

How do US Households fund excess expenditure?

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Abstract

This paper aims to answer the question: given that a household has expenditure above its current income what explains the probability that it will finance this excess expenditure by borrowing rather than by liquifying assets. First we use the euler equation approach to show which household characteristics would, in theory, affect this choice and second, we use data from the 1998 Survey of Consumer Finance to explain the probability of funding the excess by net borrowing. The results confirm most of our predictions that the probability is greater the smaller the value of the household's assets, are not currently working for pay, who face a relatively low interest rate on their credit card and who have positive attitudes toward credit in general. We also find that those who have a high credit card balance and who have had difficulty borrowing in the past are also more likely to fund excess expenditure by borrowing.

Introduction

Despite the sizeable literature on the demand for debt by an individual (see for example, Duca and Rosenthal 1993, Crook 2001, Gropp et al 1997) and the extensive literature on household savings (see Browning and Lusardi 1996 for a review) the particular issue as to how individuals respond when their expenditure exceeds their income has not been addressed. The aim of this paper is to use a simple euler equation type approach to provide a model for this decision and to provide some relevant empirical evidence.

Theory

Consider a simple two period model of utility maximisation where the aim of an individual is to maximise expected lifetime utility:

$$\text{Max}_{c_1, c_2} (u(c_1), \rho E_1(c_2)) \quad \dots (1)$$

subject to the wealth constraint that the present value of consumption equals the present value of initial assets plus the present value of expected income:

$$c_1 + \frac{c_2}{1+r} = A_1(1+r_1) + y_1 + \frac{E_1(y_2)}{1+r_1} \quad \dots (2)$$

where c_1, c_2 are consumption in periods 1 and 2

y_1, y_2 are labour income in periods 1 and 2

E_1 is the expectations operator in period 1

ρ is the subjective discount factor

r_1 is the market lending and borrowing rate in period 1

A_1 is the value of assets in period 1

Here we have assumed the capital market is perfect: the borrowing rate equals the lending rate.

We have assumed that the individual can borrow or lend all (s)he wishes at the unique market rate.

The well known solution to this optimisation problem is

$$E_1\left(\frac{\partial u}{\partial C_2}(1+r_1)\rho\right) = E_1\left(\frac{\partial u}{\partial C_1}\right)$$

$$\Rightarrow E_1\left(\frac{\partial C_1}{\rho\partial C_2}\right) = \frac{1}{1+r_1}$$

which says that the marginal rate of substitution between c_2 and c_1 equals the marginal transformation rate between period 2 assets and those in period 1 (see Hayashi, 1987).

We now wish to relate the way in which an excess expenditure is funded to various determining factors. We will do this diagrammatically. Suppose we now assume that the individual may invest initial assets, A_1 , at interest rates which differ from the borrowing rate.

This is represented in Figure 1.

Figure 1 here

Suppose the slope of XX at any point equals the marginal rate of return on invested assets, r_b . The slope of YY^1 represents the marginal borrowing rate, assumed constant. With income in period 1 of y_1 , expected income in period 2 of $E_1(y_2)$ and initial assets of A_1 , the utility maximising individual locates at S . This involves investing I_1 and consuming $C_1 > (y_1 + A_1 - I_1)$ in period 1. Depending on the utility function, S may imply $C_1 > y_1$ and $C_1 < (y_1 + A_1)$. We consider this case first. In the Figure the individual finances the amount $(C_1 - y_1)$ by borrowing because his/her utility is maximised by this decision. However, another possible way of consuming C_1 in period 1 is to reduce assets by $(C_1 - y_1)$ and not to borrow. This would result in an investment of $(y_1 + A_1 - C_1)$ and consumption of C_1^1 in period 2: point S^1 . Given the utility function in the Figure, S^1 is dominated by S^1 . S^1 is suboptimal.

