Highlights

FHFA's house price index (HPI) is a repeat transaction index. The index is estimated from a sample where each observation lists the change in the price of a property from one transaction to the next. In the purchase-only index, each transaction represents the sale of a property while the all-transactions index includes appraisal values from refinance transactions as well.[1] Because the HPI estimation sample is constructed from repeat transactions on the same property, any given property enters into the estimation sample more frequently if it is sold repeatedly rather than being held for long periods of time by the same owner. Although a property that sells frequently has a larger presence in the estimation sample than a property that sells infrequently, each of the high-frequency property's observations will only affect the HPI over the time period between sales. However, the increased number of price observations for the high frequency property should lead to a reduction in the standard error of the HPI estimate.

It has been theorized that certain properties are more likely than others to be sold repeatedly ("starter homes" for example) and that these properties—being owned by people concerned about the return on their investments—are more likely to have been improved upon. Consequently, it is thought that properties that sell repeatedly will have a higher rate of appreciation than properties which are held for longer periods of time.

The supposition that properties which sell repeatedly have a higher rate of appreciation than properties which sell relatively infrequently have led to claims that repeat transactions indexes suffer from a "high-frequency" bias.[2] This study attempts to address the issue of high-frequency bias by examining the effect of high-frequency properties on the purchase-only indexes for California and for the South Atlantic Census Division. The table below describes the distribution of transactions per property in the FHFA HPI database for both indexes.

Summary Statistics for FHFA HPI Sample for California and the South Atlantic Division - By Number of Transactions per Property

Number of Transactions per Property	Number of Transaction pairs in Estimation sample	% of Total Transaction pairs	Number of Properties in Sample	% of Total Properties	Avg. Number of Quarters Between Transactions	Avg. Annual Appreciation Between Transactions
California						
2	298,058	76.195%	298,058	87.119%	26.57	4.33%
3	79,022	20.201%	39,511	11.549%	20.44	5.01%
4	12,528	3.203%	4,176	1.221%	16.42	5.23%
5	1,424	0.364%	356	0.104%	13.79	4.93%
6	130	0.033%	26	0.008%	11.77	3.98%
8	14	0.004%	2	0.001%	5.79	5.00%

[1] For a detailed description of how the HPI is constructed, see the HPI technical description at: http://www.fhfa.gov/webfiles/896/hpi_tech.pdf

