

Understanding and Mitigating Rental Risk

Todd Sinai

The Wharton School at the University of Pennsylvania, and National Bureau of Economic Research

June 2011

Abstract

The decision of whether to rent or own a home should involve an evaluation of the relative risks and the relative costs of the two options. It is often assumed that renting is less risky than homeownership, but that is not always the case. Which option is riskier depends on the risk source and household characteristics.

This article provides a framework for understanding the sources of risk for renters. It outlines the most important determinants of risk: volatility in the total cost of obtaining housing, changes in housing costs after a move, and the correlation of rents with incomes. The article characterizes the magnitudes of those risks and discusses how the effects of risk vary across renter types and U.S. metropolitan areas. In addition, the article shows that renters spend less of their cash flow on housing than do otherwise equivalent owners and, thus, are better able to absorb housing cost risk.

Finally, potential policy approaches to rental housing that avoid increasing rent risk are discussed. A simple way to maintain renters' capacity to absorb rent risk is to avoid subsidies that result in an incentive to consume a larger rental housing quantity. Targeting rental subsidies to more mobile households or those living in low-volatility cities, where renting is less risky, should be considered. Long-term leases would provide an intermediate position between renting annually and owning but are currently rare.

Introduction

Much of the discussion about government subsidies that are targeted at homeownership or renting focuses on the subsidies' effects on the relative cost of owning versus renting. For example, how much do tax subsidies to homeownership lower the cost of owning? Is housing affordable, and do rental subsidies lower housing costs for low-income families? Are rents higher because renting is less economically efficient than owning because of misaligned incentives for renters and landlords?

Cost is just one of many differences between renting and owning, however. Another important distinction between the two tenure modes is risk. Both renters and homeowners face financial uncertainty in regard to their housing spending. How that uncertainty is manifested depends on a household's choice of tenure mode. Renters do not have large housing capital amounts at stake and thus are not affected by house price swings in their current market. Renters face uncertainty, however, about how much rent will cost during their lifetimes and are also subject to high-frequency rent volatility. In addition, renters do not automatically have an investment position in

the housing market; therefore, they are more susceptible to volatility in the future housing cost, both locally and in other cities.

Any discussion of whether owning or renting is better for households should account for risk, not just cost. For example, when housing policy is evaluated, consideration should be given not only to how policy distorts households away from the optimal dollar amount of housing consumption, but also to how policy encourages or discourages taking financial risks that are best suited for a household.

Because the risks of renting and owning are not universally bad, but are merely inappropriate for some households and more appropriate for others, policymakers should consider risk in several ways when formulating policy toward renting. First, recognize that such policy might have unintended consequences for household risk. Renting exposes a household to housing market volatility, with the magnitude depending on the geographical market. Second, avoid incentivizing renters to spend larger portions of their incomes on rent because higher housing spending raises risk for renters as well as owners. Third, tailor policy to encourage renting—or not encourage homeownership—for just those households who would experience relatively less renting risk. For example, some housing markets are inherently less volatile and renters there face little uncertainty. Fourth, consider that financial products that could enable long-term renters to mitigate risk, such as long-term leases, exist but are not popular. The reason such products are unpopular is unknown, but a possibility is that subsidies to homeownership simply make owning a cheaper way to obtain many of the same benefits.

This article is motivated in part by the recognition that rental subsidies need not be targeted solely to low-income households. Homeownership subsidies are available throughout the income spectrum (Poterba and Sinai, 2010) and one could imagine policymakers considering a parallel program for renting. When policy goals move beyond considerations such as using rental subsidies to target income transfers to needy households, or to ensure a minimum rental housing quality standard, policymakers need to be aware of potential consequences of a broad based shift to renting.

Ironically, despite the common perception that homeownership is risky, encouraging renting would induce many households to actually take on more risk. The next section describes some sources of financial uncertainty for renters and homeowners. Section 2 details how housing uncertainty morphs into risk and explains how the riskiness of renting can vary between geographic space and household types. Next, the article reviews evidence that renters are keen enough to avoid that risk that they are often willing to pay a premium above the rental cost to become homeowners. Section 4 explains how some households can absorb risk with fewer consequences. Rent risk implications for policies aimed toward rental housing are considered in section 5.

The Volatility of Renting and Owning

To begin, it is important to recognize that the choice of how much housing to consume can be divorced from the question of how to pay for it. Many peoples' perceptions of the differences between renting and owning are colored by the fact that the residences that people tend to rent

typically are quite different from the residences that people tend to buy. Rental residences are more likely to be in multifamily units, smaller, and less expensive within a given market. Thus the difference between renting and owning is often perceived as a decision about the quantity, the location, or the price point to consume. Despite the fact that owned and rented housing stocks are currently somewhat distinct, however, any given housing unit could be either purchased or rented—at some purchase price or rent amount. Indeed, if the United States were to shift away from its long history of subsidizing homeownership to something more akin to a level playing field or even a net subsidy to renting, the household types that currently tend to own could easily choose to rent instead, and housing units that currently tend to be owned could conceivably enter the rental stock. Of course, the implied annual cost of renting or owning the same unit can differ for a host of reasons, including differential tax treatment as an owner versus a landlord or renter, and the lower efficiency with which a landlord can monitor his or her rental property relative to an owner-occupier, especially if the dwelling is a single-family detached house.

Holding the housing unit and its annual cost the same across owning and renting, the financial difference between the two tenure modes comes down to the manner in which the service flow from that housing unit is paid for. Renters pay the flow cost of housing services as rent. By contrast, owners pay an upfront price to purchase a house. In addition, homeowners are responsible for property taxes and maintenance costs, whereas for a residential lease, the maintenance costs are typically included in the rent. Unlike renters, however, owners may receive money back when they sell their houses, taking either a capital gain or loss.

Another way to think about the difference in payments between renters and owners is that renters simply pay the spot price of housing services (the rent) whereas owners purchase an asset (the house) that pays a dividend exactly equal to the rent. In effect, owners use the yield from their housing asset to pay rent, with the two exactly netting out. By contrast, renters pay rent each year out of their pockets. Because renters do not have to make an initial investment in a house, however, they can instead use those funds to invest in other assets.

Both renters and owners start life with the same implicit future liability—they have to pay the market cost of obtaining housing every year for the rest of their lives. Beyond that, they make different portfolio decisions. Owners invest in houses whereas renters invest in some other set of assets. The usual equilibrium assumption, found in Hendershott and Slemrod (1983) and Poterba (1984), is that both portfolio positions should deliver the same risk adjusted return in expectation. Therefore, renters and owners in this example are equivalently wealthy and have comparable expected incomes. In other words, the only way a marginal household could expect to retain more income net of housing costs by being a renter rather than an owner is either by consuming a lower level of housing quantity or quality as a renter or by taking more risk. If owning and renting costs were not equal, after adjusting for differences in risk, households would change tenure mode until the relative costs of owning and renting became equal. For example, if everyone perceived renting to be cheaper than owning, then homeowners would sell their houses and become renters until rents rose and house prices fell enough to make the difference in cost disappear. Of course, this equivalence in rental and ownership costs holds only for some marginal homebuyers, leaving perhaps many households strictly favoring one tenure mode or the other. Ownership and rental clienteles can be driven by differences in tax treatment,

fixed home buying costs combined with the expected length of stay in the residence, underlying desire for homeownership, or other possibilities.

