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APPENDIX D

Aspects of Joint Purchase of a Consumer Durable and of Credit from a Single Seller

Here we are concerned with analysis of the special problems arising from the fact that consumer durable assets and the credit used to finance them often constitute a joint purchase from a single dealer. We have shown earlier that, in the main, consumers do not possess accurate information about finance rates; the same evidence indicated that consumers with less information paid more for credit than those with more information.[1] The indication is that consumers pay a price for their ignorance of finance rates.

That conclusion may be correct, but it does not necessarily follow from the evidence. The reason is simple enough. Consumers buying durable goods on credit are concerned with the total cost. The total cost has at least two and frequently three dimensions: (1) the cost of the commodity itself; (2) the cost of credit, and (3) the value of the used asset, if any, traded-in. The buyer is concerned only with the final result, the combined cost of goods and credit less the trade-in allowance. If the cost of credit were uncorrelated, or positively correlated with either of the other two factors, buyers paying a higher finance rate would obviously pay a higher price for the combination of goods and credit—the cost of consumer ignorance. If the price of credit is inversely

[1] See above, pp. 53-64.

correlated with the price of goods, the conclusion does not follow.[2] Let us investigate the nature of the calculations buyers must make in order to reach rational decisions about the purchase of durable assets.

We define:

$Q_1, Q_2, Q_3, \ldots, Q_n$ as the yield, net of operating expenses but before depreciation on the asset in question, during periods $1, 2, 3, \ldots, n$

P_j as the price at which the asset may be purchased for cash from the j^{th} seller

f_j as the effective annual finance rate charged by the j^{th} lender

r as the buyer's marginal borrowing cost as defined in Section I, hence the relevant rate for discounting future costs and returns

$(R_j)_1, (R_j)_2, (R_j)_3, \ldots, (R_j)_n$ as the repayment schedule offered by lender $_j$, when the asset itself is pledged as collateral

In general, it will be true that $(R_j)_1 = (R_j)_2 = (R_j)_3, \ldots, (R_j)_n$, for any lender.

We also define:

1.0
$$(R'_j)_n = \frac{(R_j)_n}{(1+f_j)^n}$$

That is, we define $(R'_j)_n$ as the present value of the repayment made during the n^{th} period, discounted at the effective annual finance rate charged by the j^{th} lender. Given this definition, it follows that:

2.0
$$\sum_{1}^{n} (R'_j) = P_j$$

If we interpret consumer purchase of a durable asset as an investment yielding an imputed return, it follows that the asset will be purchased if the discounted value of the stream of yields is equal to or greater than the discounted value of the stream of costs. The rate relevant for discounting is r, the buyers' marginal borrowing cost. In the perfect capital markets of a perfectly competitive world with economic agents endowed with perfect knowledge and foresight, and with no transactions costs or risks, f would, of course, be identical for all lenders and r and f would be equal. The present value of an asset (PV) would be

[2] If the regression coefficient relating the prices of goods and credit is negative, ignorance of finance rates would be less costly to consumers than suggested by the difference between the rates paid by those with or without rate knowledge. If the regression coefficient were negative and sufficiently large, finance rate ignorance would not result in a cost to consumers.

3.0 $$PV = \frac{Q_1}{(1+r)} + \frac{Q_2}{(1+r)^2} + \frac{Q_3}{(1+r)^3} +, \ldots, + \frac{Q_n}{(1+r)^n},$$ and the

present cost would be

4.0 $$PC = \frac{(R_j)_1}{(1+r)} + \frac{(R_j)_2}{(1+r)^2} + \frac{(R_j)_3}{(1+r)^3} +, \ldots, + \frac{(R_j)_n}{(1+r)^n},$$

The present cost, given equation 1.0, can also be expressed as

4.1 $$PC = \frac{(R'_j)_1\,(1+f_j)}{(1+r)} + \frac{(R'_j)_2\,(1+f_j)^2}{(1+r)^2} +, \ldots, + \frac{(R'_j)_n\,(1+f_j)^n}{(1+r)^n}$$

If f_j and r are equal, it follows that

4.2 $$PC = \sum_{1}^{n} (R'_j) = P_j$$

Equation 4.2 is the formulation generally used in the analysis of investment decisions, since it corresponds to the case of perfect capital markets. In this situation, the decision to buy depends solely on the relationship between present value and price. Alternatively, one could speak of the relationship between the asset yield r_a and the finance rate f, which must equal the borrowing rate r. Defining r_a as the rate which equates PV and P, the asset will be purchased if $r_a > r = f$, but is not worth buying if $r_a < r = f$.