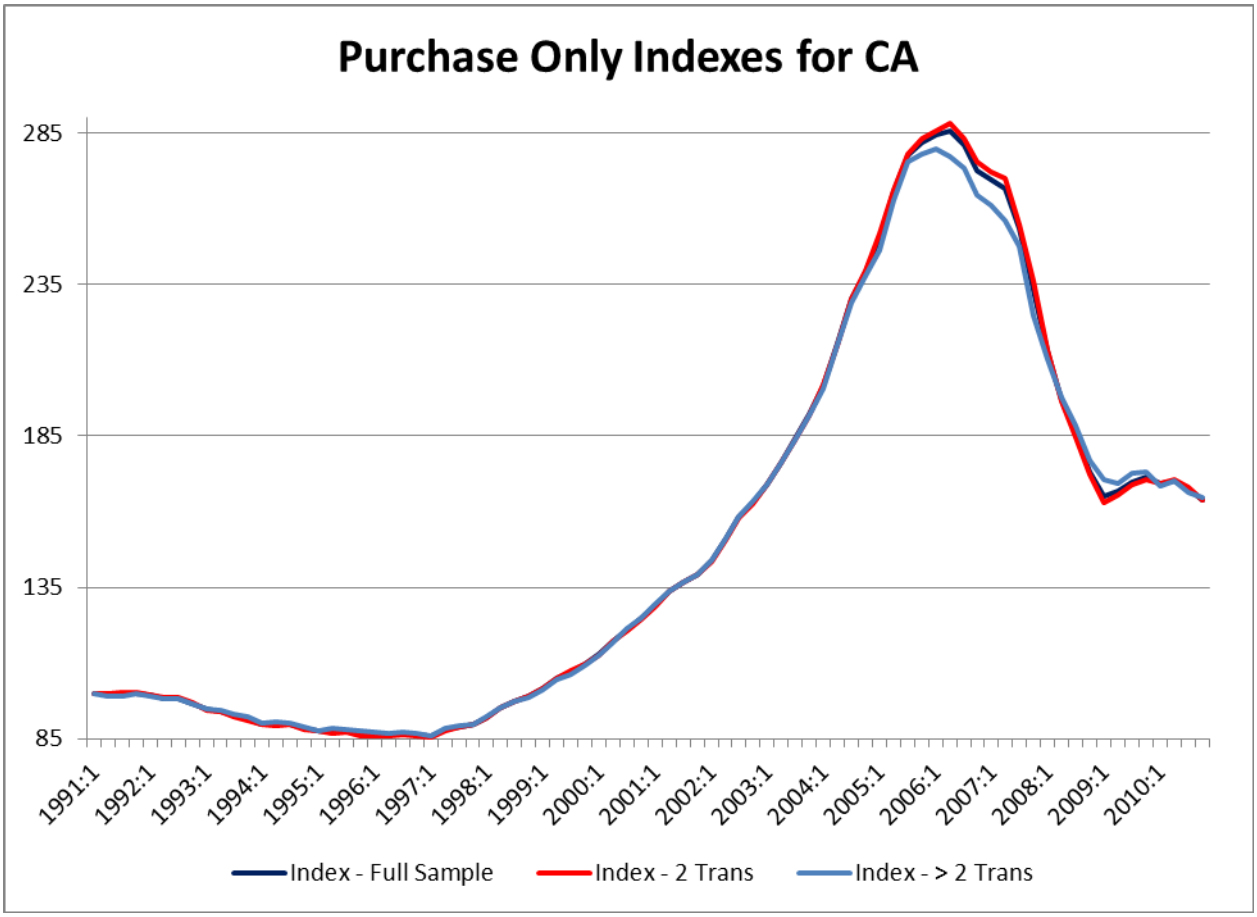
[2] For an argument supporting what this study has labeled "high-frequency bias", see Case, Pollakowski and Wachter (1997); "Frequency of Transaction and House Price Modeling"; *Journal of Real Estate Finance and Economics*; 14; pp 173-187

Number of Transactions per Property	Number of Transaction pairs in Estimation sample	% of Total Transaction pairs	Number of Properties in Sample	% of Total Properties	Avg. Number of Quarters Between Transactions	Avg. Annual Appreciation Between Transactions
South Atlantic Division						
2	574,190	72.384%	574,190	84.9184%	23.43	4.87%
3	177,144	22.331%	88,572	13.0991%	18.57	5.05%
4	35,658	4.495%	11,886	1.7578%	15.50	5.11%
5	5,436	0.685%	1,359	0.2010%	13.20	5.15%
6	700	0.088%	140	0.0207%	11.14	5.65%
7	90	0.011%	15	0.0022%	9.89	4.59%
8	28	0.004%	4	0.0006%	6.89	0.81%
9	8	0.001%	1	0.0001%	6.50	-0.56%

Note: By construction, all properties in the FHFA HPI sample will have at least 2 transactions
The South Atlantic Census Division comprises Delaware, the District of Columbia, Florida, Georgia, Maryland, North Carolina, South Carolina, Virginia and West Virginia
Source: FHFA

