Highlights

New House Price Indexes for Puerto Rico

Although property transaction prices in Puerto Rico are not subject to nondisclosure laws as they are in some U.S. locations, the island's land registry does not generally make real estate transactions data available in electronic form. The absence of a commonly-available electronic data repository has made tracking real estate prices very difficult and publicly-available house price indexes are generally not available for the territory.

Fannie Mae and Freddie Mac (the "Enterprises") buy and securitize mortgages collateralized by Puerto Rico houses and thus do have some relevant historical data. The construction of a house price index with those data has been hindered, however, by data sparseness. The issue is not too little mortgage data *per se,* rather the problem stems from the inability of the address "scrubbing" tool that is used in data processing to find "valid" addresses for the associated transactions.

As discussed in last quarter's Highlights article, a key first-step in the construction of repeat-transactions house price indexes involves standardizing incoming property addresses. The standardization is performed by special software which takes inconsistently-formatted addresses and attempts to "find" the relevant address in a database of known "valid" addresses having consistent formatting. In the contiguous United States, Alaska and Hawaii, a match is found in about 95 percent of cases. For Puerto Rico, by contrast, the idiosyncrasies of local addresses produce match rates of less than 30 percent. The sample of available observations for use in statistical modeling thus becomes a small fraction of the incoming data volume.

While FHFA's newly-acquired address-scrubbing tool has not improved data validation rates for Puerto Rico data, FHFA has now assembled a much larger pool of raw transactions data. FHFA has collected loan-level data from the Federal Housing Administration (FHA) and the Federal Home Loan Bank of New York (FHLBNY) to supplement data received from the Enterprises. The FHA data reflect transaction prices for houses with FHA-mortgages originated in periods back to the 1970s. The FHLBNY data include loans that Puerto Rico member banks proffered to the home loan bank as potential collateral for bank advances. The loan-level details (e.g., transaction date, sales price and appraisal value) provided to FHLBNY in the collateral submission process were sent to FHFA for currently-active mortgages, as well as mortgages that were active as of year-ends 2005, 2007, and 2009. Not all loans met eligibility requirements for becoming bank advance collateral.

When added to the Fannie Mae and Freddie Mac data for Puerto Rico, the FHA and FHLBNY mortgage-level data increase the size of the available Puerto Rico dataset by several fold. As a result, although address scrubbing remains a problem (with validation rates remaining low), the number of records available for index estimation in the new pooled dataset is sufficiently large to assure reasonably reliable index values.

FHFA has used the augmented data sample to produce three repeat-transactions house price indexes for Puerto Rico. All three series use the same fundamental methodology used for index construction in other parts of the United States, with the exception that FHA and

FHLBNY data augment the Enterprise data in this case.[1] As with the usual HPI series, efforts are made to remove condominiums from the sample.

The three indexes include one "all-transactions" measure and two "purchase-only" series. The all-transactions index is estimated using house values from purchase-money and refinance mortgages, where house values from the former generally reflect actual sales prices and values from the latter are generally appraisal estimates.[2] The two "purchase-only" series are calibrated using only data from purchase-money mortgages. As with FHFA's other purchase-only series, the Puerto Rico purchase-only series exhibits some seasonality and thus a seasonally adjusted series is provided with the baseline unadjusted series.

Figures 1 and 2 graph the respective series. Figure 1 plots the all-transactions series since the first quarter of 1995—the base period and the first period for which index values are reported. Index estimates for prior periods tend to have relatively large estimation imprecision due to small sample sizes and thus are not shown. Figure 2 shows the purchase-only series (both seasonally-adjusted and unadjusted) since the first quarter of 1995. The underlying data for all of the indexes in Figures 1 and 2 can be downloaded at: http://www.fhfa.gov/Default.aspx?Page=87. Figure 3 reports median house prices for Puerto Rico as calculated in the transaction-level data. A comparison of Figures 1-3 reveals similar patterns over the long-term, but short-term deviations can be significant.

