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Investment in Housing in the United States: A Portfolio Approach-- The Possible Effects of Changes In Tax Policy

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Abstract

It is well known that the preferential tax treatment of housing induces an inefficient allocation of saving and investment. This paper analyzes, in a portfolio framework, how eliminating the deductibility of mortgage interest payments for federal income tax purposes might affect investment in housing. Expected rate of return and risk is estimated for three assets, bonds, housing, and stocks. The possibility that assets are imperfect substitutes is explicitly recognized in one section of the paper. The model suggests that the share of housing is likely to decrease by 4 to 9 percentage points if mortgage interest payments are not deductible. This may call for careful phasing of the change in policy.

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Contents

Summary

Several features of the U.S. tax system distort the allocation of savings and may exacerbate the problem of low national savings. One area that has attracted particular attention is the preferential tax treatment of housing. Mortgage interest payments are tax deductible, while the imputed income of owner-occupiers is not taxed and the tax rate on capital gains from selling a house is effectively close to zero. By eliminating or at least reducing the preferential tax treatment of housing, the allocation of savings could be improved.

This paper focuses on the possible effects of eliminating the tax deductibility of mortgage interest payments in calculating the federal income tax. A mean-variance portfolio model with three assets (bonds, housing, and stocks) is developed. The investor is assumed to minimize the risk at any given expected rate of return. The rates of return are estimated for the period 1972-87 using mainly flow of funds data. The model is calibrated to reflect actual portfolio shares in the U.S. economy. Initially, the three assets are treated as perfect substitutes in the sense that, except for their risk/return characteristics, investors are indifferent between them. Subsequently, the possibility that housing and financial assets may be imperfect substitutes is examined. This is an extension of most traditional mean-variance portfolio models.

The model suggests that abolishing mortgage interest deductions would result in a substantial reduction in the proportion of assets held in the form of housing. The share decreases from 40 percent to 26.5 percent, while the share invested in stocks increases from 23 percent to 34 percent. Assuming assets are not perfect substitutes mitigates the decrease in the housing share to between 4 and 9 percentage points. There thus would be a substantial decrease even if the investor has rather strong preferences for housing. The effect is likely to be larger for high-income earners with expensive houses.

Abolishing deductibility for mortgage interest payments for federal income tax purposes would lead to large capitalization effects in the short run since the short-run supply of housing is very inelastic. These effects would need to be taken into account in designing a reform program and would suggest the need for careful phasing.

I. Introduction

It is often argued that tax policy has important effects on the allocation of personal savings across alternative investments. In particular, it has been suggested that tax preferences for housing may lead to over-investment in housing, thus undermining efficiency of resource allocation. Such an effect is magnified if the inflation rate is relatively high. 1/

This paper analyzes, in a portfolio framework, how the elimination of the deductibility of mortgage interest payments for federal income tax purposes might affect investment in housing. The results of the analysis indicate that abolition of mortgage interest deduction would lead to a substantial reduction in the proportion of assets held in the form of housing. While such a policy change clearly leads to more efficient resource allocation, the large capitalization effects that it is expected to involve in the short run raise issues regarding the relative merits of alternative ways to phase in such a policy change.

The paper is organized as follows. The second section provides the background on the tax treatment of housing in the United States today and analyzes in qualitative terms its possible implications for price and quantity developments in the housing market and for the efficiency of resource allocation. Section III describes the main features of the mean-variance portfolio model developed in this paper to illustrate some of the potential effects of the removal of tax preferences for housing. The data and calibration of the model are presented in sections IV and V and the results are presented in section VI. Section VII discusses some possible distributional effects of the tax change. In section VIII, the assumption that the assets are perfect substitutes apart from risk/return characteristics is relaxed. In section IX, some alternative policy measures are discussed. Section X provides a summary.

1/ Ebrill and Possen (1982) use a macro model with heterogenous productive capital to show that increased inflation, via shifts in asset holders' portfolios, decreases the real value of corporate capital relative to the value of the stock of durables held by consumers. Summers (1981) demonstrated that the non-neutral effect of inflation on the tax system can account for much of the increase in the value of owner-occupied housing and reduction in the value of the stock market which occurred in the late 1970s.

II. Taxation of Housing

1. Preferential treatment of owner-occupied housing

The tax treatment of owner-occupied housing in the United States is preferential in several ways. Mortgage interest is tax deductible, capital gains from housing largely escape taxation and the U.S. tax system does not include imputed income from owner-occupied housing in taxable income in contrast to many other OECD countries (Table 1).

Table 1. The Income Tax Treatment of Owner-Occupied Housing 1/

Group A	Group B	Group C
Finland	France	Australia
Greece	Japan	Canada
Luxembourg	Portugal	New Zealand
Netherlands	Turkey	
Spain	United Kingdom	
Sweden	United States	
Denmark	Federal Republic of Germany	
Norway		

Group A: Countries which tax imputed rental income and allow tax deductions on mortgage interest payments.

Group B: Countries which do not tax imputed rental income but allow tax deductions on mortgage interest payments or housing costs.

Group C: Countries which neither tax imputed rental income nor allow tax deductions on mortgage interest payments.

Source: Urban Housing Finance, OECD, 1988.

In 1985, approximately 64 percent of American households owned their own houses. The share has been relatively stable since 1960 but has risen substantially from the 1950s. Empirical estimates suggest that the preferential tax treatment of owner-occupied housing increased

1/ Large differences exist within each group. Besides differing in income tax treatment of housing, they differ in taxation of capital gains and property taxes.

the proportion of homeownership by approximately 4 to 7 percentage points. 1/

It may be noted that although the Tax Reform Act of 1986 retained full deductibility of mortgage interest, 2/ the lower marginal tax rates diminished the value of mortgage deductions. It is estimated that tax expenditures 3/ for mortgage interest payments fell from $34.2 billion under the previous law to $25.0 billion after the reform. State and local real estate taxes are also deductible. Tax expenditures related to this provision are estimated to have decreased from $12.1 billion to $8.5 billion as a result of the Tax Reform Act of 1986. 4/

Owner-occupied housing receives preferential treatment for capital gains in the United States, with the effective capital gains tax rate on owner-occupied housing being close to zero. Capital gains on the sale of the taxpayer's main residence are not liable for tax, provided that the taxpayer purchases a new residence during the following two years and that the purchase price of the new dwelling exceeds the sale price. Furthermore, the tax code grants a one-time exemption of $125,000 in capital gains on houses to taxpayers older than 55 years.

2. The effect of changes in the tax code on asset values

The value of an asset represents the (discounted) stream of future returns. To the extent that taxes affect this stream of returns, the value of the assets will be affected by changes of the tax code. That is to say, tax effects are likely to be capitalized into the value of the asset. This arises most clearly in the case of assets which are inelastic in supply. The market equilibrium results in the price of these assets adjusting to the point where the return per dollar invested is the same as on other assets (adjusted for considerations of risk and liquidity).

Consider, for example, the introduction of deductibility of mortgage interest payments. Since the supply of housing is fixed in the short run, the price of houses would be likely to increase. 5/ To what

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1/ M. Rosen and K. Rosen (1980) and P. Hendershott and J. Shilling (1982).

2/ The deductibility of mortgage interest payments extends to second homes but with the introduction of the tax reform, it is limited to interest payments on a principal of up to $1 million. Manchester and Poterba (1989) estimate that second mortgages accounted for 10.8 percent of the stock of outstanding mortgage debt at the end of 1987, up from 3.6 percent at the beginning of the 1980s.

3/ For a discussion about the Tax Expenditure measure, see Ebrill (1989).

4/ Neubig and Joulfaian (1988).

