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# A FRAMEWORK FOR CONSTRUCTING A HOUSING PRICE INDEX-A PROGRESS REPORT

BY

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**A Framework for Constructing a Housing Price Index-A Progress Report**

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**Abstract**

As evident from the 2007/2008 housing crash in the United States of America and other developed countries, the fortunes of the real estate market not only serve as a guide to overall economic activity but have implications for the overall health of a financial system. However, despite the initial efforts of Browne, Clarke and Moore (2008) and the existence of specialised commercial sub-indices, there exists no general real estate price index for Barbados to date. The lack of an official index has spurred the authors' efforts to create a real estate price index for Barbados using data provided by the nation's central revenue agency, the Barbados Revenue Authority. Ultimately, the analysis evaluated a number of approaches proposed in the literature for constructing real estate price indices, and attempted to build an appropriate real estate index for the island. The study furthers the initial efforts of Browne, Clarke and Moore (2008)by using a more comprehensive dataset and utilising the actual sale price of houses rather than the listed price. It also provides an analysis of trends over time in real estate prices, a key factor for macroprudential considerations.

**Key words:** house price index; median price index; developing countries.

**JEL Classification:** R31

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## 1. Introduction

The 2007/2008 housing crash in the United States of America and other developed economies highlighted the increasingly connected relationship between the real estate sector, the financial system and the real economy. For example, personal consumption fell by 20 percent - four times the national average – in the one fifth of US counties that suffered the largest declines in housing net worth over the period (Glick and Lansing, 2010). For many financial institutions, mortgages and other property-related lines of credit have traditionally represented major exposures and sources of income, while other non-real estate loans are backed by properties offered as collateral. In addition, with the advent of securitization, particularly with reference to mortgage-backed securities, this ongoing relationship between the real and financial sectors has become even more complex.

As noted in the inaugural Caribbean Regional Financial Stability Report 2015 (page 28), Barbados' economy is highly credit-driven with credit-to-GDP ratios in excess of 140 percent of GDP. For the dominant deposit-taking institutions, banks and credit unions, mortgages alone accounted for 42 percent of total loans and advances of commercial banks at the end of 2015, and about 44 percent of the credit unions' portfolio (CCMF, 2016). In addition, indicators of credit risk - primarily the non-performing loan ratio - jumped shortly after the global financial crisis leading to some concerns about systemic stability. However, stress tests and subsequent experience revealed that the well capitalised and liquid financial system remained stable and capable of carrying out its functions although credit expansion slowed sharply.

As of June 2016, non-performing loans to real estate, renting and other business activities accounted for 16 percent of gross classified debt, with loans to individuals and individual trusts making up another 59 percent, much of which is attributed to residential mortgages. At the same time, some finance and trust companies, some insurance companies and most credit unions provide mortgages to their customers, and at times these make up more than half of those institutions' credit portfolios. On the external side, financial inflows for various real estate projects go a long way to financing Barbados' persistent current account deficit which is typically above 5 percent of GDP[2]. Griffith and Moore (2011) estimated that "the sale of…condominiums accumulated foreign exchange earnings in excess of US$ 400 million in 2007, attracted capital in the form of foreign direct investment, expanded the tourism product as it relates to accommodation capacity, and created sources of employment opportunities that increased incomes earned, consumption, and capital expenditure on goods and services."

The fortunes of the real estate market therefore, not only serve as a guide to the direction of overall economic activity and credit, but also have implications for the overall health of the financial system. However, despite the initial efforts of Browne et al (2008, there exists no comprehensive real estate price index for Barbados to date. These authors used online list prices of 4,584 properties in Barbados spanning twelve months to construct both median and hedonic house price indices for the island. However, this limited time series, as well as the exclusion of factors such as age, proximity to schools, shopping areas and the beach – in the case of the hedonic model – was cited by the authors as challenges in carrying out their research. Potentially

[2] Central Bank of Barbados, Press Release, September 2016, Table 1, http://www.centralbank.org.bb/Portals/0/Files/September%20Press%20Release-2016.pdf

more problematic was the use of listed prices rather than the actual post-negotiation transaction price as these may not represent the true values of properties on the island due to the heterogenous nature of housing assets, informational asymmetries and lags in market value adjusting over time.

The lack of an official index prompted the International Monetary Fund, as part of their 2013 Financial Sector Assessment Program (International Monetary Fund (2014)), to suggest that the Central Bank of Barbados develop a real estate price index in order to assess the adequacy of the financial institutions' valuations of real estate collateral used in financial transactions. This would ultimately be useful in determining whether there is a need for cuts to the value of this collateral, and would be a key aspect of any macroprudential toolkit as it would enable authorities to assess where excessive build-up of risks may be occurring. Nonetheless, encouragement to compile and disseminate property price indicators has also become a general international recommendation with the house price indicators being included as Recommendation 19 in the IMF/FSB G-20 Data Gaps Initiative (DGI) (Financial Stability Board/International Monetary Fund (2009)) as well as being prescribed within the list of IMF Financial Soundness Indicators.

