2015; Gertler and Gilchrist 2018).

Liquidity Risk

Uyemura and van Deventer (1992) proposed the gap-analysis technique to measure the amount of maturity mismatching performed by a bank. The analysis groups the cash flows of the bank's assets and liabilities—that is, the inflows and outflows of cash—by expiration date in order to identify the time frame under which cash outflows exceed cash inflows. If such a time frame, called the negative liquidity gap, is greater than the liquid assets, then the bank is in an illiquid position. This occurs when there is a maturity mismatch.

To remedy the situation, the bank has three options: refinancing, attracting more liabilities, or selling assets. The first two options necessarily raise the cost of the bank's financing because it must increase its rate to capture new funding. The last option decreases the bank's profitability: more liquid assets earn a lower interest rate, and, in an asset fire sale, equity could be lost if the asset's selling price is below the purchase price. According to Mises (1953, 263), banks can avoid liquidity risk if they comply with the golden rule: “For the activity of the banks as negotiators of credit the golden rule holds, that an organic connection must be created between the credit transactions and the debit transactions. The credit that the bank grants must correspond

quantitatively and qualitatively to the credit that it takes up. More exactly expressed, ‘the date on which the bank’s obligations fall due must not precede the date on which its corresponding claims can be realized.’ Only thus can the danger of insolvency be avoided.”

Maturity mismatching increases a bank’s risk, which in turn translates to a rise in the risk component of the interest rate: “As on the one hand many firms badly need money in order to avoid bankruptcy, and on the other hand no firm any longer enjoys confidence, the entrepreneurial component in the gross market rate of interest jumps to an excessive height” (Mises 1998, 560).

It is not clear why a bank’s shareholders would find it attractive to mismatch their assets and liabilities to increase their profits. Even if the bank’s owners decide to borrow short and lend long, investors would penalize them by demanding the bank’s stock at a lower price, and debtholders would require a higher rate to compensate for the risk of maturity mismatching.

The Aggregation Challenge: The Market of Loanable Funds

The yield curve represents the relationship between the gross market interest rate and the maturity for a particular unit of analysis. Typically, the gross market interest rate refers to fixed-income securities. A unit of analysis can vary between the levels of aggregation. The most atomistic level of aggregation refers to an individual, firm, or government. Higher levels consider groups of firms that share a common characteristic, including sector, geographical region, and the level of development of the firm’s country. About this Mises (1998, 542) states, “The gross rates of interest as determined on the loan market are not uniform. The entrepreneurial component which they always include varies according to the peculiar characteristics of the specific deal.”

The loanable funds market is composed of the savers who supply funds to investors who demand those funds. This involves a significant amount of aggregation. As the intermediaries between savers and investors, banks are an essential part of the loanable funds markets, playing both the supply and demand sides. If banks mismatch assets and liabilities under conditions of uncertainty, the entrepreneurial component of the interest rate will increase, which will be reflected in the yield curve of this sector. Therefore, the yield curve cannot be fully arbitrated, because there will always be a difference in the interest rates between maturity-mismatching financial intermediaries and non-maturity-mismatching financial intermediaries due to their different levels of risk perceived by other market participants (depositors, lenders, and investors). Consequently, there is no tendency toward equilibrium or a flat yield curve.

Equilibrium Constructs: A Word of Caution

In the previous two sections, this article assumes that financial intermediaries operate under conditions of uncertainty. By relaxing this assumption, it is theoretically conceivable that financial intermediaries can fully arbitrage the yield curve. As mentioned earlier, all price differentials in an ERE have been arbitrated by financial intermediaries, represented by a flat yield curve. This equilibrium result implies that different financial products, such as debt and equity, earn the same originary interest rate where no uncertainty exists. In Rothbard's (2009, 439) words, "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."

When studying financial instruments and institutions that deal with uncertainty, economists should proceed with caution. General equilibrium constructs such as the ERE can disregard the role and properties of financial instruments and institutions in helping the entrepreneur navigate an uncertain world. Mises (1998, 414) makes this point in the case of money: "Where there is no uncertainty concerning the future, there is no need for cash holding. As money must necessarily be kept by people in their cash holdings, there cannot be any money. The use of media of exchange and the keeping of cash holdings are conditioned by the changeability of economic data. Money in itself is an element of change; its existence is incompatible with the idea of a regular flow of events in an evenly rotating economy."

For Mises, equilibrium constructs are unsuitable for studying financial instruments and institutions in a changing economy. Equilibrium constructs such as the ERE can only be used as a classification tool. According to Mises, "The imaginary construction of the evenly rotating economy is a mental tool for comprehension of entrepreneurial profit and loss. It is, to be sure, not a design for comprehension of the pricing process" (326). "It was only the elaboration of the imaginary construction of the evenly rotating economy that made it possible to distinguish precisely between originary interest and entrepreneurial profit and loss" (533).

The same analysis can be applied to maturity mismatching. By definition, risk, or the entrepreneurial component of the interest rate, appears only in disequilibrium or where uncertainty exists. Financial instruments such as debt and equity have different properties that deal with uncertainty and risk allocation. For instance, Rothbard (2009, 439) compares the difference between priorities of payments and voting rights between debt and equity:

“What functions of ownership do the creditors not have as compared to the stockholders? Even from the legal point of view, the creditors get first claim on the assets of a corporation, and they get paid before the stockholders. They are therefore definitely owners of these assets. It might be stated that since they are not shareholders, they do not vote on the decisions of the corporation, but there are many situations in which joint-stock companies issue nonvoting shares, the holders of which do not vote on company affairs, even though they receive their prorata value of the earnings.” In other words, the equity of a firm protects against losses to the debt holders. Banks with high capitalization levels can protect their deposits against potential losses because depositors have a higher priority for payment from the bank’s net interest income and, in the case of bankruptcy, are the first to receive the proceeds from the sale of assets. Another important difference between debt and equity is that the former is usually a fixed-income security for which cash flows are known in advance in the form of coupons and principal. In the case of equity, however, cash flows, in the form of dividends, are not known in advance.

Financial instruments and institutions can help structure and allocate risk according to the risk tolerance of the market participants. Financial instruments are valued as a function of how they allocate risk, which is why, under normal conditions (disequilibrium), the returns on debt are expected to be lower than the returns on equity. The danger of applying equilibrium constructs such as the ERE to financial instruments and institutions, such as debt and equity, is that they disregard that role of risk allocation.

Conclusion

It cannot be taken for granted that banks can increase their profits by borrowing short and lending long in a free-market environment, but maturity-mismatching strategies increase a bank’s risk and, therefore, its cost of funding, which reduces its capital and net interest income. Under conditions of uncertainty, the yield curve of the market of loanable funds cannot be fully arbitrated, because risky banks generate further discrepancies in the yield curve as their cost of funding rises. Finally, equilibrium constructs such as the ERE only serve as a classification tool. Applying them to financial institutions disregards the properties of financial instruments such as equity and debt that help to allocate different levels of risk among market participants.

Regulators should consider that expansionary monetary policies by central banks incentivize banks to mismatch their assets and liabilities because a decrease in interest rates causes deposits to readjust first to the new low interest rates, then to the long-term loans in a mismatch position (Bagus and Howden 2010). This may increase the banking system’s net income and equity, at least in the short run or boom phase of the business cycle, but

regulators and central banks should first consider the checks and balances provided by the price mechanism before they intervene in the financial market.

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