There are 391,176 transaction pairs in the HPI estimation sample for the state of California. Of those, 76 percent comprise properties with only two transactions, 20 percent are properties with three transactions, three percent are properties with four transactions, and properties with five or more transactions make up less than one-half of a percent of all transactions pairs. The fact that properties with more than two transactions comprise an even smaller portion of the total *properties* in the sample relative to total *transaction pairs* demonstrates how properties with high-frequency transactions make up a disproportionate share of the estimation sample. For properties with only 2 transactions, the average time between sales is more than 26 quarters (more than six years). However, the two properties in the sample that transacted 8 times had, on average, less than a year and a half pass between sales. Note, however, that the average annual appreciation rate between sales does not seem to increase as the number of sales per property increase. Indeed, the two properties with the most sales (eight) experienced only the third highest appreciation rate. The highest appreciation rate went to properties that sold four times (the third lowest number of transactions). Consequently, there does not seem to be a link between appreciation rates and the frequency of transactions among properties in the FHFA's HPI sample for California.

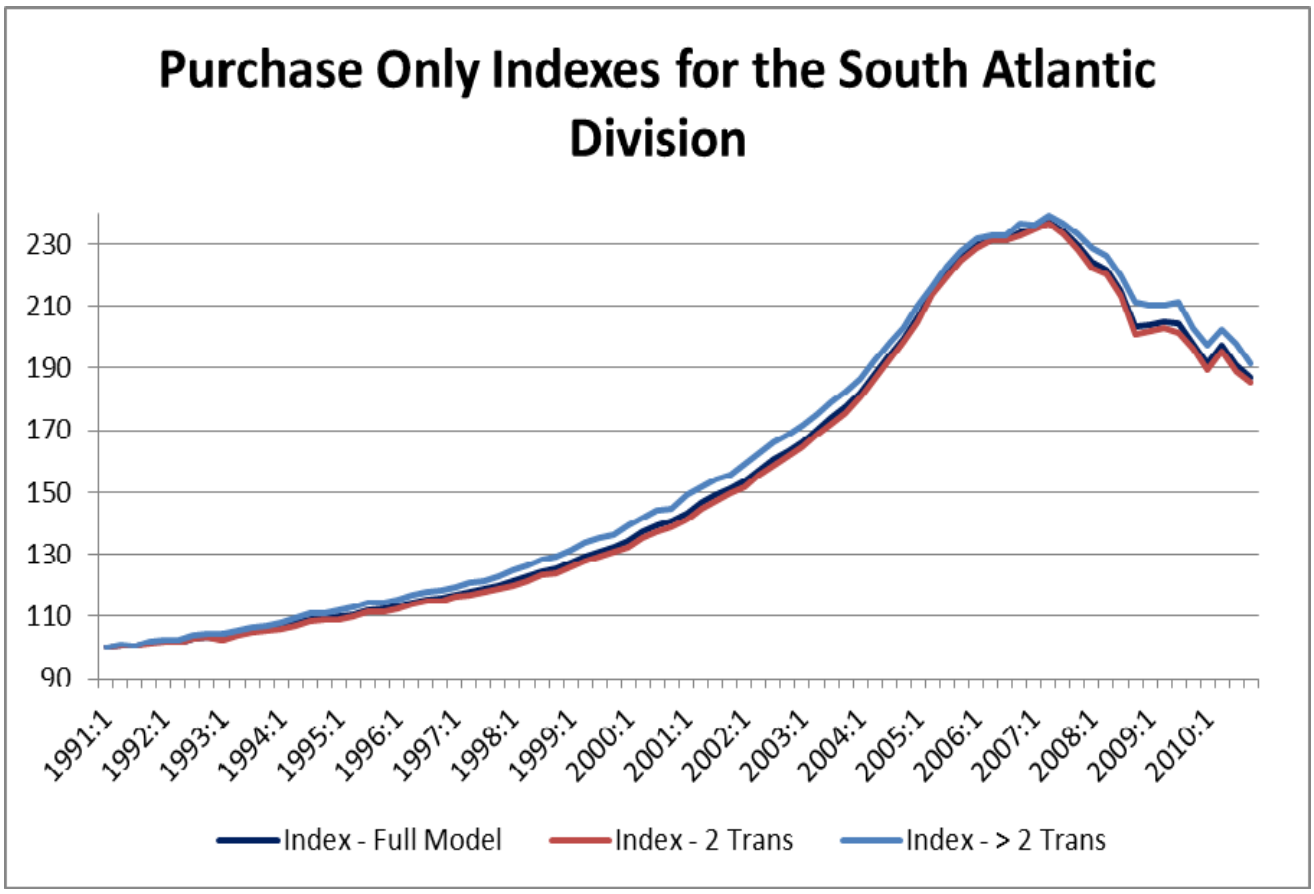
There are 793,254 transaction pairs in the HPI estimation sample for the South Atlantic Census Division. Of those, 72 percent comprise properties with only two transactions, 22 percent are properties with three transactions, four percent are properties with four transactions, and properties with five or more transactions make up less than one percent of all transaction pairs. Properties in the South Atlantic sample that transact only twice sell on average six years apart whereas properties that sell eight or more times sell on average every year and a half. For the South Atlantic Division, it is true that average annual appreciation between transactions increases as the number of transactions per properties goes from two to six transactions. However, properties with more than six transactions have a lower appreciation rate than properties with six or less transactions. The four properties that have transacted eight times in the sample only increased in price by 0.8 percent per year on average while the only property to transact nine times had an average of 0.6 percent depreciation.

