The Home As A Wealth Preserving And Accumulating Asset: A General Formulation And Balance Sheet Application

Ivan F. Beutler[1] and **Floyd W. Yorgason**[2]

The home is examined in terms of its value as a wealth preserving and accumulating asset. A systematic balance sheet approach is developed to identify basic factors by which home equity can be preserved, accumulated, or diminished. General discussion of the factors is followed by presentation of a general equation developed to systematically specify the individual and combined effects of appreciation, leverage, debt repayment, and general price inflation. The four factors are justified in terms of their value in balance sheet analysis.
Key Words: *Home, Asset, Balance sheet*

Introduction

Balance sheet analysis typically begins with a complete financial listing of assets and liabilities, and with net worth computed as the difference between total asset and total liability values. A brief literature search on balance sheet analysis reveals that it is used to assess financial well-being at many levels in the economy, including the financial strength of families (Lang, 1988), insurance companies (Stevenson, 1990), hospitals (Ozcan & McCue, 1996), the corrections industry (Funke, 1982), the household sector of the U.S. economy (Holloway, 1991), and as a guide in general economic theory (Hayakawa, 1984). Although balance sheet analysis has broad application, the focus of this paper is on its value for the individual family or household.

At the family or household level, balance sheet analysis can be used to assess the *current magnitude* of wealth holdings. Using this method of analysis, specific attention is given to the value and types of assets held, the value and types of debt held against those assets, and how the equity of each asset contributes to total equity or net worth. Progress or decline can be observed by comparing balance sheet values from one year to the next (Lang, 1988).

Family/household *ratio analysis* is a second method of balance sheet analysis for which a modest literature has developed within the last decade. Ratio analysis is used to evaluate relationships between two or more aspects of the balance sheet. In the mid-1980's Griffith (1985) followed the lead of corporate analysts and proposed 16 ratios to assess various balance sheet components for families. That same year Johnson and Widdows (1985) calculated a liquidity ratio, and then Prather (1990) presented empirical norms for 16 personal financial statement ratios. Scannell (1990) assessed dairy farm families financial well-being using debt-to-asset ratio analysis. Lytton, Garman, and Porter (1991) presented and interpreted nine financial ratios for an illustrative case family. Devaney (1993) used ratio analysis to assess the financial progress of American households, and to predict household insolvency (1994). Lee and Hanna (1995) analyzed household portfolio holdings and proposed a general theoretical proposition — that the optimal proportion of a household's investment portfolio held in risky assets (e.g. stocks) should depend on the proportion or ratio of investment wealth to total wealth. Thus, only ten years following Griffith's proposed ratio analysis and five years after Prather's development of ratio norms, Lee and Hanna's proposition has in effect, introduced a third maturing stage in ratio analysis--escalating from the proposed concept, to the development of applications, and now being integrated into the fabric of theory.

A third method of family or household balance sheet analysis, being developed by the authors of this paper, is the monitoring and evaluation of wealth growth avenues using a *condensed balance sheet approach.* Analysis is directed toward avenues of wealth growth, preservation, or decline via equity value changes. To accomplish this analysis, it is helpful to create a condensed balance sheet in which similar assets are grouped together based on avenues they share in common with regard to equity change, and for ease of reference each category is given

[1]*Ivan F. Beutler is an Associate Professor, Department of Family Sciences, 1070 SWKT, Brigham Young University, Provo, Utah, 84602. Phone (801) 378-6416. Fax: (801) 378-2520. E-mail:* beutleri@acd1.byu.edu

[2]*Floyd A. Yorgason is a Ph.D. candidate in the Department of Family Sciences at Brigham Young University.*

a general label--for example wealth producing assets (e.g. stocks and bonds), income producing assets (e.g. private business holdings), wealth preserving assets (e.g. owned family dwelling), and use assets (e.g. consumer durables). In this way, attention can be directed at a reduced number of lines on the balance sheet in order to facilitate analysis which is straightforward and sufficiently precise for decision making purposes.

