Valuing Housing in Measures of Household and Family Economic Well-Being

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I. Introduction

The most commonly used measures of economic well-being in the United States is household income. This measure is based on money income which is commonly criticized as misrepresenting the well-being of the elderly. Since the money income of elderly families and households is low after retirement, they tend to appear to be less well-off relative to other family types. A common suggestion is to note that elderly families and individuals often own their homes without mortgages and pay below 'market rent' for their homes. In this sense they are ‘better off’ than younger families with high mortgage payments. Including imputed net rental income from owned homes when examining income distributions attempts to address this issue – to find a way to account for the fact that homeowners who have paid down mortgage debt have much lower housing costs than renters or homeowners with mortgages.

These concepts figure into deliberations about the proper definitions of income. In 2001, the Canberra Group released a report consistently defining household income for use in distributional measures used by statistical organizations around the world. Some of these definitions address the need to account for home ownership in a statistical measure of economic well-being. Further, housing markets have become an important issue of late in the U.S. as the financial markets surrounding homeownership have changed radically in recent years. These changes have had a profound effect on the economic well-being of families and individuals.

One of the most significant changes in mortgage markets was the securitization of mortgage debt. Lenders provided funds to homebuyers and repackaged the debt into securities that were traded worldwide. This practice dissipated the risk of mortgage default for lenders and allowed them to soften buyer qualifications. This led to the proliferation of subprime mortgage loans. Borrowers with poor credit ratings often used these loans to buy a home or to refinance original mortgages. A subprime

loan is always more expensive than a conventional loan made to a borrower with excellent credit. The interest rate and additional points charged to the borrower can vary depending on credit history, income, assets, and amount of down payment. The outcome is that families with lower incomes pay more for the same house compared to families with higher incomes. This suggests that an appropriate accounting of homeownership in a measure of economic well-being should take explicit account of the mortgage debt for younger low income families as well as taking account of the benefit of homeownership for those without mortgages.

Other factors in the housing market have also changed. While in the past elderly families were likely to have owned their homes free and clear, in recent years mortgages and housing debt became a bigger part of the portfolio of elderly households. The Federal Reserve reported that among households headed by someone age 65 to 74, over 32 percent held housing debt, either a mortgage or balance on a home equity line of credit, on their primary residence in 2004, up from less than 19 percent in 1992 (WSJ, September 19, 2007).

Finally, the cost of housing has risen for most households in recent years. In 2007, the U.S. Census Bureau reported that among households with mortgages, about 28 percent of households spend 35 percent or more of their income on housing-related expenses, including payments for mortgages, home equity loans, and real estate taxes. The percentage of income required to meet housing costs has risen significantly over the years. According to the Center for Housing Policy, the number of working families with severe cost burdens[1] rose from 2.4 to 4.5 million between 1997 and 2005, an increase of almost 87 percent. The increase of severe cost burden among renters was 103 percent between 1997 and 2005. Similar increases were found for non-working families.

These stylized facts suggest that any measure of economic well-being should take account of homeownership and incorporate the financial arrangements that can change over time. This paper

[1] Severe cost burden is defined as paying more than half of income for housing. The Center for Housing Policy used AHS national and metropolitan data series for various years.

addresses these issues by first describing current methods used on the Current Population Survey Annual Social and Economic Supplement (CPS ASEC) to address the issue of housing in a measure of after-tax income. Section IIIB describes a new method that improves the estimates by accounting for housing in current markets and coordinates the housing expenses in both the net rental income and the tax calculations. Both methods take account of subsidies received by renters to help with payments for rents, addressing the same issue—that some families do not pay market rent for their shelter needs.

II. Concepts

A. Net implicit after-tax rental income from owned home

This research incorporates the value of home ownership and thus distinguishes homeowners from renters in terms of economic well-being. This relationship can change depending upon the operation of the housing and mortgage markets and the risk aversion of the homeowner. In some cases rents may be high and home prices low. At other times, home prices may be high relative to rents if there is a high supply of rental units and low demand. Changes in access families have to credit, coupled with expectations of home price appreciation, may induce many first time buyers into the market.

One way to measure the difference in housing burdens between owners and renters is to treat homeowners as renters. This requires an estimate of the market rent they would pay if they rented the home that they live in. The user cost of homeownership is then calculated by treating this imputed rent as income for the homeowner against which the costs of owning the home are subtracted. These costs are mortgage interest expense, maintenance and repair costs, insurance costs, and real estate taxes. Any rental income, or profit, over and above these costs is added to income. Any expenses that exceed the imputed rental income are subtracted. In this way, relative differences are accounted for between owners and renters as housing markets change over time and place.

Finally, tax benefits from home ownership must be taken into account. Most important are the deductions allowed for payment of mortgage interest and property taxes. These allowances in the tax code are intended to lower the cost of home ownership relative to renting in order to encourage homeownership in the U.S. A full accounting of the relative standing between owners and renters includes these tax benefits for homeowners. This analysis only considers the house as owned and lived in; appreciation and depreciation are not included because they most impact an owner's income when the house is sold. It is also possible that appreciation would affect, even induce, a homeowner to refinance their housing debt. Our paper views housing debt and home value at a snapshot in time, realizing that wealth effects that alter home equity may have already occurred or may benefit the owner in the future.