Differences in how renters and owners pay for their housing each lead to different sources of volatility. Renters, for example, do not know in advance how much their housing is going to cost them. It is up to the market. If rents in their cities rise faster than they expected, their total costs will be higher than anticipated. If rent growth unexpectedly stalls out, their total costs will be lower. In either case, the total lifetime cost of obtaining a home is uncertain.

Owners, on the other hand, know exactly how much their house will cost them: It's in the purchase and sale agreement. Of course, that assumes that owners never move out and thus never have to sell their houses. But for a homeowner who stays put for a long time, that sale price is relatively inconsequential. It occurs so far in the future that, unless average house price growth is substantial, the sale price is small in present value terms. It's almost as if the household never had to sell its house.

When a household move does arise, homeowners face the need to sell their house, which potentially has a volatile asset value. By contrast, renters presumably invested their wealth in a more diversified asset portfolio, and therefore, have less wealth volatility upon moving. Whether volatility in wealth at the time of a move is detrimental to the household is analyzed later in this article.

Despite the certainty of the purchase price, owners face uncertainty about the total homeownership cost. Property taxes and maintenance costs, for example, are paid by homeowners, are not guaranteed in advance, and are not insurable. These two cost components can be quite sizeable—property taxes average just above 1 percent of house value and maintenance costs are widely believed to be about 2.5 percent of house value—and, given today's low interest rates, are collectively about one-half of the annual property rental value. The volatility of these particular homeownership costs are not known; it is difficult to collect data on changes in local property taxes and, because maintenance can be deferred, it is hard to distinguish the true arrival rate of underlying problems that should be fixed or updated from when the homeowner fixed them. In this paper, the comparison between the risks of renting and owning implicitly nets out any volatility in property tax or maintenance costs.

Rent volatility is presumably caused by localized shocks to housing demand or supply. Housing demand shocks are usually attributed to changes in the local economy or migration. New housing construction typically follows demand shocks, but is limited in some areas due to regulation or topographical constraints. Saiz (2010) and Sinai (2009) present some rough evidence that rent volatility is most pronounced in areas with more volatile underlying demand and relatively inelastic supply. Using a cross section of metropolitan statistical areas (MSAs), Sinai (2009) shows that MSAs with less elastic supply and more volatile employment experience more variable apartment rents. These volatility sources would affect annual rents and current house prices, but not the annual costs of already purchased homes. Those latter costs are locked in at the time of the home purchase, with the exception of the sale price of the house, which responds to the demand and supply conditions in the market.

Another potential source of volatility for owners is financing costs. Empirically, it is rare for households to buy their houses with cash. In the 2007 Survey of Consumer Finances, 33 percent of homeowners had no mortgage debt. Homeowners who had mortgage debt averaged a 53-percent loan-to-value ratio. Fixed-rate mortgages are common in the United States, however, and allow any household to avoid interest rate volatility if it prefers to do so.

The risk in housing costs for renters and owners can come in two forms. First, the total cost of obtaining housing services during some period, such as the duration of stay in a residence, or during one's lifetime, is volatile. This total cost volatility is a pretty fundamental source of risk; simply put, one does not know in advance how much a given amount of housing will cost. Renters and owners can experience very different total cost volatilities. Renters who are going to remain in their houses for a long time face considerable risk because their total rent depends on market forces. By contrast, owners who are going to remain in their houses a long time face little risk because the purchase price of a house is known and the sale price is so far in the future as to be inconsequential (or the household will have died by then).

Economists tend to focus on total housing cost volatility because they assume that households can borrow easily (and inexpensively). That is, a year of high rent followed by a year of low rent doesn't matter to a household if it can borrow to cover rent in expensive years and pay the loan back when rent is cheap, or has sufficient liquid assets to tap to smooth the volatility. Such a household worries only about total housing costs. If, by contrast, households face liquidity constraints, the year-to-year volatility in rent generates additional risk for renter households. Owner households are less exposed to this additional risk because their nondiscretionary cash outflow for the house has less volatility. Although liquidity constrained owners must find a way to borrow money to purchase a home in the first place, after they have made the purchase the year-to-year volatility in housing costs is significantly reduced.

Households are not equally exposed to housing cost risk. Volatility can vary considerably across housing markets, therefore, renters in a volatile market have less certainty about their total housing costs than do renters in a less volatile market. Likewise, owners in a volatile market are less sure about their sale prices than owners elsewhere. The differences in volatility can be seen in exhibit 1. On the x-axis, the standard deviation in annualized growth in real rents during a 5-year period is plotted. Each dot corresponds to a MSA. Rents come from a survey by REIS of high-quality apartment buildings in 38 major markets during the 1980 through 2009 period. The standard deviation in rent growth ranges from 0.005 to 0.040. At the bottom end of the range, an apartment that rented for \$12,000 per year that experienced a one standard deviation excess real growth in rent would rent for \$12,550 5 years later.¹ At the top end of the rent volatility range, if that same apartment experienced a one standard deviation higher rent growth rate, it would rent for \$14,883 after 5 years. In the former case, renters are not exposed to much uncertainty. In the latter case, rent uncertainty is considerably higher. Thus, exhibit 1 shows that the amount of rent uncertainty varies by housing market. Sinai (2009) reports rent volatility for each MSA individually.

¹ The average growth rate in rents is approximately 0.4 percent annualized during a 5-year period. $(1 + 0.005 + 0.004)^5 \times 12,000 = 12,550$

A similar range can be seen in the standard deviation of real house price growth (again, annualized over 5 years), which is plotted on the y-axis. It ranges from about 1 to 7 percent and is constructed using the FHFA repeat sales index, adjusted for inflation. An MSA at the bottom of the house price volatility range that saw real house price growth of one standard deviation above the average would experience real price growth from \$120,000 to \$126,120 after 5 years. At the top of the range, a one standard deviation higher house price growth would cause a \$120,000 house to appreciate to \$168,306. Although homeowners might be sanguine about house price increases, a parallel decline in house prices would yield a \$114,175 real sale price in the low volatility MSA after 5 years and \$85,558 in the high-volatility MSA. Once again, some housing markets are relatively stable and others are much more uncertain. (See Sinai, 2009, for a breakdown by MSA.)