This paper deals with the family home or household dwelling, a principle asset in the wealth preserving and accumulating category identified above. Four basic factors of home equity value are identified as avenues through which home equity change may occur. A general equation is developed to demonstrate the systematic, interconnected, and analytic relationship of the four factors:

1. As avenues through which home equity may change.
2. As fundamental sources of family or household wealth.
3. As informative factors in balance sheet analysis.

Four Basic Factors of Home Equity Value

Home appreciation (or depreciation) is defined as the increase or decrease in the market value of the home (Wurtzebach & Miles, 1991). Appreciation may include proximate change in the immediate home environment through building additions, landscape improvements, or remodeling (Raven, 1986); less proximate change through improvement or deterioration in local streets and neighborhoods; change that is more macro, and driven by population shifts (Carlton, 1992); or economic adjustments that alter home prices through the relative number and impact of buyers and sellers in the current market.

Debt leverage is a more complex factor of home-equity preservation and accumulation. There are actually two key elements to leverage: the basic rate and the leverage multiplier. The basic rate equals the home appreciation or depreciation rate, and the leverage multiplier equals the ratio of debt to equity in terms of relative dollar amounts. In favorable circumstances, the leverage provided by long-term mortgage financing enables homeowners to enjoy rapid home equity accumulation. Leveraged circumstances are favorable to the extent that the home appreciation rate or leverage rate is positive (Ring & Dasso, 1985), and the debt-to-equity ratio or leverage multiplier is greater than one. However, with a large multiplier the tables are turned and the arm of leverage works against wealth growth whenever home prices depreciate and the leverage rate turns negative.

A third factor of potential wealth growth is home equity accumulation through *principal payments* as home mortgage debt is retired. Debt is retired on standard fixed-rate home mortgages through amortized payments which gradually reduce the principal outstanding increase owner equity. Systematic equity accumulation through regular home mortgage payment has been an important wealth-accumulating and wealth-preserving avenue for homeowners in the United States during the decades of post World War II. A typical pattern for young home buyers has been to make a modest down payment on the purchase of a new or existing starter home. Then, through regular monthly payments, equity has been accumulated and placed toward the purchase of a more expensive home to meet needs of a growing family or to achieve a higher standard of living. In in the later years of adulthood, mortgage free home ownership has been an important contributor to financial security.

A fourth factor is *inflation*. In nominal terms, while home appreciation, leverage, and principle payment factors may combine to produce positive equity growth, the rate of this growth needs to be adjusted for inflation and converted from a nominal rate into a real rate. Nominal rates ignore the diluting effect of inflation, whereas real rates account for it by adjusting gains to be stated in terms of general purchasing power equivalents (VanCaspel, 1980, p. 40). Differences between nominal rates and real rates can be illustrated in the example of U.S. households from 1985 to 1995. Over the ten-year period, the median price of an existing home sold in the United States appreciated 50% (U.S. Bureau of the Census, 1996, Table 1185) while the Consumer Price Index increased 42% (U.S. Bureau of the Census, 1996, Table 745). Thus, as a group homeowners realized equity growth of 50% through home appreciation in nominal terms, but the net increase in general purchasing power amounted to 8%.

Why Decompose Equity into Four Factors

Four avenues through which equity may change have been identified above, and each of these factors will next be included in a general equation formulation. However before proceeding with an explicit equation, it may be helpful to discuss the usefulness of decomposing equity change into its four factors. Considering methods of balance sheet analysis, total home equity change from year to year can be included as a standard part of the traditional current magnitude method. In this regard, the condensed balance sheet method includes decomposition which goes two steps further in the analysis. First, it explicitly recognizes which factors have contributed and

how much they have contributed to home equity change in the most recent period, and second, it uses knowledge of each factor as a conduit of future equity change in making and implementing equity enhancing decisions. Knowledge of the avenues of equity change empowers the family/household decision maker to move beyond knowing the magnitude of current home equity and to also know the means by which that magnitude was achieved in the past and in the possible future. Thus, the decomposition factors provide a framework to help decision makers know where to focus attention and intervention in an effort to influence future equity outcome. The decomposed marginal balance sheet type of formulation as presented here has not been described elsewhere in the literature, but it has been developed and is presented here out of a felt need for a more precise and useful analytical tool that can be used to evaluate the direction and magnitude of change in total equity or net worth due to home ownership.