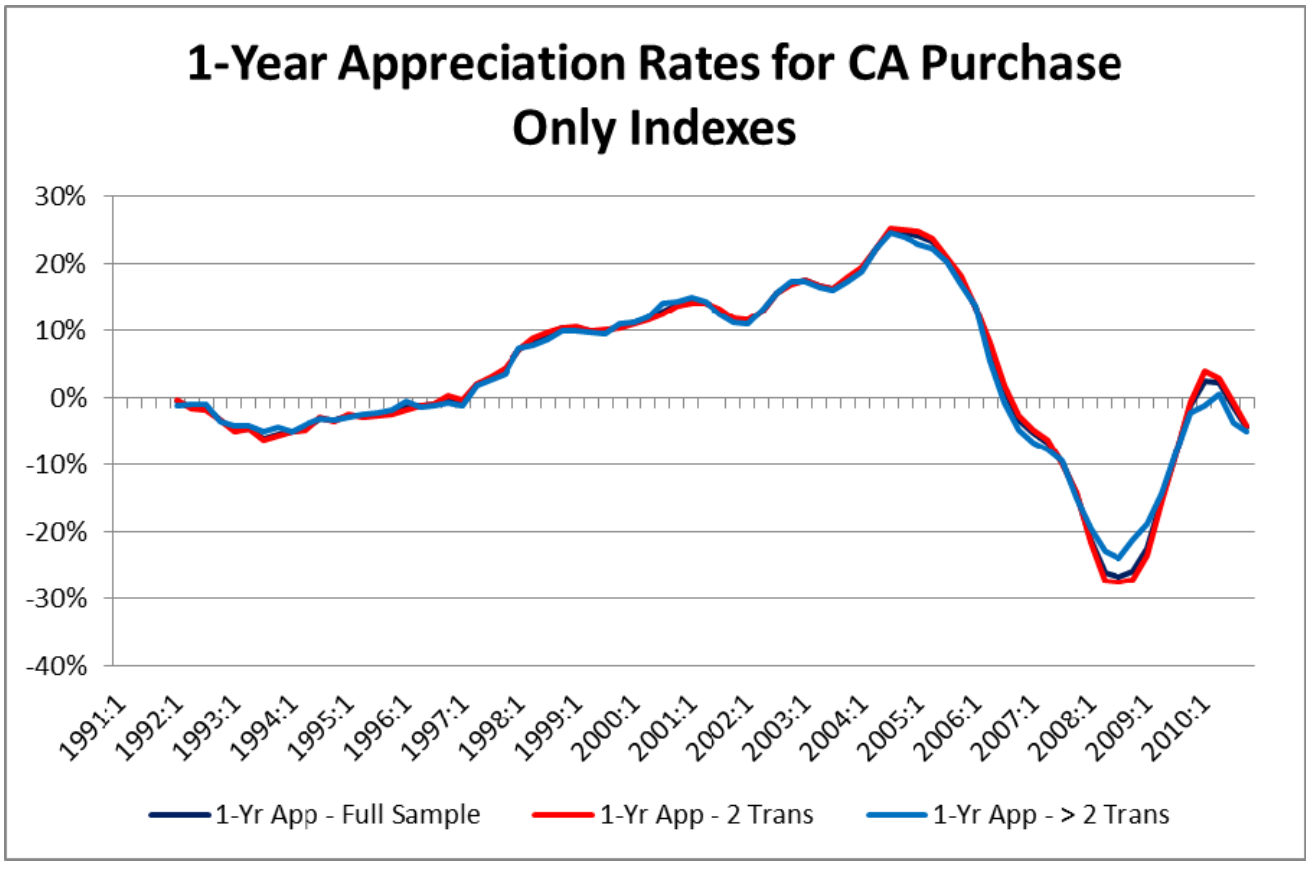


The figure above shows three different purchase-only indexes for the state of California: An index using all the FHFA purchase-only HPI data, an index using only data from properties with two transactions, and an index using only data from properties with more than two transactions. As can be seen, there is very little difference between the three indexes—with the exception of the peak of the California price bubble near the beginning of 2006 and the trough of the bust at the end