5/ Some home owners would have bought their property without knowing that the financing cost would partly be reduced by the introduction of the deductibility.

extent home owners would be better off would depend on whether the revenue shortfall resulting from the new tax treatment of housing was recovered and, if so, how. Furthermore, the value of other assets would also change so that the general equilibrium impact on the net value of total household assets would be ambiguous.

In the long run, housing supply is more elastic than in the short-run and would thus respond to the tax change. Supply would increase as long as the market price is above the replacement cost. If the long-run supply of housing is completely elastic, there would be no capitalization effect in the long run, with all the adjustment taking place on the side of the quantity supplied. In a more general case, the allocative effect 1/ is smaller, and the long-run capitalization effect larger, the smaller the elasticity of the long-run supply curve of housing.

The after-tax rate of return on different assets in the long run will be equalized (adjusted for risk and liquidity), if capital is freely mobile, whether through the capitalization effect or the allocative effect or a combination. For this reason, it cannot be ascertained solely from an examination of the rate of return whether a sector is receiving special treatment. The redistributional effect of introducing or removing deductibility of mortgage interest payments depends on who owns the assets at the date when the provision is introduced. Removing the preferential tax treatment of housing would in particular affect those home owners who have not held their properties for long since they have not experienced a large increase in their property values due to the tax provisions.

3. The effect of changes in the tax code on resource allocation

The allocation of investment, and resources more generally, is distorted by the tax preferences for housing. 2/ As with other types of subsidies, a more efficient allocation of resources can be obtained if the subsidy is removed. Mills calculated that the social return to housing in the United States is 55 percent of that available on "productive" capital and that the U.S. has overinvested in housing by about 25 percent. 3/ Slemrod (1982) simulates the change from full deductibility of mortgage interest payments to only allowing half of the interest payments to be deductible. The fraction of households who own their houses declines approximately 3 percentage points and the level of housing consumption declines.

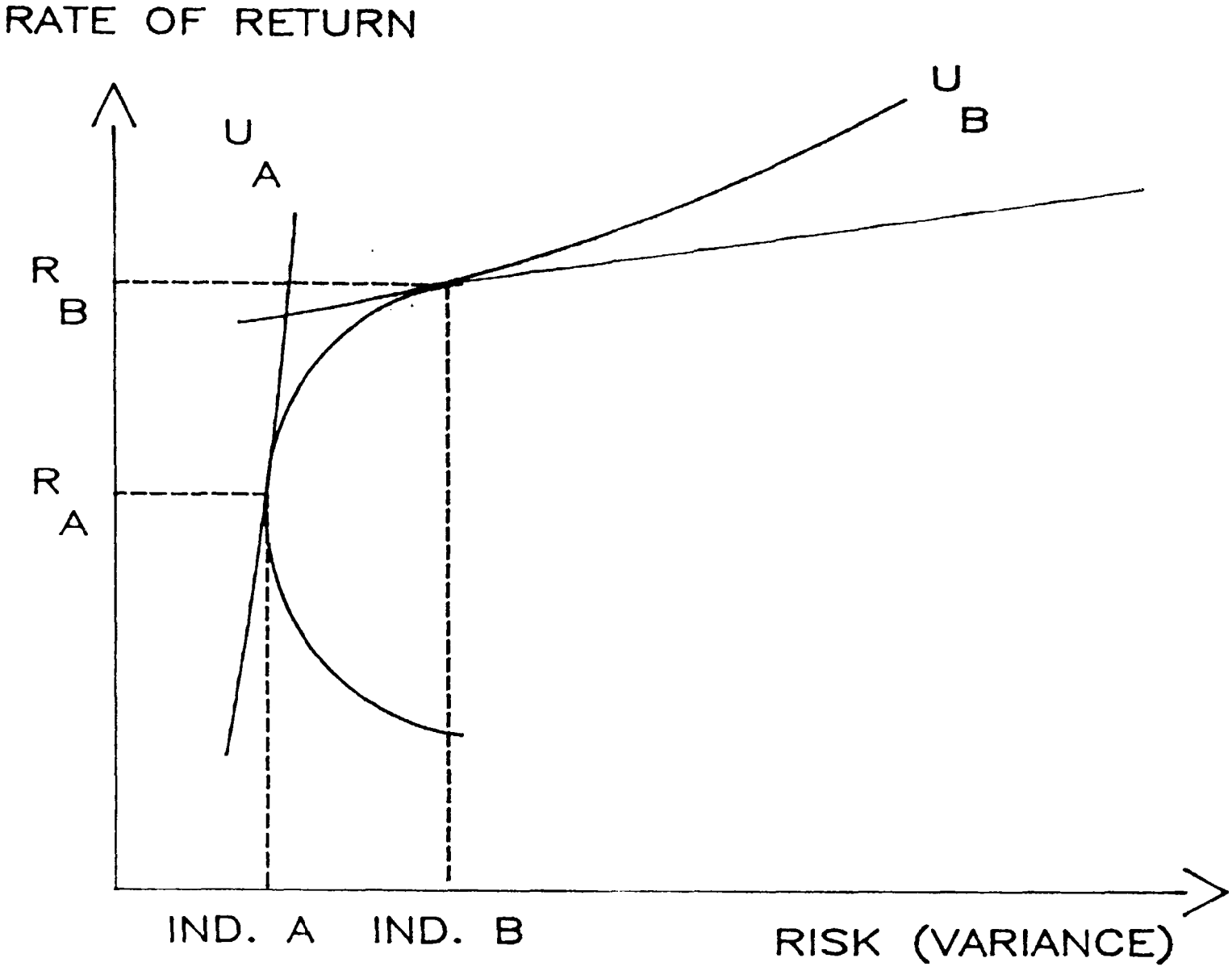
1/ The allocative effect refers to the supply response to the tax change.

2/ Assuming that the tax preferences for housing do not remove some other existing externality.

3/ Mills (1987). The situation is not unique to the United States. Especially countries with high marginal tax rates in combination with deductibility of mortgage interest payments have experienced overconsumption in housing. See Andersson (1988).

CHART 1

EFFICIENT FRONTIER



The removal of tax preferences for housing would improve the public sector financial position although its effect on the level of private saving is ambiguous. In addition, such a removal would induce a portfolio shift from housing to financial assets which could have favorable implications for the domestic saving/investment balance and for long-term economic performance more generally. Short-run capital losses and possible disruption of the economy that they might entail would need to be taken into account in designing a reform program; the issue, however, is beyond the scope of this paper.

III. A Mean-Variance Model of Investment in Housing, Stocks, and Bonds

This section outlines a mean variance model that is designed to analyze quantitatively the allocation of personal savings, and in particular to consider the effect of the elimination of the deductibility of mortgage interest payments on portfolio choice. 1/ The model consists of a representative investor placing his wealth in three assets: bonds, housing and stocks. The investor is assumed to be risk averse. His goal is assumed to be to choose the portfolio that maximizes his utility.

The first step toward attaining this goal is to identify the portfolio that minimizes risk at a given expected rate of return. The key variables the investor must consider include expected rate of return and riskiness of each asset, and whether its rate of return moves together with other assets' rates of return or separately (the covariance). On the basis of these attributes of each asset, risk-return characterization of alternative portfolios can be derived.

As Chart 1 shows, there is an efficiency frontier which consists of all the portfolios which minimize risk for a given expected rate of return. Individuals choose the point on this frontier which matches their personal preferences concerning the trade off between return and risk. For example, individual A in Chart 1 is extremely risk averse (has a steep utility curve U_A) so he chooses a portfolio with a very low level of risk. 2/ To accept any more risk, this investor would require a large increase in return. Individual B on the other hand is more willing to take risks (has a flatter utility curve, U_B). This investor requires smaller increments in expected return as he assumes higher risk levels.

