

Estimating the Value of Swiss Residential Real Estate

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1. INTRODUCTION

The testing of financial models depends heavily upon the quality of the data used to test these models. ROLL (1977), for instance, argues that the CAPM cannot be tested because of the lack of an appropriate market index. Constructing indices is a difficult task for all asset classes but is particularly troublesome in the case of real estate. Due to the infrequent trading and heterogeneity of this asset, data on real estate values are scarce. This has two important consequences for the building of real estate and/or overall indices. First, total returns (i.e. returns which include both the income and capital gain components) cannot be computed. Second, the appropriate weights for each asset class are unknown: should real estate e.g. constitute 20%, 30% or even 50% of the overall market index?

Several techniques can be used to approximate the evolution of real estate assets' values in order to compute total returns. HOESLI and ANDERSON (1991) show, for instance, that the data pertaining to real estate mutual funds should constitute a good proxy for Swiss real estate. Very few attempts have been made at determining the weights which should be given to each asset class when building an overall market index. This step requires that we know the total value of each asset class (stocks, bonds, real estate, gold,...).

IBBOTSON, SIEGEL and LOVE (1985) estimate the total world wealth at US\$27,681.5 billion (Sfr. 71,556.7 billion) as of 1984. Fixed income securities represent 13.3% (\$3,692.1 billion), stocks 11.6% (\$3,214.4 billion) and metals 3.4% (\$932.0 billion). Real estate constitutes by far the largest "piece of the pie", i.e. 55% (\$15,177.9 billion) of world wealth. Two thirds of this amount (\$10,204.5 billion) is located outside the United States and one third (\$4,973.4 billion) in the U.S.

For the U.S., several other sources are available [for a survey, see MILES (1990)]. These various value estimates are refined by MILES, PITTMAN, HOESLI, BHATNAGAR and GUILKEY (1991). These authors use regression analysis based on property tax records and find an estimate of \$2.7 trillion for commercial and industrial real estate and of \$6.1 trillion for residential real estate as of 1990¹. The MILES et al. (1991) estimate for residential real estate is consistent with the number published by the OECD (1991) and

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1. These estimates are further broken down by state.

gives support to their work. Thus, the estimates of IBBOTSON, SIEGEL and LOVE seem to undervalue U.S. real estate by approximately 30% even when inflation is taken into account.

The OECD also publishes value estimates for residential real estate in several other countries. For 1989, these estimates amount for example to Sfr. 2.1 trillion for France, Sfr. 1.4 trillion for the U.K., and Sfr. 2.8 trillion for Germany². No such official statistic is available for Switzerland; the only data available are those computed by researchers, in particular by GOLDSMITH (1981) who estimates the value of capital as of 1978.

The purpose of this paper is to estimate the value of Swiss residential real estate as of 1990 using two alternative methods. Some insight is also given as to the value of non-residential real estate. These estimates are compared in particular with the value of Swiss stocks and bonds and used to size the overall Swiss market. These results should be of interest to Swiss investors in that they will gain knowledge as to the relative weights of these asset classes in the country. This should help them construct better diversified portfolios. For foreign investors, the results should give insight as to the relative size of the Swiss real estate market by comparing our estimate to the \$10 trillion estimate made by IBBOTSON, SIEGEL and LOVE (1985) for non-U.S. real estate. This is of particular interest because the Federal Law which prevents foreigners from buying Swiss real estate³ most probably will be abolished in the future despite the December 1992 negative vote of Switzerland regarding the European Economic Area.

The paper is organized as follows. In Section 2, we make use of the perpetual inventory method to estimate the value of Swiss residential and non-residential real estate. In Section 3, we use the income capitalization method to derive an estimate for Swiss residential real estate. In Section 4, we reconcile our value estimates and in Section 5 we estimate the size of Swiss investable wealth. Finally, we conclude in Section 6.

