Comparing Apples to Oranges: Lessons from Corporate Finance for Analyzing Mortgage Payments and Rent

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Presented at the Academy of Financial Services Annual Meeting
San Antonio, Texas, October 2012

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An important decision – perhaps the most important decision – in individual financial management is the choice of housing. For most households, the largest single portion of their budget is devoted to housing, and there are often strong effects on the quality of life.

Home ownership is a major life goal for many people. Hennessey (2003) outlines four factors underlying this goal. First, the vast majority of both owners and renters believe that from a purely financial perspective, owning is better than renting. Second, there are numerous emotional, social, and psychological factors, such as pride of ownership, privacy, security and stability, and status. Third, both the financial and social aspects are reinforced by government programs such as agencies to promote home ownership, and tax incentives including the deductibility of mortgage interest and preferential treatment of capital gains. Fourth, there may be a lack of rental properties available in the desired style and location.

To examine the financial perspective, many prospective homeowners simply compare the amount of the mortgage payment to what they are currently paying in rent. This approach is encouraged by the Government National Mortgage Association (2012), popularly known as Ginnie Mae. Their website presents a chart demonstrating that even if the mortgage payment starts out significantly higher than the rent, the gap quickly narrows and reverses if rent increases every year while the mortgage payment remains fixed. Ginnie Mae acknowledges that homeowners face additional costs (utilities, maintenance and repair, etc.) above the mortgage payment.

Our paper demonstates a crucial flaw in comparing monthly rent to the size of a mortgage payment. We believe individuals – and financial planners – are neglecting fundamental principles of corporate finance that have been accepted for more than fifty years.

We begin by reviewing the literature on housing which has some relevance to our topic. We then jump to the corporate finance principles, which at first glance seems unrelated to the personal finance housing decisions. In the subsequent section we explain how the housing decision should draw from corporate finance. We then continue with a section discussing a related issue in commercial real estate. A conclusion section ends the paper.

Housing Research

One popular research area involves the time series of rents and home prices. These data are often combined in a ratio, the rent-price ratio. We discuss several papers examining the rent-price ratio before turning to other studies with a stronger personal finance focus.

Davis, Lehnert, and Martin (2008) present a clear summary of the US experience from 1960 to 2006. The rent-price ratio was quite stable for the first 36 years, ranging between 5 percent and 5.5 percent. It declined rapidly after 1995, reaching a low of 3.5 percent by the end of 2006. In a remark which now seems to be an understatement, they write that house prices would have to fall "considerably" – which they define as a decline of 3 percent per year – for the ratio to return to its historical average by 2012. Note that Davis et al. focus on imputed rents of owner-occupied housing, so this is slightly different from the comparisons faced by current renters who would like to become homeowners.

Gallin (2008) uses error-correction models and long-horizon regression models to examine how well the rent-price ratio predicts future changes in real rents and prices. He uses the tenants' rent series from the consumer price index in the US. He finds that the rent-price ratio helps predict changes in real housing prices but there is little predictive power for changes in real rents.

Campbell, Davis, Gallin, and Martin (2009) perform an analysis for each of 28 housing markets in the US: 23 metropolitan areas, 4 census regions, and the national market. They show that rent-price ratios were roughly stable in most markets from 1975 to 1996, but declined precipitously during 1997-2007. Nevertheless, their two main findings are largely robust to the time period. Changes in expected future housing premia are an important source of volatility in rent-price ratios. This volatility is dampened by covariances among expected future premia, rent growth, and expected future real risk-free rates.

We continue with three studies using a price-to-rent ratio which is the inverse of the ratio from the studies described above. When house prices rise relative to rents, rent-price ratios decline and price-rent ratios rise.

Ayuso and Restoy (2006) use an intertemporal asset pricing model as the foundation for their empirical work. Their study examines three countries: Spain, the UK, and the US. They compute rents from the corresponding components of the consumer price index. According to their model, overvaluation in the early 2000s was more excessive in Spain and the UK than in the US, with price-rent ratios around 30% above equilibrium in the UK, 20% in Spain, and 10% in the US.

