

A PORTFOLIO THEORY OF THE SOCIAL DISCOUNT RATE AND THE PUBLIC DEBT*

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FEW OF US have not at some time become intrigued with the relation between the social and the private discount rates. My interest in the subject was renewed by a series of papers by Arrow [1966], Hirschleifer [1966], Bailey and Jensen [1972], and others. These papers used state preference or capital asset pricing theory to demonstrate that with perfect and complete capital markets the government is no more efficient than the capital markets as a means for diversifying away risk, and that the social and private discount rates are the same. Special circumstances may limit the effectiveness with which government or capital markets can be used to diversify away risk, and in such circumstances either the private or the social discount rate would be raised.

Notwithstanding the apparent validity of this argument, I remained of the opinion that even with perfect and complete capital markets the social discount rate may be below the private rate. Therefore, I was confronted with the task of establishing what attributes of government the Arrow-Hirschleifer model of the problem failed to recognize.

Those of you who are familiar with my previous work will find my conclusions here a predictable outcome of that work. I have for some time disputed the Modigliani-Miller theorem that a firm's cost of capital is independent of its leverage rate in the absence of taxes, or stated differently, that the corporate discount rate is the same as the private discount rate. Their theorem assumes personal leverage is a perfect substitute for corporate leverage while my position has been that this assumption is, in fact, not valid. The Arrow-Hirschleifer theorem requires, it seems to me, an even more untenable assumption—that personal leverage is a perfect substitute for government leverage. It would then follow that government is a legal fiction of no economic significance, that financial intermediation by government has no impact on the wealth and income of persons. However, this assumption ignores a unique property of government. It is the only debtor that can raise the funds required to meet its debts by printing money.¹

Consideration of the possible advantages of financial intermediation by government on the micro level led me to the conclusion that as long as the government debt is small and inflation is not a problem, the social discount rate is well below the private discount rate. However, with analysis confined to the micro level, some questions must inevitably be left hanging which cast doubt on the validity of this conclusion. I therefore was forced to carry the inquiry forward to the macro level

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1. For an analysis of the problem that ignores this unique property of government see Barro [1974].

and, in addition, consider the consequences of government financial intermediation for the behavior of income and wealth over time.

When I first began to study asset valuation and choice under uncertainty and aversion to risk over twenty years ago, my hope was that the development of an adequate theory on the micro level would lead to significant advances on the macro level. It was quite evident that people want security as well as income, and I wondered at the validity of theory, practically all theory at the time, which assumed that the future is certain or people are indifferent to risk. Nowhere was this failure more clear, it seemed to me, than in the voluminous and inconclusive literature on monetary policy and business fluctuations where the underlying theory assumed the future is certain and where, therefore, arbitrary departures from the initial assumptions were required to deal with reality.

In the last few years a number of papers have appeared on the macro implications of capital asset pricing theory. My impression is that the objective of this literature has been to extend the Walrasian general equilibrium theory to include capital assets under uncertainty and aversion to risk and to investigate the conditions under which the system satisfies Pareto optimality conditions. The Walrasian system without this extension has contributed very little to the theory of fluctuations and growth. My guess is that this extension of the system will not bridge the gap between the two fields of thought. In any event what follows does not draw on these macro extensions of capital asset pricing theory. I might add that this line of inquiry strikes me as being a utopian capitalist analogue to the utopian socialist writings of the early nineteenth century.

I cannot explain why there has been so little progress in moving from micro models which recognize uncertainty and aversion to risk to related macro models concerned with the problems of fluctuations and growth. I could find little beyond Tobin's [1958] brilliant start in his paper which explained liquidity preference as behavior towards risk.² Partly in the hope of encouraging further research on the macro level, I shall outline a portfolio theory of income determination and fluctuations in a capitalist economy. The theory will then be used to examine the consequences of debt financed government participation in the national portfolio of risk assets. The consequences appear to be an increase in national income and a reduction in the amplitude and risk of economic fluctuations. Risk reduction increases wealth and the utility of future income. If these benefits from government investment are recognized in calculating the social discount rate, the startling conclusion is that the social discount rate may actually have been negative for most of our economic history.

Inflation and increases in the public debt have frequently been associated with each other. Therefore, it would seem desirable to investigate the possibility of a causal relation between government financial intermediation and inflation that would destroy the benefits just ascribed to the financial intermediation.

As you can now see, this paper does not follow the customary pattern of a presidential address. Common practice is to lay out a program for future research by presenting a survey of the past that points out where we have gone astray and

2. The ideas which follow are also anticipated in some measure in Tobin [1971], Chapters 10, 17, 18.

recognizes what was of lasting value for the future development knowledge. The presidency is supposed to recognize a position of authority in the field that is necessary to carry out such a survey. Unfortunately, the presidency has not persuaded me that I am part of the establishment in the theory of finance. Presenting a wisdom type paper that is anti-establishment is not likely to have much if any impact; in any event, it would have been very difficult to write.