Now suppose that the individual's utility is maximised at consumption point V where $C_1 > y_1$ and $C_1 > (y_1 + A_1)$. Here the individual could not sell sufficient assets to consume the amount indicated by V , C_1^{11} , borrowing would be necessary (and of course possible). The reason for this is that the individual's assets, A_1 , (when added to income) are insufficient to fund C_1^{11} . Therefore whether an individual chooses to fund current consumption by net asset reductions depends on, amongst other things, the volume of assets currently owned.

Secondly, suppose the individual is credit constrained. Again, assume at first that $C_1 > y_1$ and $C_1 < (y_1 + A_1)$. (S)he is unable to gain the stock of debt desired in period 1, due for example to

a poor repayment history. This could be represented in several different ways. In Figure 2 we represent a credit constraint by a discontinuity in the YY line, which is now Y, S, Z .

Figure 2 here

The maximum loan the individual can gain is RZ (given the investment of I_1 implied by the slope of YY relative to XX). If his/her utility function is represented by the series of U_i indifference curves the individual will invest I_1 , borrow RZ , to consume $C_1 (=OZ)$ in period 1 and C_2 in period 2. The individual would prefer to locate at S^{11} but this is unattainable. If the borrowing constraint is smaller, say it is $RP (< RN)$ then the individual's utility is maximised at point S^l . (S)he will invest I_2 , and sell assets equal to Ny_1 to consume $C_1^{11} (= ON)$ in period 1 and C_2^{11} in period 2. Thus ceteris paribus, the smaller the credit limit the greater the probability that excess expenditure will be funded by sale of assets.

If $C_1 > (y_1 + A_1)$ then borrowing is necessary and whether it is possible depends on the credit limit. If it is not possible then excess consumption is not possible (assuming the individual does not default on bills).

The third factor which the method of funding depends on is the interest rate of a loan relative to that on assets. Suppose that the borrowing rate was greater than the lending rate for all values of income plus assets. This is shown in Figure 3. The slope of $XX^1(-(1 + r_l))$ is lower in absolute value than the slope of $XY(-(1 + r_b))$. If the highest indifference curve was tangent to XX^1 (that is $C_1 < (y_1 + A_1)$) the individual would prefer to consume current income and assets and not to borrow. If the tangency was along ZX^1 ($C_1 < (y_1 + A_1)$ and $C_1 > y_1$) the excess

consumption (over current income) would be funded by liquidating assets (a line parallel to YY' through any point on ZX^1 would be dominated by points on ZX^1). If, on the other hand, YY' was flatter in absolute terms than XX^1 and $C_I < (y_I + A_I)$ the individual would maximise utility by investing all of $(y_I + A_I)$ and borrowing to finance current consumption.

Notice that the greater the volume of assets A_1 , given y_1 , the further to the right X^1 would be relative to Z . There would be greater opportunity for the highest indifference curve to be tangent to ZX^1 further to the right of Z implying greater liquidation of assets.

Figure 3 here

A summary of how the optimal method of funding current expenditures which exceed current income depends on various factors given in Table 1.

In the next section we try to empirically explain the chosen methods of funding excess expenditure using the theoretical model above to indicate the relevant variables for inclusion.

Empirical Model

To explain the difference between individuals in their chosen method of funding excess expenditure using the above model we need to include variables in Table 1 or to include variables which explain the variables in Table 1, if the latter cannot be observed directly. We assume that the intertemporal marginal rate of substitution depends on the following variables.

- 1 Age: following the life cycle-permanent income hypothesis we expect that the older the individual the less the preference for borrowing relative to a reduction in assets. Empirical evidence shows that the demand for debt decreases at ages beyond around 50 years (Duca et al 1993, Crook 2001) and at higher ages people reduce their assets often by in vivo transfers.
- 2 Whether the individual has family commitments, for example is married or has children. This may increase the value of ρ in equation 1, i.e. increase the subjective discount rate. Alternatively, these factors may be incorporated by arguing they affect the degree of risk aversion, which we consider below.
- 3 Positive attitudes towards the use of debt to fund expenditures would be expected, ceteris paribus, to increase the preference of an individual for the use of borrowing rather than the reduction of assets. Empirical evidence suggests attitudes significantly affect the demand for debt (Duca et al 1993).