As such, this study furthers the initial efforts of Browne et al. (2008) by using a comprehensive dataset of actual transactions provided by Barbados Revenue Authority. The paper seeks to create a real estate price index for Barbados using the actual prices of properties sold while determining those variables that may be important in explaining property prices on the island. The study evaluates a number of approaches proposed by the literature for constructing real estate price indices and determines which model may be most appropriate for estimating property prices in Barbados. Ultimately, it is intended that the constructed index will be incorporated into the Central Bank of Barbados' Financial Stability Unit's macroprudential and surveillance toolkit.

The remainder of the paper is structured as follows: Section 2 reviews the methodologies used in the literature for the construction of real estate price indices, Section 3 presents a historical perspective of housing developments in Barbados utilising census data, Section 4 gives a brief overview of the data employed in the study, Section 5 analyses the results, and finally, Section 6 summarises the findings and concludes.

## 2. Review of Previous Methodological Approaches

The uses of real estate price indices are myriad. These include the measurement of price bubbles in the housing market, an input into the measurement of consumer price inflation, as a key measure of real household wealth and as part of the analysis of a mortgage lender's exposure to default risk. Indeed, there has been increasing appreciation among policy makers that central banks should monitor asset prices, as well as goods prices (Blanchard et al., 2010).

However, the construction of aggregate measures of housing prices is not a straightforward exercise and involves a number of conceptual and practical issues. Ultimately, a real estate price index should represent the price change experienced by a typical house within the geographical area covered by the index. Therefore, an accurate starting point for constructing any price index

between two time periods is to collect prices on exactly the same product or item for two time periods under consideration - the standard matched-model methodology. However, the fundamental problem with real estate price indices is that the exact matching of properties over time is impossible because:

1) properties depreciate over time (the depreciation problem)

2) properties are renovated over time (the renovation problem) and,

3) except in very large markets, property turnover rates tend to be low[3] (infrequency of transactions).

Furthermore, properties vary immensely along several dimensions, many of which are extremely difficult to quantify. While the segmentation of the market in terms of location, size or age of property might be straightforward, controlling for quality of construction, customer appeal or level of comfort is less obvious. Nevertheless, Scatigna, Szemere and Tsatsaronic (2014) in the Bank for International Settlements' Quarterly Review reported that fifty-five countries produced property price indices in 2014.

A few methodologies have been developed in the literature for constructing real estate price indices. Each measure has benefits and shortcomings and varies in terms of the relative degree of simplicity of implementation and data intensity.

***Simple and Stratified Median Price Indices***

The most commonly used method used in building housing price indices is the simple median of transacted prices at any point in time. However, the key drawback is that real estate's heterogeneous nature and the relatively small fraction of the housing stock traded in any period mean that a sample of housing transactions at any point in time may not be representative of entire housing stock. Changes in the simple median or mean price measures of traded properties therefore may not provide the best estimates of pure price changes as they may reflect compositional changes in houses sold between periods.

The simplest approach to address the compositional problem in the construction of a real estate price index is to stratify the market into homogenous property types. Strata are defined by considering the balance of homogeneity of housing characteristics, and the number of observations required for producing a reliable median unit price. Two possibilities used in the literature are defining strata by price or by geography. Defining housing strata based on geography captures the notion that dwellings in a given area share amenities linked to the property's location[4]. Notwithstanding the stratification method used, the median price for all properties in a base period and subsequent periods is calculated and these prices are used to generate sub-indices. The median unit price for each stratum is then weighted to reach the overall price index.

[3] Prasad and Richards (2006) report around a six percent annual rate of turnover in any year in Australia and argue that the turnover rate in other countries is often lower.

[4] However, Prasad and Richards have argued purely geographical stratification is unlikely to divide houses into strata with the maximal feasible similarity in prices within strata.

The following limitations in the literature have been summarised by Diewert (2007): if there are too many cells in the stratification, there may not be sufficient number of transactions in any given period in order for an accurate cell average price, but if they are too few cells in the stratification, then there will not be a sufficient number of transactions in any given period in order to form an accurate cell average price as the resulting cell averages will suffer from unit value bias, i.e., the mix of properties sold in each period within each cell may change dramatically from period to period.

Nevertheless, depending on the limitation of the quality of the database, the median price index has been used in many instances. Since the distribution of unit prices in a stratum is positively skewed, the median price produces a more robust indictor than the mean value (EUROSTAT, Handbook of Residential Property Prices, 2011). For example, the Real Estate Institute of Australia, the U.S. National Association of Realtors, the Canadian Real Estate Organization and the Real Estate Institute of New Zealand all publish house price data with simple median or mean data. The concern that compositional changes could impact the construction of the median index is not unfounded. However, Prasad and Richards (2006) further show that the median prices can be made considerably more useful if taken from a stratified data sample compared to a single unstratified median taken from the entire data sample. Indeed, these authors note that the price clustering technique they employed- clustering by price rather than geography - produced a measure of price growth that is highly correlated with a more sophisticated - but more computationally intensive - hedonic model with locational explanatory variables. Similarly, Hansen (2006) argued that it is possible to generate good estimates of short term price movements from median prices, if the medians are taken from an appropriately stratified data sample that is designed to address the key problem of compositional change.

***Appraisal Methods***

Real estate price indices for developing countries are still relatively rare compared to those in developed countries, generally due to data limitations. Kaya et al. (2012) compiled and developed a stratified median real estate price index for Turkey using appraisal data sourced from commercial banks and real estate companies. The use of appraisal data was driven by the absence of actual transaction data and efforts were expended in standardising appraisal reporting forms. The choice of the median price method was arrived at after considering the repeated sales method, hedonic regression and sales price appraisal methods due to data availability and statistical applicability.