Irrespective of the series chosen, it is clear in the repeat-transactions indexes that Puerto Rico house values rose steadily from the mid-1990s to around 2007. Then small declines were followed by subsequent modest rebounds in the fall of 2008. In the period since, the purchase-only index diverges substantially from the all-transactions index. The all-transactions series shows a relatively modest 6 percent price decline through the end of 2009, while the purchase-only series shows a precipitous decline of between 13 and 15 percent (depending on whether the decline is measured in seasonally adjusted terms).

The divergence between the two series, although large, is not particularly unusual relative to trends that have been seen in other parts of the country. The all-transactions and purchase-only series can and often do diverge, in large part reflecting the effects of appraisal bias and differences in the types of houses that are represented in the two samples. Prices for houses with refinance mortgages, for example, can show greater strength during downturns because of sample selectivity; refinancing is much more difficult in situations where houses have declined sharply in value and thus refinance mortgages may underrepresent houses with the largest price declines.

As with other price indexes FHFA publishes, the index values are subject to statistical noise. The number of transactions used in index estimation for Puerto Rico remains modest and the

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[1] For a description of the basic methodology, see Calhoun, Charles, "OFHEO House Price Indexes: Technical Description" available at: http://www.fhfa.gov/webfiles/896/hpi_tech.pdf.
[2] House values embedded in the Enterprise's purchase-money mortgage data reflect the lesser of the sales price and the appraisal value, while the FHA data include the actual sales price. The purchase-money mortgage records in the FHLBNY data sometimes contain both sales prices and appraisal values (in which case the sales price is used), but frequently sales prices are missing. Appraisal values are used when the sales price is missing. In some cases, the FHLBNY data suggest that the mortgage purpose is to refinance, but yet a "sales" price and sales date are reported. In those cases, the transaction date and value are assumed to be the reported sales price and date.

"confidence intervals"[3] surrounding particular index values can be substantial. For example, when measured with the all-transactions index, the most recent index value for the island (189.5) has a 95 percent confidence interval of +/- 9.6 points. This confidence interval is relatively large and is in the range of what might be expected for FHFA price indexes for smaller U.S. cities.

Separately, the relatively low yields of "valid" addresses for Puerto Rico index may also warrant some concern. Given that only about a quarter of all transactions produce valid records, there is a risk that the houses that are fed into the Puerto Rico indexing model "look different" than the housing stock as a whole. If those differences are correlated with price changes in some way, price trends reflected in the calculated index may be biased indicators of marketwide price trends.

FHFA intends to study this issue and, more broadly, evaluate ways that the Puerto Rico index might be refined.

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[3] A "confidence interval" is a range of values that, under appropriate sampling conditions, will tend to include the true value for the population as a whole. In this case, the "true" value would be the index value that would arise if house values were observed in every period for every house in Puerto Rico.

Figure 1: Repeat-Transactions House Price Index for Puerto Rico

(Calculated using Mortgage Data from Fannie Mae, Freddie Mac, the Federal Housing Administration, and the Federal Home Loan Bank of New York)