2. THE PERPETUAL INVENTORY METHOD

According to this method, the value of capital is computed as the sum of the value of capital at the end of the previous year⁴ plus the capital expenditures of the current year minus the depreciation of capital⁵. Formally:

$$K(t) = K(t-1) + I(t) - D(t)$$

2. The figures in Sfr. are based on the exchange rates as of the end of the year. The values in local currencies are FF 7.7 trillion, £555.3 billion, and DM 3.1 trillion.

3. Restrictions on the purchase of Swiss real estate apply to foreign investors not residing in Switzerland. According to the Federal Law on acquisitions of real estate by non-residents ("Lex Friedrich"), the purchase of real estate is subject to authorization by the appropriate state authority. These restrictions do not concern, however, investments in real estate mutual funds which are quoted on an official stock exchange.

4. The previous estimate of the value of capital has to be converted to current prices. This is achieved on the basis of the price index for gross fixed capital formation.

5. Readers who are familiar with real estate appraisal will have noticed the similarities between this method and the depreciated cost approach to determining the value of real assets.

where

- $K(t)$ = value of capital at the end of year t
- $K(t-1)$ = value of capital at the end of year $t-1$
- $I(t)$ = capital expenditures during year t
- $D(t)$ = depreciation of capital between the end of year $t-1$
and the end of year t

An initial value for K [$K(0)$] is needed in order to construct the series. Estimates for $K(0)$ are available however in most countries. The farther $K(0)$ is set back in time, the smaller the impact of discrepancies in the initial value estimate on $K(t)$ will be. The investment expenditures [$I(t)$] can be found in the national accounts. They include the construction costs (for real estate) or the manufacturing costs (for machinery and equipment). For real estate, these expenditures obviously do not include the price of the land on which the construction is made. Measuring depreciation is difficult which explains why some authors compute the value of capital before depreciation. For long time-periods, however, it is unrealistic not to take into account depreciation: this leads to upwardly biased estimates of value.

In Switzerland, there are no official statistics regarding the value of capital but several authors have computed the value of capital at different time points. One of the best known studies is that by GOLDSMITH (1981) who reaches an estimate for overall capital value of Sfr. 642.7 billion as of 1978. GOLDSMITH, however, does not break down this estimate into subcategories (residential real estate, non-residential real estate, equipment,...).

To construct our series, we use the 1978 overall figure computed by GOLDSMITH (1981) and break it down into the four categories based on the percentages computed by FAVARGER (1992). The latter author uses survival functions to estimate the productivity of capital before depreciation and decomposes the overall figure into the following categories: residential real estate, non-residential real estate, civil engineering, and machinery and equipment. These percentages amount for 1978 to 31.0% for residential real estate, 23.7% for non-residential real estate, 20.6% for civil engineering and 24.7% for machinery and equipment⁶. The figures for each category can be read on the first line of Table 1 and amount to Sfr. 199.0 billion, 152.6 billion, 132.7 billion and 158.4 billion, respectively. The estimates for subsequent years are computed using the perpetual inventory method for each category. The results reported in Table 1 are based on the depreciation rates used in the national accounts, i.e. 1.5% for residential real estate, 3.3% for non-residential real estate, 1.5% for civil engineering, and 10.0% for machinery and equipment. These rates imply that the economic life of these assets is 67 years for residential real estate, 30 years for non-residential real estate, 67 years for civil engineering, and 10 years for machinery and equipment.

6. These percentages are fairly constant through the 1948-1986 time period examined by FAVARGER (1992). Had we chosen another starting point, the decomposition would have been fairly similar.