Brunnermeier and Julliard (2008) decompose the price-rent ratio into a rational component and an implied mispricing. They observe that a reduction in inflation can fuel run-ups in housing prices because of money illusion. They explain that people who simply base the decision of whether to rent or buy a house on a comparison between monthly rent and monthly payment of a fixed nominal interest rate mortgage suffer from money illusion. Such people mistakenly assume that real and nominal interest rates move in lockstep, and hence wrongly attribute a decrease in inflation to a decline in the real interest rate and consequently

underestimate the real cost of future mortgage payments. This causes an upward pressure on housing prices when inflation declines.

Duca, Muelbauer, and Murphy (2011) contend that most US house price models break down in the mid-2000s because of the omission of exogenous changes in mortgage credit supply. They find that incorporating a measure of credit conditions into house price-to-rent ratio models yields stable long-run relationships, more precisely estimated effects, reasonable speeds of adjustment and improved model fits.

We conclude this section with three studies from the personal financial planning literature. Waggle and Johnson (2003) examine the impact of the single-family home on portfolio decisions. They advocate including the family home and any related financing in the portfolio along with the traditional components of stocks and bonds. The incremental contribution of their study is the specific example of a mean-variance utility function. The main point about including housing in the family asset mix was made five years earlier by Reichenstein (1998).

Hennessey (2003) provides a financial model that can be used to analyze the impact on future household wealth. A key assumption is that if a household does not purchase a home, the funds will be invested in a diversified portfolio of common stocks. If stock returns are high relative to house price appreciation, there is a huge opportunity loss for investing in a house rather than stocks. Based on various world markets and starting dates from several points in the 20th century, Hennessy assumes an average annual stock return of 12.5%. This far exceeds the annual change in the median prices of single-family homes over 1980-2001, 4.2% in the US and 2.5% in Canada. With these parameter values, renting is the best financial option, especially for

Canadians. After 40 years, a Canadian household's wealth is about $5 million higher if they choose renting rather than owning.

We now make a sudden jump to the field of corporate finance. Later in the paper, we show how these results from corporate finance can help interpret the comparison between rents and mortgage payments.

Corporate Finance Principles

Modigliani and Miller (1958) present two propositions that are among the best-known results in all of finance. The discussion of Proposition I below is directly from p. 268 in their study, while Proposition II is from p. 271.

Proposition I. Consider any company j and let $\overline{X}_j$ stand as before for the expected return on the assets owned by the company (that is, its expected profit before deduction of interest). Denote by D_j the market value of the debts of the company; by S_j the market value of its common shares; and by $V_j \equiv S_j + D_j$ the market value of all its securities or, as we shall say, the market value of the firm. Then, our Proposition I asserts that we must have in equilibrium:

$$V_j \equiv (S_j + D_j) = \overline{X}_j / \rho_k \text{ , for any firm } j \text{ in class } k.$$

That is, the market value of any firm is independent of its capital structure and is given by capitalizing its expected return at the rate ρ_k appropriate to its class.

Proposition II. From Proposition I we can derive the following proposition concerning the rate of return on common stock in companies whose capital structure includes some debt: the expected rate of return or yield, i, on the stock of any company j belonging to the kth class is a linear function of leverage as follows:

$$i_j = \rho_k + (\rho_k - r)\, D_j/S_j.$$

That is, the expected yield of a share of stock is equal to the appropriate capitalization rate ρ_k for a pure equity stream in the class, plus a premium related to financial risk equal to the debt-to-equity ratio times the spread between ρ_k and r. Or equivalently, the market price of any share of stock is given by capitalizing its expected return at the continuously variable rate i_j.