of 2008. Interestingly, it is the index constructed from high-frequency transactions that seems to experience the least appreciation in the boom.

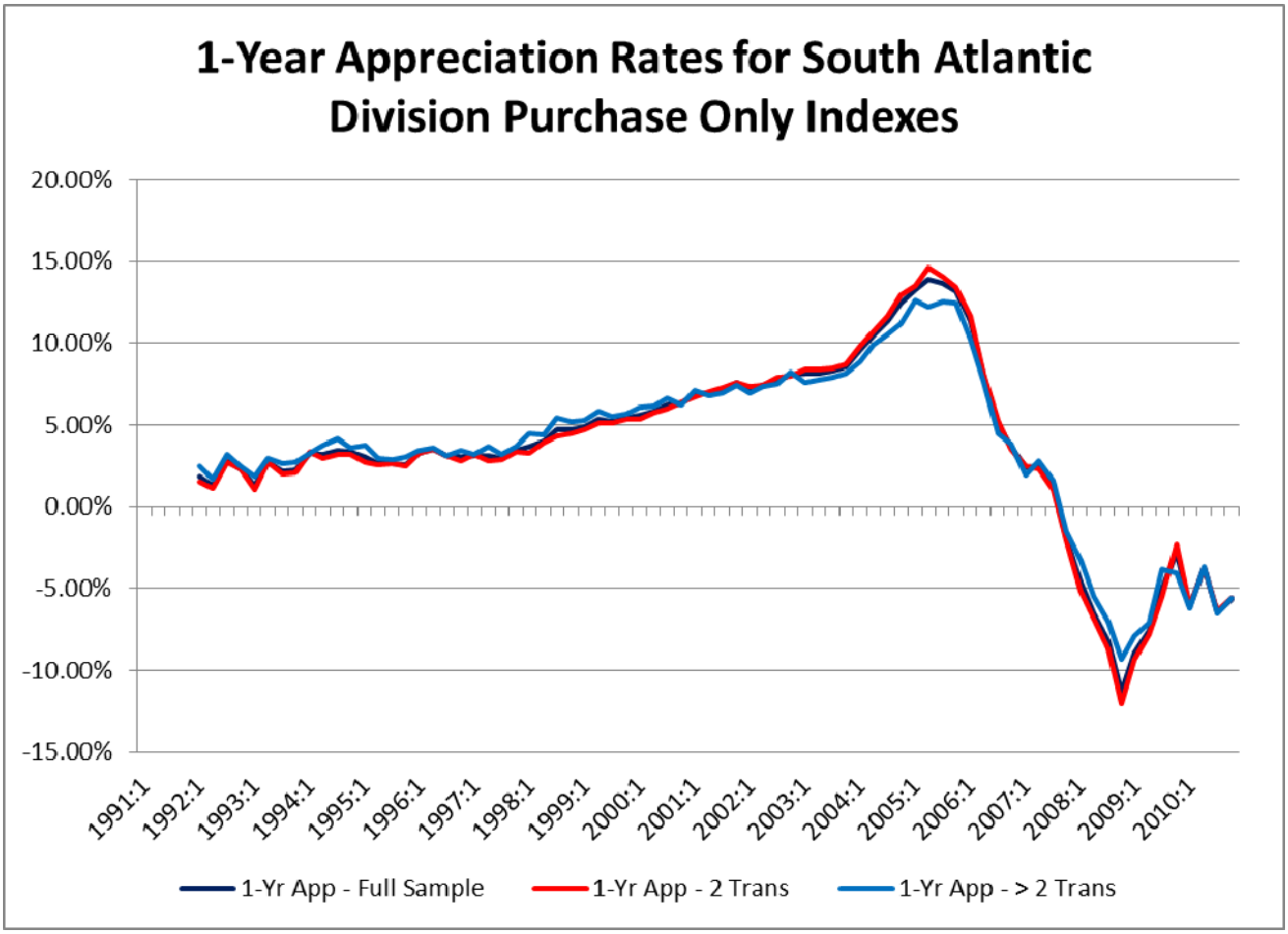
The first figure on the following page shows the same three purchase-only indexes for the South Atlantic Census Division. Unlike with California, the HPI for properties with more than two transactions appears to always be above the normal purchase-only index while the index with only two transactions is always below the normal index.