I have another reason for presenting this particular paper. With few exceptions everyone with whom I raised the ideas which follow found them very difficult to understand. In fact, that is a rather charitable description of their response. The presentation of a preliminary version under less formal circumstances evoked a violent reaction. Such a reaction is sometimes accorded to a paper that raises new and important ideas as well as a paper with no merit. In either case the paper has a difficult time with the refereeing process, and I decided to use this occasion to by-pass regular channels in presenting and publishing the paper. I trust that you will forgive my self-indulgence in taking advantage of this privilege of the office.

I

Let me begin with a brief review of the reasoning under which the private and social discount rates are the same. At one time it was widely believed that a private individual or firm requires a rate of return on investment equal to the risk free interest rate plus a risk premium that varies with uncertainty as to the investment's future payoffs. By contrast investing through the government allows diversification over a very large number of investments and provides, it is argued, a rate of return that is practically certain. The government may therefore use the risk free discount rate as its cost of capital.

We have learned, however, that capital markets are an alternative means for diversifying away risk, and capital asset pricing theory is a means for establishing just what diversification can accomplish. Sharpe [1964] Lintner [1965] and Mossin [1966] have shown that the risk of any asset can be decomposed into a systematic and non-systematic component. Systematic risk is the covariance in return between the asset and a market portfolio, with the latter including every asset in the proportion that its market value is to the market value of all assets. The non-systematic risk is the residual variance, and it can be diversified away by holding the market portfolio. The consequence is that under a brave but interesting set of assumptions, every asset will sell at a yield that only reflects its systematic risk.

If the market portfolio is risk free, the entire risk of any asset is non-systematic, and it will sell at the risk free yield. In fact, the market portfolio is risky, and every other asset sells at a risk premium equal to the product of the risk premium on the market portfolio and the ratio of the asset's covariance with the market portfolio to the variance of the market portfolio. The limit to diversification by government is the market portfolio, and the government should require the same rate of return on that portfolio as any real person could earn by investing in it directly.

The government invests on the account of the real persons in society and not on its own account. Hence, the government need not be fully diversified. Assuming that each individual's equity in the government is a small fraction of his wealth, he may adjust his holdings of other assets so that his portfolio including the equity in

the government is a market portfolio. Consequently, the government like any other corporation may undertake any investment as long as it uses a discount rate that reflects the project's systematic risk.

These conclusions assume perfect and complete capital markets. However, there are no capital markets or very poor capital markets for many types of assets, particularly those assets which involve moral hazard. The non-systematic risk of these assets cannot be diversified away and they sell at yields in excess of their systematic risk yields. Arrow [1966] has argued that for some of these assets the government can be used to diversify away non-systematic risk more efficiently than the capital markets, in which case their social discount rate is below their private discount rate. Arrow and Lind [1970] and Bailey and Jensen [1972] have pointed out that there are few government investments on which the output is sold at market prices and the benefits of the investment flow to the general public. For instance, in a flood control project the benefits are given and not sold to the farmers in the area. The farmers can diversify away very little of the project's non-systematic risk, and the government should use a discount rate that reflects the project's risk to the farmers and not just its systematic risk. In short, a wide variety of institutional or technological arrangements deny perfect and complete capital markets and require that individuals on their own account, and that governments or corporations acting on the account of individuals use a discount rate which exceeds more or less the rate that reflects the projects systematic risk.

II

My concern is with the role of government in providing leverage and not with its comparative advantage in the elimination of non-systematic risk. The complications associated with the latter issue may be avoided by assuming a system with just two assets. One is a note that will pay $\$(1+i)$ with certainty one period hence and sells at a yield of i . Privately issued notes are risk free because each issuer's notes are limited in relation to his wealth so as to make the probability of bankruptcy practically zero. Government notes are risk free because it creates legal tender.

The other asset is productive and risky, and it will be called a share. The periodic income it generates is the random variable $\tilde{x}_t$ with expected value x_t . For simplicity, we assume that no growth is expected, so that at the start of period t the values of x_{t+j} for all values of j are equal to x_t . However, the distribution of x_t is not stationary over time. It is a function of the prior realized values of $\tilde{x}_t$ such that $x_2 \geq x_1$ if $\tilde{x}_1 \geq x_1$. Otherwise the price of a share would vary only as a consequence of changes in its capitalization rate, a highly unreasonable state of affairs.