The sales price to appraisal method (SPAR) has been used in New Zealand, Sweden, Denmark and the Netherlands. The aim of the sales price to appraisal method is to develop an index with the qualities of the hedonic index, but one which is substantially easier to administer (Bourassa et al. (2004)). The SPAR method relies on all transactions that have occurred in a given housing market, and hence should be less prone to sample selection bias; it uses official valuations or appraisals since the majority of houses sold during the current period would not have been sold during an earlier base period.

The equal weighted version of the index is calculated as follows:

$$I_{Et} = \left\{ \left[ \sum_{j=1}^{n_t} (S_{jt}/A_{j0})/n_t \right] \Big/ \left[ \sum_{j=1}^{n_{t-1}} (S_{jt-1}/A_{j0})/n_{t-1} \right] \right\} I_{Et-1}$$

where $I_{Et}$ is the equal-weighted index number for time period *t*, $S_{jt}$ is the sale price of property *j* during time period *t*, $A_{j0}$ is the appraised value of the property *j* as of the base or appraisal time period and *n* is the number of sales transactions.

***Repeat Sales Method***

Another popular alternative is the repeat sales approach developed by Bailey et al. (1963). In this methodology, housing quality is controlled for by comparing sales of the same house across time. By utilizing information on "identical" properties that trade in more than one period, the repeat sales method attempts to hold the quality of the properties constant over time. Thus, the price change considered is that of the same house over multiple instances.

Diewert (2007) noted that the main advantages of the repeat sales model are that results are reproducible and the availability of source data from administrative records on the resale of the original property means that no imputations are involved. However, the author also argued that this method does not use all the available information on property sales, but only those sold more than once during the period. Additionally, it cannot adequately account for depreciation of the dwelling unit or structure, or with units that undergo major repairs or renovations. The method may also fail due to lack of market sales for smaller categories of property. In principle, estimates for past price changes obtained by the repeat sales method should be updated as new transactions information becomes available. Thus, the repeat sales method is subject to never ending revisions.

Silverstein (2014) also agreed that despite its popularity the repeat sales method also contains a number of pitfalls. Firstly, the sales price is not entered into the index until they are paired with a subsequent sale. Furthermore, repeat sales do not occur very often, so most of the transaction data are not used. In addition, houses with paired sales may not be representative of the housing market as a whole as cheaper "starter" homes tend to sell more often. Furthermore, it is possible that the difference in composition for the new sales pairs is systematic across time, potentially leading to a bias in the index.

Nagaraja et al. (2010) also examined various repeat sales methodologies, considering their predictive ability and index structure. In addition to four repeat sales methods, they also consider an autoregressive index which makes use of the repeat sales idea but also included single sales as well. They ultimately favored a hybrid repeat sales/hedonic method compared with a number of pure repeat-sales methodologies.

### *Hedonic Method*

The hedonic method rests upon the formulation of a regression model in which the dependent variable is the price of houses and the explanatory variables are those representing the quality of the dwellings that have a significant impact on price. In order to gauge the impact of a property's characteristics on its price, property values are regressed on an OLS equation with various attributes (for example, the age, size, number of rooms, location, etc.). The coefficients of the attributes are estimates of implicit prices or hedonic prices. Of course, hedonic regressions are only as good as the data on housing characteristics that are available.

One example of the of hedonic price method was Browne et al. (2008) who utilised a regression model on list prices in Barbados to derive regression hedonic coefficients. Their results find support for size, location and number of bedrooms in deriving a house price index in Barbados. These authors also compared the results of the hedonic regression with those of an unstratified median index, and while they argued that the potential problems associated with the (unstratified) medium index were substantial, the two techniques delivered similar conclusions as to the evolution of the housing prices. One possible weakness of this study was the use of the parish variable as the control for spatial orientation, as arguably greater granularity was needed to capture housing clusters.

## 3. Historical Perspectives

Barbados is a small island that is divided into eleven sub-regions or parishes. Originally, parishes were administrative units associated with the island's Anglican Church and these parishes were governed under the vestry system. Since the final set of parishes was introduced in 1640s, and parish boundaries finalised in 1721, there may be some question as to the relevance of these parish units, especially in light of the centralisation of governmental functions in the post-independence period and the abolishment of the vestry system. Nevertheless, the division into parishes allows for a greater degree of understanding of the Barbadian housing market than could be derived by solely focusing on the island as a single unit[5]. At a minimum, the parishes can be divided in what were historically the more developed coastal parishes of St. James, St. Michael and Christ Church and the rural parishes in the island (Watson and Potter, 2001).

Echoes of the old plantation system remain in Barbadian housing patterns. In the immediate post-emancipation period, the newly freed laborers became tenants on their masters' land. By the end of the nineteenth century, the planter class retained 90 percent of the land in Barbados (Watson and Potter, 2001). Mass property ownership was due in part to the near collapse of the agricultural/sugar industry, the influx of "Panama money"[6] and the passage of various pieces of

5 The parish vestry system persisted into the early 20th century. Each vestry was allowed to levy taxes on land (the major source of revenue), buildings, animals, vehicles and Anglican Church pews of its particular parish (Richardson (1995)). Out of this revenue, church maintenance, road repairs, and almshouses were funded. A vestryman ensured those parish funds were not used to support the persons outside the district's boundaries who were financial responsibility of others.