Equation Formulation of Home Wealth

Formulation of the four factors discussed above and their contribution to changes in home equity during the previous year are expressed in terms of the following general equation:[a]

$$\textit{(real)}\ \mathbf{R_h = [r_h + r_h(D/E) + r_m] - I / (1 + I)} \qquad (1)$$

R_h= nominal rate of change in home equity during the previous year (%)
r_h= home appreciation/depreciation (%)
D= home debt as a dollar amount
E= home equity as a dollar amount
r_m= rate of growth in home equity due to mortgage debt retirement (%)
(real)R_h= real (inflation adjusted) rate of annual change in home equity (%)
I= annual rate of inflation (taken from the consumer price index-- CPI)

Note in Equation 1 that the total rate of home equity growth is given by the sum of the four factors: 1) home appreciation [r_h], 2) home leverage [r_h(D/E)], 3) mortgage debt retirement through principal payments [r_m], and 4) general price inflation [I]. Equation 1 has been formulated to achieve precision and notational convenience in the study of home ownership as a wealth-preserving and-accumulating asset. The formulation will next be used to discuss each of the four factors in the technical terms of marginal balance sheet analysis. Marginal balance sheet analysis is used as a simplifying methodology in which all balance sheet data are ignored except those which are necessary to illustrate how changes in a single variable of Equation 1 can affect a change in total equity.

Factor One: Equity Due to Home Appreciation

Consider Equation 1 and the marginal balance sheet changes anticipated in r_h (rate of home appreciation) given that only the fractionally relevant data of the balance sheet is to be considered. If the market value of a debt-free home increases from $100,000 in the year 19X1 to $105,000 in 19X2, the marginal balance sheet entries would be as shown in Table 1. Note that since there is no debt, each dollar change in asset value translates into a dollar change in equity. Thus the base equity amount is $100,000 with one year's change of $5,000 for an annual appreciation rate of 5% (change/base = 5,000/100,000). Similarly, if the asset value of the home had depreciated by $5,000, as shown in Table 2, the home appreciation rate would have been a negative 5% (or 5% depreciation).

Thus, in the absence of debt, a marginal percent change in home-asset value is matched by an equal percent change in home equity. This appreciation effect is a "one to one asset to equity" change. When the asset value of a home appreciates by a given percent, in the absence of debt, the equity value also appreciates by that same percent. However, if debt is involved in the home ownership, there will be additional leverage effects, as will be illustrated below.

Factor Two: Equity Due to Debt Leverage

The effect of leverage has been addressed in a variety of contexts in finance literature (Krefetz, 1986; Fosback, 1987). The discussion here is confined to the effect of leverage on home equity growth due to the use of home mortgage debt. When debt is involved in home ownership, in addition to the appreciation effect described above, there is a leverage effect as described by the second term of Equation 1: [(r_h) D/E]. The leverage effect consists of the product of home appreciation (r_h) and the multiplier or debt-to-equity ratio (D/E). Whatever the home appreciation rate may be, be it positive or negative, that rate is multiplied by the debt-to-equity ratio to get the leverage effect. Thus debt serves to enhance equity growth when home appreciation occurs, but it also amplifies equity losses when depreciation occurs. In this way, leverage is a two-edged sword that multiplies home appreciation rates for additional gains or for greater losses, whichever the case may be.