Contemporary readers may find the M&M equation notation somewhat unusual. More familiar notation for Proposition II is used by Brealey, Myers, and Allen (2011) on p. 425:

> Expected return on equity = expected return on assets + (expected return on assets – expected return on debt) × debt-equity ratio
>
> $r_E = r_A + (r_A - r_D)\, D/E$

The expected return on equity (or in Modigliani and Miller's original terminology, the expected yield of a share of stock) is also the company's cost of equity. In corporate finance we focus on the security issuers rather than the investors, so Proposition II is typically interpreted as giving the cost of equity. It is clear from the preceding formula that higher financial leverage, i.e. a higher debt-equity ratio, will increase the cost of equity.

An alternate approach to obtaining r_E is from the Capital Asset Pricing Model (CAPM) developed by Sharpe (1964) and others. According to this model,

$$r_E = r_f + \beta_E(r_m - r_f)$$

where r_f is the risk-free interest rate, r_m is the expected return on the market portfolio, and β_E measures the sensitivity of the equity return to changes in the market return. While this model is often considered from the investor's perspective, the duality noted above still holds: the investor's required return is the company's cost of equity.

The Proposition II equation can be re-arranged to show the company cost of capital, also known as the weighted average cost of capital (WACC). Ignoring the tax-deductibility of interest on debt, Brealey et al. show (p. 426) that

$$r_A = r_D \, D/V + r_E \, E/V$$

As noted by Brealey et al. on p. 213, "The company cost of capital is the right discount rate only for investments that have the same risk as the company's overall business. For riskier projects the opportunity cost of capital is greater than the company cost of capital. For safer projects it is less." And on p. 232, "It is *project* risk that counts: the true cost of capital depends on the use to which that capital is put."

Returning to the β from the CAPM, there is a weighted average formula relating the betas for the assets of the firm, the equity, and the debt (Brealey et al., p. 221 and p. 427):

$$\beta_A = \beta_D \, D/V + \beta_E \, E/V$$

This equation makes it clear how changing the capital structure will affect the equity beta. For the special case where the debt is risk-free and therefore $\beta_D = 0$, we have $\beta_E = \beta_A \, V/E$. While capital structure will not affect the beta of the assets (i.e., β_A is constant), as the firm uses more debt and less equity, V/E increases and thus the equity beta increases. If the debt is not risk-free, the debt beta is likely a small positive value and may itself increase with leverage, leading to even greater increases in the equity beta.

Using Corporate Finance Principles to Evaluate Housing Costs

The phrase "home equity" is well-known to the general public as the difference between the market value of a house and the remaining balance of the mortgage. It has long been the practice for people to think about the amount of equity in their homes, and to consider borrowing against it with a home equity line of credit.

This equity is very highly leveraged when a mortgage is obtained with only a small down payment. The corporate finance equations discussed above demonstrate the impact of leverage. Thus the homeowner's implicit cost of equity can be extremely high.

However, the mortgage payment itself reflects only the cost of debt. It is therefore not meaningful to compare the amount of the mortgage payment to the size of the rent payment. Such a comparison would be analogous to a corporation using only the cost of debt to evaluate a capital budgeting decision. Even if a particular corporate project is financed solely with debt, it is widely acknowledged that it cannot be evaluated using just the cost of debt.

A further complication is the lack of diversification inherent in housing. Canadian finance professor Moshe Milevsky quips that your house would be a better investment if the kitchen was in Toronto, the bedroom in Vancouver, and the bathroom in California. Because a house is in a single location, it is an undiversified asset, somewhat like having a stock portfolio invested in only one stock. This poses a challenge for using the CAPM for any housing analysis, since the CAPM assumes a diversified portfolio.

There are a variety of risks that increase the difficulty of comparing rents and mortgages. Renters bear the price risk of potential rent increases in years ahead, and there is also the risk of contract non-renewal if the property owner makes other plans. In contrast, homeowners benefit from increase in house values, but bear the risk of price declines. Another problem with home ownership is the liquidity risk with high transactions costs for buying or selling. Note too that the homeowner's leverage gradually declines as the mortgage balance is paid off. Finally, depreciation risk should be recognized; major renovations are needed as the years go by.