Although renters and owners both face volatility in any given housing market, little evidence exists to show whether either group is exposed to more or less inherent housing market uncertainty than the other. In any given city, house prices and rents generally track each other. This empirical fact is consistent with theory which, with varying degrees of complication, notes that asset market equilibrium requires that house prices be equal to the present value of expected future rents plus an adjustment for differences in risk (for examples, see Meese and Wallace, 1994; Sinai and Souleles, 2005; and Ortalo-Magné and Prat, 2010). Sinai (2009) shows that, during the 1990 to 2002 period, the correlation in the standard deviations of detrended real rents and detrended real house prices was 0.87. In exhibit 1, the correlation in the real 5-year (annualized) standard deviations for these 38 MSAs is 0.39. The reason for the lower correlation is twofold. First, exhibit 1 encompasses the housing boom-bust period of the late 2000s, which was a low-correlation period whereas the sample period in Sinai (2009) ended in 2002. Second, the growth rates used in exhibit 1, being a short difference, tend to have lower correlations than do deviations from a trend, used in Sinai (2009), which are a long difference. Exhibit 2 restricts the time period to end in 2002, which leaves out the recent boom-bust period for housing. The correlation in rent and price growth standard deviation is 0.73 during the 1980 to 2002 period. The MSA points in exhibit 2 also lie closer to the bivariate regression line than they do in exhibit 1, suggesting that the 2002-to-2009 period added noise to the historical relationship between rent volatility and house price volatility. The usual high correlation in rent and house price volatility shown in exhibits 1 and 2 suggest that differences in risk between owners and renters within a given housing market are largely due to how housing services are funded, not any difference in the inherent volatility of the two housing sectors within a given MSA.

It is worth noting that although the fact that house prices and rents are correlated within a market is consistent with the asset pricing notion that a shock to either the rental or owner-occupied market should be reflected in the other sector, it is not proof. Instead, a shock that is common to both the rental and owner-occupied sectors, such as a demand shock, could be generating correlated price responses. In fact, Blackley and Follain (1996) finds little evidence that a shock to the demand for owner-occupied housing due to changes in the tax code is reflected in the rental sector.

Many households do not have the luxury of staying in one house virtually forever, even leaving aside the nasty complication of death. They might need to move for a job, for a different school system, or for a larger house or apartment. Such forced moving creates another financial

uncertainty source and another distinction between renters and owners. Renters are uncertain whether future rental costs will be higher or lower than expected. Owners are uncertain about the future sales price of their current house. In addition, like renters, they are uncertain about how much they will have to pay for their next house. Once again, the degree of uncertainty depends on the current household location and the location it might move to. In the previous example, if a renter in the lowest volatility MSA moved to the highest volatility MSA after 5 years, and both MSAs experienced a one standard deviation positive shock, the renter would be moving from a \$12,550 per year rental unit to one that cost \$14,883 per year. A similarly situated owner would be moving from a market where his house cost \$120,000 to a location where an equivalent house would cost \$168,306. And that is assuming that initial rents or purchase prices were the same in both housing markets.²

Getting From Volatility to Risk

It is important to recognize that volatility is not necessarily the same as risk. If housing service cost volatility leads to housing and nonhousing consumption volatility, one would expect households to dislike it. But volatility in housing costs can reduce volatility in housing and nonhousing consumption if changes in housing costs undo volatility in other dimensions, for example, income or the cost of consumption. Such helpful volatility is labeled a hedge, and the volatility that households dislike, a risk.

In a simple sense, just owning a house provides a hedge for housing market risk. Recall that the difference between owners and renters is just the realization of their portfolio returns, because owners own houses and renters invest in other assets. The returns on houses are highly correlated with rental costs, therefore, houses generate a higher return when rental costs are more expensive. By contrast, renters' assets have a lower correlation with rental costs because it is extremely difficult to obtain a set of financial assets that vary along with housing costs as much as a house does. In a housing market where rents are volatile, renters would face risk in their total or annual housing costs because their investment returns may be low when housing costs end up being high, or vice versa. A homeowner, by contrast, owns an asset that implicitly pays an annual dividend exactly equal to the rent needed in each year. For homeowners, that implicit rental income offsets the implicit rental expense and leaves them with less risk on net. Because the housing unit is the same whether or not the rental cost increases, a household can actually reduce the volatility of its overall consumption—housing and nonhousing—by investing in an asset with a return that offsets the preexisting rent liability.³

Owning a house also can provide a hedge for the risk households face about housing costs in a future location. If a renter unexpectedly moves to a new city, housing costs may be more or less expensive than she anticipated. An owner faces a double whammy: Not only does she not know

² Although this article focuses on the differences in financial risk between renting and owning, nonfinancial differences are also important. For example, homeowners have control of their houses—when to move, whether to renovate, and so forth—in a way that renters do not.

³ It is not necessarily the case that a household should want to undo all of their housing cost risk by buying a house. A partial hedge could be preferable. Renting plus holding an asset that pays a dividend that is correlated with rental costs could obtain that position. Likewise, owning and taking the opposite position on the hedge would generate the same position.

what the price of a house in her new city will be, she does not know at the time of purchase how much she will be able to sell her prior house for when it comes time to move. That sell buy transaction—selling the current house and purchasing a new one—creates risk if the sale price and purchase price are not equal. If so, the sale purchase pair will either require an infusion of capital (if the new house is more expensive than the old one) or will yield a cash windfall (if the new house is less expensive). Because, according to Sinai and Souleles (2009), 45 percent of families move in a 5-year period, and 10 percent of families move out of their MSA, the potential risk to either a renter or owner from a move to different housing market is quite high.

In this scenario, the renter faces less risk than the owner if housing costs in the origin and destination cities do not move together much. The renter is exposed just to the risk of the total housing costs in the destination city. In addition, the renter, who invested her equity in nonhousing assets, has a more diversified portfolio overall than the owner and faces less volatility in her wealth at the time of the move. But if housing costs in the origin and destination cities covary positively, owning a house in the origin city hedges housing cost risks in the destination city, a benefit the renter does not enjoy. In essence, when house prices in two cities covary positively, a homeowner is wealthier—she can sell her existing house for more—when housing becomes more expensive in the destination city. Likewise, she is poorer when housing is less expensive. In those cases, the volatility of her wealth net of expected housing costs is reduced by owning the house. By contrast, a renter, who is unable to avoid having low covariance between her assets and future housing costs, is more likely to experience high portfolio returns when housing becomes less expensive in the destination city and low returns when housing becomes more costly. In first case, the renter can afford more housing than before and in the second case, the renter can't afford as much. That volatility in consumption subsequent to a move is what homeowners moving between two markets with high house price covariance can avoid.

It turns out that for most Americans, the covariance in housing costs between their current housing market and the cities they are likely to move to is remarkably high (Sinai and Souleles, 2009). The median expected correlation in real house price growth is 0.6, and the 75th percentile expected correlation is about 0.9. A similar, but less interpretable, pattern is evident in expected covariances across MSAs in house price growth. A high covariance between wealth and housing costs can be obtained best by investing in a house because the average house price correlation with stock or bond prices is much lower (for example, see Gyourko and Keim, 1992). In the context of the previous example, many homeowners have home sales prices that tend to be high at the same time that the purchase price of their next houses tend to be high. That is, the increase in house value in the high-volatility market to \$168,000 is not such a windfall if the house in the next market also appreciated to about \$160,000. And a decline in value to \$88,000, absent leverage, is not so painful if the price of the new house also fell to \$90,000 or so.