6 Almost 45,000 Barbadian men and women- one quarter of the island's population – visited the isthmus of Panama between over the decade following 1905 (Richardson (1995). The effect of earnings from the Canal were transformational. The sugar bounty depression had loosed the private planters' grip on the land. While data is limited, from an estimated 8,500 small proprietors with 10,000 acres in 1897, the number of small holders increased

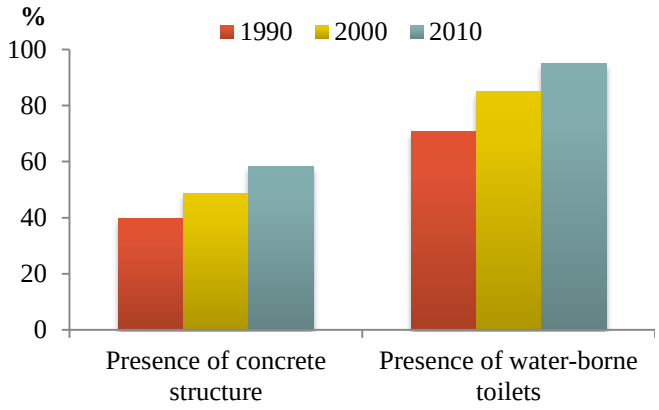
legislation, particularly the Tenantries Freehold Act and its revisions. The spatial dominance of the coastal parishes, which initially stemmed from the success of colonial Bridgetown – the island's capital - as an entrepôt, has continued to the present day however. The 1980 census revealed that 78 percent of the Barbadian population resided in the five south-western parishes of St. Michael, St. George, St. James, Christ Church and St. Philip. Similarly, the results of the 2010 census indicated that the housing stock in Barbados consisted of 94,173 units with 78.4 percent of housing units in these five parishes.

One interesting feature of the Census data is the increasing proportion of houses that are listed as "unoccupied". By 2010, this proportion was (16.2 percent) almost double the 1990 baseline of 8.5 percent. The increase in unoccupied housing was consistent across the parishes although the magnitudes were different across parishes. This trend may have been driven by a combination of demographic factors and well as an increasing proportion of Barbadians obtaining housing as an investment good.

An analysis of the three most recent censuses (1990, 2000, 2010) indicates an overall improvement of the quality of the total housing stock over time as evidenced by the increasing proportion of housing with concrete-based structures (compared to wooden) and the presence of water-borne toilet facilities (Figure 1). The proportion of homes made of stone, brick or concrete expanded steadily from 39.7 percent in 1990 to 58.4 percent by 2010. As in the case of most quality variables, geographic differences were very evident with Christ Church retaining the highest proportion of wall houses (71 percent) compared to St. Andrew (33 percent). A similar pattern follows for indoor water-based toilet facilities; while this characteristic improved over the entire country, the coastal belt parishes (Christ Church and St James) were the most significant contributors. Interestingly, St. Michael, home to the capital of Bridgetown, had a proportion of non-water borne toilets that was actually above the island's overall average, reflecting the persistent pockets of poverty within this parish. In addition, St. Michael continues to be the most densely populated parish in the island. (Figure 2). These differences between parishes suggest that the population of transactions will also differ between parishes, which the authors intend to examine as an avenue for future research.

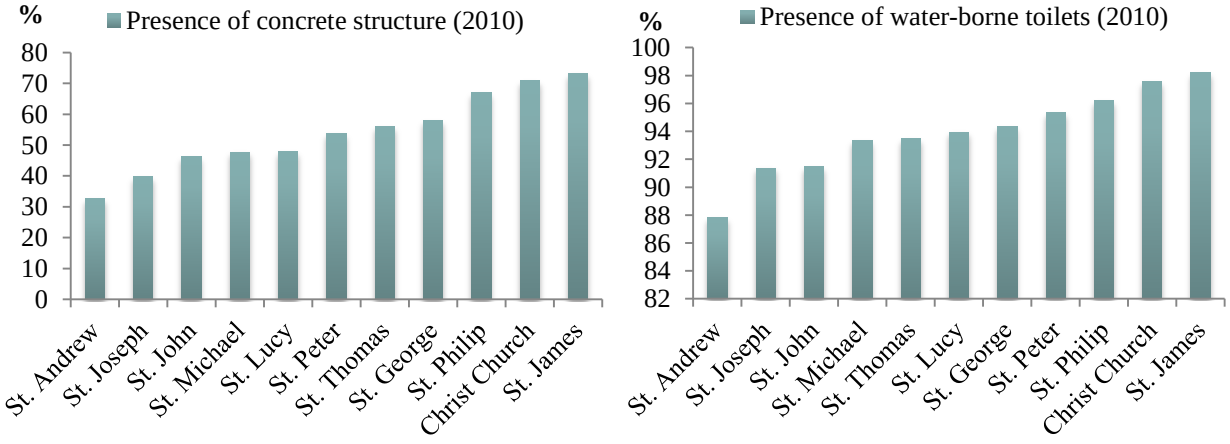
to 17,731 by 1929 Richardson (pp. 189). Richardson further notes that under the influence of Panama money, rural blacks invaded the city with enough remitted cash to make down payments for house plots, and urban streets that were formerly deserted became lined with chattel houses from the countryside (pp. 191).

