Linking the Capital and Loanable Funds Markets in Intermediate Microeconomic Theory Courses

Daniel E Saros, Valparaiso University
Linking the Capital and Loanable Funds Markets in Intermediate Microeconomic Theory Courses

Daniel E. Saros*
Assistant Professor of Economics

Valparaiso University, 1800 Chapel Drive, Valparaiso, IN 46383, USA

JEL classification: A22

Keywords: capital, derived demand, entry point, loanable funds, return on capital

*The author thanks Professor John Hoag for his very insightful comments on this paper, many of which have yet to be incorporated.
E-mail: Dan.Saros@valpo.edu; Office Phone: 219-464-5166
Abstract

It is common for microeconomics principles and intermediate microeconomic theory textbooks to discuss the demand for capital and the demand for loanable funds, but it is less common for them to identify a clear connection between the two. Taking into account the interest cost of capital, it is possible to derive the demand for capital by applying the usual rule for profit maximization. Additionally, it is possible to equate the expected return on capital with the rate of interest to derive the demand for loanable funds. The derivations of these demands demonstrate that the application of the rules for profit maximization lead to simultaneous equilibrium in the two markets. The demand for loanable funds may then be interpreted as a “second-order” derived demand. This linkage is demonstrated graphically and with basic calculus. This approach to the capital and loanable funds markets is discussed in relation to Stephen Resnick and Richard Wolff’s (1987) analysis of the structure and logic of neoclassical economic theory.
Stephen Resnick and Richard Wolff provide a broad outline of the structure and logic of neoclassical theory in their text *Economics: Marxian versus Neoclassical* (1987) that is unparalleled as an introductory text in its clarity and exposition of the normative dimensions of neoclassical theory. The text makes additional contributions such as the clarification of Marxian economics for beginning students in such a way that it is both accessible and rigorous. This article is primarily concerned with the first aim of that text and seeks to improve upon their overall presentation in a way that elucidates certain features of neoclassical theory while remaining consistent with Resnick and Wolff’s overall approach.

The article is divided into four sections. In the first section, I will summarize the traditional derivation of the demand for capital in neoclassical theory. The second section then redefines the marginal cost of capital to account for the interest cost of capital goods. It is also defines the expected return on capital in a manner that is generally not presented in neoclassical texts but which nevertheless, it is argued, captures the essence of the neoclassical approach. The demands for capital and loanable funds are then derived through profit maximization and their linkage is represented graphically. The second section provides an example that illustrates these connections using basic calculus. The third section places this analysis within the context of the interpretation of neoclassical theory as Resnick and Wolff understand it and adds to their diagrammatic representation (1987: 86) of the overall structure and logic of the “neoclassical theory of value,” as they phrase it. This section also briefly points out the way in which the conclusions of Marxian economics contrast with those of neoclassical economics regarding capital market equilibrium. The final section concludes.
Section 1: Deriving the Demand for Loanable Funds from the Demand for Capital

This section proposes the notion that the demand for loanable funds be regarded as a “second-order derived demand.” That is, the demand for capital like the demand for any input is regarded in neoclassical theory as a demand derived from the demand for the commodity being produced. The demand for loanable funds may further be regarded as a demand derived from the demand for capital goods. That is, it is profitable to borrow funds for capital investment only insofar as it is profitable to produce and sell with the capital purchased. As a result, the demand for loans is a second-order derived demand in this particular sense.

Figure 1 below presents the marginal revenue product (MRP) of capital for one firm. The law of diminishing returns to capital explains its downward slope as usual. If the market for capital is perfectly competitive then the firm is a price-taker and thus faces a perfectly elastic supply of capital equal to its marginal resource cost of capital (MRC). In the usual fashion, the demand for capital is derived through profit maximization using the familiar rule that for any resource the MRP and MRC must be equal.

**FIGURE 1: The Derivation of the Demand for Capital**

![Diagram of MRP and MRC](image)
The above discussion implies that no funds are borrowed for the purchase of capital. Once funds are borrowed at a given interest rate (i), it is possible to take into account the interest cost of capital when defining the MRC. For example, if funds are borrowed to purchase all capital, then the MRC becomes \( P_K(1 + i) \). That is, the cost of capital now includes the purchase price of a single unit of capital \( P_K \) as well as the interest that must be paid to the lender for the use of the borrowed amount \( iP_K \). This approach obviously assumes simple interest and a single period until the loan matures. The derivation of the demand for capital changes as shown in Figure 2 below.

