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Correcting Second Home Equity in HRS/AHEAD:
The Issues, a Method, and Some Preliminary Results

Honggao Cao and F. Thomas Juster

Abstract

Second home equity is an important component of both housing equity and net worth for the old population. It has been covered, implicitly or explicitly, across all waves of HRS and AHEAD surveys. But due to a skip-pattern error, not all households with second homes were asked detailed questions about current market value, amount of mortgage, etc… The negative impact of the inconsistent treatment of second home on the estimation of housing equity and net worth is substantial. When the second home information is not collected for all the households who own second homes (as in AHEAD 1995 and HRS 1996), the second home equity measure based on the partial data is likely to suffer from selection bias, rendering vulnerable both measures of total housing equity and total net worth. This paper reports on an imputation method to correct for this bias that we demonstrate and find effective.

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I. The Issues

Second home equity is an important component of both housing equity and net worth for the old population. It has been covered, implicitly or explicitly, across all waves of HRS and AHEAD surveys. The treatment of second home equity, however, has not been consistent. Questions regarding second home should be asked for all households who have second homes at the time of the interview. Parallel to the questions about the primary (or main) home, the question sequence about second home should be independent of the sequence about real estate investment, making second home equity distinguishable from real estate equity. HRS92, HRS94, and HRS98 and after are the only survey waves that have exactly followed these rules.

In AHEAD93, second home was explicitly treated as part of real estate investment. When asked about their real estate assets, a household was directed to include “any real estate (other than its main home), such as land, a second home, rental real estate, a partnership, or money owed to you on a land contract or mortgage” (see Question K2, AHEAD93 Codebook). In both AHEAD95 and HRS96, second home was correctly treated as independent of primary home and real estate investment. But due to a skip-pattern error, not all households with second homes were asked detailed questions about current market value, amount of mortgage, etc. Specifically, any respondents who had not lived in their second homes for at least two months of the year would not have been asked about their second home equity (see Questions CS31, CS35, and F40 for the relevant question flow in the AHEAD95 and HRS96 Codebooks). Since most people do not live in their second homes for two months or more of the year, this problem has skipped most second-home owners, and effectively past the detailed questions about value, mortgage, etc, mis-classified most second home owners as not owning second homes.

The negative impact of the inconsistent treatment of second home on the estimation of housing equity and net worth is substantial. Based on results from HRS 1992, 1998, 2000, and 2002, second home equity in the aggregate accounts for more than 10% of total housing equity, more than 3% of total net worth for the HRS cohort (Table 1), and about 8% of total housing equity, about 3% of the total net worth for the AHEAD cohort (Table 2). When second home equity is combined with real estate investment (as in AHEAD 1993), there is no direct way to get an accurate measure of second home—and thus, total housing—equity. On the other hand, when the second home information is not collected for all the households who own second homes (as in AHEAD 1995 and HRS 1996), the second home equity measure based on the partial data is likely to suffer from selection bias, rendering vulnerable both measures of total housing equity and total net worth.

Table 1. The Role of Second Home Equity in Total Housing Equity and Total Net Worth: the HRS Cohort, HRS 1992-2002

	HRS 1992	HRS 1994	HRS 1996	HRS 1998	HRS 2000	HRS 2002
% 2nd Home Ownership	13.9	13.0	4.0	13.2	13.1	13.3
Second Home Equity	15,140	11,515	4,735	12,528	14,372	17,855
Primary Home Equity	82,566	88,207	90,512	99,428	110,248	114,780
Total Housing Equity	97,707	99,723	95,248	111,956	124,621	132,635
Total Net Worth	274,366	310,365	319,485	378,375	418,389	410,450
% of 2nd Home Equity in Total Housing Equity	15.5	11.5	4.9	11.2	11.5	13.5
% of 2nd Home Equity in Total Net Worth	5.5	3.7	1.4	3.3	3.4	4.3

Note: Total net worth is a combination of the total housing equity and non-housing assets, which exclude “trusts not reported earlier”. All the housing equity and net worth variables are weighted means in 2002 dollars. The HRS 1996 results contain obvious errors in the percentage of second home ownership and second home equity.