Table 1: Value estimates for residential real estate, non-residential real estate, civil engineering, and machinery and equipment using the perpetual inventory method (Sfr. billion)

| Year | Residential real estate | Non-residential real estate | Civil engineering | Machinery and Equipment | Total |
|------|-------------------------|-----------------------------|-------------------|-------------------------|--------|
| 1978 | 199.0 | 152.6 | 132.7 | 158.4 | 642.7 |
| 1979 | 214.6 | 162.1 | 141.4 | 147.5 | 665.6 |
| 1980 | 236.9 | 176.6 | 162.0 | 151.7 | 727.2 |
| 1981 | 262.3 | 193.6 | 176.8 | 156.4 | 789.1 |
| 1982 | 281.0 | 206.3 | 187.1 | 158.2 | 832.6 |
| 1983 | 290.8 | 211.7 | 190.9 | 160.8 | 854.2 |
| 1984 | 301.4 | 217.3 | 194.6 | 162.2 | 875.5 |
| 1985 | 317.8 | 227.2 | 201.5 | 173.3 | 919.8 |
| 1986 | 341.4 | 243.4 | 212.8 | 170.2 | 967.8 |
| 1987 | 364.2 | 259.4 | 223.0 | 174.1 | 1020.7 |
| 1988 | 397.6 | 284.1 | 239.6 | 186.4 | 1107.7 |
| 1989 | 435.7 | 313.1 | 258.2 | 205.2 | 1212.2 |
| 1990 | 474.3 | 346.6 | 281.0 | 214.4 | 1316.3 |

Source: Total figure for 1978 as reported by GOLDSMITH (1981), all other figures computed by the authors.

For 1990, we obtain an overall value of Sfr. 1,316.3 billion. Residential real estate amounts to Sfr. 474.3 billion and non-residential real estate to Sfr. 346.6 billion⁷. It may seem surprising that the 1989 and 1990 values for real estate are higher than in 1988 despite the real estate crash which occurred at the end of the 1980s. This is due to the fact that the data are adjusted year by year using a gross fixed capital formation price index rather than a real estate price index (which does not exist). It can nevertheless not be inferred that the 1990 value for residential and non-residential real estate is overestimated because real estate values rose in numerous years at a much faster rate than that of gross fixed capital formation. This should more than compensate for the decline in real estate values which has taken place in recent years.

Simulations have also been conducted in order to identify if our results are sensitive to the depreciation rates used. If the economic life of the assets is hypothesized to be shorter than that used in the national accounts, i.e. equal to 50 years for residential real estate, 25 years for non-residential real estate, 50 years for civil engineering, and 6.7

7. The ratio of residential real estate value to non-residential real estate value is much smaller (1.4) than that computed by MILES et al. (1991) for the U.S. (2.3). This is due in large part to the fact that government buildings, schools, hospitals, etc. are included in our non-residential estimate whereas they are not in the estimate made by MILES et al.

years for machinery and equipment, we reach an overall value of Sfr. 1,208.2 billion. If we assume that the assets have a longer economic life (75 years for residential real estate, 40 years for non-residential real estate, 75 years for civil engineering, and 15 years for machinery and equipment), the overall figure amounts to Sfr. 1,405.3 billion. Under these two alternative hypotheses concerning depreciation rates, the value of residential real estate (not including land) amounts to Sfr. 453.5 billion and Sfr. 481.6 billion, respectively, and the value of non-residential real estate to Sfr. 327.4 billion and Sfr. 370.3 billion, respectively. This sensitivity analysis shows that the effect of changes in the economic life of the assets is small. For example, when the economic life of residential real estate is shortened from 67 years to 50 years, the value decreases by only 4.4%.

In order to give additional support to our results, we also computed the value estimates using different starting values. If the 1978 figure for capital value as computed by BÜTTLER, ETTLIN and RUOSS (1987) is used as starting value (Sfr. 558.6 billion vs. the Sfr. 642.7 billion estimate of GOLDSMITH), we reach an overall figure of Sfr. 1,229.4 billion for 1990. The value estimates for residential real estate and non-residential real estate amount in this case to Sfr. 440.1 billion and Sfr. 325.5 billion, respectively. We observe that the relative changes in the value estimates for 1990 are much lower than the relative change of 13.1% in the starting value; for example, the decrease in the residential real estate estimate only amounts to 7.2%. If the 1978 estimate of ZARIN-NEJADAN (1991) is used as starting value (Sfr. 592.0 billion, i.e. 7.9% less than the GOLDSMITH estimate), the results are even closer to those we initially obtained. The effect of a change in the initial capital value is reduced by the annual capital flows. Thus, if the period during which the analysis is conducted is long enough (in our case, 12 years), the effect of an error in the initial value is substantially diminished.