As an alternative to affecting the individual's marginal rate of substitution, the degree to which an individual is risk averse may be modelled as altering his perceived interest rates for borrowing or lending by the addition of a risk premium. It is not obvious which would, on average, be regarded as involving greater risk: commitment to future repayments or having reduced assets which could then not be used for unexpected expenditures. Therefore in Figure 3, for example, it is not clear which of XX^1 or XY would be the steeper after the addition of the premium.

Whether an individual is credit constrained can be represented by whether a person has been recently turned down for credit, and by variables which may explain whether a person is discouraged from applying.

The value of assets can be observed directly.

The data used in this paper is the Federal Reserve Board's Survey of Consumer Finance 1998. This contains data relating to 4309 households from two samples: a multistage national area probability sample (2813 cases) and a list sample from individual tax files (1496 cases). The publicly available dataset contains only 4305 cases for disclosure reasons. Both samples involved a high degree of stratification and the list sample oversampled high wealth households.

It is impossible to remove the oversampled high wealth cases. However, probability sampling weights corresponding to the inverse of the probability of observation are available for each case. Econometric methodology assumes that, provided the model is complete and the residuals of the statistical models used follow the assumed distributions, the use of sampling weights is unnecessary for parameter estimates (Rogers (1992)). But a sampling statistician, who does not believe he is proposing a complete behavioural model, would argue that sampling weights must be inserted into the estimates of the parameters. If the residuals do not have the assumed distributions, or if use of the sampling weights significantly alters the estimated parameters, then sampling weights should be used. When used, sampling weights make the estimates of the coefficients more efficient and, in principle, make estimates of standard errors unbiased. In this paper we present the results using sampling weights⁽¹⁾.

Our sample is restricted to individuals who spend more than their income in 1997, who held at least one bank credit card and who either funded this excess by borrowing or by selling assets. We did not include those who simply did not pay their bills. We did this for the following reasons.

Firstly, we restricted the sample to bank credit card holders because this enabled us to gain a better empirical measure of the interest rate the individual would expect to pay if (s)he borrowed to fund the excess expenditure. The interest rates on a variety of short term loans are available in the dataset, but it is not obvious that such loans could be extended: they are tied to specific acquired assets such as cars or home improvements. Too few households had available lines of credit which were unrestricted to make up the entire sample.

Secondly, whilst the standard euler equation model assumes the individual will repay any debt⁽²⁾, in practice a minority default. However, the number of cases which declared bankruptcy or did not pay their debts was too few to constitute a third group.

The dependent variable is therefore whether a household borrowed or sold assets to fund expenditure above their income, given that their expenditure did exceed their income. As explanatory variables we include the following. We measure age as its logarithm (*lage*). We measure family commitments by a dummy indicating whether the head of household (HoH) is married or living with a partner (*Married 1*), and also by the number of children aged less than 18 years in the household (*nkids*). We include gender of the HoH (*sex*). We also include three dummies indicating whether the HoH believes “it is a good idea for people to buy things on the instalment plan” (*attgen*), whether the HoH feels it is “all right. to borrow money to ...cover expenses of a vacation” (*attlex*) and whether the HOH feels it is “all right ... to borrow money to ... finance the purchase of a fur coat or jewellery” (*attfc*). To indicate whether a household

was credit constrained we included a dummy which indicated whether, in the last 5 years, anyone in the household had been turned down for any form of credit (turndn). We also included other variables which we would expect to be correlated with the probability of having loan applications rejected: whether the household has had difficulty repaying any loan in the last year (default), years in current main job (yatjob), whether or not the HoH owns his/her main residence (ownspr) and a dummy variable representing race (white). Current household monthly income is measured as total income less outgoings (on mortgage payments, auto loans, rent and payments on certain existing loans) (dispinc20). We also include a dummy indicating whether or not the HoH is not currently working for pay (nwfp). The argument is that if a person is not currently working for pay (s)he will believe that in future years their income will remain at the current level or be higher. Therefore their expected future income is greater than their current income.