Table 2. The Role of Second Home Equity in Total Housing Equity and Total Net Worth: the AHEAD Cohort, AHEAD 1995-2002

	AHEAD 1993	AHEAD 1995	HRS 1998	HRS 2000	HRS 2002
% 2nd Home Ownership	-	5.0	7.7	10.8	10.9
Second Home Equity	-	4,845	8,591	7,956	11,032
Primary Home Equity	87,159	90,351	91,128	95,499	95,129
Total Housing Equity	-	95,197	99,719	103,455	106,161
Total Net Worth	217,933	307,000	302,214	312,356	304,137
% of 2nd Home Equity in Total Housing Equity	-	5.1	8.6	7.7	10.4
% of 2nd Home Equity in Total Net Worth	-	1.6	2.8	2.5	3.6

Note: Total net worth is a combination of the total housing equity and non-housing assets, which exclude “trusts not reported earlier”. All the housing equity and net worth variables are weighted means in 2002 dollars. The AHEAD 1995 results contain obvious errors in second home equity. The AHEAD 1993 total net worth is apparently also flawed, an issue to be addressed elsewhere.

In this memo, we intend to correct—at least partially—the second-home data. The plan is to use the information in HRS98 as the gold standard, imputing second home equity for HRS96 and AHEAD95 from data in later waves on ownership and data of purchase. Section II explores the cross-wave relationship in second home ownership between HRS98 and HRS96, and between HRS98 and AHEAD95. Based on these connections, Section III proposes a simple method for correcting the second-home errors in HRS96 and AHEAD95, and Section IV reports some preliminary results after the data corrections. The memo concludes with an extension of our simple correction method to the second home problem for AHEAD93, where the problem is that second-home equity is combined with real estate investment.

II. HRS98, HRS96, and AHEAD95: Building Cross-Wave Connections

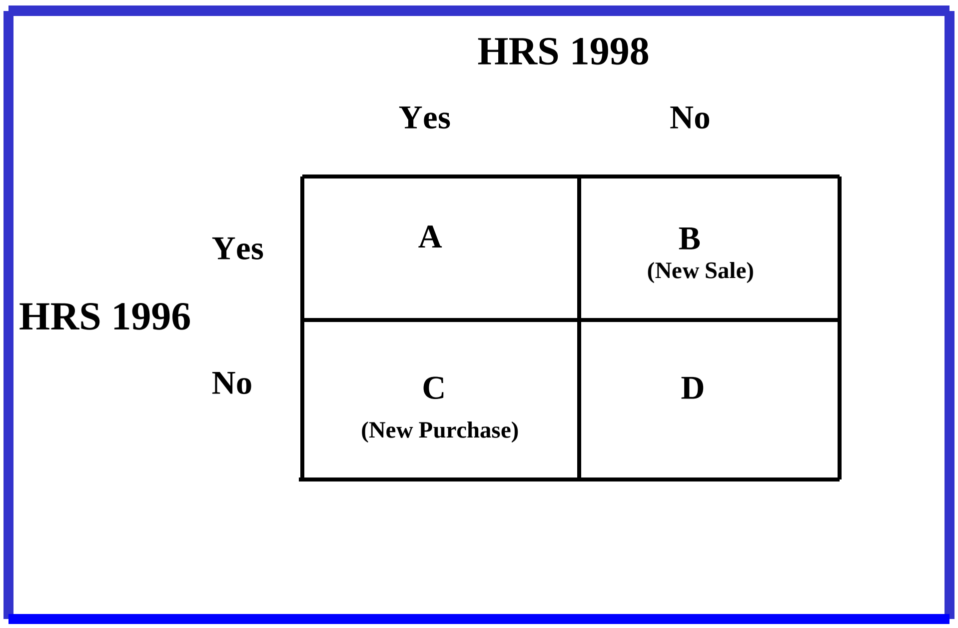
Two facts in HRS98 about housing and assets make it feasible to correct second home equity for HRS96 and AHEAD95. First, information on the year of purchase for second home is available in HRS98. This allows one to be able to predict second home ownership in a previous wave. If a second-home-owning household reported in HRS98 that it had purchased its second home in 1994, for example, it should also have a second home in HRS96 or AHEAD95. Conversely, if the purchase year was 1997, the household would usually have no second home in HRS96 or AHEAD95.