In the next section, we use the income capitalization approach to estimate the total wealth of residential real estate.

3. THE INCOME CAPITALIZATION METHOD

According to this method, the value of assets is obtained by dividing the income associated with these assets by an appropriate capitalization rate. Formally:

$$\text{Value} = \frac{\text{Income}}{\text{Capitalization Rate}}$$

To estimate residential real estate wealth, we first need to find the total income stream associated with residential real estate. The gross income is given by all rents or imputed rents for this type of asset. In order to reach an estimate for all rents, we use statistics published by the Bundesamt für Statistik (Swiss statistical office). This office computes both the number of units for various subcategories of residential real estate and the

average rent for each of these categories. By appropriately measuring the number of units in each category, and then multiplying the figure for each subcategory by the average rent of units in this category, it is possible to estimate the total income stream associated with residential real estate.

The 1980 census provides the basis for measuring the relative importance of residential units by date of construction and size of the units. Table 2 includes the number of units and the relative weight of each type of unit according to the date of construction and the size of the units. Unfortunately, the census could only be satisfactorily conducted for 2,348,756 units (930,206 units built before 1947 and 1,418,550 units built from 1947 to 1980), i.e. for approximately 87% of the total number of units in this country which amounts to 2,703,785 units. For our purpose, we use the relative weights derived from the census data to allocate the total existing units which were constructed before 1981 to the subcategories⁸. Complete statistics exist regarding units built from 1981 to 1990. We separate the units built in 1990 from those constructed between 1981 and 1990 because data regarding average rents are given for those two subperiods. Table 3 includes the number of existing units as of 1990 by date of construction and size. This table provides some interesting insight as to the age of Swiss residential properties. For instance, approximately 34% of existing units were built before 1947 and 86% of units were built prior to 1981.

Table 2: Number of units and relative weights according to date of construction and type of apartment⁹, for residential units built before 1981 (based on available census data)

| DATE OF CONSTRUCTION | TYPE OF APARTMENT | | | | | TOTAL |
|----------------------|-------------------|--------------------|--------------------|--------------------|--------------------|-----------------------|
| | Studio | 1-bedroom | 2-bedroom | 3-bedroom | 4+-bedroom | |
| Before 1947 | 45,935 (4.9%) | 123,272 (13.3%) | 267,555 (28.7%) | 226,624 (24.4%) | 266,770 (28.7%) | 930,206 (100.0%) |
| From 1947 to 1980 | 129,625 (9.1%) | 196,145 (13.8%) | 409,468 (28.8%) | 379,882 (26.8%) | 303,430 (21.5%) | 1,418,550 (100.0%) |

Source: Swiss statistical office and computations of the authors.

8. We hypothesize that the units demolished between 1980 and 1990 were units built prior to 1947.

9. We converted the Swiss units to U.S. units, e.g. a one-bedroom apartment consists of a bedroom, a living room and a kitchen.

Table 3: Number of units according to date of construction and type of apartment, for all residential units built before 1991

| DATE OF CONSTRUCTION | TYPE OF APARTMENT | | | | | TOTAL |
|----------------------|-------------------|-----------|-----------|-----------|------------|-----------|
| | Studio | 1-bedroom | 2-bedroom | 3-bedroom | 4+-bedroom | |
| Before 1947 | 53,325 | 142,739 | 309,825 | 262,425 | 308,963 | 1,077,277 |
| From 1947 to 1980 | 148,338 | 224,458 | 468,434 | 436,717 | 348,561 | 1,626,508 |
| From 1981 to 1989 | 20,608 | 53,068 | 85,147 | 127,370 | 126,022 | 412,215 |
| 1990 | 2,511 | 6,526 | 9,803 | 13,180 | 12,109 | 44,129 |

Source: Swiss statistical office.