B. Housing subsidies

Other types of households, besides homeowners without mortgages, do not pay market rent for their housing. Some low-income families are eligible for housing subsidies that help them pay rent. This is an important non-cash benefit for many households. Addition of housing subsidies to income will tend to reduce measured inequality somewhat by shifting some low-income families up in the income distribution.

The CPS ASEC records whether or not a respondent lives in public housing or pays reduced rent because of a government subsidy. The value of the subsidy is not reported, but may be estimated using a hedonic regression technique to predict market rent using data from the AHS. Using these same data, the subsidy amount can be estimated by subtracting reported rent that is paid out-of-pocket by subsidized families from predicted market rent or assuming that families pay a percentage of income for housing, a typical programmatic rule in housing programs.

III. Methods

A. Current methodology

This section presents the current housing treatment in the Census Bureau's CPS ASEC income computations. Home equity, mortgage interest paid, property taxes paid, and housing subsidies are imputed from other data sources and incorporated with other household characteristics to produce income and poverty estimates. The purpose, production, and accuracy of each is considered in turn. Then, the alternative approach based solely on the AHS is discussed and results compared.

Published CPS ASEC tabulations on alternative income definitions currently incorporate housing through return to equity and housing subsidy estimates, and indirectly in income tax estimates. Calculation of a return to home equity approximates net implicit rental income in order to level the playing field between owners and renters. Housing subsidies are also valued when the survey respondents say they live in public housing or receive housing assistance. Further, housing costs are incorporated into the income tax model when computing itemized deductions. Mortgage interest and property taxes paid are imputed and combined with other deductible expenses such as medical and dental expenses and charitable contributions. These total itemized deductions lower the amount of taxable income, and thus the amount of federal income tax used to compute after-tax income for homeowners.

Return to equity

The method used at the Census Bureau for the past two decades estimates the return to home equity for the CPS ASEC based on imputed values from the AHS and a municipal bond rate. This method captures the alternate investment flow from home equity, subject to the rate of return chosen. The Census Bureau uses the return to high yield municipal bonds. This approach is sensitive to the chosen rate of return and the quality of the housing value imputation.

The CPS ASEC housing tenure question determines the universe for the return on equity

computation. A donor record from the AHS National file is found for each CPS ASEC homeowner through a statistical match. Common variables between the files are used to determine the best donor record. These variables include the householder's age, number of persons in the household, total household income, and location variables such as core based statistical area, state, central city indicator, or region. Housing characteristics such as home value, land value, property taxes and housing debt are appended to the CPS ASEC record from the AHS donor record. Home equity is computed by subtracting outstanding home debt from the reported value of home and land. Total debt is computed, not collected. AHS respondents report their monthly payments, original loan balance(s), loan origination date(s), interest rate(s), and loan term(s). Total mortgage debt is calculated using this information.

The return to home equity is calculated by multiplying home equity by the annual S&P high-grade municipal bond yield. Next, the value is multiplied by the annual change in owner's equity based on the Federal Reserve's Flow of Funds data. This adjustment addresses the lag between the AHS National data, bond yield, and CPS ASEC information. Property taxes are subtracted from this adjusted return to home equity value for the final amount.[2]

The 2006 CPS ASEC reflects income and tenure status in 2005. The municipal bond yield rate for 2005 was 4.29 percent and the flow of funds adjustment was 1.14. The median return to home equity was $3,703. Property taxes are deducted from the return to equity estimate to compute net return to home equity, lowering the median value to $2,205. Approximately 5.5 percent of households received a negative net return to home equity value. This can occur when mortgage values exceed the home and land value or through the subtraction of property taxes paid. The aggregate amount of imputed net return to home equity in the 2006 CPS ASEC was $290.6 billion. The imputed values were much higher than in prior years because the donor AHS file used in the statistical match was

[2] Property taxes have historically been subtracted from the return on the housing asset. Conceptually, property taxes are already included selected rate of return.

refreshed.[3]

Housing subsidies

CPS ASEC respondents who lived in public housing or indicate that they received housing assistance form the universe for the housing subsidy imputation. A rudimentary hedonic regression estimated using 1985 AHS data is the basis for current housing subsidy values. This method generates subsidy values for each of four regions in the U.S. These vary by family size and composition and are updated each year based on the change in the CPI for residential rents.[4]

Income taxes

Individuals with income from any source form the universe for the CPS ASEC tax model. Tax filing units are formed based on household relationships. Income is aggregated according to these units. The Census Bureau imputes certain income and expenditure values that are not collected in the survey to better model individual taxes.[5] The variables are imputed from a sample of Internal Revenue Service (IRS) tax returns that are made available to the public. This sample has a restricted set of variables and a specific sampling frame designed to cover the entire spectrum of income tax filers. This is a major difference from the CPS ASEC, which samples households in the civilian, non-institutionalized population of the U.S. The IRS file is released with at least a three-year lag. IRS return data for 2001 were used to impute the tax variables in the 2006 CPS ASEC.