HRS98 also has information on housing transactions. In Section N (Widowhood and Divorce), each household was asked if it had bought or sold any home (main or second) since the last interview. While this information may not help us identify all previously mis-classified second home owners, it would help us separate a previously mis-classified second home owner from an owner who had bought his/her second home after his/her previous interview. We shall elaborate this point as we proceed.

There are four possible answers to a question whether a household owned a second home in HRS98 and/or in a previous wave, say, HRS96: it owned a second home in both waves, it owned a second home in neither waves, and it owned a second home in only one of the waves. Figure 1 depicts the four potential scenarios generated from the question.

Cell A represents all households who owned second homes in both waves. Theoretically, it includes second-home-owning households who made no housing transactions since the HRS96 interview, and households who sold and bought second homes after the HRS96 interview. The information on second home equity is available in both waves for these households, and this information will be the backbone in our exercise of second home equity imputation.

Figure 1. Second Home Ownership in HRS98 and HRS96: A Theoretical Model



Cell D represents all households who did not own second homes in HRS98 and HRS96. For these households, second home transactions are possible, but unlikely. (They could, in principle, have both bought and sold a second home in 1997.)

Cells B and C include most of the households who made housing transactions after the HRS96 interview. A household without a second home in HRS96 would be in Cell C if it purchased one after the interview, while a household with a second home in 1996 would be in Cell B if it sold the home after the interview. Information on second home equity is available only in HRS98 for the households in Cell C, and in HRS96 for the households in Cell B.

One consequence of the inconsistent treatment of second home equity described earlier is that a great number of the households who are supposed to be in Cell A are mis-classified into Cell C, thereby reducing the percentage of households who had second homes in both waves (Cell A). As evidenced in Tables 3 and 4, the percentages of second-home owning households in

HRS96 and AHEAD95 were, respectively, 3.4 and 4.1, both substantially lower than their counterparts in HRS98 (12.4 for the HRS96 households, and 6.9 for the AHEAD95 households).

Table 3. Second Home Ownership in HRS98 and HRS96: Empirical Results before Correction

		HRS 1998		
		Yes	No	Total (%)
HRS 1996	Yes	163	47	210 (3.4)
	No	612	5,343	5,955 (96.6)
	Total (%)	775 (12.6)	5,390 (87.4)	6,165 (100) (100)

Note: Only the households interviewed in both HRS96 and HRS98 are listed in this Table.

Table 4. Second Home Ownership in HRS98 and AHEAD95: Empirical Results before Correction

		HRS 1998		
		Yes	No	Total (%)
AHEAD 1995	Yes	101	68	169 (4.0)
	No	192	3,892	4,084 (96.0)
	Total (%)	293 (6.9)	3,960 (93.1)	4,253 (100) (100)

Note: Only the households interviewed in both AHEAD95 and HRS98 are listed in this Table.

III. The Correction Method

Our method of correcting second home equity consists of two stages. In the first stage, we identify the mis-classified households in Cell C, assigning them back to Cell A. This may be done based on the following two sequential rules ---

(a) If a HRS (or AHEAD) household in Cell C reported in HRS98 that it had purchased its second home before 1996 (or 1995), this household will be treated as mis-classified, and assigned to Cell A; and

(b) If the first rule fails to assign the household to Cell A, but records in HRS98 show that the household did not sell any home after the HRS96 (or AHEAD95) interview, the household will still be assigned to Cell A.[1]

For simplicity, a household who can be identified as mis-classified through these rules will be called as *identifiable mis-classified household*. Our second home equity corrections are limited to such households. Any households in Cell C who cannot be identified as mis-classified will remain in that cell, and we will not correct second home equity in HRS96 or AHEAD95.

The second stage of our correction method involves an estimation of the second-home equity for the identifiable mis-classified households in HRS96 or AHEAD95, based on the information available for the households in Cell A that are identified in Tables 3 and 4. Obviously, there are various ways to do this. The method presented below seems to be one of the simplest.