Outside the imaginary world of perfect capital markets, the analysis is more complicated. In general, it is no longer true that the present cost of the stream of repayments is equal to the price of the asset. The market finance rate will often be less than the marginal borrowing cost, because many buyers will be forced to acquire equity in the asset by borrowing from themselves. The finance rates available from different lenders vary, and all such rates will be higher than the market yield from liquid assets. Thus a buyer with substantial liquid assets will find that *PC* for any credit purchase is higher than *P*, since the rate charged by the lender is ordinarily higher than the cost to the buyer of borrowing from himself—which is the relevant marginal cost for a buyer with substantial liquid assets.[3] For buyers with some but not

[3] This is clearly true if we are talking about highly liquid assets, such as savings accounts and government savings bonds. It may or may not be true if the buyer's assets include equities; the expected yields from equities, including capital gains, may well be higher than the going rates of some lenders.

substantial liquid assets, the marginal borrowing cost depends on the value they place on liquidity. Liquid assets held solely because of their market yield are worth only that yield rate; liquid assets held for security or precautionary motives evidently will have a higher yield to the holder than the market yield, and may be worth more to the buyer than the finance rate.

If the buyer is not rationed by the lender (in the sense defined in Section I), credit financing will often result in a *PC* greater than *P*. The buyer's marginal borrowing rate r must be equal to or less than the market finance rate f, depending on the buyer's asset position and on the value placed on liquidity. For unrationed consumers, a decision whether to use credit or liquid assets requires that the buyer compare the lowest finance rate with the cost of giving up liquid assets. If the buyer is misinformed about the finance rate, he may decide to use credit when using assets really costs less. It follows that accurate information about the finance rate is indispensable to rational decision making.

It should be noted, however, that the lowest nominal finance rate offered by any lender is not necessarily the lowest rate available. If credit obtained from the seller of the asset carries a higher nominal rate but also includes, e.g., a larger trade-in allowance or cash discount if the buyer also purchases credit, the real price of credit is lower than the nominal price. In this case, the buyer would have to recalculate each nominal f, adjusting it for any variation in the product prices charged by different sellers.

For unrationed consumers, an alternative procedure is to compare the discounted present cost of the repayment schedules implicit in the product prices and finance rates of the several dealers. For consumers with substantial liquid assets, such calculations are likely to show a *PC* in excess of the cash price, leading them to use liquid assets if they decide to purchase. For unrationed consumers with some but insufficient liquid assets to buy for cash, choices must be made among alternative credit sources and downpayment amounts. If all lenders offered only one contract maturity, a straightforward comparison of monthly payment amounts, the $R_j, R_k, \ldots, R_n$ would determine the lowest real finance rate available from any lender. If contract maturities vary, and if rates vary directly with contract maturity, the borrower is faced with a more difficult decision. Discounting the repayment schedules at the relevant marginal borrowing cost would indicate which finance rate-maturity option has the lowest *PC*. Unrationed buyers cannot determine their marginal borrowing cost unless the real finance rates are known, since it is otherwise impossible to determine whether to use liquid assets and how much. It is still necessary, of course, that buyers compare the present value of the asset with the present cost of the lowest payments schedule.

For rationed buyers, the marginal borrowing rate r must be higher than the market finance rate f, hence *PC* must be less than *P*. The asset is worth buying if the asset yield r_a is greater than the marginal borrowing rate r, but it is not always worth buying when r_a exceeds f. Rational purchase decisions require that the buyer know (1) the Q's, which are the stream of yields from the asset, (2) the R_j's, which are the repayment schedules of each potential lender, and (3) the marginal borrowing rate r, which is the discount rate.

For rationed consumers, rational choice does not require that the buyer know the distribution of $(R_j)_n$ between R'_j and $(1+f)^n$.The R'_j terms add up to the price of the goods, the $1+f$ terms to the price of the credit. Dealer A may offer a lower f but a higher R'_j compared with dealer B; the buyer is clearly concerned with the size of R_j, not with its composition. This comparison is made easily in the limiting—but perhaps common—case where the buyer is comparing a set of offers involving the same durable good, downpayment, and number of payments. The Q's and n are thus identical for each offer. In order to choose the best offer the buyer has to compare R_j—which is the same for each period from 1 to n—with the R's from other dealers, $R_k, R_l, \ldots, R_n$. The dealer offering the lowest R must also be offering the lowest *PC* regardless of the nominal distribution of R between R' and $1+f$. The buyer's decision whether the best offer is worth accepting rests on his ability to measure the value of time to himself, that is, to compare *PV* with the best *PC* by discounting the Q's and R's back to the present. For this calculation, knowledge of f is of no value per se, unless households with knowledge of f are likely to make a more accurate appraisal of r.[4]

[4] Note the implications of this analysis for the behavior of households that typically underestimate r, perhaps because they also underestimate f. Since it is generally true that the stream of Q's is longer than the stream of R's, using an r that is too low will tend to increase *PV* relative to *PC*. On the other hand, the fact that most credit buyers are rationed means that r generally exceeds f. Purchasers who underestimate r will overestimate *PC*, but the overestimate will be stronger, the longer the contract maturity—other things being equal. However, given any r, a