The second figure on the ensuing page depicts the one-year appreciation rates derived from the HPI estimates for California. As can be seen, there is almost no difference in one-year appreciation rates among the various indexes—with the exception being that properties with more transactions seemed to experience less depreciation during the trough of the bust in the beginning of 2008.


Purchase Only Indexes for the South Atlantic Division
230
210
190
170
150
130
110
90
1991:1
1992:1
1993:1
1994:1
1995:1
1996:1
1997:1
1998:1
1999:1
2000:1
2001:1
2002:1
2003:1
2004:1
2005:1
2006:1
2007:1
2008:1
2009:1
2010:1
Index - Full Model
Index - 2 Trans
Index - > 2 Trans


1-Year Appreciation Rates for CA Purchase Only Indexes
30%
20%
10%
0%
-10%
-20%
-30%
-40%
1991:1
1992:1
1993:1
1994:1
1995:1
1996:1
1997:1
1998:1
1999:1
2000:1
2001:1
2002:1
2003:1
2004:1
2005:1
2006:1
2007:1
2008:1
2009:1
2010:1
1-Yr App - Full Sample
1-Yr App - 2 Trans
1-Yr App - > 2 Trans

The figure below depicts one-year appreciation rates derived from the HPI estimated for the South Atlantic Division. Notice that, although the purchase-only HPI for properties with more than two transactions was everywhere above the normal HPI, the actual 1-year appreciation rate for properties with more than two transactions is not exceptionally different than 1-year appreciation rates for properties with only two transactions.



The tables and figures presented here indicate that there is no “high-frequency” bias in the purchase-only HPI for California and the South Atlantic Division. First, properties with high transaction frequencies do not seem to experience a different level of appreciation than properties with low transaction frequencies. Second, separate HPI estimates for two-transaction properties and for properties with more than two transactions do not seem to deviate from the standard purchase-only HPI for California—while there do appear to be some differences in purchase-only indexes for the South Atlantic Division. Third, when these HPI estimates are translated into annual appreciation rates, there is still no substantial difference between appreciation rates for either California or the South Atlantic Division.