The risk of forgoing the investment position embedded in homeownership by renting instead varies critically by geography and household type. In general, houses in markets with little volatility cannot be used as a hedge against volatile house prices elsewhere whereas houses in cities with more volatility have the potential to be better hedges. However, the expected covariance – and thus the potential hedge – can vary widely across households within a given city because households are likely to move to different places. Some households in some cities

have a zero or negative expected covariance between their house price growth and house price growth in the cities they expect to move to, while households in other cities or other industries may tend to move to more correlated housing markets. In addition, owning a house might provide a good hedge for durable consumption items whose costs rise when real estate values go up. Such goods would have land as a significant input factor. Assisted living care, for example, might be more affordable to homeowners than to renters because if house values and assisted living costs tend to rise at the same time, homeowners could usually sell their houses to pay for assisted living care.

Another way that owning a home might reduce the effect of housing market uncertainty is that it provides an option to move. Suppose an owner's house price rose more than house prices elsewhere. He would be able to sell his house and move to other places that, perhaps, were previously unaffordable. If, however, his house price fell by more than house prices elsewhere, the owner would not have to move. Instead, he could stay put and consume just as much housing services as he always has. Only homeowners have the option to move and trade up their housing if market conditions allow without being forced to trade down their housing when market conditions are poor. Such homeowners would prefer house price uncertainty, as long as the uncertainty is relatively uncorrelated with house prices elsewhere.

One important factor complicates this analysis. So far, this article implicitly assumes that households' incomes are independent of housing cost changes, so incomes do not necessarily go up when rents rise. If incomes and rents covaried, renting would be more favorable (Davidoff, 2006). Rent uncertainty would be offset by income uncertainty, and together would reduce housing and nonhousing consumption volatility. If households had greater incomes when rents were higher, they not only could afford the higher rent, they would still have money left over for nonhousing consumption. In a sense, rent volatility could hedge income uncertainty, leading to less volatility in consumption overall. Davidoff (2006) considers the case where households are not liquidity constrained, and examines the correlation between total housing cost and lifetime income. In addition, if liquidity constraints are an issue, a positive covariance in annual incomes and rents would reduce renting risks relative to owning. Both cases can be exemplified by the idea of one company towns. If housing demand and employees' wages are driven by the productivity of the local factory then rents in that location would be high when incomes were high, and being a renter would yield less volatility in both housing and nonhousing consumption. By contrast, an owner would have more nonhousing consumption volatility (because housing costs would be constant and income would be variable) and her house value would be lowest precisely when she would want to move away: when the factory was not doing well and she was laid off.

Income uncertainty also complicates the analysis of the risk of moving to a new city. A positive covariance between income subsequent to a move and house prices in the destination reduces moving risk. For example, if a household that moves to a city where home prices have gone up more than expected also earns more than expected, that household's wealth is again higher (due to higher human capital wealth) precisely when housing is more expensive. The household need not own a home to obtain the benefit of income as a hedge for future housing costs. Indeed, depending on how much income changes offset changes in housing costs after a move, owning a home could overcompensate and create too much volatility. That is, if both home prices and

incomes rise when a household moves to a location where housing costs rose more than expected, the household's wealth might have gone up by more than necessary to cover the additional housing costs. The degree to which incomes and home prices might covary depends on things like the worker's industry and that industry's share of the local employment market. For example, if an industry is a large local employer and has a profitable year, it may pay employees more, and their good fortune could then be capitalized into home prices, generating a high correlation between income and home prices.

Direct evidence is lacking on the degree of covariance between incomes and house prices subsequent to a move. Paciorek and Sinai (2010) provide indirect evidence that income does not fully hedge housing cost uncertainty and that homeownership does provide an additional reduction in housing consumption volatility. They find that after netting out any income relationship, owners of homes that provide better hedges against future housing cost uncertainty have lower variability of housing consumption after a move. This result indicates that homeowners, on average, are not overcompensating for volatility in future housing costs. If they did overcompensate, hedged homeowners should experience increased housing volatility, not less.

Paying for Reduced Risk

Households seem to recognize the value of the reduced risk that accompanies homeownership. Several recent studies have found that in circumstances where homeownership provides a better hedge, households have higher housing demand. Sinai and Souleles (2005) show that the likelihood of homeownership is higher when a household lives in a more volatile housing market and is less likely to move (for exogenous demographic reasons). In low-volatility housing markets neither renting nor owning generates much uncertainty. By contrast, in high-volatility housing markets, short horizon owners experience sizeable sale price risk whereas long horizon renters experience sizeable rent risk. Han (2010) shows that the home sale price risk effect reduces the quantity of housing purchased by homeowners who are more likely to move out of the local housing market. Sinai and Souleles (2009) find that the reduction in demand for homeownership by short horizon households in high-volatility housing markets is mitigated for households that expect to move between highly covarying housing markets. For homeowners in short horizon households, the uncertainty about the sale price is a benefit because it reduces the uncertainty of the purchase price of their subsequent home. The benefit can be quite sizeable. Paciorek and Sinai (2009) estimate that, for households that move, the value of the lower variability in subsequent housing consumption is as much as 20 percent of their home price.

Importantly, households appear willing to pay a higher house price to avoid the higher volatility that accompanies renting. Sinai and Souleles (2005) provide empirical evidence that home prices capitalize a premium that increases with the amount of rent volatility avoided by owning. They find that a one standard deviation increase in the volatility of detrended real rent leads to a 0.18 to 0.62 increase in the price to rent ratio, or a 1.1- to 3.9-percent increase in prices (holding rents constant). Those home prices capitalize only the willingness to pay of the marginal homebuyer. Within a housing market, then, inframarginal households value avoiding the risk of renting even more than the risk premium embedded into home prices. (And some households still rent because they are unwilling to pay the premium required to own.)

Capacity for Volatility

If renting delivers more risk than owning and households realize that fact (and the evidence that they have a higher demand for homeownership when renting is riskier suggests they do), why does popular opinion seem to perceive that homeownership is riskier than renting? One possibility is that renters have a greater capacity to absorb uncertainty in housing costs or incomes. The primary channel by which that happens is that renters spend a smaller fraction of their incomes or net worth on housing than owners, holding constant age and marital status. This fact can be seen in exhibit 3 which regresses a measure of annual log housing costs on log income and an indicator variable for a renting household, plus some controls. The first three columns use household-level data from the 1980, 1990, and 2000 U.S. Census. The last two columns use household data from the Survey of Consumer Finances in 2004. Annual housing costs for renters are defined as 12 months of rent.

Estimating annual housing costs for owners is tricky, because a house's price is observed, but not its rental value. In this paper, rental value is imputed for owned houses in a couple of ways. First, a hedonic model of rents is constructed using the data from the Census. The hedonic model is then applied to predict rental values for each of the homeowners. Second, a user cost model is applied, following the method of Poterba and Sinai (2008). The user cost (UC) is the sum of the annual after tax expenses (including the cost of capital) less the expected capital gain, which is the money the owner gets back by selling the home for more than what he paid, per dollar of house. The two approaches are conceptually related. For a landlord, rent (R) plus the expected capital gain needs to yield the market return on his investment. For an owner, the annual cost plus the expected capital gain needs to deliver the same return. Thus, R should equal $UC \times P$, when P is the price of the house. However, an important distinction remains between rent and user cost: Rent is a cash payment to landlords. User cost has a higher cash cost than rent but user cost is reduced – on paper – by any house price appreciation.