1/ I have used a simulation program called GAMS to solve the model. See General Algebraic Modeling System (GAMS) by D. Kendrick and A. Meeraus (1985) and Meeraus (1983).

2/ The backward bending part of the curve is inefficient since it is connected with a lower expected rate of return and a higher level of risk.

The three assets among which the investor chooses have different levels of risk and different covariances with one another. Bonds are the low risk asset, and stocks are the high risk asset. The riskiness and the rate of return of housing lie between these two assets. Housing is different in several respects from the other assets. 1/ Stocks and bonds are very liquid assets while housing is less so. Moreover, selling houses involves relatively high transaction costs, often including moving costs, which must be included in the model. 2/

There has been relatively little analysis of investment in housing as part of portfolio choice, examining the rate of return, risk, and liquidity. 3/ Zerbst and Cambon show that rates of return for real estate which were calculated in the seven studies that they reported were all negatively correlated with returns from investment in stocks. 4/ The same seven studies demonstrate that either a negative or small positive correlation between the returns on stocks and bonds. 5/ Similar results are obtained in this study.

Some rather restrictive assumptions are generally needed in order to take risk into account explicitly. This paper adopts a customary assumption that the variance and covariance of the expected rates of return as well as the expected rate of return perceived by investors are constant over time. 6/ It also assumes that the individual has no preferences among assets as long as they yield the same return and are subject to the same level of risk. This assumption will be relaxed in Section 8, making it possible to evaluate what level of increased risk the investor would have to accept if the assets are not perfect substitutes.

The variance of return on the portfolio, VAR(PORT), can be expressed as, 7/

1/ For a description of special characteristics of housing see Smith et al. (1988).

2/ Ibbotson and Siegel (1984) point out that these marketability costs must be taken into account when comparing real estate returns with those on stocks and bonds.

3/ Bossons (1978) discusses the portfolio motives for holding housing assets.

4/ Zerbst and Cambon (1984).

5/ For a summary of several of these studies, see Irwin and Landa (1987).

6/ Lehmussaari (1987) has shown how the results may vary if one allows for changing covariances over time. Frankel and Engel (1984) among others allow for flexible expected rates of return.

7/ The expected rate of return on the portfolio can be expressed simply as a weighted average of the returns on the individual assets.

$$VAR\ (PORT) = \sum_i s_i^2\ VAR\ (S_i) + 2 \sum_i \sum_j s_i\ s_j\ COV_{i,j} \qquad (1)$$

where s_i equals the share of the asset in the portfolio, $VAR(S_i)$ equals the variance of the rate of return on the asset and the last term equals the covariance between assets i and j. 1/ The shares add up to unity. 2/

IV. Data Requirements

This section describes the assets included in the model and the data which has been used. The portfolio model requires data for expected rates of return for the assets, their variance, and each asset's covariance with every other asset. The data employed are primarily from Flow of Funds sources, compiled by the Federal Reserve. The rates of return are estimated on historical data for the period from 1972 to 1987 using mainly quarterly data which are annualized. The average rates of return are used as proxies for expected rates of return in the future. For each of the assets, a more detailed description of data sources and definitions is provided in the appendix.

1. Rates of return on the assets

The calculations of the rate of return on housing takes account of several important features of the housing market and tax policy--notably that housing investment is typically partially debt financed, that taxes are deductible for federal income tax purposes, and that significant transactions costs are associated with the purchase, maintenance, and sale of housing. 3/ The formula which emerges for the rate of return on housing can then be expressed as:

$$RRHOUSE = \frac{PROPV_{t+1} - PROPV_t}{(1-\alpha)} - r * (1\text{-}TOTMTAX) * \frac{\alpha}{(1-\alpha)} - \frac{PROPTAX * (1\text{-}TOTMTAX)}{(1-\alpha)} - TCOST \qquad (2)$$

1/ The covariance is closely linked to the correlation coefficient, μ_{ij}, which can be expressed as $\mu_{ij} = (\sigma_{ij}/\sigma_i\sigma_j)$, where σ_{ij} equals the variance-covariance matrix of the returns of the assets and $\sigma_i\sigma_j$ is the product of the standard deviation of the returns on assets i and j. The correlation coefficient will be within the range of minus 1 and plus 1.

2/ In the model presented below, it is assumed that the shares have to be non-negative.

3/ The rate of depreciation is implicitly assumed to equal the consumption of housing services.

The notation is as follows:

RRHOUSE = rate of return on housing investment.

$PROPV_t$ = housing price at time t.

r = mortgage interest rate.

TOTMTAX = estimated total marginal tax rate (federal plus state and local income tax rate).

PROPTAX = estimated property tax rate.

TCOST = estimated housing transactions costs on an annual basis.

α = the debt share in housing financing.

The rate of return on the least risky asset--designated here as bonds--is calculated as a weighted average of the after tax rates of return on bank deposits, the yield on ten-year treasury securities and the yield on triple A corporate bonds. The weights reflect their respective shares in household wealth.

The net rate of return on stocks takes into account dividends as well as capital gains. The rate of return on stocks can be summarized as:

$$(1-TOTMTAX)*DIV + (1-CGTAX)*CAPGAIN \qquad (3)$$

where

DIV = dividend yield

CAPGAIN = capital gains on an annual basis

CGTAX = effective tax rate on capital gains (losses).

The three assets yield different rates of return and have different risk characteristics. Data indicate that the least risky asset, bonds, has had a low rate of return while stocks, on average, have had a high but very volatile rate of return. The rate of return and the risk level of housing lies somewhere in between the two other assets.