We represent the volume of assets using two variables. Liquid assets (checking accounts, savings accounts, money market accounts and call accounts plus cds plus directly held mutual funds) as a proportion of income (liqperinc) are included because for relatively minor excess expenditures these liquid assets are the type of assets which would be used first to pay such excess expenditure. We divide by income because we are trying to explain the choice of payment method not the net volume of debt taken. Secondly, we include total assets (assets20) to represent the ability to pay major over-expenditures from assets. We also include two measures of debts: total debts (tdeb2) and credit card balances outstanding after the most recent repayment (bcbal). Our explanation is that the greater the level of debt outstanding the less the ability of the household to borrow further.

Our measure of the interest rate which the household expects to pay if it borrows is the interest rate on the credit card with the greatest outstanding balance or on the credit card received most

recently (ccint). The relevant SCF question asks for the above figures and tells the interviewer that the rate required is the rate on new balances. This choice of rate was discussed above.

Most respondents to the SCF hold portfolios of different types of assets including several types of liquid assets. But the survey does not ask the respondent for the rate of return (s)he believes (s)he is receiving on each asset. The best estimate we can make in the light of this is to assume the rate for a given type of asset is the same for all households. Whilst some households will search more than others for the optimum interest rate for a given type of asset, the interest rate would not vary according to the risk of default which does vary considerably between households. Assuming a given interest rate for the same type of asset is equivalent to including a dummy for the possession of this type of asset. Therefore we include such a dummy for the possession of cds (haveds) and for total directly held mutual funds (excluding money market mutual funds) (havnmmf). We could not include a dummy for the possession of total transaction accounts assets because all households had at least \$1 invested in them.

Finally we include a dummy variable to indicate whether households are relatively risk averse (riskav).

We assume that the probability that the household borrows, given a vector of covariates, $P(B/X)$, is a cumulative logistic distribution:

$$P(B / X) = \Lambda(\beta' \underline{X})$$

that is, a logistic regression model. The parameters were estimated using maximum likelihood with probability sampling weights and Huber (i.e. robust) standard errors.

Results and Discussion

Of the demographic and attitudinal factors that would enter the utility function only the attitudes towards credit and general and towards the use of credit for jewelry and fur coats have an effect of the choice of funding method. If the HoH takes the attitude that “ it is a good idea that people buy things on the installment plan” the probability of borrowing to fund a deficit would be 0.237 higher than if this attitude is not adopted. On the other hand if the HoH holds the view that “it is alright for someone to borrow money to finance the purchase of a fur coat or jewelry” the probability of borrowing decreases by 0.277. These are the largest and third largest marginal effects established. Being married and older both have the predicted signs but are not significant.

Turning to the credit constraint variables, we see that years at main job has the predicted sign whereas having been turned down for credit in the last five years has the opposite effect to that predicted. Having been turned down increases the probability of borrowing by 0.204. Having had difficulties in repaying debt in the previous twelve months does not influence funding choice.

The asset variables are significant and have the predicted sign. If either total assets or liquid assets as a proportion of income increase the probability of funding by borrowing decreases. However the marginal effect is modest. A \$100,000 increase in total assets decreases the probability of borrowing by just 0.033. On the other hand having a high credit card balance outstanding increases the probability of borrowing. This is contrary to the theoretical prediction although the marginal effect is very small.

The income variables have the predicted signs although current disposable income is significant at only 10%. Not working for pay increases the probability of borrowing by 0.27 and a \$100,000 increase in disposable income would increase the probability by 0.653.