The holding period return on a share is the random variable $\tilde{k}$ with expected value k . The expected value of $\tilde{k}$ is also called the share's yield or return. The price per share is $P = x/k$. The holding period return on a share, $\tilde{k}$, is equal to $\tilde{x}$ plus the change in share price divided by the initial price.

Each investor takes i , k and his current wealth as given and allocates his wealth between the note and the share so as to maximize the expected value of the utility of his wealth one period hence. With aversion to risk, the risk advantage of the note makes each investor indifferent between the two at the margin. Also, as k

increases in relation to i , each investor increases the fraction of wealth he holds in shares.

Assume that the government issues a note and uses the proceeds to buy a share denominated so that initially it sells at the same price as a note. Assume further that the government will raise taxes by the interest on the note and reduce taxes by the holding period return on the share during the coming period. One may argue that the social and private discount rates are equal on the following grounds. An individual whose tax bill will be reduced by the fraction $\lambda(\tilde{k} - i)$ may sell λ shares and buy λ notes. Dropping the λ , the share sold on personal account offsets the share purchased on government account, and the note purchased on personal account offsets the note issued on government account.

To elaborate, the individual originally held a share which provided $1 + \tilde{k}$ one period hence. Subsequently, he has a note which provides $1 + i$ and a change in his tax bill of $\tilde{k} - i$, which add up to $1 + \tilde{k}$, the same wealth he initially expected one period hence. The individual's wealth one period hence is the same random variable with these transactions as it would have been without them.

However, the government is under no obligation to change taxes as described above, and in the benign world of theory we may presume that the government will adopt the best among the available policies. Let the government pay the investor k/i in notes in exchange for one share selling at the price $P = \$1.00$. One period later the government will pay k in interest on the notes and earn $\tilde{k} \geq k$ on the share it acquired. However, if $\tilde{k} \geq k$, the difference is covered not by taxes but by debt or debt retirement. Furthermore, the government will maintain its investment in the share at \$1.00 forever, using debt to cover the periodic amount of $\tilde{k}_t - k$ and the interest on the debt outstanding in excess of k/i .

The holding period return of the investor who exchanged the share for the notes is changed from $\tilde{k}$ to k . The expected value is unchanged but the risk is eliminated, and the resultant increase in his welfare is reflected in the increase in his wealth by $k/i - 1$.

Are there any unfavorable consequences of this note financed purchase of a share that must be charged against the welfare increase just established? There will be no change in the tax bill of any member of society, and no other person is made better or worse off. Of course, if $\tilde{k}_t - k$ proves to be positive on average over time, the government debt will decline. Conversely, if $\tilde{k}_t - k$ proves to be negative on average, financing the deficit will cause the government debt to grow over time. I see no reason why current asset yields or expectations as to future returns should be influenced by the possibility of either course of events. It follows that government financial intermediation increases wealth by reducing the uncertainty of future returns. Since debt financed government investment to earn a return equal to the private discount rate for risky assets increases wealth, the social discount rate is below the private rate.

III

The previous analysis was carried out on the micro level where the individual takes his current wealth and asset yields as given and allocates his wealth among assets so as to maximize his utility. To be consistent with this level of analysis, it was

assumed that the government's debt financed investment in the risky asset was so small as to leave asset yields unchanged. Let us now move to the macro level. There, the physical quantity of each type of asset is given, and asset yields and total wealth adjust so that the micro decision process persuades individuals to hold the outstanding quantity of each type of asset. To represent the process assume there are four types of assets: money, one period notes, shares and a consumer good. Shares are real wealth that produce additional shares and a consumer good, which for simplicity is assumed to be perishable.

The quantity of money an individual holds with one period risk free notes an alternative is only a function of the interest rate and the transaction demand for money. Given the transactions demand for money, the quantity of money an individual holds is a decreasing function of the interest rate. However, on the aggregate level the quantity of money is independent of individual decisions on how much they hold. The interest rate adjusts to persuade individuals to hold the outstanding quantity of money. To neutralize monetary policy, it will be assumed that the government varies the amount of money plus notes in the form of money to keep the interest rate constant.

Returning to the micro level, with the interest rate determining the amount of his wealth that the investor holds in money, the excess of the yield on shares over the interest rate determines the allocation of the remainder of his wealth between notes and shares. As share yield increases, the fraction held in notes decreases and the fraction held in shares increases. However, on the macro level the quantities of notes and shares are independent of how investors allocate their wealth between them. Given the interest rate, share yield changes to persuade investors to hold the outstanding quantities of notes and shares.

