

# THE EFFECTIVENESS OF HOMEOWNERSHIP IN BUILDING HOUSEHOLD WEALTH

## TECHNICAL APPENDIX

By Jordan Rappaport\*

A crucial concept in the article's analysis is the breakeven ratio at which wealth accumulation over a ten-year occupancy is the same regardless of whether a household purchases a home or rents it. This appendix details how the breakeven ratio is calculated. Many of the details overlap with the description in the main text.

As described in the main text, the main determinants of the breakeven ratio are the rate of rent inflation, the rate of house price appreciation, mortgage interest rates, the returns on stocks and bonds, and various tax considerations. Calculating the breakeven ratio requires making specific assumptions relating to each of these.

The years of each of the ten-year periods, 1970-80 through 1999-2009, can be labeled as "year 0" through a "year 10." The house is purchased at the end of year 0. It is occupied at the very beginning of year 1. All transactions—both one time and recurring—are assumed to occur at the end of each calendar year. In particular, rent and other payments that typically recur monthly will instead be assumed to be combined into a single yearly payment in December.

Both owner and renter households are assumed to be a married couple with two children. These households earn labor income equal to the median total income among married-couple families. This assumption modestly overstates household income since the median income

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benchmark also includes capital income (e.g., interest earnings, dividends, etc.). The difference does not significantly affect results. Homeowner households are assumed to have no capital income. Renter households have capital income derived from their cumulative investments in stocks and bonds as described below. Households are able to make cash outflows that exceed their income and incur debt without limit. A necessary condition for this occur is that rents exceed homeownership outflows. Even then, renters have a wealth cushion from the investment of an amount equal to the homeowner's down payment in year zero. In the scenarios of this analysis, renters never need to do borrow.

The centerpiece of the breakeven calculation is a full accounting of *all* the cash outflows associated with homeownership including the offset from tax advantages and the net proceeds from the eventual sale of the house. At the very end of year zero, a married-couple household purchases a house with the median value in that year among single-family owner-occupied detached houses. This median house value is based on owner-reported values by households in the decennial censuses taken from 1970 to 2000, along with the American Community Survey in 2008. For ten-year periods starting in non-census years, the median value is adjusted from the closer of the most recent census year or the following census year using the Freddie Mac purchase-only repeat sales index. For example, the 1970 census median value is the basis for the ten-year periods beginning in 1970 through 1974. The 1980 census median value is the basis for the ten-year periods beginning in 1975 through 1984, and so on.

This use of different base years is important because the “quality” of houses (size, workmanship, locational amenities) has been increasing over time. Thus, the increase in the real median price of houses over time is only partly attributable to a rise in the price “per unit” of housing. Although the rent-to-price ratio is normalized by a \$100,000 purchase price, the

nominal purchase price level matters because it affects the tax benefits of homeownership. A description of this dependence is included in the main text.

The house is assumed to be purchased with a 20 percent down payment. A smaller down payment would magnify both positive and negative homeownership investment returns. In addition to the down payment, the home buyer incurs a 2 percent closing cost relative to the mortgage (based on a survey of estimated costs and assorted home buyers' guides on the internet; these guides are applicable to 2010 and shortly before, and so may not be representative of costs in earlier years). The mortgage is a fixed 30-year loan with an interest rate equal to the average reported by the Freddie Mac Primary Mortgage Market Survey for Q4 of year zero. The home buyer also pays "points" to bring their mortgage interest rate down. Assumed points paid are the average for Q4 of year zero as reported by Freddie Mac. This average ranged from approximately 1 percent of the loan during most of the 1970s to 2 percent or higher during the 1980s. Alternatively calculating the breakeven based on a zero-point mortgage is not possible with the Freddie Mac dataset

If, at the end of each of years 1 through 9, the interest rate on a new 30-year fixed loan is sufficiently below the interest rate being paid on the current loan, the homeowner refinances and thereby incurs cash outflows equal to closing costs and points paid. A drop in mortgage rates sufficient to trigger a refinancing requires that the saved interest over the remaining years of the ten-year stay exceed the origination costs and points paid on a new mortgage. Note that this decision rule does not allow for the delaying of refinancing in the hope that rates will drop even further. The refinanced loan is assumed to exactly pay off the previous loan.

In years 1 through 9, the homeownership (end of year) cash outflows are made up of mortgage payments (principal plus interest), maintenance payments (1 percent of the initial

purchase price adjusted up by cumulative CPI inflation since year 0—Harding and others), homeowners' insurance (0.33 percent of the initial purchase price adjusted up by the estimated increase in home prices since the purchase—Himmelberg and others; Poterba and Sinai) and state and local real estate taxes (1 percent of the initial purchase price adjusted up by the estimated increase in home prices since the purchase—Himmelberg and others; Poterba and Sinai).