The interest rate on credit card debt is significant and has the predicted sign. However the elasticity is very small: a one percentage point increase would decrease the probability of borrowing by 0.017. No effect was detected for a change in the interest rate on cds or on. Directly held (non-money account) mutual funds. Finally, everyone in the family having some form of health insurance would appear to reduce the probability of borrowing, but it is not significant. Risk aversion also does not appear to affect the choice and neither does race.

The overall impression given by these results is that those who have sufficient assets prefer to use them, rather than to borrow to fund excess expenditure. This is suggested by the significantly negative signs of the asset variables. On the other hand, those who choose borrowing and receive loans are those who, holding ever other variable constant, have found it difficult to borrow in the past, have a large balance outstanding, have fewer assets and who are currently not working for pay. It may be argued that these are the people who are least able to repay but who, if they overspend, have little choice but to borrow further. A higher borrowing rate will independently reduce the preference for borrowing over selling assets.

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Table 1
Predicted effects of exogenous determinants of funding decision

Marginal rate of substitution	?
Existence of credit constraints	Decreased probability of net borrowing
Increased interest rate of debt/interest rate on loans	Decreased probability of net borrowing
Increased volume of assets	Decreased probability of net borrowing

Table 2
Logistic Regression Results

Dependent Variable: log [P(borrows)/1-P(borrows)]

	Coefficient	t-statistic	Marginal Effect on P(borrows) (at mean)
<u>Utility function variables</u>			
married1	-0.569	-1.10	-0.139
lage	-0.975	-1.56	-0.237
grade	-0.024	-0.40	-0.006
sex	-0.047	-0.10	-0.012
attgen	0.970	2.26*	0.237
attlex	0.576	1.69	0.139
attfc	-1.362	-2.63*	-0.277
nkids	-0.313	-1.60	-0.076
<u>Credit constraint variables</u>			
turndn	0.836	2.16*	0.204
ownspr	0.167	0.39	0.041
yatjob (years)	0.057	2.46*	0.014
default	-0.235	-0.47	-0.056
<u>Asset variables</u>			
assets20 (\$00,000)	-0.135	-2.23*	-0.033
liqperinc	-1.346	-2.35*	-0.328
bcbal (\$00,000)	0.000	2.46*	1.58×10^{-5}
tdebt20 (\$00,000)	0.324	1.06	0.079
<u>Income</u>			
Dispinc20(\$00,000)	2.678	1.66	0.653
Nwfp	1.108	2.28*	0.270
<u>Interest rate variables</u>			
ccint (x 100)	-0.001	-1.99*	-1.729×10^{-4}
havcds	0.267	0.49	0.066
havnmmf	0.364	0.64	0.090
<u>Other variables</u>			
hins1	-0.647	-1.42	-0.160
riskav	-0.555	-1.45	-0.132
white	-0.145	-0.35	-0.036
constant	5.296	1.99*	

F(24,272)= 2.34

Prob > F = 0.0006

No of observations: 296

Notes

* denotes significance at 5%.

1. Sample consists of all households sampled in the SCF 1998 who have a bank credit card and who funded excess expenditure either by borrowing or by selling assets.
2. For the following variables the marginal effect is for the discrete change in a dummy from 0 to 1: married1, attgen, attlex, attfc, default, ownspr, nwfp, white, hins1 turndn, riskav, sex, havcds, havnmmf.
3. Probability sampling weights and Huber standard errors used.

Ref: ee2h.log

Notes

1. The *Survey of Consumer Finance* imputes five different values for each missing value. Therefore there are five different versions of the dataset. This paper uses imputation 1 only.
2. See Lawrence (1995) for recent amendments which incorporate the effects of possible default.