For instance, assume that investors want to hold a larger fraction of their wealth in shares. They sell notes and buy shares. The yield on shares falls, and the fraction of wealth they want to hold shares in falls. In addition, the fall in k increases the value of the outstanding shares, and the fraction of wealth invested in shares is thereby increased. Hence, some fall in k will persuade investors to continue holding the number of shares they have.

Assume now that the government makes a tender offer to buy the fraction λ of each investor's shares. The offer is to pay k/i times the price per share in one period notes which carry an interest rate of i . I continue to use a tender offer on such favorable terms instead of a purchase at market value to acquire the shares for two reasons. One is to avoid the temporary impact on price of the large government acquisition. The other reason is that the analysis of the consequences of financial intermediation by government is simplified without limiting the conclusions of interest.

If the shares acquired by the government had a pre-tender value of Z , the notes issued are worth Zk/i , and investor wealth is immediately increased by $Z(k-i)/i$. No investor will refuse the tender.

Under the periodic government policy described earlier, the interest bill on the notes issued is Zk initially, and $Z\tilde{k}$ is earned on the shares acquired. If $Z\tilde{k} > Zk$, the excess is used to retire notes, and if $Z\tilde{k} < Zk$, additional notes are issued to cover the difference. The same is true in every subsequent period, except that the

notes issued or retired also cover the amount by which the interest on the outstanding notes differs from Zk . The government's taxes and expenditures are not changed by the financial intermediation.

In accepting the tender offer investors give up the risky receipt of $Z\tilde{k}$ in exchange for interest income of Zk . The expected value of their income is unchanged, but its risk is reduced. This risk reduction, reflected in an immediate increase in wealth by $Z(k-i)/i$, is not the full extent of their increase in welfare. Given the pre-tender values of k and i , investor utility is not maximized by the post-tender allocation of their wealth between shares and notes. Therefore, investors sell notes and buy shares, and with monetary policy keeping the interest rate unchanged, the yield on shares falls. Some fall in the yield on shares with the interest rate unchanged, and the consequent rise in the value of shares persuades investors to hold the post-tender quantities of notes and shares outstanding. This rise in the value of the shares remaining in investor's hands may be considered a measure of their further increase in welfare.

It is clear that the wealth and welfare of every shareholder is increased by the tender offer in proportion to his original share wealth, and the position of every other member of society is unchanged. By varying the terms of the tender offer and related variables, any desired distribution of the gain from the government's financial intermediation may be arranged. In fact, at the risk of being accused of a heresy, one may call this financial intermediation a Pareto optimal policy.

Many of you no doubt remain troubled by this conclusion that financial intermediation by government can increase wealth and welfare. The stock of real assets and the future income they will generate has not been changed. As recently as 1968, Baumol argued that the social and private discount rates must be the same, on the grounds that government investment to earn the same return that could be earned on private investment leaves national income unchanged. However, our measure of welfare is not future national income but the present value of the future income. We all know that insofar as diversification through the capital markets reduces the risk of each person's income, national welfare is raised even if national income is not thereby changed. If I am correct in arguing that financial intermediation by government has beneficial risk consequences beyond those which may be achieved through the capital markets, wealth and welfare are thereby raised.

Sharpe has argued with me that the risk reduction through the diversification made possible by the capital markets is real while the risk reduction through financial intermediation by government is an illusion. What is illusion and what is reality in the measurement of the risk of future income and of wealth? The substitution of Zk with certainty for $Z\tilde{k}$ would appear to reduce the risk of investor income. The reduction in k without any change in expected future income would appear to increase wealth. Perhaps a good traditional course in the economics of the public debt would persuade investors that these gains are illusions and help them dispell the illusions. I doubt it. I would argue that the reasoning under which we consolidate and thereby cancel the debts of real persons and private corporations does not hold for governments. On income account taxes paid should be netted out against interest earned, as I have done in the previous analysis.

However, there is no risk burden on tax payers that cancels out the risk reduction from substituting government debt for shares in investor portfolios.

There is no doubt that investors will perceive and take as true the increase in their security and welfare established in the previous analysis. There also is no doubt that the rest of society will recognize no reduction in its income, security or welfare. In that event is our so-called illusion of no benefit? Perhaps creating the illusion will have harmful consequences over time. The argument that this is illusion and not reality may be based on the belief that the actual course of future events, the level and variability of future income are in fact unchanged or adversely influenced by the government's financial intermediation. Will the periodic note financed purchase or sale of shares to keep the government's share investment at Z and pay the interest on the outstanding notes shift the risk on the shares from investors to the rest of society? Will it increase the variability or reduce the level of national income over time? Perhaps it will have the opposite consequences. To answer these questions we must consider the behavior of the system over time.