**FIGURE 2: The Interest Cost of Capital**

In Figure 2, the demand for capital is derived in exactly the same way as previously. That is, MRP is equated with MRC. The difference, however, is that the MRC now includes the interest cost of a unit of capital as well. The total principal amount borrowed is \( P_K K \), the total interest charges are \( iP_K K \), and the total cost of the capital is \( (1 + i)P_K K \).
It is now possible on the basis of the foregoing analysis to define the expected return on capital and show the linkage between the loanable funds market and the capital market. To motivate this definition, it is only necessary to recall the neoclassical assertion that each unit of capital ultimately generates revenue for a firm through the sale of the products it helps create. The expected return on capital may then be expressed as a rate of return as follows:

\[
\text{Expected marginal rate of return on 1 unit of capital} = \frac{\text{MRP}_K - P_K}{P_K}
\]

This definition of the expected rate of return on capital is a gross rate of return that only takes into account the purchase price of capital and does not yet account for the interest cost of capital. Because the price of capital is fixed, the expected rate of return must fall as more funds are borrowed and more capital is employed. That is, the MRP declines as more capital is employed due to diminishing returns to capital as pointed out previously. The expected rate of return must, therefore, follow the pattern as shown in Figure 3.

**FIGURE 3: The Falling Expected Return on Capital**
The link between the loanable funds market and the capital market can now be represented graphically by means of a numerical example. Assuming that the rate of interest is 10% and the price of one unit of capital is $5, then we may consider an example in which the firm purchases 100 units of capital with borrowed funds. In this particular example, it is assumed that the firm is not maximizing profits as can be seen because MRP exceeds MRC. This assumption has been made so as to bring out the various relationships more clearly as represented in Figure 4 below.

**FIGURE 4: Linking the Capital and Loanable Funds Markets (An Example)**

In Figure 4, the blue areas represent the interest cost of capital and the yellow areas represent the net proceeds (i.e., above interest costs) earned as a result of the use of capital in production. It is now easy to derive the demand for loanable funds given a constant rate of interest because profit maximization requires that the firm equate the expected rate of return and the rate of interest. Figure 5 shows the quantity of loans a
firm demands at each interest rate. One may thus conclude that the demand for loanable funds is a second-order derived demand. It depends most directly on the demand for capital and by extension on the consumer demand for the commodity produced.

**FIGURE 5: The Derivation of the Demand for Loanable Funds**

![Diagram of the Derivation of the Demand for Loanable Funds]

**Section 2: An Example of the Linkage Between the Capital and Loanable Funds Markets Using Basic Calculus**

Using basic calculus it is possible to represent the linkage between the capital and loanable funds markets. For example, assuming a Cobb-Douglas production function with a given amount of labor in the short run and given the rate of interest, the price of capital, and the price of output (P), the MRP can be determined in the usual way as shown in Figure 6.
FIGURE 6: The Derivation of the MRP

\[ Q = \frac{1}{3} L^2 \]
\[ \bar{L} = 512 \]

\[ \bar{i} = 0.25 \]
\[ \bar{P}_K = 0.80 \]
\[ \bar{P} = 3 \]

\[ \Rightarrow Q = 64K^\frac{1}{3} \]
\[ \Rightarrow MP_K = \frac{\Delta Q}{\Delta K} = \frac{\partial Q}{\partial K} = \frac{64}{3} \cdot \frac{1}{K^\frac{2}{3}} \]
\[ \Rightarrow MRP_K = P \cdot MP_K = \frac{64}{K^\frac{2}{3}} \]

The profit-maximizing quantity of capital can now be easily determined on the basis of the information given. Using the definition of the MRC developed in section 1, it is possible to solve for the profit-maximizing quantity of capital by equating MRP and MRC as shown in Figure 7.