Table 1
Home equity rate of growth (R_h) due to home asset appreciation (r_h) of 5% illustrated using marginal balance sheet analysis.*

Year	Asset	Debt	Equity	Change
19x1	$100,000	---	$100,000	---
19x2	105,000	---	105,000	+5,000

*r_h = annual equity change/base equity amount
= 5,000/100,000 = 5%

Table 2
Home equity rate of growth (R_h) due to home asset depreciation (r_h) of -5% illustrated using marginal balance sheet analysis.*

Year	Asset	Debt	Equity	Change
19x1	$100,000	---	$100,000	---
19x2	95,000	---	95,000	-5,000

*r_h = annual equity change/base equity amount
= -5,000/100,000 = -5%

Consider the marginal balance sheet analysis which illustrates the combined home appreciation and leverage effects. Suppose that consistent with the example of Table 1, a new owner has $100,000 of equity. However, instead of purchasing a $100,000 home and owning it debt free, she purchases a $500,000 home using her $100,000 dollars as a down payment, with the remaining $400,000 financed through a home mortgage, as illustrated in the marginal balance sheet of Table 3. To illustrate one change at a time, suppose the new owner makes yearly payments large enough to pay interest on the home mortgage but does not retire any principal. Then, consistent with the example of Table 3, suppose asset appreciation equals 5%. The new owner will experience equity growth of not $5,000 or 5%, but $25,000 or 25% equity growth, as illustrated in Table 3. Note that debt produced a powerful leverage effect that multiplied equity growth fivefold! Equation 1 can be used to show that the new owner's equity growth is due to two factors: (1) the appreciation effect (r_h = 5%), and (2) the leverage effect [(r_h = 5%) (D/E = 400,000/100,000 = 4) = 20%], for a total effect of 25%, as shown in Table 3. However, as attractive as our new owner's gains may be, if the appreciation rate had a negative 5%, she would have experienced a 25% reduction in equity value. Thus, leverage is a two-edged sword!

Table 3
Home equity rate of growth (R_h) due to home- asset appreciation (r_h) and leverage [r_h(D/E)] with 5% appreciation illustrated using marginal balance sheet analysis.*

Year	Asset	Debt	Equity	Change
19x1	$500,000	$400,000	$100,000	---
19x2	$525,000	$400,000	$125,000	+25,000

*R_h = annual equity change/base equity amount
= 25,000/100,000 = +25%

Factor Three: Equity due to Mortgage Debt Retirement
Home mortgage debt retirement through principal payments (r_m) and its impact on home equity growth represents a third factor for potential equity accumulation. Application of this factor represents one of the methods which many U.S. families have used in post World War II decades to develop wealth. Equity accumulation occurs on a regular basis as amortized mortgage payments are made. It may also occur through lump sum prepayments. All else equal, mortgage payments reduce debt and increase home equity.[b]

For purposes of illustration, consider a home with an asset value of $100,000, an equity base of $20,000, and a mortgage debt outstanding of $80,000, APR of 10%, and an annual mortgage payment of $10,000. The debt retirement effect is equal to the dollar amount of principal paid off during the year divided by the base amount of equity. The amount of principal paid off during the year is equal to $2,000, i.e., the total principal and interest payment (given as $10,000) minus the interest paid during the year ($8,000 or 10% of $80,000 principal outstanding). Thus the debt retirement effect for the example in question equals 10% ($2,000 principal paid during the year divided by $20,000 base equity amount). The magnitude of equity growth due to mortgage debt retirement varies depending on a variety of factors. For example, if the above loan had been amortized with monthly payments over 30 years, equity growth would have averaged about 4%. But accelerated 15-year repayment would result in a debt repayment effect of about 11%. All else equal, the familiar admonition to "get out of debt" has merit in terms of home debt retirement and its effect on wealth growth through home equity accumulation.