IV

To establish the consequences of government financial intermediation for the levels of national and investor income, we must establish a model of income determination that incorporates portfolio behavior by investors in a three asset economy without such intermediation.

I make the following assumptions. There is some government debt as a consequence of past debt financed expenditures on wars and public consumption, and this debt is allocated in some way between money and notes. For simplification, government expenditures are solely for the purpose of paying the interest on the notes, and a tax on total wealth is set equal to the interest bill, so that after tax income excludes interest on the debt. Each investor's tax bill is independent of his portfolio decisions.

With regard to production, it consists of the consumer good and the share. The wage rate is fixed and the price per unit of output adjusts to equate the marginal product per unit of labor with the wage rate. The form of the production function makes the price wage ratio and the nominal and real income per share rise with employment. The real wage per hour of employment falls as employment and output rise, but for the present assume that the range of variation in employment is limited to the range over which the real wage per member of the labor force increases with employment.

At the start of t , Q_t is the stock of shares and x_t is the expected value of the income per share during t . Hence, $Q_t x_t$ is the income during t investors expect at the start of t . An exponential average of past values of the price per unit of output determine the expected price at the start of t , and the expected price determines the expected employment output and investor income per share. However, for simplicity it will be assumed that x is an exponential average of the prior $\tilde{x}$, while recognizing the factors that will cause x to vary over time.

Actual national income during t will be the sum of the consumption and

investment expenditures during the period. Again for simplicity, it is assumed that workers consume their entire income, in which case national income is determined by the sum of investors consumption and investment expenditures. It can be seen from the previous production function and range of employment assumptions, that the real and nominal income of the labor force and of investors are positively correlated with each other and with employment and the price level. Hence, we need only concern ourselves with nominal investor income to draw conclusions about the movement of all other variables. Our problem is the influence of share yield on investor consumption and investment.

Investor consumption may be a constant or decreasing fraction of permanent income. Even if the fraction of permanent income consumed is independent of its level, a reasonable hypothesis is that consumption is a smaller fraction of non-permanent income. The former is Qx , and non-permanent income is $Q(\tilde{x} - x)$. Capital gains and losses due to changes in share prices are an even less permanent component of income than $Q(\tilde{x} - x)$, and they are excluded from our definition of income. Of course wealth changes with share prices, and the fraction of income consumed may vary with wealth. It should be noted that the production or replacement cost of a share and its market value, the latter being $P = x/k$, need not be equal.³

If share yield remained constant over time, consumption would simply be a function of income as described above. However, k varies and the fraction of income consumed should vary inversely with k for two reasons. First, the future consumption that may be substituted for a dollar of current consumption rises with k . Although x is the expected income per share, k is the expected income per dollar invested in a share. Second, wealth is a source of security in that it supplements income as a means of meeting unexpected consumption requirements in any future period. The lower the ratio of wealth to its periodic income the lower the ratio of future security to future income. As k rises with Qx given, the wealth to income ratio falls. The investor raises the ratio by increasing the fraction of income saved, and hence the desire for security leads investors to increase the fraction of income saved as k rises.

Investment during a period is the net addition to the stock of shares valued at cost or $c_i(Q_{t+1} - Q_t)$. Each investor's investment decision is made with the objective of maximizing his wealth, and this is accomplished by the investment that equates r , the marginal rate of return on investment with k . An investor's wealth is $W = S + M + B$, with M and B the money and notes the investor holds and $S = Qx/k$ the value of his shares. The change in wealth with investment in shares is $\partial W / \partial Q = (r/k) - 1$. Hence, investment in each period equates r with k .

The marginal rate of return on investment function depends on a number of things including the state of technology. However, we may reasonably simplify

3. What appears to be a logical impossibility here is resolved by recognizing that each firm has some quantity of another asset, e.g. land. This asset is capitalized in an arbitrary number of shares, and the differences among book value, replacement cost and market value of a share will depend on the book value assigned to the other asset and the rent it earns.

matters by assuming that the function shifts with income per share and with time and it shifts inversely with the stock of shares. Hence, the investment that equates r with k varies with x and time and it varies inversely with both Q and k .

The process of national income determination may now be described as follows. At the start of a period each investor takes his wealth as given and makes a portfolio decision to satisfy his transactions demand for money and to satisfy his preferences for risk and return. However, the quantities of money notes and shares are given as are the expected values of national income and income per share. The quantity of money and the expected value of national income determines the equilibrium interest rate. The number of shares and the expected income per share determine share wealth for any k . Given M , B , Qx , and i share yield takes the value that persuades investors to accept the allocation of their wealth among assets that results. The equilibrium k varies with i and with the size of Qx in relation to M and B as described earlier.