**Figure 7: The Profit-Maximizing Quantity of Capital (An Example)**

\[ MRP_K = MRC_K \]
\[ \frac{64}{K^\frac{2}{3}} = (1 + 0.25) \cdot 0.80 \]
\[ \frac{2}{3} = 64 \]
\[ K = 512 \]

Total Cost of Capital = $512

Borrowed Funds = $409.60

Interest Charges = $102.40
Equivalently, it is possible to determine the profit-maximizing quantity of capital and loanable funds by equating the expected rate of return on loanable funds and the rate of interest. Figure 8 depicts this solution graphically. The reader should notice that the expected return on capital approaches its limit of –1 as the amount of borrowed funds grows. The reason for this limit is that the MRP approaches zero as the amount of capital employed approaches infinite. A MRP equal to zero implies that no revenue is generated as a result of the employment of one more unit of capital. Nevertheless, the entire price must be repaid to the lender and so would reflect a 100% loss for the firm.

Figure 8: The Profit-Maximizing Quantity of Loans (An Example)

\[
\text{Expected Return} = \text{Interest Rate}
\]

\[
\frac{64}{K^3} - .80 = .25
\]

\[
\frac{80}{K^3} = .25
\]

\[
K^3 = 64
\]

\[
K = 512
\]

\[
P_wK = 409.60
\]

Section 3: An Interpretation of the Capital and Loanable Funds Markets Within the Context of the Structure and Logic of Neoclassical Theory

It is possible at this point to interpret the capital and loanable funds markets within the context of the neoclassical theory of value in accordance with the
understanding of that theory that Resnick and Wolff develop. The loanable funds market
demand curve is derived as the horizontal summation of all individual firms’ investment
demand curves for loans and all individual borrowers’ (consumer) demand curves for
loans. The demand for consumer loans can be derived easily enough when analyzing the
consumer’s choice between present and future consumption. If the consumer prefers
present consumption enough relative to future consumption, the consumer will borrow
against future income. Those consumers valuing future consumption relatively more
save in the present period and supply loanable funds to borrowers in exchange for
interest. Given the derivation of these supplies and demands, loanable funds market
equilibrium becomes possible.

Capital market equilibrium in the foregoing analysis suggests a triple equality in
neoclassical theory. That is, the rate of return on capital equals the rate of interest and
each of these equals the price of (financial) capital. The equality between the rates of
interest and return on capital follows from the analysis of profit-maximization provided
above. The assertion that these rates are equal to the price of financial capital is
considered to be self-evident according to the commonly held view that the “price of
money” (or borrowed funds) is the interest rate.

The theoretical conclusions reached in Marxian economics differ sharply from
those represented here as consistent with neoclassical theory. As Theodore Lianos
(1987) demonstrates clearly, the rate of profit and rate of interest may diverge with either
rising above the other over the course of the business cycle. In Marx’s own work, no
expectation of the equality of the rate of profit and the rate of interest was asserted. In
particular, the quantity of interest was regarded as a portion of the total profit for any
given industrial enterprise. Hence, we should not expect the rate of interest to equal the rate of profit unless we arbitrarily assume that the borrowed money capital stands in the same proportion to the total interest as the total invested capital (borrowed and owned) stands in proportion to the total profit. Lacking any justification for this particular assumption, no justification for this assertion can be found in Marxian economic theory.

The notion that the price of money is the rate of interest or even interest is one that Marx harshly rejected. A few of Marx’s remarks regarding this distinction are worth noting here to emphasize the difference, as he understood it.

If interest is spoken of as the price of money capital, this is an irrational form of price, in complete contradiction with the concept of the price of a commodity.

Interest as the price of capital is a completely irrational expression right from the start. Here a commodity has a double value, firstly a value, and then a price that is different from this value, although price is the money expression of value.

Price, after all, is the value of the commodity as distinct from its use-value (and this is also the case with market price, whose distinction from value is not qualitative, but merely quantitative, bearing exclusively on the magnitude of value). A price that is qualitatively distinct from value is an absurd contradiction. (Marx, 1991: 475-476).

From Marx’s comments we can rule out the possibility that Marxian theory is consistent with the notion that interest is the price of money. It asserts a false qualitative distinction between price and value when the greatest difference that can exist between the two concepts is purely quantitative in nature.

According to Resnick and Wolff’s interpretation of the neoclassical theory of value, the neoclassical entry point of fixed physical and human nature is used to explain in deterministic fashion the forms of appearance of modern capitalist society. That is, society’s resource endowment, current technology, and fixed consumer wants determine
commodity prices and the distribution of income. Figure 9 below outlines the basic structure and logic of the theory.