Housing data enter the income tax model through the simulation of itemized deductions. Tax filers have a choice: to itemize their deductions or take the standard deduction. These deductions lower a filer's taxable income amount before marginal tax rates are applied. To minimize taxable

[3] For 2006 CPS ASEC, the 2003 AHS replaced the 1995 AHS for the statistical match to obtain home equity variables.
[4] To maintain a consistent series of subsidy amounts, and for ease of production, the 1985 national file has been used, updated annually with national level rent indexes.
[5] Capital gains and losses, IRA contributions, childcare expenses, retirement and health insurance expenditures for the self-employed, and itemized deductions are imputed from a sample of tax returns released to the public by the Internal Revenue Service (IRS) Statistics of Income (SOI) Division.

income, a tax filer should choose the larger of their standard deduction or itemized deduction amount.

The CPS ASEC tax model imputes values for itemized deductions, including all allowable expenses from Schedule A of the IRS Individual Income Tax Return. Expenses listed on Schedule A are: eligible medical and dental expenses, taxes paid, interest paid, gifts to charity, work and miscellaneous expenses, and casualty and theft losses. Table 1 shows the housing related categories, noting the number of returns and aggregate dollar amounts of expenses claimed for tax year 2005 from published IRS statistics and demonstrating the importance of these items.

Table 1. Housing Related Itemized Deduction Categories, Tax Year 2005

Itemized Deduction Category	Number of returns	% of total returns	Thousands of dollars	% of total itemized deductions
Total Itemized Deductions	47,755,427	100.0%	1,121,810,935	100.0%
Real estate taxes	41,310,587	86.5%	144,702,292	12.9%
Home mortgage interest	38,574,509	80.8%	383,733,110	34.2%
Deductible points	3,136,056	6.6%	2,617,789	0.2%

Source: Individual Income Tax Returns 2005, IRS Publication 1304

Housing related elements comprise nearly half (47.3 percent) of total itemized deductions dollars. Of the 47.8 million itemizers, 80.8 percent claimed their mortgage interest and 86.5 percent claimed their property taxes paid for a deduction. These people are necessarily homeowners, but not all homeowners itemize or file tax returns.

According to estimates from the Joint Committee on Taxation, projections of the cost of the mortgage interest deduction have risen from $44.2 billion in 1993 to $66 billion in 2002, to $72.6 billion in 2005.[6] This makes the home mortgage interest deduction the largest housing finance program. Individuals can deduct interest on up to $1 million in mortgage indebtedness, plus interest on another $100,000 in home equity loans.

In the 2006 CPS ASEC, 63 percent of adults were placed into tax filing units. Itemized deductions were imputed to 18.1 percent of these tax units, with a median amount of $14,370. The tax

[6] Based on Estimates of Federal Tax Expenditures for various fiscal years, Joint Committee on Taxation.

model assigned $542.2 billion of total itemized deductions. Mortgage interest paid and property taxes paid comprised 77.5 and 21.4 percent of the aggregate itemized deduction dollar amount, respectively. Nearly all of the records with itemized deductions were homeowners. The CPS ASEC tax model imputes itemized deductions based largely on reported income, household composition and housing tenure. The resulting aggregate itemized deduction amounts and proportions of housing related values differs from the administrative totals from IRS, which also include deductions for allowable medical and dental expenses, state and local income taxes, charitable contributions and other miscellaneous expenses that are difficult to impute for the CPS ASEC.

New approaches

The new methods used in this paper use the 2005 National AHS. Following previous work (Short et al., 2007) a hedonic regression for renters and owners is employed to provide predicted market rent for rental housing and a capitalization rate for owner-occupied housing. This capitalization rate is used to estimate an imputed gross rent for owner-occupied housing given various amenities. It also produces an estimate of market rent for rental units with various characteristics. With the owner dummy set to zero this model is a typical hedonic regression for rental units.

Previously, national AHS data for 2003 was used to evaluate approaches to impute home equity and imputed rent. Short et al. (2007) compared 1) the current CPS ASEC method of using net return to home equity, 2) a national account method per Yates (1994), 3) a capitalization rate approach per Crone et al (2004), and 4) a hedonic approach following Frick and Grabka (2004). Expenses were deducted from rental income or equity based on each approach to produce a net amount.

The first two approaches produced returns to equity that were more invariant to location by design. The first approach (currently used for CPS ASEC) uses the return on municipal bonds in conjunction with home equity based on a match to the AHS. The second approach used rent-to-value ratios based on National Income and Product Accounts (NIPA) and subtracts operating expenses per

the AHS to derive net rental income. The third approach constructed capitalization rates based on pooled owners and renters from the AHS. This approach was more flexible than the net return to equity or NIPA approaches. We were able to incorporate location variables via dummy variables for fair market rent deciles (FMR) to capture housing price variation. The hedonic approach used only renters from the AHS to estimate gross rent, which was used to predict market rent for homeowners in similar types of homes. The hedonic approach was intuitively appealing but produced much lower rent amounts than the other methods.