The equilibrium k from the viewpoint of investors portfolio decisions, however, need not be the equilibrium value from the viewpoint of their consumption and investment decisions. That is, the sum of their investment and consumption may not equal Qx . In other words the portfolio equilibrium k may not make savings equal to investment.⁴ If investment is greater than savings out of an expected income of Qx , employment output and output price will rise and make actual investor income, $Q\tilde{x}$, large enough to generate the savings that matches the investment decision.

How will employment and income be changed if they are changed at all by a government decision to engage in financial intermediation at the start of t . Assume that the government purchases, or to avoid the price effects of a large purchase, compels investors to exchange Z dollars worth of shares for notes. As described earlier the government will reduce taxes by $Z(k - i)$, and at the end of the period, debt will be retired in the amount $Z(\bar{k} - k)$ if $k > \bar{k}$ and vice versa.

The reduction in the uncertainty of investors' future income and the substitution of notes for shares will make their portfolios too conservative. Investors will sell notes and buy shares. As k falls and share wealth rises, the change in the relative quantities of notes and shares becomes more acceptable. The equilibrium k from the viewpoint of investor portfolio decisions is lower after the government's financial intermediation.

However, with the expected income of investors remaining equal to Qx , the reduction in k reduces the fraction of their income investors decide to save and it also raises their investment decision. The equality of actual savings and investment is achieved by a rise in investor income above the level without the financial intermediation. Since the real and nominal income of investors and the labor force are all positively correlated, both sections of the population gain from the financial intermediation.

We have established that the one period income consequences of financial intermediation like the immediate wealth consequences are favorable. What may happen to make these benefits turn sour—prove to be illusory and not real? Will

4. The distinction here is similar to that drawn by Wicksell [1936] between the actual and natural or equilibrium rate of interest.

the instability of the system over time be increased? Will inflation and secular decline be the long run consequence? These questions will be examined in the order stated.

V

To establish the cyclical consequences of government financial intermediation, let us first examine the cyclical behavior of our system without such intermediation. Recall that at the start of t we have M , B , Q , x and expected national income given. They determine the portfolio equilibrium values of i and k , and with i and k determined actual investor income during t , $Q_t \tilde{x}_t$, is determined.

We may easily have $\tilde{x}_t \geq x_t$. Assume that $\tilde{x}_t > x_t$. The $t+1$ expected income per share will be an average of x_t and $\tilde{x}_t$, so that $x_{t+1} > x_t$. The rise in x will shift the return on investment function upward, since it is an increasing function of the return on the outstanding shares. With investment rising $\tilde{x}_{t+1} > x_{t+1}$. The mutually reinforcing rise in investment and income will continue indefinitely unless countervailing forces intervene.

One such countervailing force is the rise in the interest rate as the transactions demand for money rises with national income, if the quantity of money is held constant.

Another countervailing force is the rise in the stock of shares. Investment rises with income per share because the rise in x shifts the return on investment function upward. However, the increase in the stock of shares tends to shift the return on investment function downward. Furthermore, the rise in x is due both to a rise in output per share and a rise in the price per unit of output, with the relative importance of the latter variable increasing as the level of output rises. Insofar as a rise in x is matched by a rise in the production cost of a share, it has no favorable impact on investment demand.

The portfolio behavior of investors will also serve to moderate and reverse the rise in investment and income. The rise in x and Q raises the fraction of investor wealth in shares if k remains unchanged. However, investors will not hold an increasing fraction of their wealth in shares with k unchanged. Hence, k rises. This both retards the rise in share wealth and persuades investors to hold the increasing fraction of their wealth in shares. As k rises, the investment that equates the marginal return on investment with k is reduced. Finally, the rise in k also raises the fraction of income saved and thereby reduces the income needed to finance any level of investment.

The combination of the above forces tends sooner or later to turn investment and income down. When investment and income are falling, the reverse process moderates the decline and encourages an upturn. I will not argue that this is an adequate description of a self-perpetuating cyclical process. To generate cyclical fluctuations and long run growth we probably also require (1) structural characteristics which depress demand and result in secular stagnation in a closed system, and (2) the possibilities of growth through new technology and the absorption of non-capitalist systems or sectors of the economy. The fluctuations in investment and income that result create the fluctuations in holding period returns on shares and their amplitude determine the risk premium excess of share yield over the interest rate.

What happens to the cyclical behavior of the system if the government adopts the periodic policy described earlier after acquiring some fraction of the outstanding shares? Recall that the government maintains its investment in shares at Z by selling shares and retiring debt when $\tilde{k} > k$. Similarly, when the holding period return is less than share yield, the government issues debt to acquire shares. It is clear that when investment and income are rising, $\tilde{k} > k$, and the sale of shares by the government will cause k to rise even more rapidly than otherwise. Similarly, during a downturn $\tilde{k} < k$, and the purchase of shares by the government will cause share yield to fall more sharply and reduce the extent and duration of the downturn.