This example further illustrates how the appreciation effect, the leverage effect, and the debt retirement effect

combine and represent factors by which wealth is produced and preserved through home ownership. As Table 4 shows, suppose home asset value at the beginning of the year is $100,000 with home mortgage debt totaling $80,000, resulting in equity of $20,000. Further, suppose that during the first year the asset value of the home appreciates 5% and debt retirement, in terms of principal reduction, equals $2,000. These changes are shown on the marginal balance sheet of Table 4. The overall change in equity growth is $7,000, creating an enormous 35% growth in equity ($7,000/20,000). Further, note that the appreciation effect accounts for 5% growth, the leverage effect accounts for 20% growth, and the debt reduction effect accounts for 10% growth. Typical of trends in a majority of home real estate markets since the decades of the fifties, the example presented in Table 4 is attractive due to positive price appreciation. However, depreciating asset values can also be accounted for using Equation 1. Consider what happens to wealth due to home equity when the example in Table 4 remains unchanged except for a shift from appreciation (5%) to depreciation (-5%). The effect is dramatic. The appreciation effect changes from plus 5% to negative 5%, the leverage effect changes from a positive 20% to a negative 20%, and the debt retirement effect remains unchanged at plus 10% for a total change of -15%. Indeed, it is sobering to realize that in a depreciating market homeowners may be paying large sums of money to pay-off their mortgage debt, only to realize a decline in home equity value.

Factor Four: Inflation Effects On Home Equity

Inflation diminishes home equity growth through home-price appreciation, debt leverage, and mortgage-debt repayment. To account for this reduction nominal rates of equity accumulation must be converted into real rates. As Equation 1 indicates, conversion from the nominal rate [$R_h=r_h+r_h(D/E)+r_m$] to the real rate [(real)R_h] is accomplished by subtracting the inflation rate from the nominal rate and dividing this calculation by one plus the inflation rate [$(R_h-I)/(1+I)$][c].

Consider how inflation would diminish the 35% nominal equity growth rate, as illustrated in the example of Table 4. If the annual rate of inflation had been 4%, then much of the 5% price appreciation effect would have been negated by the diminishing effect of general price inflation. However, as application of Equation 1 indicates, the effect of inflation in this example is only reduced from the overall nominal appreciation rate of 35% to the real rate of 30%.[d]

An inflation adjusted "real" rate of change in home equity can be obtained through the complete application of Equation 1. During post-World War II decades, general price inflation has persisted at varying magnitudes. All other things equal, during periods of high general price inflation, nominal rates of home appreciation have been diminished by the general tax of inflation. Especially taxing to individuals have been those situations in which they have experienced home-price depreciation concurrent with general price inflation serving to amplify the negative effects of diminishing home equity values.

Table 4

Home equity rate of growth (R_h) due to home-asset appreciation (r_h) of 5%, leverage [r_h (D/E)] and mortgage-debt retirement (r_m) of 10% as illustrated.*

Year	Asset	Debt	Equity	Change
19x1	$100,000	$80,000	$20,000	---
19x2	105,000	78,000	27,000	+7,000

*R_h = annual equity change/base
equity amount (r_h) (5,000/100,000)
+leverage [r_h (D/E)] 5% * (80,000/20,000)
+mortgage debt retirement (r_m) (2,000/20000)
= 5% + 20% + 10% = 35%

If the rate of change in the median resale price of single family homes is considered as r_h, the home appreciation/depreciation rate, there has been positive growth since 1970, but in real terms, the median price is now lower than in 1979 (Figure 1).

Conclusion

Equation 1 provides an analytical tool for addressing questions regarding home equity preservation and accumulation. For example, consider this question: In terms of home equity growth, would a 5% rate of home appreciation exactly offset a 5% rate of general price inflation, or would home appreciation lead to equity growth that would exceed the negative effect of inflation? Reference to Equation 1 readily indicates that the answer is conditional. If there is no debt, and therefore no leverage or debt repayment involved, then the question's answer is yes--in terms of equity growth the effect of 5% inflation will just offset the effect of 5% price appreciation. But if the home is levered through debt financing, then the question's answer is no, since a positive and multiplied leverage effect and a debt