**Figure 9: The Deterministic Nature of the Neoclassical Theory of Value**

Resnick and Wolff explore these linkages through their discussion of profit maximization and utility maximization in the capital and labor markets. Whenever they derive supply and demand in each market, they carefully identify how the neoclassical entry point of given physical and human nature is used within the overall context of the theory to explain commodity prices and income distribution. Of course, their reason for elaborating the structure and logic of the theory in this manner is to demonstrate that neoclassical theorists operate with a value-laden theory. Any alteration in society’s distribution of income, for example, given the fixed character of human and physical nature is simply not a possibility without contradicting fundamental aspects of our economic reality. The fact that economics students are generally not made aware of this underlying logic encourages them to adopt this worldview without criticism or concern.
Resnick and Wolff provide an argument that is entirely sufficient to reach their general conclusions about neoclassical theory and the way that it is taught. Nevertheless, I have attempted to provide a more complete picture of the structure of the theory by exploring the relationship between the capital and loanable funds markets. In addition to the capital and labor markets, I have included the markets for land (N) and loanable funds in their diagrammatic representation of the structure and logic of neoclassical theory. These modifications are represented in Figure 10.

Figure 10: The Structure and Logic of the Neoclassical Theory of Value (Expanded)

Figure 10 may be read from left to right so as to connect the aspects of physical and human nature that determine commodity price and income distribution within the context of the four markets included in the diagram. The connections may be more explicitly identified in tabular form as in Table 1 below.

<table>
<thead>
<tr>
<th>TABLE 1: THE STRUCTURE OF NEOCLASSICAL MICROECONOMIC THEORY</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>THEORETICAL OUTCOMES</strong></td>
</tr>
<tr>
<td><strong>CONSUMER PRICES</strong></td>
</tr>
<tr>
<td>Product Supply</td>
</tr>
<tr>
<td>Technology</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>INCOME DISTRIBUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>WAGE INCOME</strong></td>
</tr>
<tr>
<td><strong>CAPITAL INCOME</strong></td>
</tr>
<tr>
<td><strong>INTEREST INCOME</strong></td>
</tr>
<tr>
<td><strong>RENTAL INCOME</strong></td>
</tr>
</tbody>
</table>
Once the discussion of neoclassical theory has been broadened to explain these four sources of income, we have a more complete picture of the neoclassical determinants of the functional distribution of income. Figure 11 below represents how the economic pie was divided in 2005 and distributed in the form of wage income, rental income, interest income, and profit income. This particular illustration is modeled after a similar presentation in McConnell and Brue’s popular *Economics* (2008: 66) text.

**Figure 11: The Functional Distribution of Income for the U.S. Economy (2005)**

![Functional Distribution of Income](image)

**Section 4: Conclusion**

This article has linked the loanable funds and capital markets together in a way not typically presented in neoclassical texts. Many introductory texts refer to the linkage but often do not explore it in much detail (Hubbard and O’Brien: 707-708; McConnell and Brue: 472; Samuelson and Nordhaus: 270-271). Intermediate texts often do not refer to the connection at all (Varian, 1999). Doing so, however, provides one with a clear sense of how Marxian economics reaches entirely different conclusions. In addition, it
has been shown that this method of presentation is consistent with the overall structure and logic of the neoclassical theory of value as interpreted by Resnick and Wolff. The demand for loanable funds has been shown to be a second-order derived demand in the sense that it is derived ultimately from consumer demand and thus the neoclassical entry point of human wants and consumer income endowments. Like all economic outcomes in neoclassical theory, interest income is an economic consequence that cannot be modified without interference in the marketplace. Such interference is thus doomed to failure because it is a misguided effort to improve upon a situation predetermined and guaranteed by human nature and physical realities beyond all human control. College economics should focus on revealing the value-laden character of theories purporting to describe social reality in purely objective terms. In this way, young people will have the opportunity to develop their own understanding of economic and social reality rather than having it handed to them in prepackaged and uncritical form.

Appendix: Simultaneous Equilibrium

It can also be easily shown that the condition for equilibrium in either market implies simultaneous equilibrium in the other market. As shown below, profit maximization in the capital market necessarily implies profit maximization in the market for loanable funds.

\[
MRR_K = MRC_K \\
MRR_K = (1 + i) \cdot P_K \\
MRR_K = P_K + iP_K \\
\frac{MRR - P_K}{P_K} = i
\]
REFERENCES