We saw earlier that the immediate impact of financial intermediation by government was favorable. The return to investors on the shares held by the government becomes risk free and the yield required on the shares that remain in investor hands is reduced. Both increase investor wealth. We also saw that the level of investor and national income, real as well as nominal, vary with the fraction of shares held by government. We now see that the amplitude of fluctuations in the return on shares diminishes over time. This reduction in risk further reduces k and raises wealth and welfare. The reduction in the amplitude of economic fluctuations cannot be harmful to the rest of society.

VI

Before taking up the possible inflationary consequences of government financial intermediation, it may be useful to consider some peripheral issues, among them a comparison of the consequences of government portfolio policy with the consequences of monetary and fiscal policy. In particular, is portfolio policy nothing more than the instruments of monetary and fiscal policy draped in new titles?

Monetary theory represents all assets other than money with a note or bond. In this two asset one yield world the substitution of money for notes in the public's hand reduces the interest rate and stimulates demand. With the public holding money, notes and shares, the substitution of money for notes still reduces the interest rate. However, this has no direct impact on investment and consumption demand. What happens is a shift from notes to shares as a consequence of the fall in the interest rate relative to share yield. This brings down share yield, since the number of shares and the number of notes apart from the issue of money for notes is unchanged. The reduction in share yield stimulates investment demand and reduces savings. Furthermore, as we saw earlier, with the interest rate held constant by means of monetary policy, the note financed purchase of shares by government reduces share yield and stimulates demand directly. Therefore, monetary policy and what may be called financial intermediation policy are two quite distinct policy instruments. The introduction of a risky asset and risk aversion into the economy make possible the recognition of the difference.

The portfolio consequences of a change in the public debt are also different than the fiscal policy consequences. When the government engages in debt financed expenditures on consumer or investment goods Keynesian multiplier analysis establishes the rise in income needed to generate the savings that covers the deficit. By contrast the debt financed purchase of outstanding shares or existing assets

requires no increase in savings and income to provide the real financing. There is no direct impact on the level of economic activity, since the government has merely changed the composition of investor portfolios. This change, however, reduces share yield and stimulates demand. Therefore, fiscal policy has a dual impact on demand, one immediate and the other delayed, the delayed impact representing the portfolio consequences of the increase in the public debt.

Perhaps a more troublesome question is whether the public debt must be used to finance the purchase of marketable risky assets in order to obtain the benefits described earlier. In fact, the public debt in the United States and elsewhere has been incurred for the most part to finance war and consumption expenditures. A public debt incurred for such reasons might seem to serve as well as the debt financed purchase of shares. The yield at which privately held risky assets sell depends on the relative size of the public debt and not on how it was created. It is also clear that monetary policy and fiscal policy as well as portfolio policy represent instruments for realizing stabilization and growth objectives.

It would therefore seem that monetary, fiscal and portfolio policy are means for dealing with cyclical fluctuations and growth that are not mutually exclusive. However, each has its own advantages. For instance, government expenditures on consumption goods that may not be worth their cost is avoided when financial intermediation is used to increase the public debt. Other arguments for and against each policy instrument can be advanced, but doing so would carry us too far afield.

Insofar as the critical variable is the size of the public debt and not the properties of the assets that the debt finances, is it incorrect to say that the social discount rate is below the private discount rate? The answer is yes and no. For any particular investment, the two discount rates are the same apart from capital market imperfections. On the other hand there is an optimal secular level for the public debt. Consequently, the debt financed public consumption or investment expenditures needed to bring the public debt to that level should be evaluated at a lower discount rate than the private rate. Finally, in evaluating the desirability of having the debt finance some fraction of the stock of marketable risk assets, the benefits from the counter cyclical portfolio policy described earlier should enter into the calculation.

VII

The task that remains is to establish whether government financial intermediation is inflationary. It would seem that the answer is yes for the model of a capitalist economy established earlier. Inflation takes place when an index of all product prices rises. In our system there is one product, and with the stock of shares given an increase in output requires an increase in the product's price. The debt financed purchase of shares by government increases both the output and price of the product.

However, we may distinguish a system in which prices fluctuate from a system in which prices have been rising and are expected to continue rising over the long run. Price and output will fluctuate over time due to random shocks and the peculiar way in which these shocks are amplified and reversed in a capitalist economy. If a secular upward trend in output can be maintained with the public debt held

constant, there will be a secular downward trend in prices over time. If there is no expectation of change in the public debt as a fraction of the privately held risk assets, the price level should fluctuate with no long term trend, or what is more important the best estimate of the price level n periods hence remains the expected price level one period hence.