Table 4: Average monthly rent for residential units, according to date of construction and type of apartment (Sfr.)¹⁰

| DATE OF CONSTRUCTION | TYPE OF APARTMENT | | | | |
|----------------------|-------------------|-----------|-----------|-----------|-----------|
| | Studio | 1-bedroom | 2-bedroom | 3-bedroom | 4-bedroom |
| Before 1947 | 489 | 559 | 663 | 801 | 1061 |
| From 1947 to 1980 | 498 | 664 | 801 | 1007 | 1370 |
| From 1981 to 1989 | 498 | 664 | 801 | 1007 | 1370 |
| 1990 | 670 | 1102 | 1531 | 1725 | 2362 |

Source: Swiss statistical office.

10. We use the same categories as those reported in Table 3. The Swiss statistical office uses only three categories (before 1947, from 1947 to 1989, and 1990), however, which explains why the average rent for the 1947-1990 and 1981-1989 categories are the same.

The average monthly rents for each subcategory are given in Table 4. As would be expected, the average rent is higher for more recent buildings. Interestingly, the increase in the average rent is in most cases larger for bigger units. The average rent for studios built from 1947 to 1980 is only 2% higher than that for units built before 1947, whereas the difference amounts to 26% for 3-bedroom apartments.

By appropriately multiplying the figures included in Tables 3 and 4, it is possible to derive the total rental income for each subcategory. The results are reported in Table 5¹¹. This table shows that the total monthly rents for residential real estate amount to Sfr. 2.9 billion; the annual rental income is thus equal to Sfr. 34.3 billion. The relative weights for each age group are as follows: 29.8% for units built before 1947, 53.1% for units constructed between 1947 and 1980, 14.5% for units built between 1981 and 1989, and 2.6% for units built in 1990.

Table 5: Monthly total rental income for residential units, according to date of construction and type of apartment (Sfr. million)

| DATE OF CONSTRUCTION | TYPE OF APARTMENT | | | | | TOTAL |
|----------------------|-------------------|--------------|--------------|--------------|----------------|----------------|
| | Studio | 1-bedroom | 2-bedroom | 3-bedroom | 4+-bedroom | |
| Before 1947 | 26.1 | 79.8 | 205.4 | 210.2 | 327.8 | 849.3 |
| From 1947 to 1980 | 73.9 | 149.0 | 375.2 | 439.8 | 477.5 | 1515.4 |
| From 1981 to 1989 | 10.3 | 35.2 | 68.2 | 128.3 | 172.7 | 414.7 |
| 1990 | 1.7 | 7.2 | 15.0 | 22.7 | 28.6 | 75.2 |
| TOTAL | 112.0 | 271.2 | 663.8 | 801.0 | 1,006.6 | 2,854.6 |

Source: Calculations of the authors on the basis of the data included in Tables 3 and 4.

The rental income constitutes a gross income. According to the income capitalization method however, one should capitalize the net operating income, i.e. the gross income minus the operating expenses. From a technical point of view, we reach the same result if we capitalize the gross income by an adjusted rate. Although the former approach is

11. The total rent for 4 and more-bedroom units is underestimated because the average monthly rent is only available for 4-bedroom units and not for larger units. The rent of single-family homes is thus not taken into account. We used this figure however to reach the total rental income of 4 and more-units. In Section 4, however, we adjust our value estimate in order to reduce this bias.

better from a theoretical standpoint, we use the latter approach in this paper because it is the most frequently used by professionals in Switzerland. If the gross income is capitalized in order to reach a value estimate, a premium must be added to the appropriate capitalization rate to account for the operating expenses.

Whatever approach is used, the capitalization rate includes a riskfree rate and a premium to compensate the investor for the risk taken as well as the illiquidity of the asset. On this basis, it seems reasonable to assert that the capitalization rate should be higher than the mortgage interest rate because the risk associated with an equity position is higher than that associated with a debt position. In reality, the capitalization rate can be smaller than the mortgage interest rate when investors anticipate a growth in the income stream. This conclusion is based on the dividend growth model which was first developed by J.B. WILLIAMS in 1938¹².