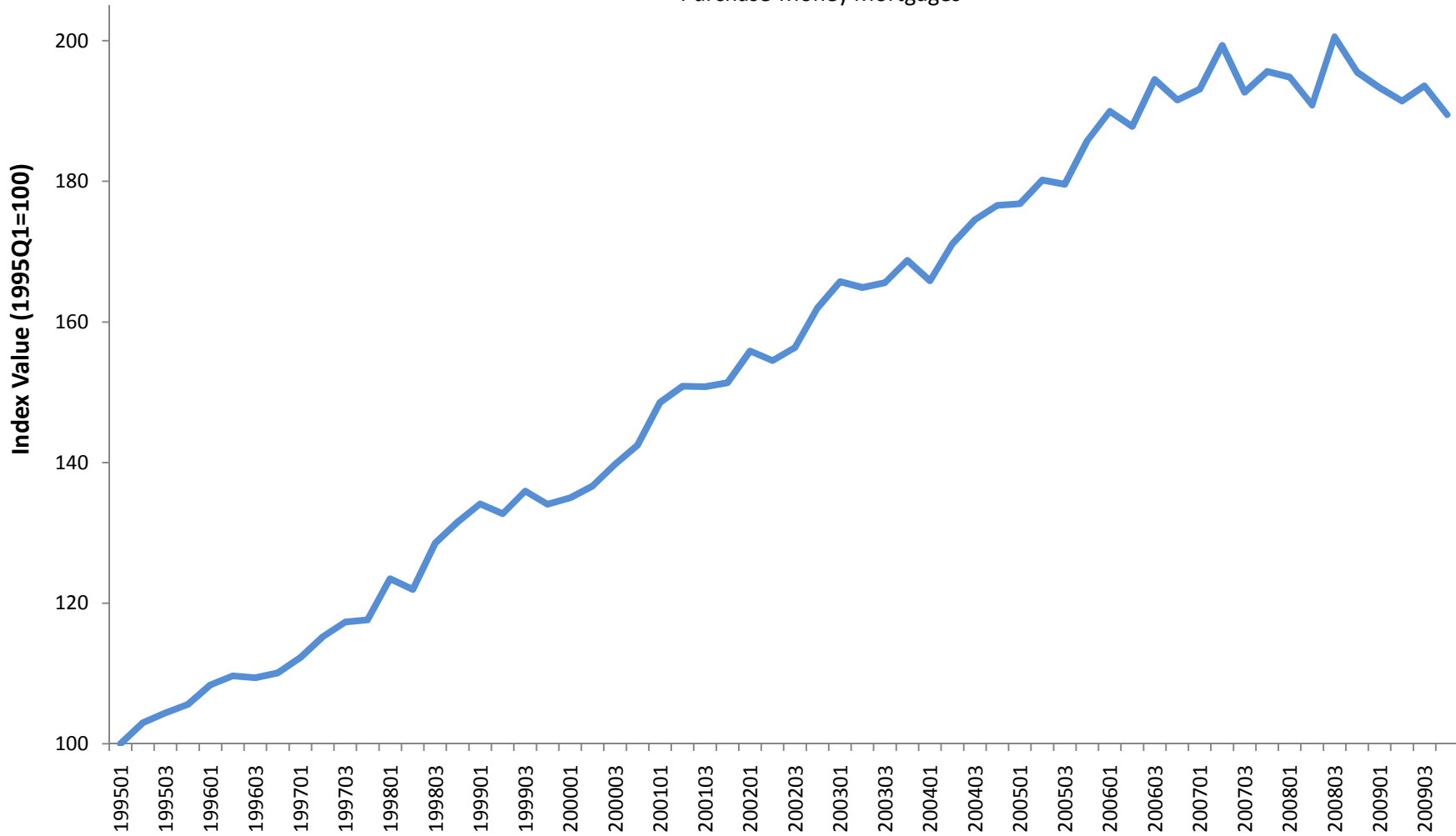"All-Transactions" Index Estimated with Valuations from Refinance Mortgages and Purchase-Money Mortgages

Figure 2: Repeat-Transactions House Price Index for Puerto Rico
(Calculated using Mortgage Data from Fannie Mae, Freddie Mac, the Federal Housing Administration, and the Federal Home Loan Bank of New York)