The first column of exhibit 3 uses the hedonic to impute rents to homeowners. It shows renters, on average, spend about 17 percent less per year on rent (or equivalent) than owners, holding a number of household characteristics, including income, constant. In the second column, a scaling factor, estimated from the user cost model, is applied to self-reported home values to obtain the rental equivalent for an owned house. Under these conditions renters are estimated to spend 17 percent more per year on housing than owners. The explanation for the discrepancy between columns 1 and 2 is evident in column 3, which modifies the user cost scaling factor to exclude the capital gains component and thus deliver a number closer to a cashflow measure of housing spending (without the capital gains offset since it is a just a paper gain). In that case, renters are estimated to spend 63 percent less on housing than similarly situated owners. Basically, owners are spending more cash on their residences than renters, but they (on average) more than get that difference back on paper in the form of capital gains.

The last two columns repeat the exercise using the Survey of Consumer Finances (SCF) and the user cost imputation. The same gap between the standard user cost and the user cost that excludes the benefit of capital gains can be seen in this data set. Renters spend an estimated 53 percent less on housing (on a more or less cashflow basis) than owners (the last column). When

owners are credited with the benefit of the expected capital appreciation, renters are estimated to spend 21 percent less than them on their housing service flow. In results not reported in this article, the same pattern can be found when net worth (excluding housing) is controlled for in the SCF regressions.

Renters spend less on housing, *ceteris paribus*, for many possible reasons. One reason might be that renters are savvy enough to recognize that they are accepting more housing cost volatility and intentionally buffer themselves against that volatility by consuming less housing relative to income or net worth. Another is that renters choose to rent in part because they are the types of people, even holding observable characteristics constant, who do not like to consume much housing and the rental stock is typically cheaper than the owned stock. A third possible reason is renters are saving for a down payment to buy a house. A fourth possible reason is that the tax price elasticity of demand for housing might be greater than one, and thus the tax subsidy to homeowners leads to higher spending even net of tax. Glaeser and Gyourko (2006) summarize that elasticities found by the literature range from 0 to 2.

In any case, the lower spend rate on housing suggests that renters can more easily absorb higher than expected rent growth. In addition, they can better handle declines in their incomes because they have not committed to spending as high of a fraction of their incomes. Sinai and Souleles (2005) provide some evidence that households realize that spending less on housing provides a buffer against housing market volatility: households that live in housing markets that are costly relative to their incomes are more apt to take housing market volatility into account when making their housing decisions than households with housing costs that are a smaller portion of their spending.

The tendency of owners to spend a larger fraction of their incomes on housing than renters could be one of the main reasons that the conventional wisdom views homeownership as riskier. If renters spent as much of their incomes on housing as owners implicitly do, they would be more likely to be evicted for nonpayment of rent in a downturn than they currently are. Still, even if renters and owners exhibited comparable housing spending, it is less expensive to be forced to move out of a rental apartment than to move out of a house, merely because the transaction cost of selling a home is higher than the transaction cost of moving out of an apartment.

A possible virtue of renting, however, comes in how the time path of rental payments in a market where rents are expected to increase differs from the cash outflow an owner must pay. A renter pays a low initial rent because a landlord expects some capital gain due to the anticipated growth in rental income and thus does not need as high of a cash yield in the form of rent. But because rents typically go up over time, the expected rent trajectory for renters starts low and rises. Homeownership cash costs are essentially level. In addition, they are higher than rents would be because the owner expects to get money back on paper on average via capital gains, but doesn't actually monetize that gain until he sells. For liquidity-constrained households with rising expected incomes, renting matches cashflows better than owning.

Another important reason the conventional wisdom might view renting as less risky than owning is that the use of leverage by homeowners magnifies the consequences of a bad shock. Namely, owners can be under water on their mortgages, whereas renters, who have no mortgages, cannot.

Negative equity can lead to many problems ranging from impaired mobility (Chan, 2001; Ferreira, Gyourko, and Tracy, 2010) to foreclosures and risks to the financial system. These risks, however, result from using high levels of debt finance to purchase housing, not from merely owning housing in isolation. If households were able to pay cash for their houses, none of the problems listed above would exist. Indeed, many of the major complications created by the housing bust of 2007 are due to defaults and foreclosures, which are a feature of mortgage finance, not homeownership *per se*.

It would be disingenuous to dismiss the risk of mortgage finance, however, because most homeowners in the United States use mortgages to purchase their houses. According to Sinai and Souleles (2008), 90 percent of homeowners under the age of 45, but less than 20 percent of homeowners above the age of 75, have mortgages. Low-income and younger homeowners simply do not have the assets to obtain their preferred home without a mortgage. Using data from the 2004 Survey of Consumer Finances, Poterba and Sinai (2011) show that less than 30 percent of aggregate mortgage debt could be replaced with equity from financial assets on households' balance sheets. Young, low-income households in particular could reduce their mortgage debt by no more than 15 percent. Like it or not, using leverage appears to be bundled with homeownership.

A full treatment of the risks of home mortgages is beyond the scope of this article. In addition, it is already well understood that financing a volatile asset with high leverage—whether in commercial real estate, houses, or even airlines—is risky. Instead, to enjoy the risk management aspects of homeownership, homeowners need to mitigate the risks of leverage. The steps are simple in theory, although more difficult to execute in practice. Use conservative amounts of debt: households that use less leverage are less likely to find themselves owing more than the home is worth. Do not purchase more home than you can afford: households that purchase conservative amounts of housing are less likely to find themselves unable to pay for it. And beware of the risks of mandatory debt refinancing, whether explicitly (through a new mortgage) or implicitly (through an adjustment in an option ARM). With typical fully amortizing mortgages, refinancing is an issue only when a household moves. At that point, a household runs the risk that mortgage rates have risen—and it then becomes an expensive proposition to give up a low-rate mortgage to switch houses—or that financing criteria have become more conservative and they cannot borrow enough to afford a new house. This difficult dilemma can be eased either by households saving to accumulate enough assets to reduce the total leverage on their balance sheets or by the creation of portable mortgages that could be transferred (with reasonable restrictions) to a new house.