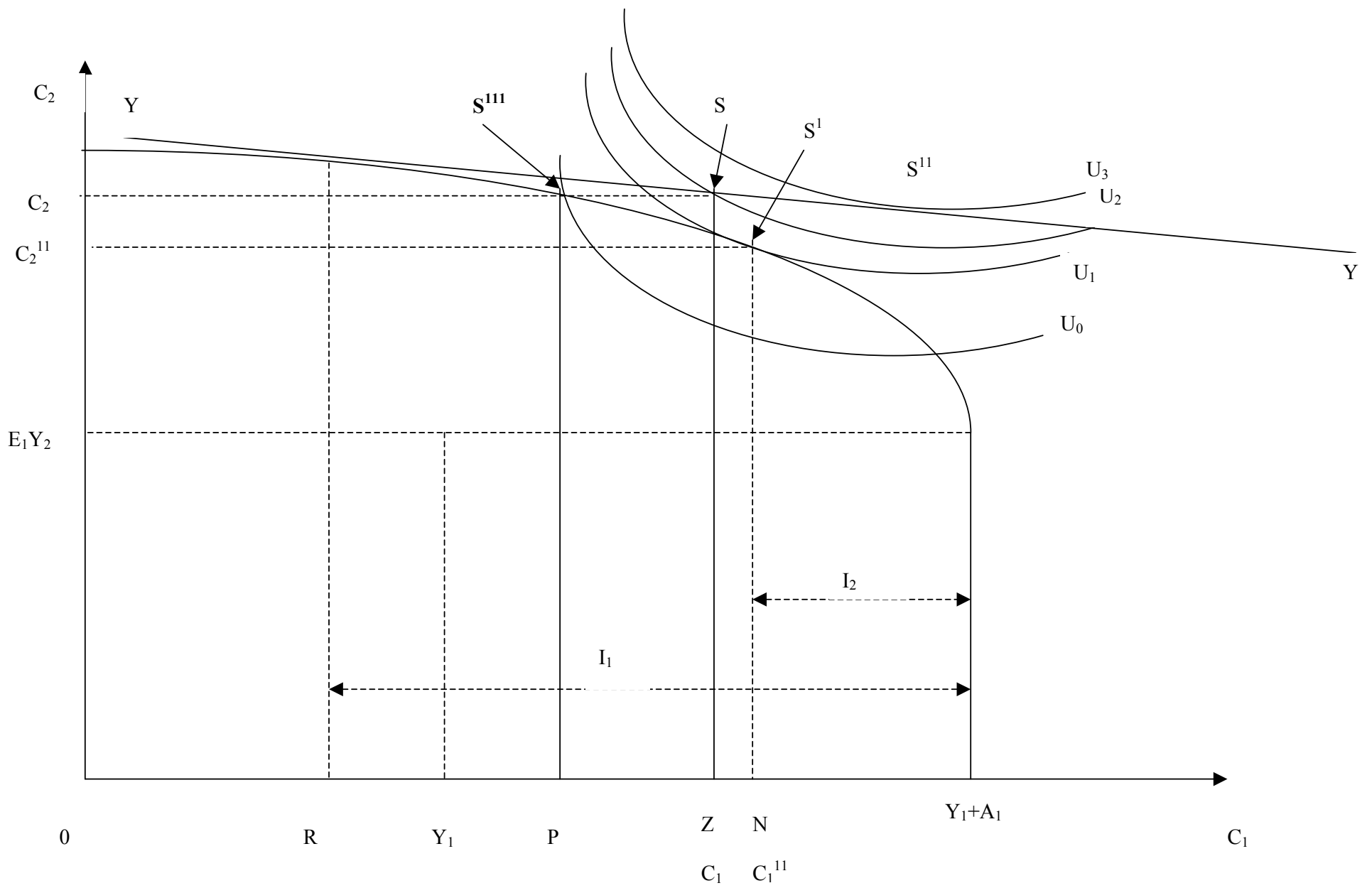


Figure 2