**Figure 1a: Proportion of Housing in Barbados with Selected Characteristics**



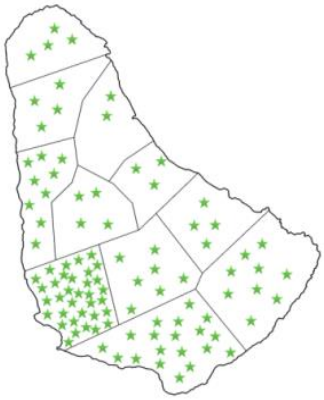

*Source: Barbados Population and Housing Census 1990, 2000, 2010*

**Figure 1b: Proportion of Housing in Barbados with Selected Characteristics**




*Source: Barbados Population and Housing Census 1990, 2000, 2010*

**Figure 2: Distribution of the Population by Parish (2010)**



*Source: Barbados Population and Housing Census 2010*

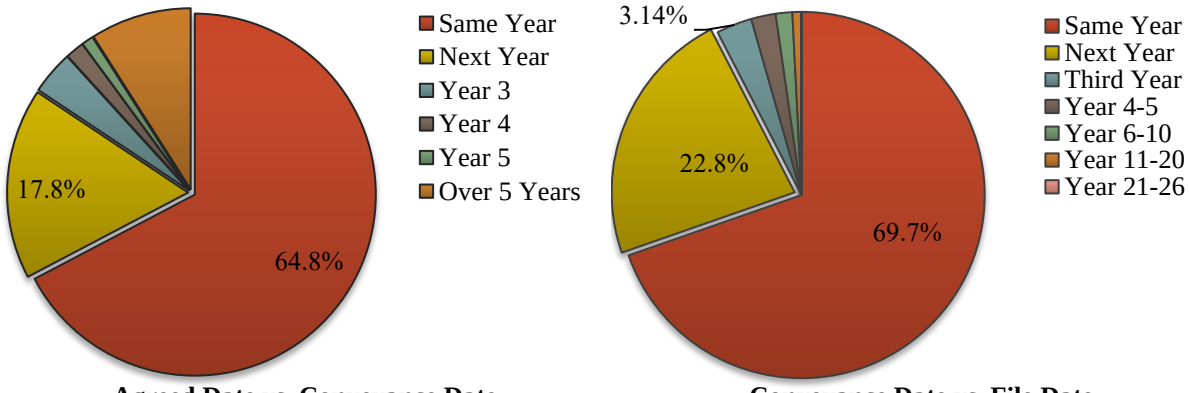
## 4. Data

The data employed in the study were obtained from the Barbados Revenue Authority (BRA) and covers each transaction or property transfer that is filed with the Government of Barbados' Land Registry Department (LRD) between 1990 and 2014. Included in the dataset is the respective transaction date (date agreed), the date conveyed, the date the transaction is filed at the Land Registry, the transaction price, the size and existing use of the property, the location of each property transfer, whether the sale includes or excludes a structure and the nature of the structure (residential, commercial, apartment etc.).

An accurate measure of price in a given market should ideally be linked to the actual sale or transfer of a property at an agreed price between the parties involved at the date on which the agreement was made. However, given that the origin of the data is the LRD, the Barbados Revenue Authority's data capture property transactions as they are filed. Consequently, there are three possible dates that could exist for a particular transaction: the 'date agreed' is the date the parties agreed on the terms of the sale by the vendor; the 'date conveyed' represents the date on which the legal title was transferred to the buyer; finally, 'the date filed' is the date the transaction was filed and recorded at the LRD.

Figure 3 illustrates that in about 65 percent of cases the 'date agreed' and 'date conveyed' were in the same year on average, with another 18 percent, being conveyed the following year. Additionally, while the majority of property transactions are filed within the year of conveyance (70 percent), 23 percent are filed the following year, and another 3 percent two years after. The remainder is filed many years after in some instances, where for example, some transactions from 1989 were only filed in 2006. There is no existing legislation which details the time period within which the property should be filed with the LRD.