Selecting an appropriate capitalization rate is a difficult task and we should be aware that the value estimate is very sensitive to a variation in that rate. In our case, we use a rate of 7.75% which includes all the elements discussed above. It consists of the mortgage interest rate (6.5% in 1990) and a premium for operating expenses (125 basis points). We don't consider any additional risk premium to compensate for the higher risk associated with an equity position because we assume that this part of the risk premium is offset by the expected growth in income. This capitalization rate is in line with the rates used in 1990 by the management of Swiss real estate mutual funds in order to estimate the value of the funds' assets. The operating income (i.e. the rental income minus the operating expenses) of the properties held by Interswiss, for example, was capitalized at the rate of 6.6% in 1990. On the basis of the income capitalization method, we reach a value estimate of Sfr. 442.0 billion.

In the next section, we discuss some of the reasons which might explain the differences between our value estimates, and we reconcile these estimates.

4. RECONCILIATION OF THE ESTIMATED VALUES

Our value estimate for Swiss residential real estate based on the perpetual inventory method amounts to Sfr. 474.3 billion. Using the income capitalization method, we reach an estimate of Sfr. 442.0 billion. It may seem surprising that the latter value estimate which encompasses both land and structures is lower than our value estimate based on the perpetual inventory method (which does not comprise land). Several reasons related to the methodologies and the data used can explain this discrepancy, but at this point, two factors need to be discussed.

First, several older units are rented at below market rents because tenants have occupied the units for many years and rents have not been adjusted and/or because rents cannot be increased because of legal restrictions. Second, the four and more-bedroom

12. For an application of this model to real estate, see for instance BENDER and HOESLI (1989).

units are multiplied by the average rent for four-bedroom units because no other data are available. We can attempt to adjust our value estimate based on the income capitalization approach to take into account these two factors. If we hypothesize that the before 1980 units are rented on average at a price which is twenty percent below market, the value estimate would be Sfr. 73.2 billion higher. Units which have more than four bedrooms account for approximately 10% of all units. We can assume reasonably that these units could be rented at twice the price of four-bedroom units, which would lead to an increase in residential values of Sfr. 61.8 billion. If we add these two figures to our previous estimate, we reach a revised estimate of Sfr. 577.0 billion.

Regarding the perpetual inventory method, our Sfr. 474.3 billion estimate does not include land. Land is hypothesized to account for 20% of real estate prices, which seems a reasonable average figure because multi-family apartment buildings have a relatively low land-to-value ratio and single-family units a relatively high ratio. The estimate for residential real estate which includes land amounts to Sfr. 592.9 billion.

In order to substantiate these estimates we can use additional figures. One such figure is the insured value for residential buildings. In 1990, the total insured value for residential real estate amounts to Sfr. 778.7 billion. Insured values are computed on the basis of the historical construction cost which is adjusted using the construction costs' index. Thus, insured values are replacement costs which do not take into account loss in value due to wear and tear as well as functional and economic obsolescence. Insured values thus overestimate true market values. It can be estimated that the overestimation amounts to approximately 30%. Thus, the value estimate would be Sfr. 545.1 billion to which we must add the value of land to reach an overall value of Sfr. 681.4 billion.

We can also compare our value estimate to outstanding mortgages for residential buildings. As of 1990, the value of outstanding mortgages amounted to Sfr. 411 billion of which 75% concerned residential real estate (Source: Swiss Housing Office), i.e. approximately Sfr. 308 billion. No data exist regarding the average percentage of outstanding mortgages on residential buildings, but evidence suggests that this percentage is less than 50%. Based on this assumption, the total value of residential real estate is higher than Sfr. 616 billion.