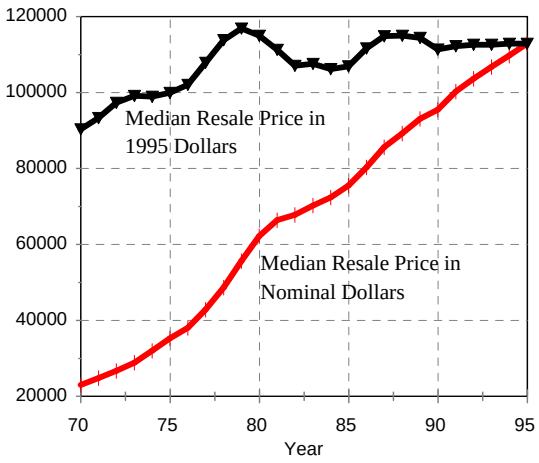
retirement effect will be added to the positive price appreciation effect. The respective magnitude of these two effects will depend on the size of the debt-to-equity ratio and the rate at which principle repayment on the mortgage is being made.

The *wealth growth avenues* method of family/household balance sheet analysis presented here provides additional evaluation insight when added to the *current magnitude* and *ratio analysis* methods described in the introduction of this paper. For example, focusing primarily on the home asset to be consistent with the theme of this paper, consider the balance sheet information given in Table 4 above and the evaluation information provided by each of the three methods. If line two of Table 4 represents the current date or beginning of the year 19x2, using a *current magnitude* method it would be appropriate to note the current home asset value as $105,000 with $78,000 of debt and $27,000 of home equity. It would also be instructive to note how these asset, debt, and equity amounts compare with other balance sheet entries, and to also note that the home balance sheet entries connect with the income and expenditure statement via monthly mortgage payments of $687.50 scheduled for 18 years and eight months. Equity growth progress during the last twelve months could also be noted for a gain of $7,000.

The balance sheet entries of Table 4 would affect *ratio analysis* values, such that all else equal, monthly mortgage payments would decrease the *liquid assets/monthly expenditure* ratio and the *liquid assets/total debt* ratio, and increase the *total debt/net worth* ratio and *tangible & equity assets/net worth* ratios. Using Prather's (1990) normative ratio values as a standard of comparison, adding home values to a balance sheet such as those of Table 4 would result in greater solvency and liquidity risk, but also greater inflation protection.

The *wealth growth avenues* analysis presented in this paper adds to the traditional balance sheet analysis a different set of insights that focus on wealth growth and wealth growth potential. For example, to the *current magnitude* observation that home equity increased by $7,000 in the last twelve months, it can be added that this represents a 35% nominal increase (29.8% real given 4% inflation), and from this analysis the sources of equity growth are made clear: 5% due to home appreciation, 20% due to debt leverage, and 10% due to mortgage debt retirement. The potential for wealth growth during the next twelve months, if home appreciation continues at 5% and inflation at 4%, will be 27.5% nominal (22.6% real): 5% due to home appreciation, 14.5% due to debt leverage, and 8% due to mortgage debt retirement. However, there would be zero equity growth if home prices were to fall by 2.05% during the next year. If home prices fell 5% during the next twelve months, home equity value would decline by 11.5% nominal (14.9% real, assuming also 4% inflation). These values provide numbers to describe the solvency and liquidity concerns briefly noted above in connection with *ratio analysis*.

Figure 1
Median Resale Price of Existing Single Family Homes in the U.S., 1970-1995, in Nominal Dollars, and in Terms of 1995 Dollars.



Created by Sherman Hanna based on U.S. Bureau of the Census (1996, Table 745 and Table 1185).

Application of Equation 1 is not meant to make anyone a millionaire or a real estate tycoon. However, the equation models systematic relationships between the basic factors of home wealth accumulation and preservation:

1. The highly related, but separate effects of home appreciation and home leverage.
2. The powerful and multiplying effect of debt leverage with its reversal potential from positive to negative.
3. The historically important mortgage debt repayment effect.
4. The eroding effects of general price inflation.

The general equation is modeled within the rigor and tradition of standard balance-sheet analysis. Hopefully, this work will engender additional research and insight into this vastly important and historically significant avenue of family wealth preservation and accumulation.