Implications for Rental Policy

Currently, the housing playing field is tilted toward homeownership, especially at the high end of the income distribution, due to its favorable tax treatment and the government subsidy for mortgage finance (first through the implicit guarantee of GSE debt and subsequently through the Fed's active role as a purchaser of mortgage backed securities). For less well-off households, the playing field is more neutral. The subsidy to homeownership is smaller for low-income households that despite financing their houses largely with debt, typically do not receive much benefit from the mortgage interest deduction because they do not have enough potential

deductions to merit itemizing on their tax returns. (Poterba and Sinai (2011)) Renting is subsidized largely through place based public housing and voucher programs. Because of the large amount of crowd out of private housing consumption by public subsidies, however, low-income housing subsidies can be more like targeted income transfers than subsidies to renting. (Sinai and Waldfogel, 2005)

The playing field between renting and owning can be leveled in two ways. One is to reduce the subsidy to homeownership. The other is to increase the subsidy to renters to compensate for the existing subsidy to homeownership. These two approaches are neither equivalent in terms of risk nor incentives. It is important to recognize that housing or rental policies typically influence not only whether households own or rent, or how much housing they consume, but also how much and what kinds of risk they take on. Assessments of housing policies should account for whether households are induced to take more appropriate risks, not just whether household consumption is affected.

To assess differences in risk, it is helpful to recall that homeownership can be thought of as housing consumption plus an investment in housing in the local market. Both components have independent effects on risk. The housing consumption part has the same risks for both renters and owners—the cost of housing services can fluctuate. Because everyone needs a home, both renters and owners need to obtain housing services and face this source of risk. The difference between them, in fact, comes in how they handle it.

Owners deal with the uncertainty about future housing costs by making investments in their local housing markets: They buy houses. (It is an extremely local market, because they buy their own houses.) Renters just accept the volatility of housing cost fluctuations and invest in a more diversified portfolio. This decomposition of owning into renting plus an offsetting investment makes some sources of risk apparent. First, risk rises with spending on housing services (holding income constant). Thus, the most obvious way for any household—renter or owner—to control risk is to avoid spending too much on housing relative to its income or wealth. For renters, spending less on rent relative to income reduces the effect of rent fluctuations on nonhousing consumption or income fluctuations on the ability to continue to pay rent. Therefore, policymakers should be careful to make sure that any incentive for renting is not also an incentive to spend more on rent. Likewise, current tax policy subsidizes the consumption of additional housing for homeowners. Reducing this subsidy would mitigate the risk that follows from homeowners being incentivized to devote more of their resources to housing.

The second way a renter can manage the risk of rent fluctuations is by taking on an offsetting investment in local housing. Although it seems ironic to encourage households to make a volatile investment, the investment simply negates the household's preexisting risk. For example, one can think of owning a home as owning a financial asset that for each period in perpetuity pays the current rental cost of a home combined with renting the house. When rents are higher, the financial asset pays just enough more to cover the increment. When rents are expected to be higher in the future, the financial asset is worth more, just offsetting the extra cost.

Currently, the only viable way to invest in local housing markets is to own the home you live in. That is a polar case investment of 100 percent of the approximate expected rental cost (in present

value, adjusted for risk) if a household were to live in the home in perpetuity. Renting is another polar case, but of zero investment. For many households, owning can be too much investment in housing because they do not expect to stay in the home for a long enough time. In that case, the residual home value at the time of its sale is uncertain, potentially leading to risk.

An investment in housing, however, need not be limited to 100 percent (owning) or zero (renting). For example, long-term leases eliminate the primary risk renters face, not being able to lock in their total cost of obtaining housing, for a set time period. That is because a long-term lease is like a financial asset that for each period during the lease term pays the current home rental cost. The economic difference between a lease and ownership is merely the fixed rent term length (a lease is finite but ownership is perpetual). Indeed, an infinitely long, transferable lease is just like owning. Other differences between leasing and owning are merely institutional. For example, lease payments typically are paid each year whereas a purchase price is paid upfront. The timing and amount of lease payments are set by contract; however, the only reason they are not frontloaded like a purchase is that the landlord and tenant choose not to.⁴ Another typical institutional difference between renting and owning is that residential tenants typically do not have discretion about making renovations to a property like an owner does. But they would, if the lease contract were not written to disallow it.

Given their potential benefits, one wonders why it is that long-term residential leases are not already commonplace in the United States? Although long-term fixed rent leases (or with built in, known escalations) are prevalent in commercial real estate in the United States, they are exceedingly rare in domestic residential leases. Genesove (2003) finds that fewer than 2 percent of residential leases in the United States are for 1 year or more, although many renter households live in the same rental unit for longer than 1 year. One possible explanation is that it simply is cheaper to obtain long-term lease benefits by owning. As discussed previously, homeownership is favored by the tax code. Perhaps, absent subsidized ownership, a long-term rental sector would develop. Unfortunately, existing empirical research does not address that issue. In most studies, the own-rent margin is not estimated to be very sensitive to the tax subsidy amount for homeownership. This empirical research cannot truly address any systemic shifts in the housing market that might arise from a large change in the overall tax treatment of homeownership, however, because typically they are estimated from small changes in tax rates.

Another possible explanation for the lack of long-term renting in the United States is that tenants would have to pay a premium for such a lease. One expensive likely feature of a long-term residential lease would be that a tenant could break the lease at will. When would a tenant break a lease? Besides exogenous moves, if market rents dropped below what was agreed upon in a long-term lease, a strategic tenant would move out to a cheaper apartment and the landlord would have to re-lease the unit at a lower rent. If rents rose above what was agreed upon in the lease contract, the tenant would not move out. This one-sided benefit in favor of the tenant would be most valuable in housing markets where rents were the most volatile. Commercial leases avoid this asymmetry by enforcing that a tenant pays either the rent for the entire lease term or a penalty that makes the landlord whole if the tenant departs. It seems less likely that individual residential tenants could be forced to do that in a contract and, even if they could, that a landlord

⁴ Presumably, a tenant would be worried about counterparty risk—the landlord would collect an up-front rent payment and then fail to provide the contracted rental unit.

could efficiently collect. Instead, a landlord would have to be compensated for the tenant's option through higher rent for long-term leases. That rent premium would have to be largest in housing markets where housing costs fluctuated the most and for longer leases, where the odds are higher that market rents could drop below the rates in the long-term lease. Paradoxically, the very households that would value long-term leases—those that intend not to move—face the highest rental premium and the lowest ownership cost. As renters, they would have to pay a high rent premium because the option to break the lease is most likely to be “in the money.” Because households who are unlikely to move amortize the high transaction costs of ownership over a longer horizon, they reduce the per period ownership cost.

A second risk source, detailed previously, is uncertainty about housing costs in future residences, whether those new houses are in the same city as the current ones, or in new housing markets. Homeowners' investment positions hedge them against changes in housing costs in future houses in the same city because the value of their investments go up when local housing costs rise. To the extent that changes in housing costs are correlated across cities the household might move to, the same change in sale value hedges an owner against changes in housing costs in other cities. Renters, because they lack investment positions in housing, are unhedged. Long-term leases could remedy this omission if the leases could be transferred to new tenants. The reason is that long-term leases become more valuable when current rents rise, just as houses become more valuable when rents go up. A household that moves out of a rental unit could sell the right to take over a favorable lease and use the proceeds to defray higher rent in the next rental unit. One possible reason that long-term leases have not gained traction in the United States is that the domestic population is fairly mobile and assumable leases are atypical.