According to the various approaches used in this study, we have the following estimates regarding the total value of Swiss residential real estate:

| | |
|---|--------------------|
| Perpetual inventory method (including land) | Sfr. 592.9 billion |
| Income capitalization method (revised estimate) | Sfr. 577.0 billion |
| Insured value (minus 30%, plus land value) | Sfr. 681.4 billion |
| Outstanding mortgages (debt-to-value ratio = 0.5) | Sfr. 616.0 billion |

Based on these results as well as on the above discussion, we believe the overall value lies in the Sfr. 600-700 billion range. In order to proceed, we set this value at Sfr. 650 billion.

5. ESTIMATION OF THE SIZE OF SWISS INVESTABLE WEALTH

The Sfr. 650 billion estimate for residential real estate has to be combined with the value of other asset classes to gain insight as to the total investable wealth in Switzerland.

1) Concerning the value of non-residential real estate, recall that in Section 2 we reached an estimate of Sfr. 346.6 billion without the land. If we use again a 20% land-to-value ratio, we reach an estimate of Sfr. 433.3 billion. The real estate wealth owned by the Government should not be taken into account because this does not constitute investable wealth. Using the same ratio of residential wealth to non-residential wealth (= 2.26) as that computed by MILES et al. (1991) for the U.S.¹³, we can estimate the Government real estate wealth to be worth Sfr. 146 billion. We also need to eliminate non-residential real estate which is owned by corporations to avoid double counting. By surveying the annual reports of the major Swiss corporations, we reach an estimate of Sfr. 70 billion. Thus, our final value estimate for non-residential real estate excluding governmental properties is Sfr. 220 billion.

2) As far as securities are concerned, we use the data from the annual report of the Zurich stock exchange as of December 31, 1990. The capitalization of Swiss stocks is estimated at Sfr. 221 billion. This figure represents the capitalization of all stocks included in the Swiss Performance Index (SPI)¹⁴. The total value of bonds amounts to Sfr. 205.1 billion (Sfr. 112.6 billion for Swiss debtors and Sfr. 92.5 billion for foreign debtors).

3) Besides real estate and securities, there are many other investable assets (commodities, jewelry, art work,...). It is extremely difficult however to estimate the value of these goods. For our purpose, we use the same percentage level as IBBOTSON et al., i.e. 20.2% of total wealth.

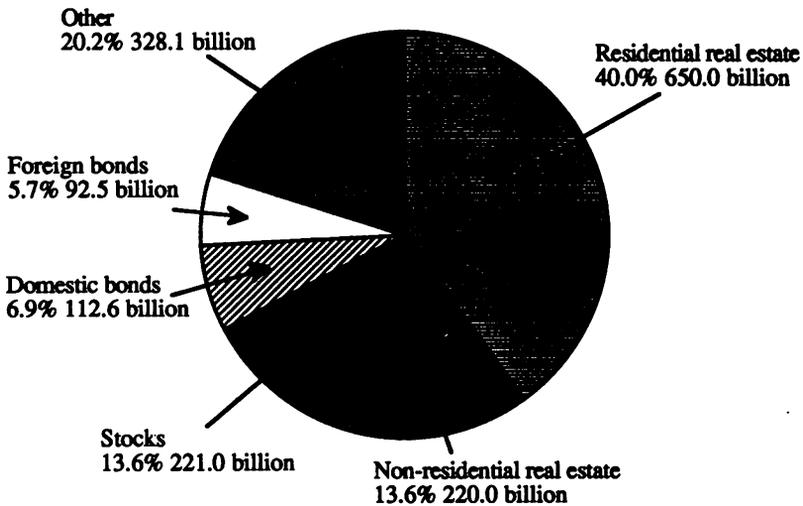
The total size of the "pie" is Sfr. 1,624.2 billion. Figure 1 illustrates the relative weight of each asset class. Not surprisingly, real estate constitutes the largest part of Swiss assets with 53.6% of overall wealth. This figure is comparable to the proportion of world wealth in real estate (54.9%) reported by IBBOTSON, SIEGEL and LOVE (1985). In the U.S., however, this proportion is smaller (48.7%) probably because of the relatively low real estate prices. Stocks and bonds constitute each approximately 13% of Swiss wealth.