**Figure 3: Average Time for Completion of Property Transfers**




**Agreed Date vs. Conveyance Date**

*Source: Barbados Revenue Authority*

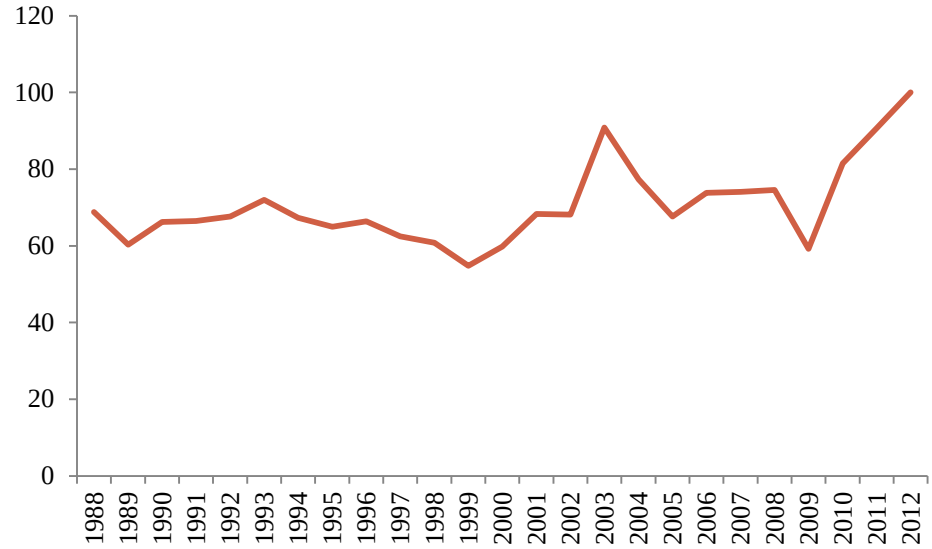
**Conveyance Date vs. File Date**

*Source: Land Registry Department*

For the purpose of this study, the 'date agreed' was utilised' in estimating the real estate price index. However, it is noted that information relating to transactions not yet filed will always be missing from the dataset at any given point in time. However, this characteristic would be more significant for the most recent year(s) available.

Nevertheless, if it is assumed that the transactions not yet filed are evenly distributed across 'price' for any given year, the resulting price index should not be significantly biased by this phenomenon. Additionally, since this relationship appears fairly constant over time (Figure 4), the inherent bias in the transaction volumes for recent years can be estimated and volume measures adjusted to provide a more accurate estimate of recent vintages of transactions.

**Figure 4: Ratio of Transactions Filed in the Same Year as Sale Agreed (%)**




*Source: Barbados Revenue Authority*

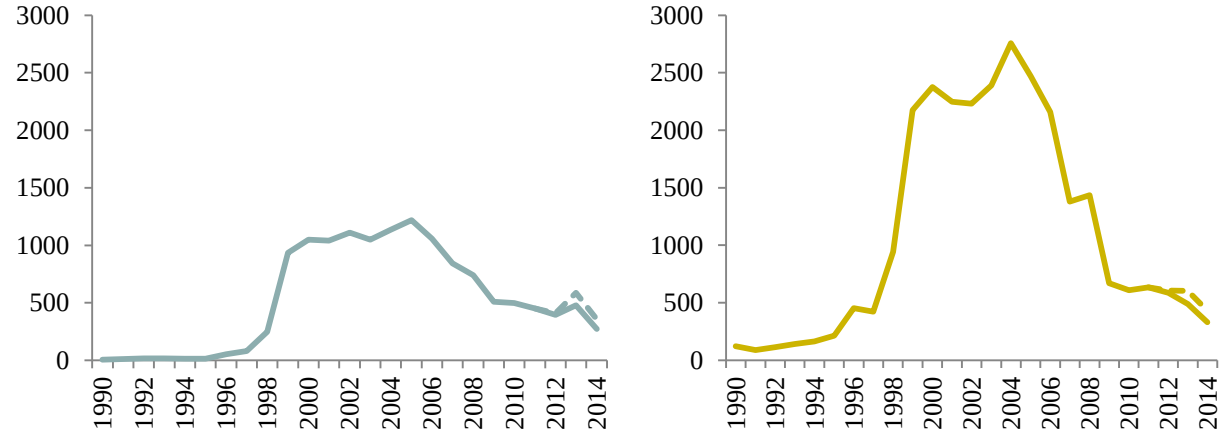
The initial data set under consideration consisted of 53,028 individual transactions; however, adjustments were made to facilitate the estimation of the index. Unfortunately for 11,645 entries there was no information on the "year agreed" variable resulting in a contraction of the sample to 41,383 transactions. Another adjustment which resulted in some data loss was the elimination of outliers. Low and high cost thresholds were determined by examining box plots of the unadjusted data. These outliers were especially pervasive in the land (only) transactions which featured thousands of transactions which had a very low or zero cost. Discussions with the BRA indicated that these transactions could represent gifts - "deed of gifts" or low cost transactions - which represented subsidised transfer of titles due in some cases to family relationships or the tenantries freehold purchase act. These can also represent transactions for drainage, road reserves and open areas or shared spaces that were allotted by developers to owners who purchased property in their development. High cost transactions were similarly eliminated (greater than BDS $100 per square foot) as these largely appeared to represent errors in terms of amounts of the area or the measurement unit under which the area was recorded. The net result in either case appeared to be inordinately large unit prices. However, one consequence of applying the high cost filter is that it eliminated some high (cost)-end type properties in Barbados' tourist belt. The overall result of these adjustments was a reduction in the sample of land transactions to 21,489.

A similar process reduced the housing prices transactions to 8,648. There were also some inconsistencies in the data, such as a fairly complex mix between the measurement units – metric versus various imperial units – which were all rectified prior to estimating the index.

Figure 5 illustrates number of properties which changed ownership over the period[7]. Panel A depicts these volumes for properties with a structure, while Panel B illustrates number of transactions for land (only). As noted previously, while the most recent years may be understated due to missing data, an analysis of file dates vs conveyance dates revealed that the relationship remains quite stable over time, with 69 percent occurring the same year, 92 percent by the following year and so on. Therefore to correct for this bias, an adjustment was made to the data in the latter years using this relationship, as illustrated by the dashed line in the charts.