CHART 2

RATE OF RETURN ON HOUSING AND ITS SHARE IN THE TOTAL PORTFOLIO

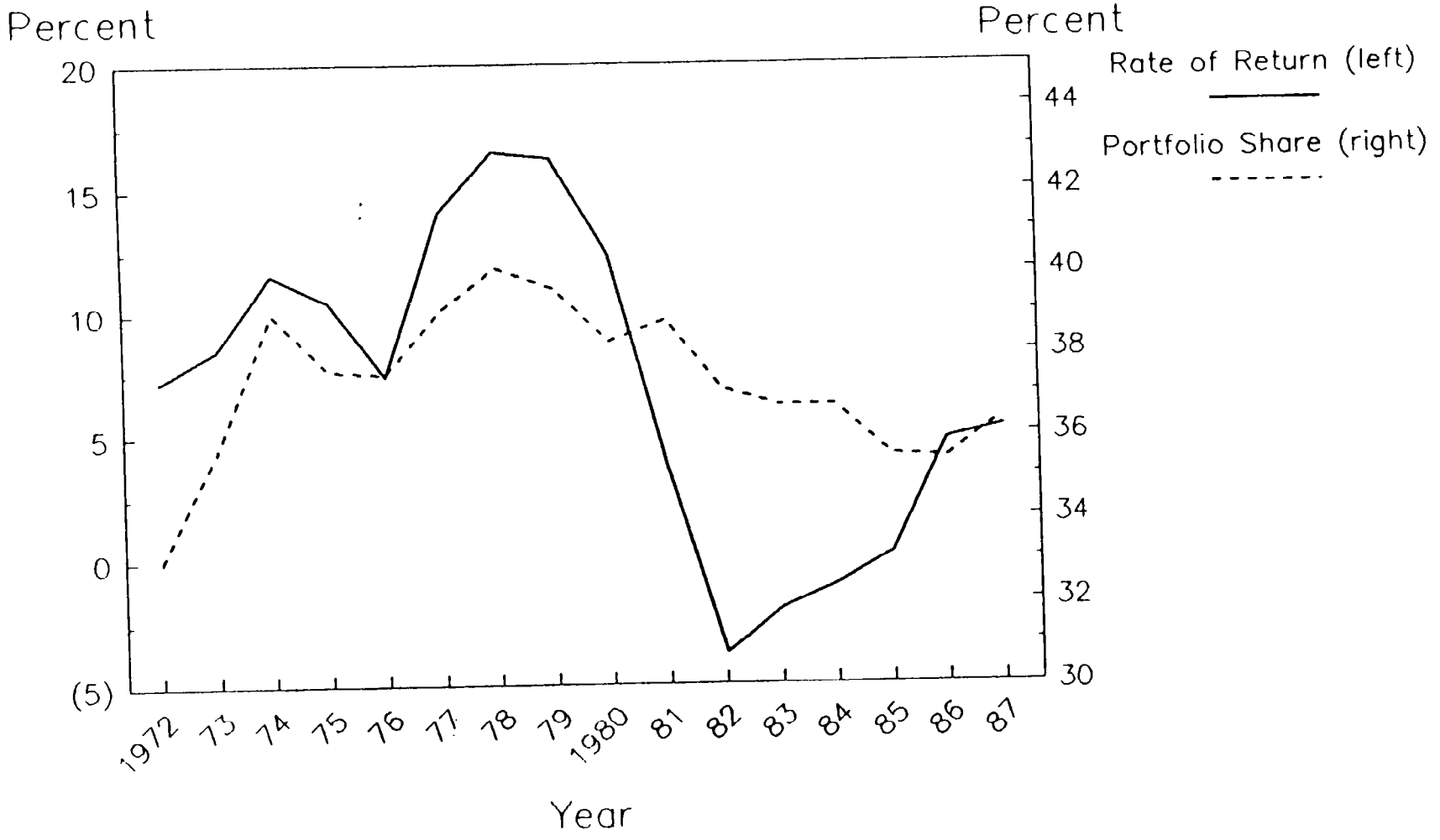


Table 2. Rates of Return and Correlation Coefficients, 1972-1987

	Housing	Bonds	Stocks
Rates of return			
Mean	7.0	4.6	10.6
Maximum	16.6 (1978)	5.3 (1983)	35.7 (1983)
Minimum	-3.7 (1982)	4.1 (1972)	-14.2 (1974)
Standard deviation	5.9	0.4	12.6
Correlation matrix			
Housing	1.000		
Bonds	-0.754	1.000	
Stocks	-0.334	0.121	1.000

As regard the covariance of the assets, data indicate that the returns on stocks and housing tend to move in opposite directions (have a negative correlation coefficient) while the returns on bonds and stocks are positively correlated, albeit slightly. The returns on housing and bonds are highly negatively correlated. The average rate of return for the period 1972 to 1987, and the correlation coefficients are listed in Table 2 above.

2. Actual portfolio shares

Using the Federal Reserve's Flow of Funds data on year-end levels of these assets, the shares of three broad categories of household wealth--housing, bonds, and stocks--were calculated. In allocating the total portfolio of the households into those three assets, housing is defined to include all tangible assets while bonds are defined to include deposits, credit market instruments, and pension fund reserves, and stocks are defined to include corporate equities and equity in non-corporate business. 1/

The share of the portfolio invested in housing increased from around 30 percent in the late 1960s to 40 percent in the late 1970s. The rate of return on housing increased during this period (Chart 2). However, in the early 1980's, the rate of return on housing decreased

1/ Another method of calculating portfolio shares would involve narrower definitions of each of these three asset categories and obtaining the shares by dividing each of those by a lower total wealth. However, the assets shares would not have changed much if the alternative approach had been taken.

significantly and in some years it was even negative. The share of household wealth in housing declined during this period but resumed its rising trend when the rate of return started to increase again. As expected, the share responds only slowly to changing rates of return.

V. Calibration of the Model

Assuming that the average rates of return and levels of risk obtained in the previous section are representative of what an investor may expect, it is possible (by minimizing the risk for different expected rates of return) to trace the frontier of efficient portfolios. The risk increases with the required rate of return. The portfolio with the least risk (which involve practically no risk at all) would consist of 94.5 percent bonds, half a percent stocks, and 5 percent housing, and would have yielded a rate of return of 4.78 percent.

The actual portfolio held by the average U.S. investor in 1987 was very different from the least risk portfolio (Table 3). As the investor requires a higher rate of return, the composition of the portfolio shifts in favor of housing and stocks. With increasing shares invested in stocks, an investor can achieve a very high rate of return but the risk associated with such a portfolio will be large compared to portfolios with a lower rate of return.

Chart 3 shows how the allocation of the portfolio changes as the required rate of return increases. At a required rate of return of 6.95 percent, the composition of the observed portfolio and the risk-minimizing portfolio is rather similar.

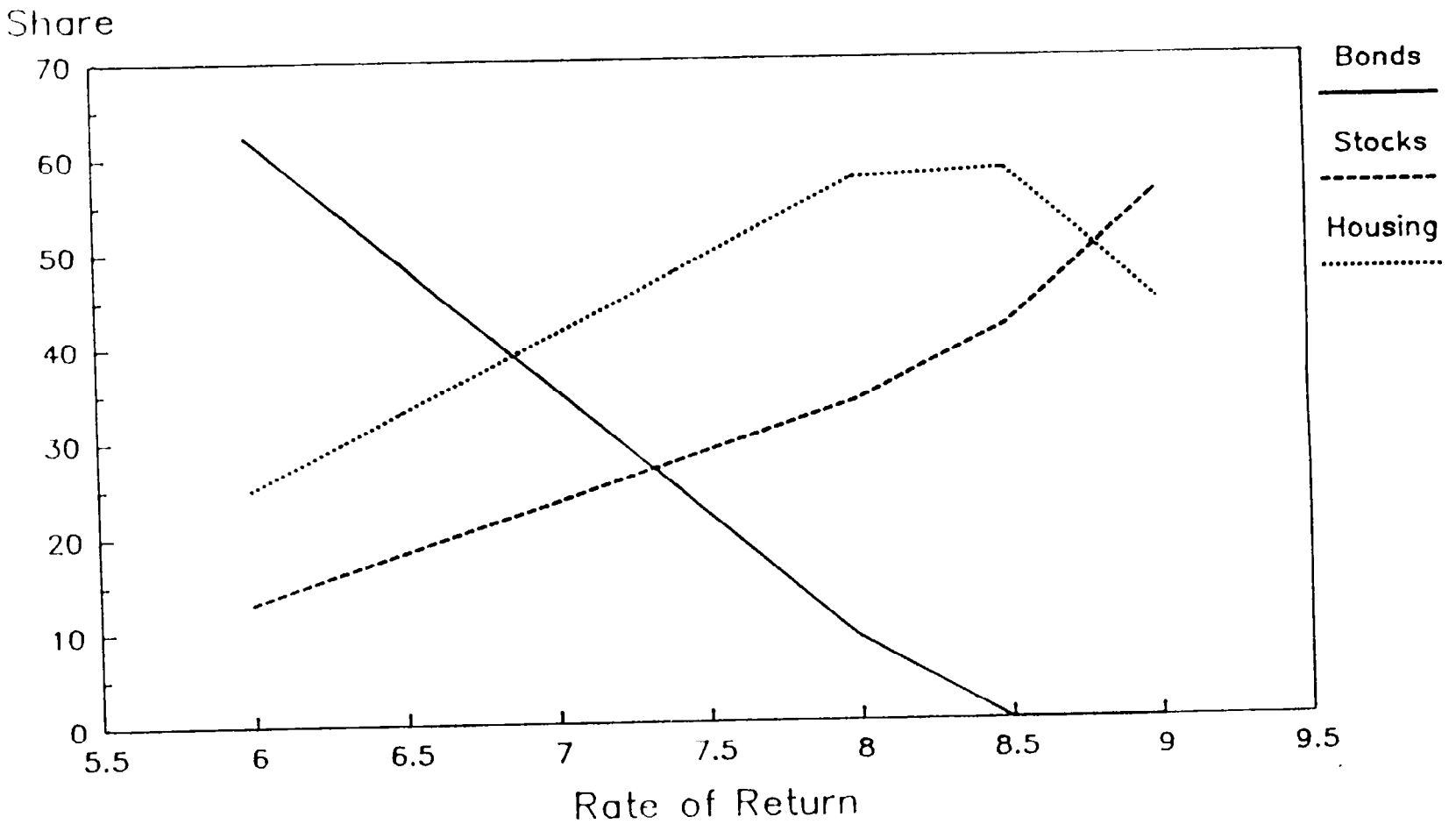
Table 3. Shares in the Total Portfolio in 1987 and in the Model With a Required Rate of Return of 6.95 Percent