The current paper combines the capitalization rate and hedonic methods, a natural result given the construction of the approaches. The hedonic had estimated $\ln (R_g) = bX + e$, where R_g is gross rent and X is the vector of housing amenities while the capitalization rate modeled

$$\ln(V \text{ or } R_g) = aD + bX + e$$

where V is home value, R_g is gross rent, D is a dummy variable equal to one if owner occupied and zero if renter occupier, and X is the vector of housing characteristics. The models were identical when the cases were renter occupied. We combine the owners and renters, and add owner interaction terms, regressing the housing characteristics on the dependent variable (log of rent for renters or log of value for owners). Interaction terms are included for characteristics that are relevant for both owners and renters. Some of the variables, such as whether or not the rent include utility costs, or whether or not the unit has all appliances, are not interacted with owner.

The regression results are shown in Table 2. Note that the coefficient on *owner* is 4.67. Following Phillips (1988) and Crone et al. (2004) this represents a base capitalization rate of 11.24 percent. Interactions terms raise or lower this rate depending on characteristics and location. For example, the coefficient on the variable fmrown10, which represents high housing cost areas interacted with owner, is 0.379. Adding this to 4.67 results in a lower capitalization rate of 7.69 percent.

This calculation yields an average capitalization rate of 7.57 percent with varying rates for

different types of housing and geographic locations that are captured by the interaction terms with owner and other characteristics. For each housing unit –owner or renter– in the AHS sample, the regression results yield an imputed market rent, obtained for owners by multiplying the computed capitalization rate by home value. Net imputed rental income for homeowners is calculated by subtracting costs from imputed market rent.

Using variables available in both the CPS and the AHS, a statistical match is performed. The match is a predictive mean match on a sample that partitions by region, elderly or not, and housing tenure with predicted rent or value as the dependent variable. The independent variables used in regression for the match are shown in Table 3.

Once a match has been found between households in the CPS and housing units in the AHS, CPS households have values for actual rent paid for renters and net implicit rental income along with its components, such as mortgage interest paid and property taxes.

Table 4 shows the results of the two approaches to estimating net rental income. This income is added to cash income of homeowners to approximate their increased well-being compared to renters. Lower amounts are assigned to nearly the same number of households through the hedonic approach. The current method, calculating a return to home equity, estimates much larger returns that are tempered by the deduction of property taxes in line 3, which is the current CPS ASEC variable on net return to home equity, HOUSRET. Note that property taxes are one of the expenses, along with mortgage interest, maintenance and repair expenses, deducted in the new method.

Table 4. Estimates of Net Rental Income Compared to Return to Home Equity

	Number of households	Aggregate amount	Median value assigned
New method	78.3 million	$161.1 billion	$1,874
Return to home equity	78.2 million	$462.4 billion	$3,703
Net return to home equity	78.2 million	$290.6 billion	$2,205

Source: 2005 AHS National imputed to 2006 CPS ASEC

Using the new method, the components of net rental income, mortgage interest and property tax amounts, were appended to the 2006 CPS ASEC. These can be used to generate a set of tax estimates using the CPS ASEC tax calculator that will be consistent with the assigned net rental income. These estimates are compared to those generated using our current method, which independently obtains these items by matching to the SOI files, in Table 5. The AHS match assigned both mortgage interest and property taxes paid to more households than the SOI match currently used. This is due to alignment issues in the methods: the AHS match sought housing values for all homeowners, while the SOI match sought itemized deduction amounts for modeled tax filers. The AHS file used is a nationally representative sample of all households; the SOI file universe contains all taxpayers and oversamples high income returns. The AHS hedonic approach assigned fewer mortgage interest and property taxes compared to the SOI, resulting in fewer tax units benefiting from itemizing their deductions. Lower itemized deductions resulted in higher taxable income and federal tax liabilities in the AHS approach.

Table 5. Estimates of Taxable Income and Federal Taxes, Hedonic vs. Current Approach

	AHS-based housing values in itemized deductions	SOI-based housing values in itemized deductions
Number of tax units with itemized deductions	23.3 million	33.4 million
Aggregate itemized deductions (itemizers)	$367.0 billion	$542.3 billion
Aggregate taxable income (all filers)	$5.1 trillion	$5.0 trillion
Aggregate federal taxes after credits (all filers)	$883.5 billion	$863.9 billion

Source: CPS ASEC tax model output based on 2006 CPS ASEC and imputations from 2005 AHS National and 2001 SOI Public Use File