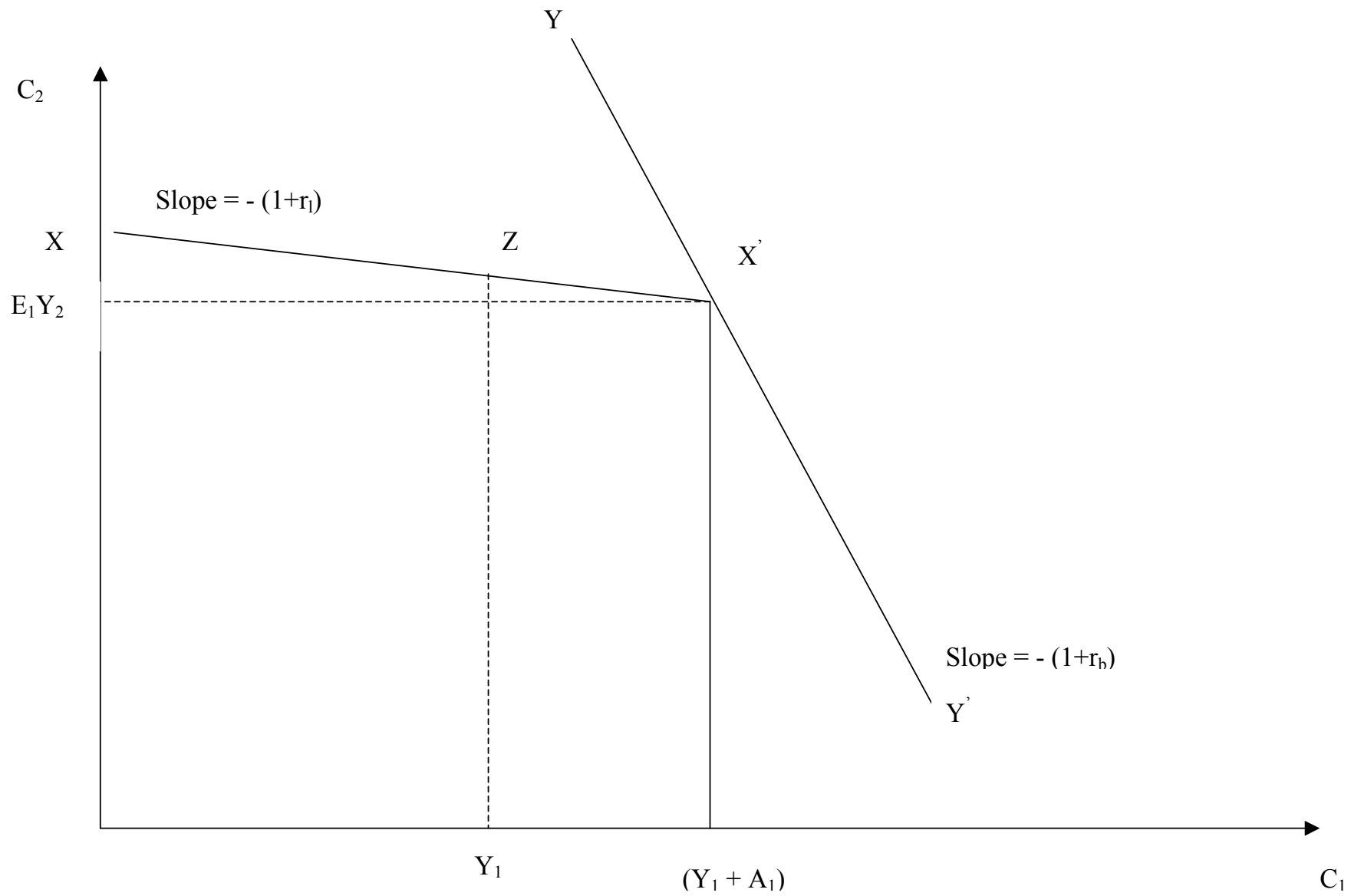


Figure 3