Other potential options for renters to avoid the risk from moving involve taking positions between the extremes of only renting or only owning. These alternatives run into a host of concerns about implementation, however. For example, if a renter knew with certainty where she would move next, just not when, she could become a landlord in that other city. She could buy a housing unit there and rent it to a tenant, meanwhile renting a place herself in her current city. This strategy separates the investment in housing, which provides the hedge against uncertain future housing costs, from the consumption in housing. This approach poses a number of practical problems. For example, when it is time for her to move, the combination tenant and landlord would have to break the lease both with her landlord and with her tenant. She would have to manage her rental property. And, since being a landlord is homeownership, this approach does not achieve a policy goal of encouraging households to be renters rather than owners.

An alternative to being a landlord would be to invest in a housing index that tracked the destination city. This alternative would provide an investment position in housing without the hassle of managing a property. A renter could even invest in a basket of city housing indexes, weighted by her likelihood of moving to each of the cities. Such indexes, such as the S&P/Case-Shiller[®] Home Price Indices, are tradable and would simply need to be packaged into products that consumers could easily understand (for examples, see Case, Shiller, and Weiss, 1993; DeJong, Driessen, and Van Hemert, 2007; Shiller, 2008; and Voicu, 2007). Adopting this strategy faces several difficulties. First, where does a household find the money to maintain a long position in possible future cities? And, if leverage is necessary to buy the position in the housing index, a decline in the index can leave the renter under water just like a decline in home

prices can do to an owner. Instead, a renter might prefer an option-based product to reduce their risk. For example, a renter who wished to limit his exposure to home price increases could purchase an option that pays the excess of home prices in a destination city above some threshold if home prices rise enough. Such financial products would be expensive, however, because the option seller would absorb the risk from the renter, and the derivatives markets necessary to create such products have failed to develop.

Because the market has not delivered mechanisms for renters to reduce their housing risk, policymakers could mitigate the adverse effects on risk of subsidizing renting by targeting rental subsidies to those households that do not face much rental risk. Households with a short expected duration of stay in a home face less risk from renting and more risk from owning than do long duration renters, therefore, these households possibly could be subsidized to rent (and definitely should not be subsidized to own). Households living in stable housing markets, with not much rent volatility, face little rental risk no matter their horizon, and thus encouragement to rent would not significantly affect their housing risk. Households in industries with wages that covary positively with rents face relatively low risk as renters. Targeted incentives would thus distort risk-taking the least.

Conclusion

It is natural, given the recent volatility in home prices, for the public policy pendulum to shift from favoring homeownership to supporting renting. It is important to keep in mind that the alternative to homeownership, renting, is also risky. It is also hard to claim that one tenure mode is more or less risky than the other in any absolute sense. Rather, the risks are multidimensional and affect various household types to differing degrees.

This article focused on two aspects of housing risk: First, what is the housing cost uncertainty in the current residence? Second, what is the housing cost uncertainty if a household were to move to a new residence, or a new city? It then discussed ways in which public policy could encourage renting or, alternatively, cease to encourage homeownership, and still minimize the additional risk taken on by renters.

Because housing markets with volatile prices also tend to have volatile rents, neither renting nor owning have an inherent financial risk advantage. Instead, the tenure mode affects how underlying volatility manifests itself. In low-volatility housing markets, choosing renting versus owning exposes a household to little difference in risk. In high-volatility markets, owning locks in the current residence cost but leaves the sale price uncertain whereas renting leaves the annual cost uncertain. Households with long durations of stay reduce their housing cost risk by owning rather than adopting annual leases. Owning also provides an investment that hedges housing costs after a move for households that would move within a housing market or move to a new housing market with correlated home price changes but which adds volatility if those conditions are not met. Renters are exposed to home price risk for future houses.

These risk sources for renters can be mitigated in three broad ways. The first is to help households to be sufficiently conservative financially that they can absorb volatility in housing costs. This article showed that renters tend to spend less cashflow on rent than owners do on

housing costs. Many possible reasons exist for this cost difference, but it is doubtful that renting is an inherently cheaper way to obtain housing. Instead, current renters probably consume less housing than owners do. The lower amount of housing consumption provides a financial buffer against unexpected changes in rents or income. Any rental policy should avoid subsidizing additional spending on rent by renters because that would increase household risk. By contrast, the current tax treatment of owner-occupied housing provides a subsidy that increases in the amount spent on housing, encouraging increased housing consumption.

The second risk mitigation approach would be for renters to adopt positions somewhere in between the current norm of annual leases and a perpetual lease, which is like owning. Long-term leases could provide certainty about housing costs for a shorter horizon household and a possible hedge against housing costs in future markets. Housing derivatives based products could also aid renters; however, neither option has proven to be popular.

A third approach would be to target rental subsidies to those households that have low renting risks. Such targets include highly mobile households, those in low-volatility cities, and those with incomes that tend to covary with rents.

Because nearly all households either rent or own, an alternative to rental policy would be less favoritism towards homeownership. One wonders if the paucity of long-term lease contracts is due in part to crowd out from subsidized homeownership. A reduction in the subsidy to owner-occupied housing could be across the board, or it could be targeted to those households with the highest ownership risk.

Author

Todd Sinai is an Associate Professor of Real Estate and Business and Public Policy at The Wharton School, the University of Pennsylvania, and a Research Associate at the NBER.

Acknowledgments

The author thanks the Zell-Lurie Real Estate Center at Wharton for research support, Moises Yi for outstanding research assistance, and Ingrid Gould Ellen and two anonymous referees for helpful suggestions. This article was originally prepared for the “Reconsidering Rental Housing Goals” meeting at HUD, May 13, 2010.

References

- Blackley, Dixie and James Follain. 1996. “In search of empirical evidence that links rent and user cost,” *Regional Science and Urban Economics* 26: 409-431.
- Case, Karl, Robert Shiller, and Allan Weiss. 1993. “Index-Based Futures and Options Markets in Real Estate,” *Journal of Portfolio Management* 19 (2): 83–92.
- Chan, Sewin. 2001. “Spatial Lock-In: Do Falling House Prices Constrain Residential Mobility?” *Journal of Urban Economics* 49 (3): 567–586.

Davidoff, Thomas. 2006. "Labor Income, Housing Prices and Homeownership," *Journal of Urban Economics* 59 (2): 209–235.

De Jong, Frank, Joost Driessen, and Otto Van Hemert. 2007. *Hedging House Price Risk: Portfolio Choice with Housing Futures*. New York: New York University: Mimeo..

Ferreira, Fernando, Joseph Gyourko, and Joseph Tracy. 2010. "Housing Busts and Household Mobility," *Journal of Urban Economics* 68 (1): 34–45.

Genesove, David. 2003. "The Nominal Rigidity of Apartment Rents." *The Review of Economics and Statistics* 85 (4): 844-853.

Glaeser, Edward, and Joseph Gyourko, 2006. "Housing Dynamics." *NBER Working Paper 12787*. Cambridge, MA: National Bureau of Economic Research.

Gyourko, Joseph, and Donald Keim. 1992. "What Does the Stock Market Tell Us About Real Estate Returns?" *Journal of the American Real Estate and Urban Economics Association* 20 (3): 457–485.