While the overall CPS/AHS match assigned mortgage interest paid to 48.4 million households, only 17.8 million households used the amounts to itemize deductions. Housing deductions (mortgage

interest paid and real estate taxes) were imputed to the 23.3 million households in Table 5, but approximately one-quarter of those households did not use the imputed amounts to itemize their deductions. This could occur because some of the households did not have a tax filing requirement, or because the amount imputed, combined with other allowable deductions, did not exceed the standard deduction for the filing unit. Ten percent of the 48.4 million households with imputed interest were headed by a person age 65 or older. When this group is conditioned by itemizing status, 3.9 percent of the 17.8 million households were headed by someone age 65 or older. By contrast, in the current method, mortgage interest and property taxes are only imputed to filers. Nine percent of the 33.4 million itemizers in the current method are headed by a person age 65 or older. The AHS hedonic approach improves on the current approach by imputing property taxes to nearly all homeowners, and imputing mortgage interest to more than half of owners. However, the lower amounts being assigned fail to exceed standard deductions for many modeled tax units.

Valuing housing subsidies is an easy extension of the methodology reported here for valuing imputed rent. Part of the calculation required to value housing subsidies is to obtain an estimate of market rent for a given household. Subtracting actual rent paid from imputed rent for subsidized homeowners yields the amount of rent subsidized. Neither of these pieces of information, imputed rent or rent paid, is available on the CPS questionnaire. Part of the estimates created in the process above for homeowners also yields an estimate of market rent. The difference between market rent and rent paid yields an estimate of the housing subsidy. Preliminary results on this calculation follow Stern (2000), but note that this method results in a large number of negative values. This problem was not addressed in earlier work and is also not addressed here other than to set non-positive values to a small positive number.

Table 6 shows updated subsidy values compared to the current method. As noted earlier, the hedonic regression yields an imputed market rent for rental units. The imputed rent is assigned to

subsidized renters. The value of the subsidy amount is then calculated two different ways. The first uses the predicted rent and subtracts 30 percent of household income; the second method uses predicted rent and subtracts reported monthly costs, primarily rent paid as reported by the matching AHS housing unit. The table compares these calculations to the currently used method and shows the mean subsidy by region. On average, both new methods result in substantially higher values.

Table 6. Mean Annual Subsidy Values by Region

	Midwest	South	West	NE
Subsidy Method 1	3,343	2,852	4,288	4,651
Subsidy Method 2	5,429	4,518	7,538	7,994
Current Method	1,963	2,396	2,739	2,666

Source: 2005 AHS National values imputed to the 2006 CPS ASEC

IV. **Results**

The previous section reviewed the various components of two approaches to value housing in a measure of economic well-being. This section completes the analysis by examining the effect of the two methods on estimates of income distribution.

The examination of the effect of accounting for homeownership compares three measures. The first measure is before-tax money income, commonly used to describe the distribution of income in the U.S. as well for measures of income inequality. Second, is a measure that includes a return to home equity, independently calculated tax deductions, and housing subsidies based on 1985 AHS data. The third measure adds net rental income using the new methods and that same housing unit's reported interest payments and property taxes as elements of income tax deductions, and adds subsidy values from the 2005 AHS.

The main difference between the two measures that account for housing and taxes is that the newer method results in lower overall income than the older method. Mean income for families under the old method is $49,283 and $48,187 using the new method. Medians are not statistically different, median income is $35,980 under the old method and $35,963 under the new.

The density functions in Figure 1 show the distribution of income for all households using these three definitions. Income is on the horizontal axis; the vertical axis indicates the frequency at which the value occurs in the data. As may be expected, the after-tax distributions are less skewed (blue represents the old method and green the new method) than the before-tax income measure (in red). The two after-tax measures are generally similar to one another for all households, with the newer method assigning values to families more often around the median value, the older method assigning values slightly higher in the distribution.

Narrowing our focus to elderly households separately shows more detail. Viewing the peaked

before-tax curve in Figure 2 to that in Figure 1 indicates that the elderly have lower and less disperse incomes than the population as a whole. For elderly households taking account of housing with either method unambiguously shifts the income distribution up, the older method shifting up more than the newer method.

Looking at income distributions suggests that the old method of accounting for housing and taxes has generally similar effects overall, with only slightly larger values assigned to households under the old method.

IV. Discussion and Conclusions

This paper has examined the incorporation of housing benefits in some measures of economic well being. The research examined two methods of doing this. One method, currently used in the Census Bureau alternative income definition series, approximates imputed net rental income using a return to home equity approach. The current method includes housing benefits based on 1985 AHS data, and simulates income taxes independently of housing cost imputations. The second method attempts to account for housing financing changes, uses currently estimated housing subsidy values and incorporates housing expenses in that calculation of taxes.

By design, the newer method does a better job of targeting the benefits and costs of housing for certain subgroups of the population, in particular younger households paying high housing costs as interest and property tax expense on owned homes. Results suggested that the current method, which cannot account for housing costs, assigns too much net rental income to younger households. As mortgage financing markets change over time, including additional debt for older homeowners at higher interest rates and loan-to-value ratios for lower income households, a method that takes explicit account of interest payments and debt produces better estimates to assess the ability of households to meet their shelter needs. The new method described here provides an improved method of valuing housing subsidies with some additional methodological problems that will be addressed in future

work.