Commercial Real Estate

There are some similarities between the rent/price ratio described above and the "cap rate" which is widely used in commercial real estate. The cap rate, which is short for the capitalization rate, is defined as the ratio of net operating income to property value. Peyton (2009, p. 38) observes that "cap rates were originally conceived as a shorthand expression of real estate value in the primitive times before desktop computers were equipped with discounted cash flow software." This section reviews several studies involving cap rates.

Cap rates have been studied for many years. For example, Nourse (1987) examines cap rates for income property from 1966 through 1984. His focus is on the impact of the 1976 and 1981 tax law changes. The small decrease in cap rates can be interpreted as a low impact of the two tax law changes. He conjectures that the investors most affected by those changes were not the dominant players in the market.

Jud and Winkler (1995) develop a model of cap rates that draws on both the WACC and the CAPM, the key elements of corporate finance used in our study. However, their findings are not directly applicable to the personal finance decisions.

Conner and Liang (2005) observe that real estate property market forces drive property earnings, while cap rates should be determined by capital market forces. Their study examines the historical relation between the two forces.

In two related studies, Hendershott and MacGregor (2005a, 2005b) examine whether capitalization rates are linked to real cash flow growth. Their proxies for expected real rental growth in the U.K. correctly forecast future real growth, and cap rates reflect mean reversion in future real cash flows. Similar proxies in the U.S. are also good predictors of future real NOI

growth. However, they find that U.S. cap rates are low when real cash flows are above trend and vice versa, which is the opposite of what rational expectations would imply.

Ghysels, Plazzi, and Valkanov (2007) find that about 30% of the fluctuation in the cap rate is explained by the combination of demographic and local economic variables along with growth in rents. But a larger part of cap rate predictability is due to the orthogonal part from their decomposition, and that part is unrelated to fundamentals.

Chichernea, Miller, Fisher, Sklarz, and White (2008) study the geographical cross-sectional variation in cap rates. Their models combine housing demand growth, supply constraints, and liquidity risk. They argue that previous studies focus only on the demand driver of rental growth rates. By also considering supply-side constraints, we can better understand the variations in cap rates. Their methods can also be used to identify conditions of disequilibria among different markets.

Clayton, Ling, and Naranjo (2009) examine the relative roles of fundamentals and investor sentiment in commercial real estate valuation. They observe that real estate markets are more susceptible to sentiment-induced mispricing because of illiquidity, segmented markets, and the infeasibility of short selling. Their error correction models suggest that investor sentiment affects national-level cap rates.

Conclusion

There are two further viewpoints that could favor homeownership. First, even though leverage produces a high implicit cost of equity, the immediate returns in the form of imputed rents are not taxed. The homeowners are simultaneously landlords and tenants; they take money out of one pocket and put it back in the other, in transactions that are not taxable. This is an additional tax benefit beyond the deductibility of mortgage interest and preferential treatment of

capital gains. Hendershott and Slemrod (1982) demonstrate how to calculate the effective tax rate, and they relate this to housing decisions.

In a novel approach, Hung and So (2012) explore the dual role of houses as both durable consumption goods and as financial investments. When prices rise, homeowners can reap the benefit by selling the house at a profit. When prices fall, the owner can ignore the investment loss by simply keeping the house, treating it as a durable good providing shelter. This asymmetry can be related to call option pricing. Owners will rationally pay more than construction costs because they are receiving an at-the-money call option.

Nevertheless, we end this paper by returning to our main point. Homeowners' cost of equity is an increasing function of their mortgage leverage, and will start out extraordinarily high if only a small down payment is made. When this is ignored, incorrect financial decisions about housing may result.

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