Prior to 1995 the volume of property transactions with structures, "housing transactions", was negligible. After 1997, the volume of transactions rose significantly, before peaking in 2007. Thereafter, the series has shown a fairly consistent decline in transactions, notwithstanding a brief revival in 2013. Between 1990 and 1996, the volume of property transfers without structures (land only transactions), remained quite flat, averaging 125 per year over the period. By 1999, these had reached 2,177 transfers and continued to climb until 2007. However, since 2007, there have been substantial declines in the number of transactions being filed, with 2014 estimated to have 786 transactions in that year. For both series, the pattern over the period remains quite similar in both cases, as illustrated in Figure 5.

**Figure 5: Number of properties which changed Ownership (1990-2014)[8]**




Panel A: Number of property transfers (Properties with a structure)

Panel B: Number of property transfers (land only)

*Source: Barbados Revenue Authority*

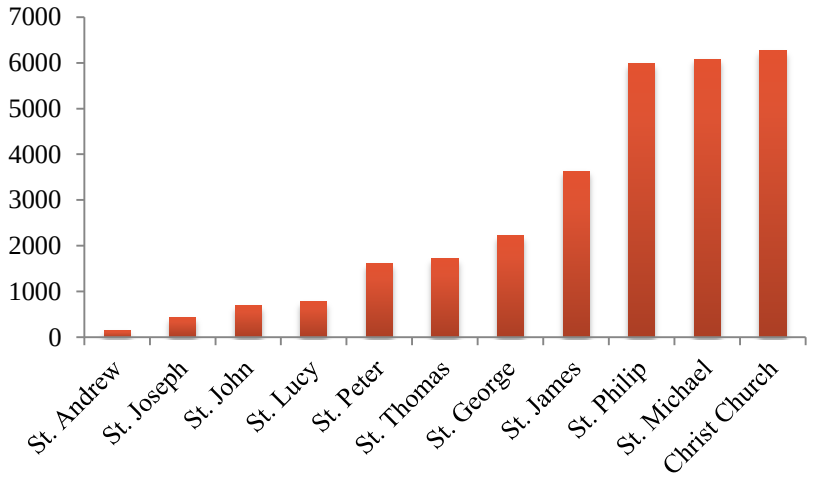
The majority of transactions filed over the period relate to properties situated in the south-west or more sub-urban parts of the island; on average, 74% of these properties were located in four of

[7]Transaction volumes are based on the un-adjusted data set.

[8] Dashed line illustrates the bias adjustment given that data for latter years tends to be understated given the inherent lag in filing of conveyances

the eleven parishes. Figure 6 illustrates this proportion of property transfers by parish over the sample period, and further examination of the data for individual years revealed only modest variation in the geographical dispersion of transactions between 1990 and 2014.

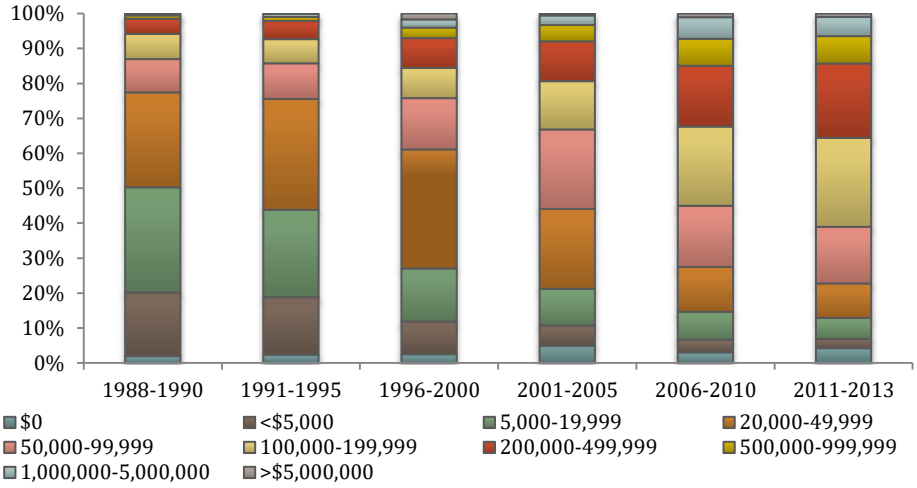
**Figure 6: Proportion of Properties which changed Ownership by Parish 1990-2014**




*Source: Barbados Revenue Authority*

Figure 7 depicts the composition of property transfers by transaction price and indicates an overall redistribution of the average price of properties filed over time. In the 1988-90 period, 31 percent (the largest category) of properties was in the $5,000 to $49,000 range, followed by the $20,000-$49,000 category which captured 27 percent of transfers. Properties greater than $500,000 accounted for just 1.5 percent of all transactions. In contrast, by the 2011-13 period 47 percent of ownership changes were for properties were between $100,000 and $499,999, while properties greater than $500,000 accounted for almost 12 percent. Moreover, the over $5 million category is now being featured at 1 percent in 2013, which did not feature at all in 1988.