Let second-home equity as reported in HRS98 and HRS96 (or AHEAD95) be, respectively, X and Y. The relationship between the two is assumed to be (1),

Y = Xя + Ѓ (1),

where я is a factor related to the rate of appreciation of second-home equity,[2] and Ѓ is a random error term.

Equation (1) may be estimated by least squares. Based on this equation, we then generate predicted value for each household in HRS96 (or AHEAD95) for which a reported X is available in HRS98. The final estimate of the second home equity for each identifiable mis-classified household may then be determined by a hotdeck imputation procedure that is based on the predicted value of Y.

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[1] We understand that these rules cannot identify all mis-classified households in Cell C (for example, a household who had made multiple housing transactions after the HRS96 (or AHEAD95) interview), nor can they prevent some households in Cell C from being mis-identified (for example, a household who reported in HRS98 inaccurate information on the purchase year of its second home or its housing transaction history). But we believe that these rules should be able to correctly identify most of the mis-classified households.

[2] To be exact, if the rate of appreciation of the second-home equity is *r*, then я = 1/(1+*r*).

IV. Preliminary Results

The effect of the corrections on the HRS/AHEAD second home data may be best seen in Tables 5 and 6. Before the corrections, only 3.4% of HRS96 and 4.0% of AHEAD95 households have reported to have second homes, and have non-missing information on their second-home equity. After the corrections, the number increases to 13.1% for the HRS96 households, and 8.4% for the AHEAD95 households.

Table 5. Second Home Ownership in HRS98 and HRS96: The Effect of Corrections

HRS 1996		HRS 1998		
		Yes	No	Total (%)
Pre-Correction	Yes	163	47	210 (3.4)
	No	612	5,343	5,955 (96.6)
Post-Correction	Yes	763	47	810 (13.1)
	No	12	5,343	5,355 (86.9)
	Total (%)	775 (12.6)	5,390 (87.4)	6,165 (100) (100)

Note: Only the households interviewed in both HRS96 and HRS98 are listed in this Table.

Since the percentages of second home ownership in HRS96 and AHEAD95 are significantly increased after corrections, one can imagine that the mean values of the second home equities in the two waves will be increased significantly as well. The only question is: With the new second home equity results, is the data quality for the housing equities and net worth really improved?

In Tables 7 and 8 we have replicated Tables 1 and 2 with the corrected information on the second home equity for HRS 1996 and AHEAD 1995. The time-series patterns of second home ownership and equity are more consistent now for both the HRS and AHEAD cohorts. In HRS 1996, 13.1% of the households owned second homes, compared to 13.9% in HRS 1992, 13.0% in HRS 1994, 13.2% in HRS 1998, 13.1% in HRS 2000, and 13.3% in HRS 2002. In AHEAD

1995, 8.2% of the households owned second homes, compared to 7.7% in HRS 1998, 10.8% in HRS 2000, and 10.9% in 2002.

With the corrections, the mean value of the second home equity in HRS 1996 has increased by about 165%, from $4,735 to $12,590, while the mean value of the second home equity in AHEAD 1995 has increased by about 90%, from $4,845 to $9,262. The second home equity now comprises 12.2% of total housing equity and 3.8% of total net worth in HRS 1996, and 9.3% of total housing equity and 3.0% of total net worth in AHEAD 1995. All these numbers are quite comparable to the counterpart data in other HRS or AHEAD waves, suggesting that our corrections have indeed improved the data quality.

Table 6. Second Home Ownership in HRS98 and AHEAD95: The Effect of Corrections

AHEAD 1995		HRS 1998		
		Yes	No	Total (%)
Pre-Correction	Yes	101	68	169 (4.0)
	No	192	3,892	4,084 (96.0)
Post-Correction	Yes	290	68	358 (8.4)
	No	3	3,892	3,895 (91.6)
	Total (%)	293 (6.9)	3,960 (93.1)	4,253 (100) (100)

Note: Only the households interviewed in both AHEAD95 and HRS98 are listed in this Table.