Endnotes

a. *It is important to note that this formulation is for year-by-year changes and does not lent itself to multiple year or multiple period analysis in the sense that average annual rates of growth are not being calculated in the analysis.*

b. *Only the principal paid portion of the mortgage payment is included because this is the only cost that shows up on the balance sheet as accumulated equity via mortgage payments. It is assumed that other current costs of home ownership such as taxes, interest, and insurance are being paid as per the usual mortgage agreement. These additional current costs also appear in the income and expenditure statement rather than the balance sheet.*

c. *Where I is an appropriate application of the consumer price index (CPI) as published quarterly by the U.S. Bureau of Labor Statistics (e.g.,U.S. Bureau of the Census, 1996, Table 745).*

d. *(real)* $R_h = 30\% = [\{R_h=35\%\} - \{I=4\%\}] / [1 + \{I=4\%\}]$.

References

Carlton, J. (1992, October 13). Housing cave-in: Southern California is rattled as prices of homes keep falling, *Wall Street Journal*, A1.

Devaney, S. (1993). Change in household financial ratios between 1983 and 1986: Were American household improving their financial status? *Financial Counseling and Planning, 4*, 31-46.

Devaney, S. (1994). The usefulness of financial ratios as predictors of household insolvency: Two perspectives. *Financial Counseling and Planning, 5*, 5-24.

Fosback, N. G. (1987). *Stock market logic: a sophisticated approach to profits on Wall Street*. Fort Lauderdale, FL: Institute for Econometric Research.

Funke, G. S. (1982). *Assets and liabilities of correctional industries*. Lexington, MA.: Lexington Books.

Griffith, R. (1985). Personal financial statement analysis: A modest beginning. In G. Langrehr (Ed.), *Proceedings of the Third Annual conference of the Association for Financial Counseling and Planning Education*, 123-131.

Hayakawa, H. (1984). Balance sheet identity and Walras' law. *Journal of Economic Theory, 34*, 187-202.

Holloway, T. G. (1991). The roles of home ownership and home price appreciation in the accumulation and distribution of household sector wealth. *Business Economics, 26*(2), 38-44.

Johnson, D. & Widdows, R. (1985). Emergency fund levels of households. In K. Schnittgrind (Ed.), *Proceeding of the 31st Annual conference of the American Council on Consumer Interests*, 235-241.

Krefetz, G. (1986). *Leverage: the key to multiplying money*. New York: Wiley.

Lang, L. (1988). *Strategy for personal finance*. New York: McGraw Hill.

Lee, H.-K. & Hanna, S. (1995). Investment portfolios and human wealth. *Financial Counseling and Planning, 6*, 147-152.

Lytton, R. H. Garman, E. T., & Porter, N. M. (1991). How to use financial ratios when advising clients. *Financial Counseling and Planning*, 2, 3-24.

Ozcan, Y. A. & McCue, M. J. (1996). Development of a financial performance index for hospitals: DEA approach. *Journal of the Operational Research Society*, 47 (1), 18-26.

Prather, C. G. (1990). The ratio technique applied to personal finance statements: Development of household norms. *Financial Counseling and Planning*, 1, 53-70.

Raven, J. (1986). Home Improvements: Best Investments for Your Money, *Money, 14*, 6, 14-18.

Ring, A. A. & Dasso, J. (1985). *Real estate principles and practices*, 10th ed., Prentice-Hall, Inc,. Englewood Cliff, N.J.

Scannell, E. (1990). Dairy farm families' financial management. *Financial Counseling and Planning, 1*, 133-146.

Stevenson, M. (1990, October 27). Balance sheet baloney. *The Economist*, 317, 17-19.

U. S. Bureau of the Census. (1996). *Statistical Abstract of the United States: 1996*. (116th edition) Washington, DC.

VanCaspel, V. (1980). *Money Dynamics, For the 1980's*, Reston Publishing Company, NY.

Wurtzebach, C. H. & Miles, M. E. (1991). *Modern real estate*, 4th ed., John Wiley & Sons, NY.