What if the government increases the public debt through the purchase of some fraction of the outstanding shares, pursues the countercyclical portfolio policy described earlier and follows a long run policy of maintaining a stable debt share ratio? The short run impact will be an expansion of output and price to a higher level. However, after the system adjusts to the new long run debt share ratio the best estimate of the price per unit of product n periods hence will be the price one period hence. In other words, a change in the debt share ratio should not create the inflationary situation described earlier—an upward trend in prices that is expected to continue indefinitely.

I believe it can be shown that there is a unique debt share ratio which maximizes the real wage bill, and a reasonable case can be made for considering this the optimal ratio. A higher ratio would increase employment and output, but it would reduce the real wage bill as well as the real wage rate. In any event, establishing and maintaining an optimal debt share ratio should not make the public debt inflationary.

It has not been my purpose to establish the reasons for the continuing inflation we have been experiencing. However, the association between the rise in the public debt and inflation puts the burden of proof on me to show that one is not the cause of the other. The fundamental cause of inflation, it seems to me, is the way that capitalism has evolved to meet our desire for security as well as income.

As I noted earlier, neo-classical theory has been concerned solely with income. Security was not even mentioned let alone incorporated in the formal development of the theory. This is no accident, since there is no economic security under a perfectly competitive capitalist system. Recall that the individual's decision variable in reaching his optimal trade-off between risk and return is the fraction of wealth he holds in the form of risk free debt. However, in the aggregate the supply of risk free assets is the public debt, and in an ideal perfectly competitive system the public debt is zero.

Marx was not the only nineteenth century writer to chronicle the great insecurity of both workers and capitalists due to the wide fluctuations in income and wealth they experienced and faced. In *The Great Transformation* Karl Polanyi brilliantly demonstrated that the development of capitalism was only made tolerable, notwithstanding the great advances in income it accomplished, by the relative size and political power of the traditional sectors. The latter both absorbed the shocks and curbed the excesses of the market determination of prices and incomes. However, by the turn of the century if not sooner, the relative decline of the traditional sectors at home and abroad made them inadequate to the task.

First capital and then labor and the professional classes turned to the development of institutional arrangements which made it possible to find security within the system. Cartels, combinations, oligopolistic practices, trade unions, and professional associations developed not only to increase the expected values of the future incomes of their members, but also to reduce the uncertainty of their incomes. As

control of the market increased and mobility became more difficult, the ravages of control by the market became more intolerable, and the institutional defences were raised higher.

The state is the most powerful instrument for the control of price and entry, and every group that finds its own resources inadequate to the task calls on the state to the extent possible. Groups also increase the level and security of their income by calling on the state to undertake expenditures for its services or products. Furthermore, since the control of price and entry become increasingly difficult as aggregate demand falls, the state is called upon to maintain aggregate demand.

Perhaps the most dramatic use of the state to increase income and security is to be found in the growth of the social security system. Martin Feldstein [1975, p. 15] estimated that in 1971 the present value of the excess of future benefits over future payments for the current members of the United States social security system was \$2 trillion. For comparison, the total private wealth of households exclusive of social security wealth was estimated at \$3 trillion by Feldstein. Even after allowing for the non-marketable and non-contractual nature of this public debt, its growth since the end of World War II represents an enormous increase in the public debt. The public debt is clearly being used to solve the problem of security in a capitalist economy and its implications for the functioning of the economy are just beginning to be recognized.

The most disturbing thing about the continuing inflation is the possibility that a stable rate of inflation requires an increasing rate of unemployment and a stable rate of unemployment requires an increasing rate of inflation and growth in the public debt. Stagflation has been with us for a relatively short period of time, but we cannot dismiss it as an aberration, because weaker systems have suffered with it for considerably longer periods. I will not attempt a theory of stagflation here. Regardless, it is clear that inflation is not a consequence of growth in the public debt. Rather a rising public debt and money supply and continuing inflation are all consequences of the institutional arrangements that we have adopted to protect us against the ravages of competitive markets.

Where do we find competitive markets outside of the pages of economic journals? Elsewhere the phrase is a battle cry in the defense of monopoly privileges. The most privileged cry the loudest because they rely the least on the state for protection from the market. In this environment controlling the money supply and the public debt is a solution to the inflation problem only insofar as it is a peculiarly effective device for forcing some of us to give up the institutional safeguards that we have created in order to avoid becoming economic outcasts. Is this a constructive and realistic solution to the problem or is it a romantically reactionary solution? I leave you with that question.

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