Share	Housing	Bonds	Stocks
1987	36.5	37.2	26.3
Model	40.3	36.8	22.9

VI. The Tax Deductibility of Mortgage Interest Payments

This section discusses how limiting the deductibility of mortgage interest payments could bring about a more efficient allocation of savings and analyzes the nature of the adjustments that might be involved. Such a tax change would initially result in capital losses for home owners, an adjustment which would be required to equalize the after-tax

CHART 3
SHARE OF ASSETS IN THE PORTFOLIO
Base Case



rates of return across alternative assets (adjusted for risk). The decline in the relative price of housing then would induce the response of the supply of resources to the housing sector. Investment in that sector would be discouraged and the stock of housing would be progressively reduced compared with what it otherwise would have been. The process would involve a recovery of the price of housing and would continue until the price returns to a level that covers resource costs.

The forces driving the adjustment can be considered by analyzing how an individual investor would react to the change in the tax code, holding other factors constant. On the basis of equation (2) in the portfolio model at hand, the investors would then find that the rate of return on housing has decreased by 2.2 percentage points from 7 percent to 4.8 percent. 1/ On the basis of this information, new shares in the portfolio with minimum risk can be found corresponding to each expected rate of return.

In considering how investors might react to this changed environment, two polar cases can be distinguished. One is the case when the investor requires the same rate of return as before the change despite the fact that one asset, housing, now yields a considerably lower rate of return. To get that rate of return, the investor must hold more of the risky asset, i.e., stocks, and the risk of the overall portfolio increases. The other polar case is one in which the investor requires the same risk level as before but will accept a lower rate of return. However, the investor does not fall into either of these polar cases but he is willing to trade off rate of return for a lower risk level and find a risk-return combination which is superior to the two polar cases. 2/

The result from the model simulation (shown in Chart 4) indicate that the trade off between rate of return and risk leads to the new optimum portfolio that yield the rate of return of 6.7 percent (down from 6.95 percent before the change in the tax code but higher than a rate of return of 6.24 percent that the investor would have to accept if he wished to keep the risk level unchanged). The share of housing

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1/ When simulating the change in tax policy, the variance-covariance matrix is assumed to be unchanged. However, re-estimating the variance-covariance matrix with the new rates of return on housing does not lead to any significant changes of the result (the change in the share of the housing is within 1 percentage point).

2/ By assuming that the household could have chosen any other portfolio they reveal their preferences for risk versus rate of return. Using this information for the relevant interval of rates of return, a superior combination between the two polar cases can be found.

decreases from 40.3 percent to 26.5 percent 1/ while the share invested in stocks would increase from 22.9 percent to 33.9 percent. The share of bonds would increase somewhat.

The specific results that have been derived are based on a portfolio model in which the individual looks only at the rate of return and risk but has no other preferences for any particular asset. There are, however, reasons for believing that the share of housing would decrease by somewhat less because of a variety of general equilibrium effects and, in addition, because there are other, non-monetary, returns connected with investment in housing: the benefits of living in a certain area, the correlation with the rental market, etc. If the assets are imperfect substitutes, i.e., individuals have preferences for certain assets beyond their risk/return characteristics, they would be willing to accept a lower rate of return or a higher risk level to have that asset in their portfolio. Section 8 below analyzes the implications of such preferences.

VII. Distributional Effects

On the basis of portfolio considerations, the share allocated to housing would be relatively small for an investor who requires a low rate of return, while it would be considerably larger for an investor demanding a relatively high rate of return (see Chart 3). Chart 5 shows what percent of the original housing share is maintained after mortgage interest deductibility is eliminated for investors with different required rates of return. The investor requiring a low rate of return would retain almost 80 percent of his initial housing share while the investor requiring a higher rate of return would only retain around 65 percent of his initial housing share. Chart 6 shows how the shares would change for all three assets for an investor requiring a 6 percent rate of return or an 8 percent rate of return.

The fact that different categories of investors will shift away from housing to different extents may mean that the elimination of the deductibility of mortgage interest payments would affect expensive and inexpensive housing units differently. When individuals demanding high rates of return (typically high income earners) shift from housing to other assets, they are likely to demand less expensive housing units. Consequently, the demand for high priced housing units is likely to fall and the price to drop, while the demand by these individuals for low and middle priced housing may increase relative to high priced housing. According to the model, those investors already buying low and middle priced housing will not shift as much away from housing investment.

1/ An alternative approach, assuming that the tax effect is fully capitalized into the value of housing, result in a decrease of the existing housing shock from 36.4 percent in 1987 to 25.5 percent, i.e., by some 30 percent.

CHART 4

DEMAND FOR HOUSING:

With and Without Mortgage Deductibility (against federal income taxes)