Han, Lu. 2010. 'The Effects of House Price Uncertainty on Housing Demand: Empirical Evidence from the U.S. Housing Markets,' *Review of Financial Studies* 23 (11): 3889-3928.

Hendershott, Patric, and Joel Slemrod. 1983. "Taxes and the User Cost of Capital for Owner-Occupied Housing," *AREUEA Journal* Winter 10 (4): 375–393.

Meese, Richard, and Nancy Wallace. 1994. "Testing the Present Value Relation for Housing Prices: Should I Leave my House in San Francisco?" *Journal of Urban Economics* 35: 245–266.

Ortalo-Magné, Francois, and Andrea Prat. 2010. "Spatial Asset Pricing: A First Step." *CEPR Discussion Papers 7842*, London, UK: Centre for Economic Policy Research.

Paciorek, Andrew, and Todd Sinai. 2010. "Does Home Owning Smooth the Variability of Future Housing Consumption?" *NBER Working Paper 16531*. Cambridge, MA: National Bureau of Economic Research.

Poterba, James. 1984 (November). "Tax Subsidies to Owner-Occupied Housing: An Asset Market Approach," *Quarterly Journal of Economics* 99 (4): 729–752.

Poterba, James, and Todd Sinai. 2008. "Tax Expenditures for Owner-Occupied Housing: Deductions for Property Taxes and Mortgage Interest and the Exclusion of Imputed Rental Income," *American Economic Review: Papers and Proceedings* 98 (2), 84–89

Poterba, James, and Todd Sinai. 2011 (June). "Revenue Costs and Incentive Effects of the Mortgage Interest Deduction for Owner-Occupied Housing," *National Tax Journal*, 64 (2, part 2), 531-564.

Saiz, Albert. 2010 (August). “The Geographic Determinants of Housing Supply,” *Quarterly Journal of Economics*. 125 (3): 1253-1296.

Shiller, Robert. 2008. ‘Derivatives Markets for Home Prices,’ Working paper 13962. Cambridge, MA: National Bureau of Economic Research.

Sinai, Todd. 2009. “Spatial Variation in the Risk of Home Owning,” in *Housing Markets and the Economy, Risk Regulation, and Policy*, edited by Edward Glaeser and John Quigley. Danbury, CT: Lincoln Institute of Land Policy.

Sinai, Todd, and Nicholas Souleles. 2009 (October). “Can Owning a Home Hedge the Risk of Moving?” *NBER Working paper 15462*. Cambridge, MA: National Bureau of Economic Research.

———. 2008. “Net Worth and Housing Equity in Retirement,” in *Recalibrating Retirement Spending and Saving*, edited by John Ameriks and Olivia S. Mitchell. Oxford, United Kingdom: Oxford University Press.

———. 2005. “Owner Occupied Housing as a Hedge Against Rent Risk,” *Quarterly Journal of Economics* 120 (2): 763–789.

Sinai, Todd, and Joel Waldfogel. 2005. “Do Low-Income Housing Subsidies Increase the Occupied Housing Stock?” *Journal of Public Economics* 89 (11-12): 2137-2164.

Voicu, Cristian. 2007. “Optimal Portfolios With Housing Derivatives”. Cambridge, MA: Harvard Business School; *Mimeo*.

Exhibit 3. Differences in Annual Spending on Housing by Renters and Owners

Data Source	IPUMS (Census)			Survey of Consumer Finances	
	Predicted Rent	User Cost	User Cost Excluding Capital Gains	User Cost	User Cost Excluding Capital Gains
Renter indicator	- 0.1681 (0.0004)	0.1709 (0.0007)	- 0.6308 (0.0007)	- 0.214 (0.014)	- 0.525 (0.014)
Log household income	0.1171 (0.0002)	0.2957 (0.0004)	0.2936 (0.0004)	0.504 (0.004)	0.521 (0.003)
Adjusted R ²	0.3998	0.2777	0.4674	0.6426	0.6937
MSA dummies?	Yes	Yes	Yes	No	No
Age dummies?	Yes	Yes	Yes	Yes	Yes
Married dummy?	Yes	Yes	Yes	Yes	Yes
Year dummies?	Yes	Yes	Yes	NA	NA
Sample period	1980, 1990, 2000	1980, 1990, 2000	1980, 1990, 2000	2004	2004
Number of observations	4,070,627	4,070,627	4,070,627	19,099	19,099

Exhibit 1

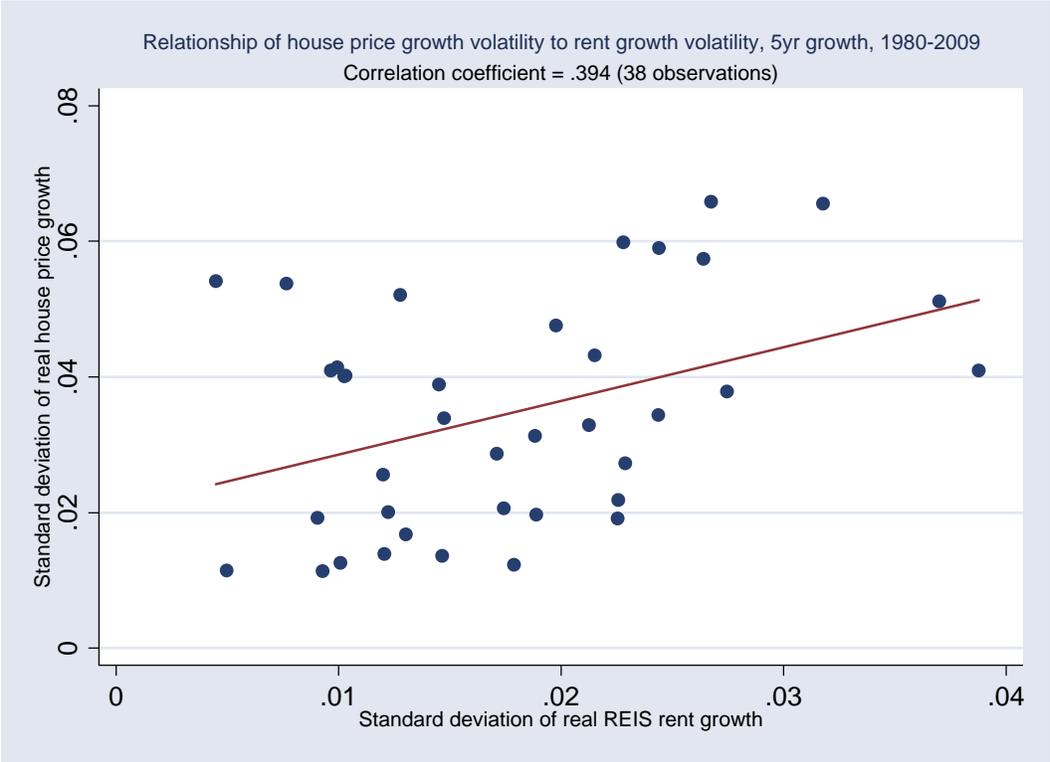


Exhibit 2.