The "pie" encompasses the major assets in which investors can invest. Every effort was made to avoid double counting. Mortgages are not included for instance because real estate assets are included. Also, the value of assets held by corporations is not directly included in the "pie", because we take into account the value of stocks and bonds used to finance these assets.

13. The ratio of Government real estate expenditures to overall real estate investments in Switzerland for the period 1980-1990 confirms this hypothesis.

14. The SPI represents approximately 97% of the Swiss market capitalization.

Figure 1: Relative weight of each asset class as of 1990 (total wealth = Sfr. 1,624.2 billion)



A weight of 53.6% for real estate seems very high for most institutional investors; for example as of the end of 1989 the average percentage of real estate in pension funds' portfolios amounted to 17.1%. Parts of real estate wealth do not constitute investable wealth for institutional investors, this is the case e.g. of most single-family houses and commercial real estate properties. Moreover, real estate assets are relatively illiquid assets and this should temper their attractiveness [see HOESLI (1992)]. Thus, 53.6% should not constitute a target for institutional investors. Individual investors on the other hand, frequently hold a much higher percentage of their wealth in this asset class due to the fact that housing is expensive. They are willing to accept high stakes in real estate because it acts as a consumption good as well as an investment vehicle.

6. CONCLUSION

Two methods were used to estimate the value of Swiss real estate wealth: the perpetual inventory method and the income capitalization method. Our estimate, based also on the insured value of all residential buildings and the amount of outstanding mortgages, amounts for 1990 to Sfr. 650 billion.

This result, together with the value of other assets, allows us to construct a “pie” representing Swiss investable wealth. Real estate constitutes 53.6% of Swiss wealth, stocks 13.6% and bonds 12.6%. The overall wealth for 1990 amounts to Sfr. 1,624,2 billion.

These results should prove useful both to Swiss and foreign investors. By knowing the relative weight of each asset class, some Swiss investors might reconsider their asset allocation in order to build better diversified portfolios. Foreign investors also should benefit from knowing that approximately 5% of non-U.S. real estate (3% of world real estate) is in Switzerland although the country is very small (41,000 km²) and has a relatively small population (approximately 7 million people). In a global perspective, further research should be conducted to break down by country and/or geographical regions the \$10,204.5 billion estimate for foreign real estate as of 1984 made by IBBOTSON, SIEGEL and LOVE (1985). This task will certainly be tedious indeed but should prove very useful in an increasingly global world.

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SUMMARY

The purpose of this paper is to estimate the value of Swiss residential real estate wealth using two alternative methods: the perpetual inventory method and the income capitalization method. We also use the insured value of all residential buildings and the amount of mortgages in order to substantiate our value estimate. On the basis of this estimate, we then examine the size of the overall Swiss investable wealth.

RESUME

Le but de cet article est d'estimer la valeur de l'immobilier résidentiel en Suisse. Pour ce faire, nous avons recours à la méthode de l'inventaire permanent et à celle de la capitalisation des loyers. Afin de conforter notre estimation, nous utilisons également la valeur d'assurance de tous les bâtiments résidentiels et le montant des hypothèques. En nous basant notamment sur notre estimation concernant la valeur de l'immobilier résidentiel, nous estimons ensuite la valeur totale des différents véhicules de placement en Suisse.

ZUSAMMENFASSUNG

Der Inhalt dieser Arbeit ist die Schätzung des Marktwertes der schweizerischen Wohnungen. Zu diesem Zweck benutzen wir zwei verschiedene Methoden: zum einen stützen wir uns auf die Methode des permanenten Inventurs, und zum anderen auf die Kapitalisierung der Einkünfte. Um unsere Schätzung zu festigen, benutzen wir auch die Versicherungswerte der Gebäude und den Betrag der anfallenden Hypotheken. Zum Schluss untersuchen wir, auf der Basis unserer Schätzungen, den Gesamtwert der schweizerischen Anlagemöglichkeiten.