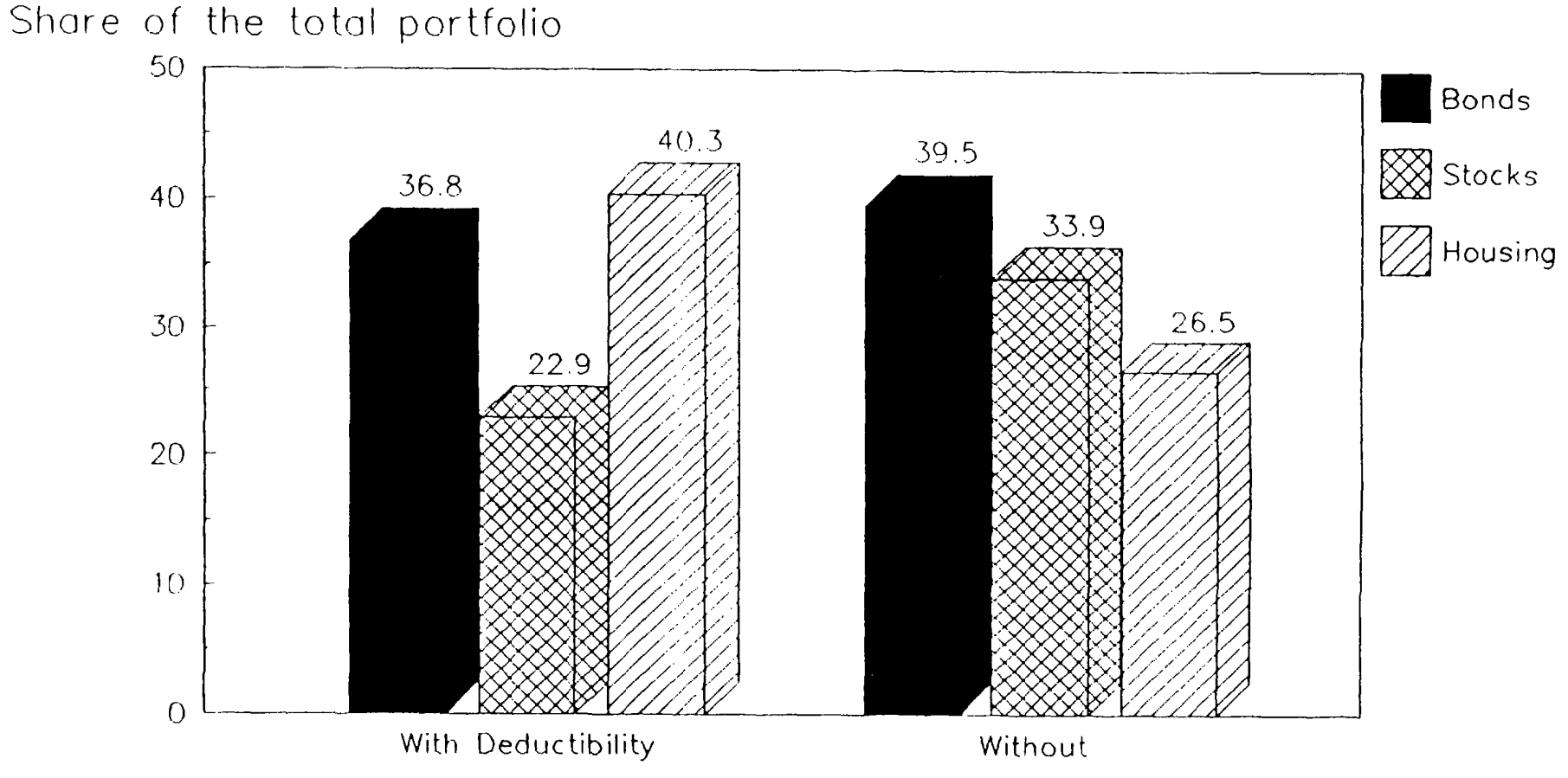


CHART 5

RELATIVE SHARE OF HOUSING TO ITS PREVIOUS LEVEL

(100=unchanged level)

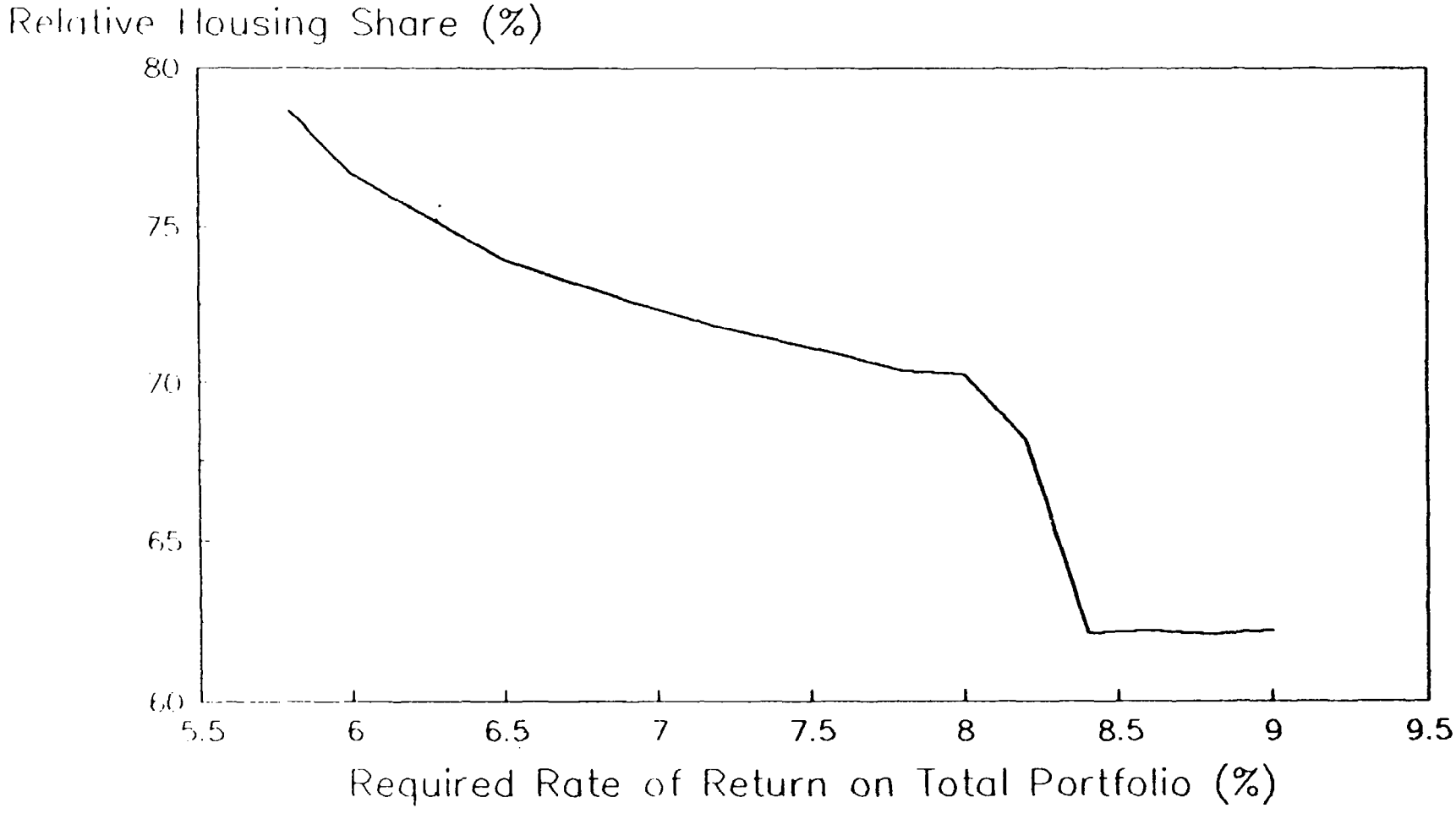
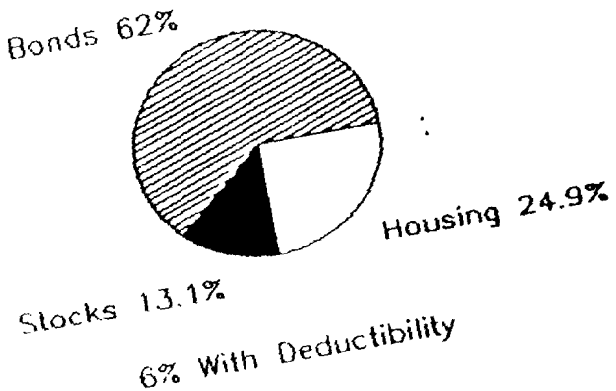
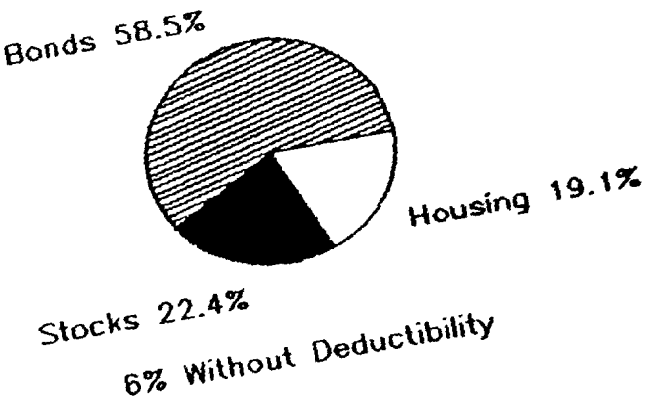
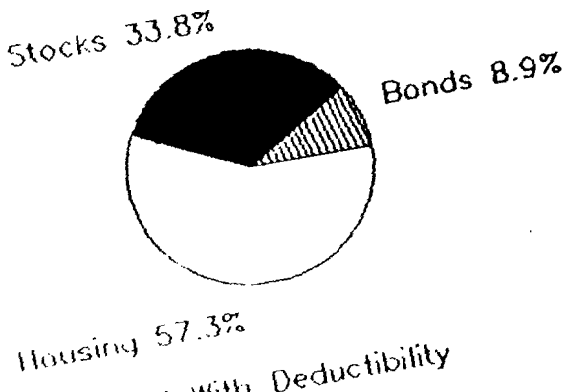