Table 1: Summary statistics and regression results for capitalization rate method: Owners and Renters AHS2005

		Descriptive Statistics		Regression with interactions	
		Mean	s.d.	coefficient	T stat
Dependent variable =	ln(rent/value)	10.50	2.57		
Intercept		1.00	0.00	5.483	76.9
owner	Indicator variable for housing tenure	0.75	0.44	4.671	57.4
rooms	Count of all rooms in dwelling	3.17	1.57	0.034	1.9
$room^2$	Number of rooms squared	12.49	16.86	-0.002	-1.4
bedrooms	Number of bedrooms recode: 1 for <2, 2=2, 3=3+	2.81	1.00	0.110	5.2
$bedrooms^2$	Bedrooms squared	8.89	6.04	-0.007	-1.6
bathrooms	Baths dummy: 1= 2 or more baths, 0 otherwise	1.59	0.68	0.291	4.8
$bathrooms^2$	Bathrooms squared	2.99	2.63	-0.046	-2.5
halfbaths	Number of half baths	0.33	0.52	0.083	4.0
$halfbaths^2$	Half baths squared	0.38	1.18	-0.019	-3.6
dwelling age	Age of dwelling(current year - year built)	39.98	25.42	-0.006	-5.6
$(dwelling\ age)^2$	Dwelling age squared	2,234.55	2,366.23	0.000	4.3
rent includes fuel	Rent includes fuel (electric, gas, oil or other fuel)	0.14	0.35	0.032	3.5
rent includes water/trash	Rent includes water and trash	0.39	0.49	-0.034	-4.7
off street parking	Off street parking or garage included	0.95	0.23	0.072	5.0
central air conditioner	Indicator for central air system	0.64	0.48	0.102	13.1
not detached	Indicator for detached/not detached	0.25	0.44	0.011	0.7
mobile home	Indicator for mobile home structure type	0.07	0.25	-0.282	-9.0
in MSA	Indicator for central city/suburb	0.77	0.42	-0.012	-1.3
midwest	Region dummy	0.24	0.43	-0.115	-5.5
south	Region dummy	0.37	0.49	-0.213	-10.4
west	Region dummy	0.21	0.41	-0.082	-3.91
public transport good	Indicator for satisfactory public transportation	0.39	0.49	0.038	2.88
police good	Indicator for satisfactory neighborhood police protection	0.89	0.32	0.026	1.4
schools good	Indicator for satisfactory public elementary school	0.22	0.42	-0.004	-0.3
at least one housing problem	Indicator for presence of cracks, holes, peeling paint or rats	0.06	0.24	-0.034	-1.7
all appliances	Indicator for presence of refrigerator, dishwasher and disposal	0.44	0.50	0.136	18.2
crime bothers	Indicator for bothersome crime in neighborhood	0.14	0.35	-0.054	-3.5
traffic bothers	Indicator for bothersome neighborhood street noise or traffic	0.25	0.44	0.014	1.1
Fair Market Rent deciles					
fmrdum2	FMR amount in second decile dummy variable	0.10	0.31	0.174	5.6
fmrdum3	FMR amount in third decile dummy variable	0.10	0.31	0.315	10.4
fmrdum4	FMR amount in fourth decile dummy variable	0.10	0.30	0.315	10.1
fmrdum5	FMR amount in fifth decile dummy variable	0.10	0.31	0.425	13.7
fmrdum6	FMR amount in sixth decile dummy variable	0.10	0.30	0.462	14.8
fmrdum7	FMR amount in seventh decile dummy variable	0.11	0.31	0.493	15.9
fmrdum8	FMR amount in eighth decile dummy variable	0.10	0.30	0.598	18.8