Interestingly enough, accurate knowledge of finance rates may lead to *less* rational decisions on the part of consumers subject to credit rationing. Let us suppose that rationed consumers do not know very much about the rates charged by different lenders, but they do know (intuitively) that they have a preference for terms longer than those available from primary lenders. If such consumers were to accept the lowest available real f offered by lenders, to the exclusion of other considerations, they would often choose shorter maturities or smaller loan sizes, or both, than rational choice would dictate. The reason is that the offer with the lowest real f usually involves a much higher marginal borrowing cost than offers with higher real finance rates. Given the price of the item and the borrower, low finance rates are generally associated with smaller average indebtedness because of shorter maturities or larger downpayments, or both. The borrower who prefers a higher average debt level than permitted by any primary lender must borrow from himself by reducing current consumption or liquid assets, or both, if he wants to purchase the assets. But he must borrow more from himself if he accepts relatively short maturities with low real f's, and the total financing cost will be greater, even though the cost of the funds obtained from the market is smaller.[5] For rationed consumers, therefore, r will not generally be minimized by shopping for the lowest real f and, in fact, will often be maximized, given the preferred average debt level.[6]

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longer maturity will still be preferred to a shorter one provided that r exceeds f. On balance, a tendency to underestimate r seems to influence the relative valuation of costs and returns mainly by increasing the estimate of returns relative to costs. Consequently, such households may tend to make purchases that are really not "worth" making.

[5] See Section I, pp. 10-17, for a discussion of the marginal borrowing cost schedule for unrationed and rationed consumers. The point here is that a choice based on the lowest obtainable real f disregards the costs associated with internal borrowing—and these costs mount rapidly with increased internal borrowing.

[6] Assuming that real market finance rates are positively correlated with contract maturities, the analysis suggests that rational choice by buyers subject to credit rationing involves shopping for that finance rate which comes closest to (but is lower than) the equilibrium marginal borrowing cost from internal funds. In these circumstances, the rationed buyer must forego the lowest f, or he would be unrationed: rather, he must attempt to equate the market f with his internal rate; he cannot succeed if he is in fact rationed, but the objective is to minimize the difference between the two.

It should be noted that the present value—present cost—criterion applies equally well to both rationed and unrationed buyers. In general, therefore, a sufficient condition for rational choice is that the borrower know Q, the R_i, R_j schedules, and his own discount rate, the marginal borrowing rate r.[7] For rationed buyers, knowledge of market rates is not essential, provided the buyer knows his discount rate is higher than any of the going market rates of primary lenders. For unrationed buyers —since knowledge of market rates is necessary for an estimate of the appropriate discount rate—knowledge of real finance rates is both a necessary and sufficient condition for rationality in credit purchases.

Summary

Whether accurate finance rate information is necessary for rational purchase decisions depends largely on the financial circumstances of the prospective purchasers. Three broad classes can be distinguished.

(1) For unrationed buyers with liquid assets greatly in excess of the purchase price, the marginal borrowing rate r will be below the market finance rate f; durable assets are worth buying until their yield (r_a) falls to the marginal borrowing rate, that is, $r_a = r < f$. Such buyers need know only that market borrowing is more expensive than using up liquid assets; rational purchase decisions require shopping for the lowest cash price.

(2) For rationed buyers with no liquid assets (in excess of minimum transactions and precautionary balances), the marginal borrowing rate is above the market finance rates of primary lenders; durable assets are worth buying to the point where their yield falls to the marginal borrowing rate, that is, $r_a = r > f$. Such buyers need know only that they prefer longer maturities than the market will offer; rational pur-

[7] The decision-making process is still more complicated if the buyer is comparing dissimilar products (Ford and Mercury cars), and rates, prices, downpayments, and maturities of different dealers; here, both the Q's and the R's will vary. The transaction involving the greatest excess of PV over PC will clearly yield the largest net return over cost, yet this comparison again requires that the marginal borrowing rate be known, not that the distribution of R_j between R'_j and f_j be known.

chase decisions require shopping for the smallest available monthly payment, given the longest available maturity.

(3) For buyers with some liquid assets in excess of minimum balances or with maturity preferences close to the maximum offered by primary lenders, rational purchase decisions are more complicated and are likely to require accurate finance rate information. For such buyers, it will be true that, in equilibrium, $r_a \sim r \sim f$. Rational purchase decisions are likely to involve choices about how much liquid assets to give up, whether a slightly lower market finance rate is worth a somewhat shorter maturity, and so on. Rationality in choices of this kind is clearly impossible without completely accurate information about finance rates.