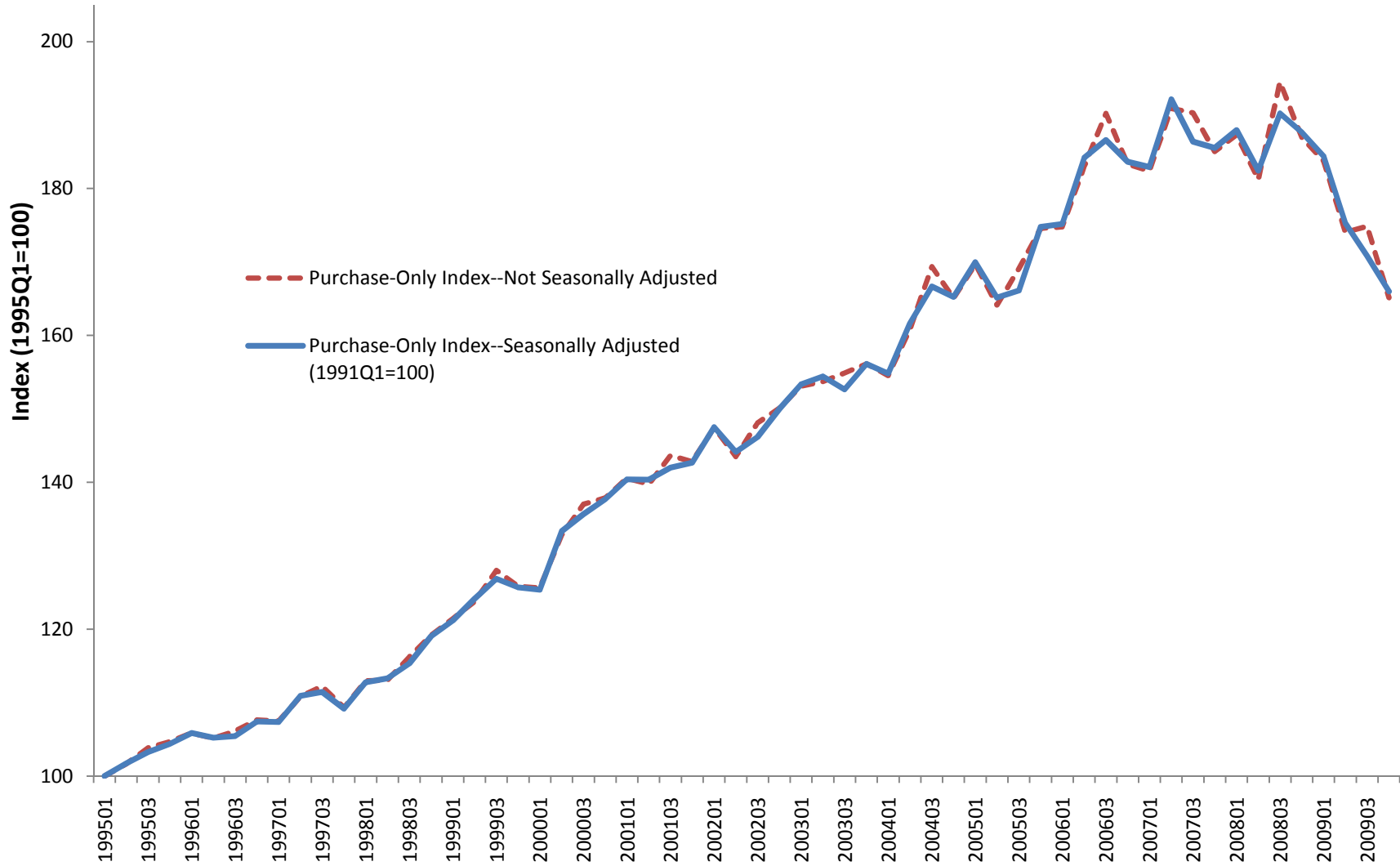"Purchase-Only" Index Estimated with Valuations from Purchase-Money Mortgages

Figure 3: Median Home Values in Puerto Rico

(Calculated using Mortgage Data from Fannie Mae, Freddie Mac, the Federal Housing Adminstration and the Federal Home Loan Bank of New York)

Median Values
(Purchase Money Mortgages + Refinances)

Median Values
(Purchase Money Mortgages)