fmrdum9	FMR amount in ninth decile dummy variable	0.08	0.28	0.804	24.6
fmrdum10	FMR amount in tenth decile dummy variable	0.10	0.31	0.915	28.4
FMR deciles * owner					
fmrown2	Owner interaction with frmdum2	0.08	0.28	-0.041	-1.2
fmrown3	Owner interaction with frmdum3	0.08	0.27	-0.067	-2.0
fmrown4	Owner interaction with frmdum4	0.08	0.27	-0.068	-2.0
fmrown5	Owner interaction with frmdum4	0.08	0.27	0.001	0.0
fmrown6	Owner interaction with frmdum6	0.07	0.26	-0.019	-0.6
fmrown7	Owner interaction with frmdum7	0.08	0.27	0.083	2.5
fmrown8	Owner interaction with frmdum8	0.07	0.26	0.043	1.3
fmrown9	Owner interaction with frmdum9	0.05	0.23	0.193	5.3
fmrown10	Owner interaction with frmdum10	0.07	0.26	0.379	10.6
oothrms	Owner interaction with othrms (rooms-bedrooms)	2.55	2.07	0.130	6.6
oroomsq	Owner interaction with rooms squared	10.70	16.91	-0.009	-4.7
obedrms	Owner interaction with bedrooms	2.30	1.55	0.111	4.0
obedrmsq	Owner interaction with bedrooms squared	7.66	6.79	-0.016	-3.2
obaths	Owner interaction with baths squared	1.28	0.96	0.062	1.0
obathrmsq	Owner interaction with baths squared	2.55	2.83	0.016	0.8
ohalfb	Owner interaction with half baths	0.29	0.50	0.078	3.4
ohalfbsq	Owner interaction with half baths squared	0.33	0.91	-0.001	-0.1
odwellage	Owner interaction with dwelling age	28.65	27.54	-0.001	-0.8
odwlagesq	Owner interaction with dwelling age squared	1567.55	2184.40	0.000	0.7
onotdet	Owner interaction with not detached	0.07	0.26	-0.151	-7.1
omobhm	Owner interaction with mobile home	0.05	0.23	-1.162	-33.8
omw	Owner interaction with midwest	0.19	0.39	-0.006	-0.3
osouth	Owner interaction with south	0.28	0.45	0.005	0.2
owest	Owner interaction with west	0.15	0.36	0.253	10.4
otransok	Owner interaction with public transport good	0.25	0.44	-0.048	-3.1
opolok	Owner interaction with police good	0.67	0.48	0.039	1.8
osklok	Owner interaction with schools good	0.17	0.37	-0.029	-1.7
oholesrat	Owner interaction with at least one housing problem	0.04	0.19	-0.057	-2.2
ocrime	Owner interaction with crime bothers	0.09	0.29	-0.046	-2.4
otraffic	Owner interaction with traffic/noise bothers	0.17	0.38	-0.046	-2.9
		N	38,732	R^2	0.9482

Table 2: Regression results for predictive mean match

		Descriptive Statistics		Regression results	
		Mean	s.d.	coefficient	T stat
Dependent variable =	ln(rent/value)	10.50	2.57		
Intercept		1.00	0.00	5.735	148.1
fmrdum2	FMR amount in second decile dummy variable	0.10	15.22	0.165	5.0
fmrdum3	FMR amount in third decile dummy variable	0.10	15.25	0.251	7.8
fmrdum4	FMR amount in fourth decile dummy variable	0.10	15.09	0.217	6.7
fmrdum5	FMR amount in fifth decile dummy variable	0.10	15.24	0.338	10.5
fmrdum6	FMR amount in sixth decile dummy variable	0.10	14.90	0.334	10.3
fmrdum7	FMR amount in seventh decile dummy variable	0.11	15.42	0.369	11.4
fmrdum8	FMR amount in eighth decile dummy variable	0.10	14.81	0.436	13.3
fmrdum9	FMR amount in ninth decile dummy variable	0.08	13.96	0.586	18.2
fmrdum10	FMR amount in tenth decile dummy variable	0.10	15.34	0.540	17.0
zdum2	Household income in second decile dummy variable	0.09	14.68	-0.051	-3.4
zdum3	Household income in third decile dummy variable	0.10	14.98	0.029	1.9
zdum4	Household income in fourth decile dummy variable	0.10	15.12	0.102	6.6
zdum5	Household income in fifth decile dummy variable	0.10	15.22	0.158	10.1
zdum6	Household income in sixth decile dummy variable	0.10	14.85	0.219	13.6
zdum7	Household income in seventh decile dummy variable	0.11	15.81	0.269	16.8
zdum8	Household income in eighth decile dummy variable	0.11	15.42	0.359	21.7
zdum9	Household income in ninth decile dummy variable	0.11	15.38	0.472	27.7
zdum10	Household income in tenth decile dummy variable	0.10	15.14	0.659	37.1
hhage	Age of householder	49.46	854.99	0.003	2.3
hhage2	Age of householder squared	2736.48	91459.00	0.000	-0.4
hs	Householder completed high school but not bachelors	0.56	24.90	0.124	12.7
col	Householder completed bachelors degree	0.19	19.50	0.241	19.7
prof	Householder completed masters, professional degree or doctorate	0.10	15.17	0.280	19.7
ret	Household received social security or pension income (indicator)	0.26	21.88	0.044	3.9
mobhm	Structure type is mobile home	0.07	12.48	-1.197	-88.6
married	Indicator for married spouse present	0.53	25.03	0.106	12.7
black	Indicator for black (alone or in combination)	0.12	16.05	-0.162	-15.4
male	Indicator for sex	0.58	24.81	-0.031	-4.6
hsp	Indicator for spanish origin of householder	0.10	15.24	-0.069	-6.0
job	Indicator for reports to work at same place each day	0.57	24.86	-0.043	-5.7
kid	Number of unmarried kids under 18 in household	0.66	53.64	0.034	10.1
mw	Region dummy	0.24	21.33	0.000	0.0
south	Region dummy	0.37	24.25	0.026	2.6
west	Region dummy	0.21	20.53	0.252	23.3
msa	Indicator for central city/suburb	0.77	21.01	-0.012	-1.2
zadult	Number of adults 18 and over in household	1.90	41.48	-0.016	-3.3
propy	Household received income from business, farm or ranch (indicator)	0.27	22.28	0.110	14.7
incast	Household received food stamps in last 12 months	0.02	6.35	-0.079	-3.1