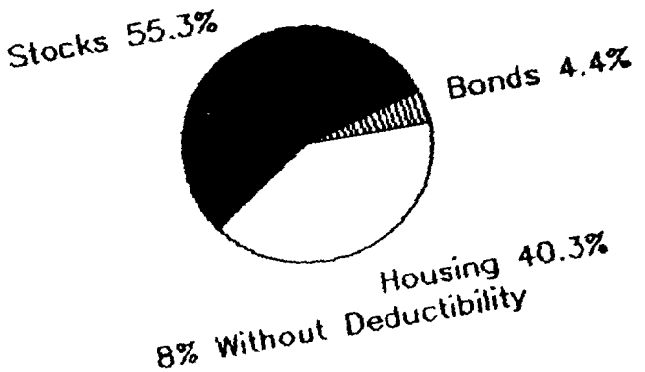
CHART 6

SHARES OF ASSETS IN TOTAL PORTFOLIO AT DIFFERENT REQUIRED RATES OF RETURN









Overall, the increased relative demand for low to middle priced housing may partly offset the decrease in the rate of return on such housing. Thus, the effect of the change in the tax rules on housing prices may be largest for expensive houses.

VIII. Imperfect Substitutability of Assets

This section introduces the possible role of asset characteristics other than risk and return. An individual's preferences for different attributes of assets will determine how willing he is to substitute one asset for another. Assuming for simplicity that all assets can be grouped into two categories, housing, H, and financial assets, FIN, a preference structure can be readily expressed.

It may be noted that if there is no substitutability at all between assets, the preference structure is of the Leontief type. A less extreme case is constant expenditure shares, the Cobb-Douglas case. Another case is when the individual has no preferences between the two assets (separate from their risk/return characteristics), i.e., they are perfect substitutes. In general terms the preference structure can be formalized in the following way:

$$U = U(H,FIN) = [g*H^{rho} + (1-g)*FIN^{rho}]^{1/rho}$$

where g is a share parameter and rho is an elasticity parameter. How much an individual changes his portfolio will depend not only on these parameters but also on the expected rates of return and risk characteristics of the assets. By assuming that investors are rational, the share parameters can be calibrated from actual portfolio shares (since the rates of return are already known). By assuming a value for rho, it is possible to calculate how much the portfolio will shift when the rates of return are changed. 1/

Two cases are considered. In the first, rho is equal to 0 (an elasticity of substitution of 1), implying that the investor has only limited preference for housing. In this case, the housing share decreases from 40 percent to almost 31 percent (at a required rate of

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1/ The optimality condition shows that the shares of the assets depend on prices and share parameters in the following way:

$$H = \left|\frac{RH}{RFIN}\right|^{\tau} * \left|\frac{g}{(1-g)}\right|^{\tau} * FIN$$

τ is equal to 1/(rho-1). g is a share parameter. RH is the rate of return on housing and RFIN the rate of return on financial assets.

return of 6.7 percent) when the federal tax deductibility of mortgage interest is eliminated. In the other case, the individual has strong preferences for housing. 1/ This translates to a rho equal to -1 (an elasticity of substitution of .5). 2/ The housing share in this case decreases from 40 to 36 percent when the deductibility of mortgage interest is removed.

In the context of the model at hand, imposing a preference structure on the maximization problem results in a higher level of risk compared to the case when the assets are perfect substitutes. However, for a relatively small increase in the risk level, a portfolio allocation with a larger housing share can be obtained. 3/ The main effect on the other shares in the portfolio in this case, as it turns out, is almost a one to one trade off of bonds for housing. Stocks are affected only to a limited extent because of the positive correlation between bonds and stocks in combination with a negative correlation between housing and stocks (Chart 7).

The inclusion of imperfect substitutability of assets makes the portfolio model more realistic. An elasticity of substitution between .5 and 1 may be plausible, in which case eliminating the deductibility of mortgage interest when calculating the federal income tax would then result in a decrease in the housing share by some 4-9 percentage points. A shift to other assets, primarily corporate stocks would take place.

IX. Alternative Policy Measures to Promote an Efficient Allocation of Resources

As observed earlier, mortgage interest is deductible in the United States even though the imputed income from housing is not taxed. The fact that interest on loans taken for business purposes is tax deductible, and likely to remain so in the future, could make it difficult to remove the deductibility of mortgage interest from an administrative point of view. Such a tax change would create incentives for tax arbitrage (to transfer loans from mortgages to business loans or to set up businesses whose only purpose would be to enable the homeowners to deduct their interest payments).

With this in mind, an alternative way to achieve a symmetric tax treatment would be by taxing imputed income from housing. Since most

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1/ The individual in this case has a preference structure which is less elastic than the Cobb-Douglas case but more elastic than the Leontief case.

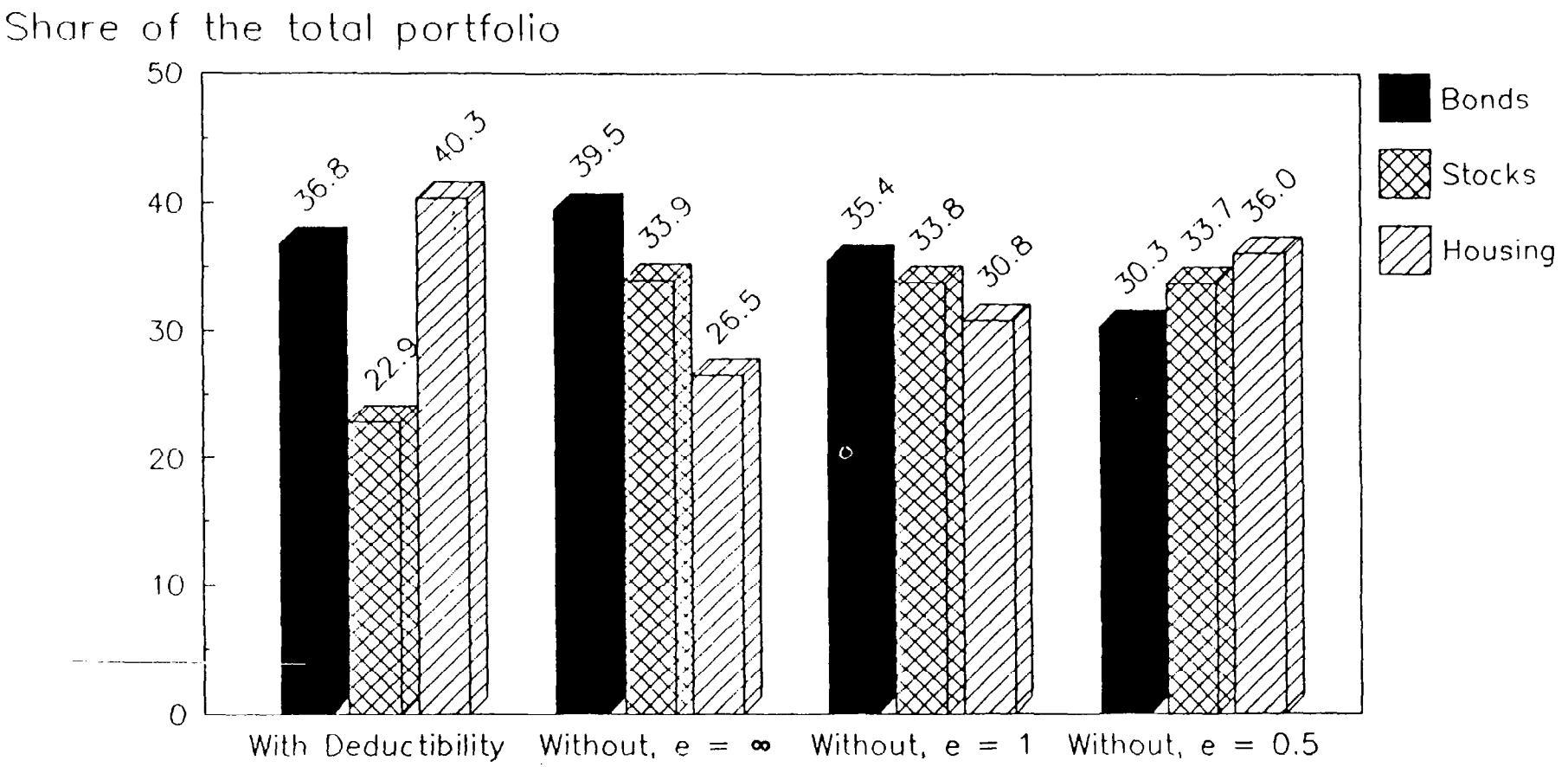
2/ McGibany and Nourzad (1988) estimate that the elasticity of substitution between net private capital and long-term government bonds and notes is as low as .3.