These cash outflows are partly offset by the tax savings made possible by homeownership. This tax savings derives from the deductions directly attributable to homeownership (mortgage interest payments and state and local real estate taxes) as well as deductions on non-housing items that renters typically are not able to take. As described in the main text, homeownership deductions are assumed to be necessary for itemizing to lower taxes compared to taking the standard deduction. As a result, non-housing deductions are dependent on taking housing deductions and so are “credited” as an offset to homeownership cash outflows. Examples of these non-housing deductions include those for state and local income taxes and for charitable contribution

Non-housing deductions are estimated using the NBER TaxSim model. Specifically, among all households in the NBER sample with income close to the married family median for a given year, mean total non-housing deductions are calculated for those households who itemized and whose housing deductions exceeded the standard deduction. Excluded from this sample, then, were renter households and owner households with housing deductions too small to justify itemizing. Some of the excluded homeowner households may nevertheless have itemized because they had above-average non-housing deductions which caused the sum of their housing and non-housing deductions to exceed the standard deduction. Conditioning on a minimum

housing deduction to estimate average non-housing deductions thus eliminates an important selection bias. Non-housing deductions estimated in this way ranged from about \$1,700 (nominal) in the early 1970s to more than \$7,000 from 2005 to 2009.

The actual tax saving calculation compares the tax liability of a representative household that owns its house and takes both homeownership and non-homeownership deductions with the tax liability of a representative household that rents. Both of these households are assumed to have no capital income. The amount by which the homeowner's tax liability falls below the renter's tax liability is credited to the homeowner as an offset to cash-out homeownership expenses.

Cash flows in year 10 include all of those just described for years 1 to 9. Separately, in an accounting sense, the homeowner household sells the house at the end of the year. Doing so results in a cash inflow equal to the value of the house, as estimated by the growth of the Freddie Mac Conventional Home Price Index over the ten years since the original purchase. This cash inflow is offset by the payoff of the outstanding balance on the mortgage and by selling costs equal to 8 percent of the selling price (Black, Diaz, and Wolverton; Black and Nourse). The resulting net proceeds from the house sale constitute the owner household's final wealth.

Renter households are assumed to exactly match the cash flows of homeowner households. This matching by the renter is made up of payments of rent, investments in stocks and bonds, and the taxes the renter pays on interest, dividends, and capital gains. Rents are assumed to increase at the rate of owner's equivalent rent inflation in the Consumer Price Index. The capital gains taxes are assumed to be incurred on any increase in the S&P 500 stock index over the course of a year. Paying capital gains taxes yearly rather than when a stock is actually sold is necessary for computational reasons. Based on the estimated tax liabilities of renters

investing in equity at the rate consistent with the calculated breakeven ratio, the average tax rate on capital gains was increasing through the 1970s. Hence paying capital gains taxes year by year moderately biased up the breakeven ratio for ten-year periods that occurred primarily during this period. In other words the calculated final wealth of renters who invested in stocks was higher than it would have been had they paid more of their capital gains taxes at then of the ten-year occupancy. Conversely, capital gains taxes for the breakeven household stepped down from 15 percent to 5 percent in 2003 implying that the equity breakeven is biased downward for ten-year periods beginning in the mid 1990s. More generally, a delay in paying capital gains taxes is likely to modestly boost final after-tax returns in a rising market.

Investors in stocks are assumed apply capital losses from one year against capital gains in a later year. For ten-year investment periods that end with an unapplied capital loss, the household receives a monetary credit equal to the unapplied loss times an estimate of the household's marginal tax rate on capital income.

In a given year, the amount by which the sum of a renter household's rent payment and tax liability on capital income falls below a homeowner household's net cash outflow constitutes "saved cash flow," to be invested in either stocks (S&P 500 index) or bonds (1-year Treasuries). Additionally, in year 0, the renter household matches the owner household's required cash outflow to purchase the house. In other words, the renter household invests 20 percent of the homeowner's purchase price plus any closing costs into either stocks or bonds. At the end of year 10, the renter household's ending wealth is simply the after-tax value of their investment portfolio plus any surplus cash flow over the course of year ten, which at the end of the previous nine years would have been invested.

The comparison of the homeowner household and renter household's ending wealth shows, for a given initial rent and type of investment, whether homeownership or renting and investing built more wealth more effectively built wealth. This "effectiveness" of wealth building reflects that housing and non-housing consumption are each held equal between the homeowner and renter households.

The mechanics of calculating the breakeven rent-to-price ratio, for a given ten-year time period, are as follows. First, the cash outflows and final wealth are calculated for the purchase of a median-priced house in year 0. Next, surplus cash flows, corresponding investments (in either stocks or bonds), and final after-tax wealth are calculated for each of 17 different possible year 1 rent values (rent payments begin in year 1 rather than year 0). These 17 rent values are relatively closely spaced. Monthly rents in 1971 are assumed to range from -\$5 (i.e., paying a tenant to forego homeownership) up to \$250. Inflating this 1970 spread to 2009 using the rate of rent inflation implies 17 monthly candidate rents that range from -\$28 to \$1,384. Interpolation between the two final wealth values that bracket owner final wealth estimates the breakeven rent-to-price ratio for the given investment type for the given ten-year period.

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