It is interesting to note that the households who were mis-classified in both AHEAD 1995 and HRS 1996 appeared to have lower values on their second home equities. For those mis-classified households in AHEAD 1995, the mean value of their second home equities was $100,852, compared to $126,656 for those reported to own second homes. In HRS 1996, the two numbers were $81,525 and $109,137, respectively. Since a mis-classified household was one who lived in second home for less than two months of the year, the results seem to suggest a positive correlation between the duration of second home stay and the quality of the second home.

Table 7. The Role of Second Home Equity in Total Housing Equity and Total Net Worth after the Second Home Equity Problem in HRS 1996 Corrected: the HRS Cohort, HRS 1992-2002

	HRS 1992	HRS 1994	HRS 1996	HRS 1998	HRS 2000	HRS 2002
% 2nd Home Ownership	13.9	13.0	13.1	13.2	13.1	13.3
Second Home Equity	15,140	11,515	12,590	12,528	14,372	17,855
Primary Home Equity	82,566	88,207	90,512	99,428	110,248	114,780
Total Housing Equity	97,707	99,723	103,102	111,956	124,621	132,635
Total Net Worth	274,366	310,365	327,340	378,375	418,389	410,450
% of 2nd Home Equity in Total Housing Equity	15.5	11.5	12.2	11.2	11.5	13.5
% of 2nd Home Equity in Total Net Worth	5.5	3.7	3.8	3.3	3.4	4.3

Note: Total net worth is a combination of the total housing equity and non-housing assets, which exclude “trusts not reported earlier”. All the housing equity and net worth variables are weighted means in 2002 dollars. Both the second home ownership and equity now show more consistent time-series patterns.

Table 8. The Role of Second Home Equity in Total Housing Equity and Total Net Worth after the Second Home Equity Problem in AHEAD 1995 Corrected: the AHEAD Cohort, AHEAD 1995-2002

	AHEAD 1993	AHEAD 1995	HRS 1998	HRS 2000	HRS 2002
% 2nd Home Ownership	7.8	8.2	7.7	10.8	10.9
Second Home Equity	7,857	9,262	8,591	7,956	11,032
Primary Home Equity	87,159	90,351	91,128	95,499	95,129
Total Housing Equity	95,016	99,613	99,719	103,455	106,161
Total Net Worth	217,933	311,417	302,214	312,356	304,137
% of 2nd Home Equity in Total Housing Equity	8.3	9.3	8.6	7.7	10.4
% of 2nd Home Equity in Total Net Worth	3.6	3.0	2.8	2.5	3.6

Note: Total net worth is a combination of the total housing equity and non-housing assets, which exclude “trusts not reported earlier”. All the housing equity and net worth variables are weighted means in 2002 dollars. Both the second home ownership and equity now show more consistent time-series patterns. The percentage of second home equity in total net worth in AHEAD 1993 seems to be on the high side, but that is due to the very low level of net worth in AHEAD 1993.

V. The AHEAD 1993 Problem

The AHEAD93 problem (i.e., second home equity combined with real estate investment equity) is different from the problem troubling HRS96 and AHEAD95. But it may be handled in a way similar to what we have done for HRS96 and AHEAD95. Basically, we may continue to use the information about second home in a later wave (e.g., purchase year, housing transaction history in AHEAD 1995) to predict the existence (or the lack of it) of second home in AHEAD93, and then impute second home equity for those identifiable second home owners.

Two points need to be made here. First, in predicting the second home ownership for AHEAD 1993, one needs to use the corrected—not just reported—second home ownership information in AHEAD 1995. Second, to impute second home equity, one has to make an assumption about the rate of appreciation of the housing market.

Table 8, Column 1 summarizes the second home ownership and equity results for AHEAD 1993. According to the table, 7.8% of the households owned second homes in AHEAD 1993, and the mean value of the second home equity was about $7,857.[3] Compared to the results in other AHEAD waves, both the numbers seem to be quite reasonable.

[3] To impute second home equity for AHEAD 1993, we first estimated a simple linear relationship between the second home equities in AHEAD 1995 and HRS 1998. We then predicted the AHEAD 1993 equity based on the relationship and the observed or imputed equity values in AHEAD 1995 or HRS 1998.