3/ The increase in risk will be larger the more inelastic the preferences are.

CHART 7

DEMAND FOR HOUSING:

With and Without Mortgage Deductibility (against federal income taxes)



e = elasticity of substitution between housing and financial assets

homes are assessed a value for property tax purposes, these values could provide a basis for calculating an imputed rental income for tax purposes. A main problem with this approach is that the value of property assessed for property taxes is in many cases far below the market value. 1/

Another alternative would be to raise the effective tax rate for capital gains arising from houses. The existing provisions make the effective capital gains tax rate close to zero. 2/ One argument for raising the capital gains tax rate on housing is that the preferential tax treatment has increased demand for housing and thereby induced some of the capital gains. Of course, only real, not nominal, capital gains should be subject to a higher effective capital gains tax, and inflationary gains should not be taxed. The general equilibrium effects of such a policy including a possible increase in labor market immobility would have to be carefully considered before such a tax change is enacted. Other potential negative effects could include increased lock-in effect of capital gains.

X. Conclusion

The asymmetric tax treatment of different assets, whether intended to achieve social goals or other objectives, is likely in general to hamper efficiency. In the specific case considered here, to the extent that the favorable tax treatment of housing diverts funds from other investment, it induces an inefficient allocation of saving and investment. 1/

The results from the mean-variance portfolio model in this paper indicate that the elimination of the federal income tax deductibility of mortgage interest payments would cause individuals to shift their investment from housing to assets with higher returns, largely stocks. The extent of the portfolio adjustment would be greater for those who, other things being equal, are more willing to assume larger risks to achieve higher returns. If individuals have strong preferences for housing, and regard stocks only as an imperfect substitute for housing for investment purposes, the effect would be smaller than in the case of perfect substitutability. Under such an assumption, a decrease in the housing share in the portfolio resulting from the elimination of

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1/ This is a problem when calculating property taxes as well.

2/ For a discussion of the capital gains tax treatment, see Andersson (1989).

1/ Although the research on income tax incentives and its effects on housing has taken numerous approaches, the studies have reached remarkably similar conclusions; tax preferences have favored investment in housing, raised the price of houses and directed resources in favor of housing and away from other capital uses. For a summary of different approaches and studies on homeownership, see L. Smith et al. (1988).

mortgage interest deductibility for federal ncome tax purposes is likely to be in the range of 4-9 percentage points.

The general equilibrium effects of this policy change would be complicated as all asset prices in the economy would change to some extent. In the short run, the elimination of mortgage interest deductibility could entail some adjustment problems, including those related to capital losses for homeowners. These losses would probably be greater for those who have invested in high price homes. In the long run, a more efficient resource allocation would be likely to lead to increased production capacity.

Appendix

A Description of Data Used

1. The rate of return on housing

The rate of return on housing is calculated in the following way. The value of houses is represented by the median sales price of existing single family homes, 1/ PROPV, and the mortgage interest rate is measured as the effective conventional mortgage rate for all homes. 2/ The tax rate used is the marginal income tax rate, TOTMTAX, which is the combined federal and state and local income tax rate. The federal income tax rate is calculated as the average marginal tax rate for a family of four with twice the median income. 3/ The state and local marginal income tax rate is calculated as the ratio of state and local personal tax receipts from income taxes to personal income. 4/

The debt share, α, is calculated as the share of outstanding mortgages to the market value of the housing stock, PROPV. 5/ The property tax rate, PROPTAX, is calculated as the ratio of property tax revenues to the market value of housing.

The transaction cost connected with the purchase and sale of housing, TCOST, is estimated to have been in the range of 1 to 2 percent on an annual basis. The average holding period of a house is assumed to be seven years. 6/ Taking into account that the estimated capital gains also include the increase in the value of the house due to improvements of the house, the total cost, including transaction costs, is estimated to be 2 percent on an annual basis.

2. The rate of return on bonds

The net of tax nominal rate of return on the least risky asset, bonds, is calculated as a weighted average of the rate of return on bank deposits; 7/ BDEP, the yield per annum on treasury securities at constant maturity of ten years, 8/ TSEC; and the yield per annum on triple A

1/ Compiled by the National Association of Realtors.
2/ Compiled by the Federal Home Loan Bank Board.
3/ From the Office of Tax Analysis, U.S. Department of the Treasury.
4/ From U.S. national accounts sources.
5/ The share has varied from 41 percent in 1972 to 36.1 percent in 1978 and 1981 and up to a maximum of 43.9 percent in 1987. Source: Balance sheet of the U.S. economy, The Federal Reserve Board.
6/ Based on surveys by the National Association of Realtors.
7/ Measured as the effective interest rate on passbook savings in the Federal Reserve Quarterly Model of the U.S. economy.
8/ Board of Governors of the Federal Reserve System statistical release G.13.

corporate bonds, 1/ CORPBOND. The rate of return on the composite "safe" asset can be written:

(.1*CORPBOND + .25*TSEC + .65*BDEP) * (1-TOTMTAX)

3. The rate of return on stocks

Dividend price ratio, DIV, are obtained from Standard & Poor's (S&P's) 500 composite series taking into account the value of the stock at the beginning of the period. 2/ Capital gains, CAPGAIN, are calculated from the annual change of the S&P's index. An accrued capital gains tax rate, CGTAX, is applied to capital gains 3/ while losses are assumed deductible against the statutory capital gains tax rate, 4/ and the rate of return on stocks can be summarized as:

(1-TOTMTAX)*DIV + (1-CGTAX)*CAPGAIN

1/ Measured as yield on Moody's AAA corporate bonds, supplement to Banking and Monetary Statistics, section 12, statistical release G.13, FRB.

2/ Average of Wednesday figures from "Standard and Poor's Current Statistics" and "Outlook".

3/ Capital gains are taxed when realized. The accrued capital gains tax rate has been obtained from Fullerton, A. D., and M. Karayannis, "The Taxation of Income from Capital in the United States, 1980-86, NBER Working Paper 2478. For the period before 1972 to 1979, the statutory capital gains tax rate was unchanged (28 percent) and the accrued capital gains tax rate of 1980 has been applied.

4/ Capital losses may be used to offset capital gains and to some extent ordinary income (up to $3,000).

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