	(indicator)				
owner	Indicator variable for housing tenure	0.75	21.85	5.094	188.6
fmrown2	Owner interaction with frmdum2	0.08	13.75	-0.022	-0.6
fmrown3	Owner interaction with frmdum3	0.08	13.48	0.060	1.7
fmrown4	Owner interaction with frmdum4	0.08	13.27	0.124	3.5
fmrown5	Owner interaction with frmdum4	0.08	13.43	0.181	5.2
fmrown6	Owner interaction with frmdum6	0.07	12.96	0.208	5.9
fmrown7	Owner interaction with frmdum7	0.08	13.54	0.310	8.9
fmrown8	Owner interaction with frmdum8	0.07	12.94	0.290	8.2
fmrown9	Owner interaction with frmdum9	0.05	11.38	0.397	11.3
fmrown10	Owner interaction with frmdum10	0.07	12.77	0.759	22.4
		N	38,732	R^2	0.9402

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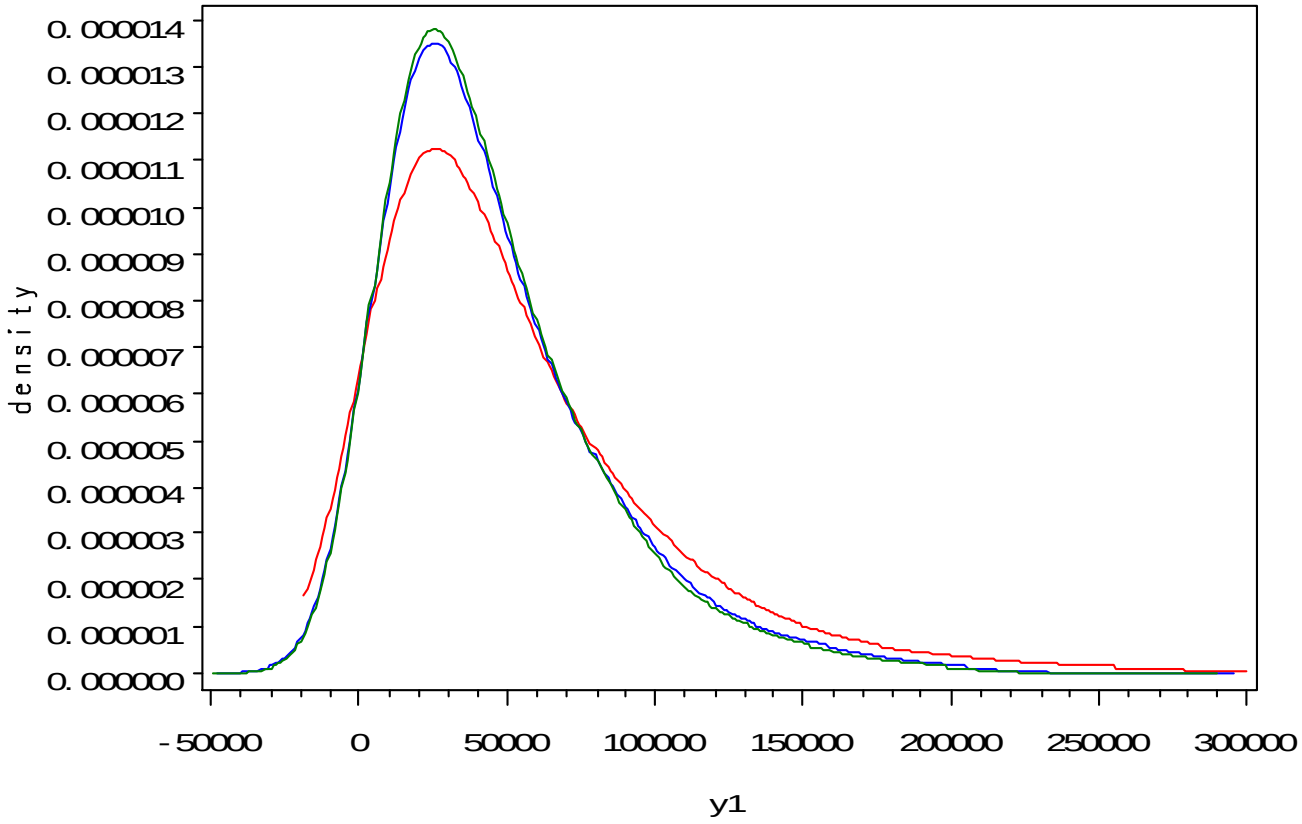

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