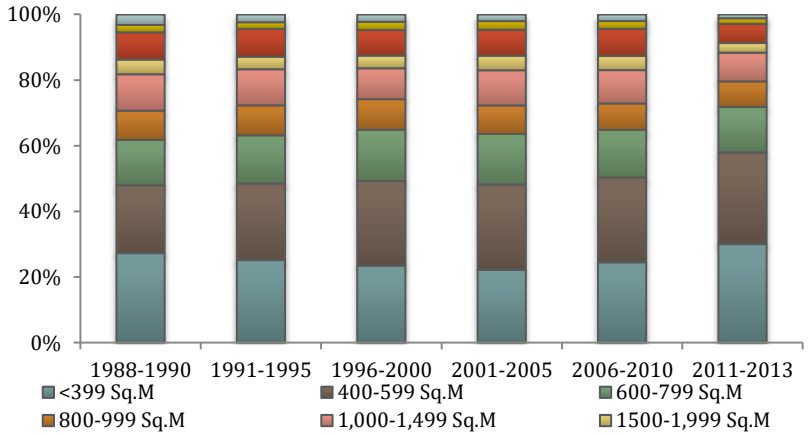
**Figure 7: Proportion of Properties which changed Ownership by Transaction Price**




*Source: Land Registry Department*

This shift in the distribution of transaction prices observed indicates to some extent the degree of increase of property prices over time. However, constructing a true measure of property prices is quite challenging due to the sporadic nature in which these transactions occur, and more importantly, is dependent on the characteristics of the properties under consideration (for example size) and how these have changed over time. Figure 8 indicates that the relative proportions of transactions with a particular size[9] remained quite stable over time, with majority of the properties being characterised by the smaller sized bands. On average, 25 percent of transfers were for properties less than 400 square metres (4,306 square feet), while another 25 percent represented those between 400 and 600 square metres (6,458 square feet).

**Figure 8: Proportion of Properties which changed Ownership by Size**




*Source: Land Registry Department*

The relatively stable size proportions combined with the growing shift towards higher priced properties once again points towards an overall increase of prices over the period. However, other characteristics of the property should also be considered, such as the size and relative quality of the structures over time, including the number of rooms.

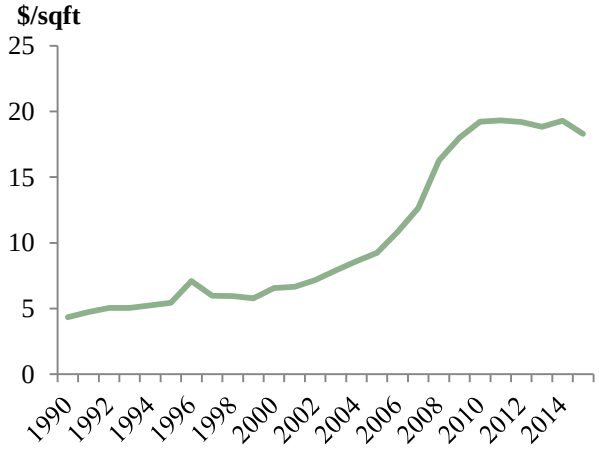
Initially the paper set out to estimate various models of a real estate price index for Barbados. However, given that less than one percent of the housing stock has historically been traded during any particular year, the repeat sales method – which is dependent on repeat sales of an identical unit – would be impractical to implement. Additionally, the dataset provided by the BRA did not consistently contain sufficient characteristics of the houses sold on the market rendering a hedonic index problematic to derive. Consequently, the simple median price approach was utilised to estimate the real estate index for this study. While it is clear that the housing stock improved over the period, the authors do not believe that these improvements would be fatal to the usefulness of the index. In the following section, the authors outline the results of their constructed median price index.

[9] Size here refers to the land area of the property.

## 5. Results

The median price was estimated for land (only) transactions, as well as for properties with a structure. The results (Figure 9) indicate strong price trends that are in accord with conventional wisdom associated with the Barbadian building boom, but several subtleties were also revealed.

**Figure 9: Estimated Median Prices Land (1990-2014)**



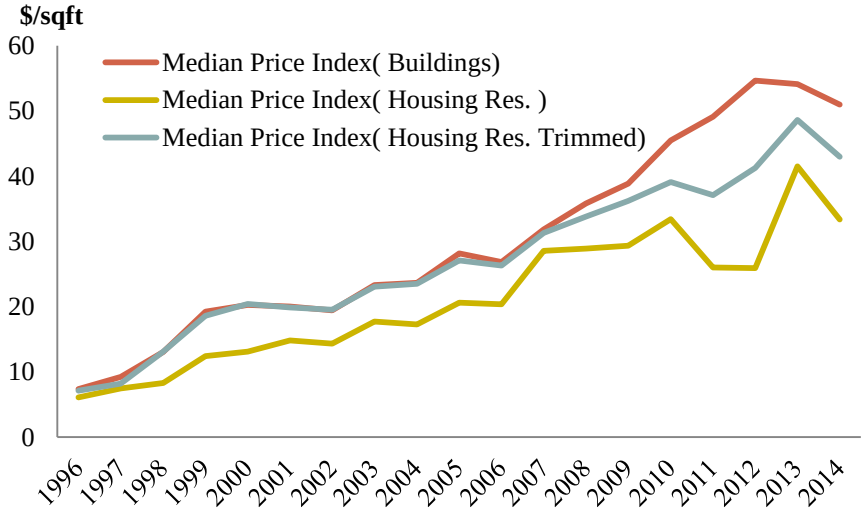

*Source: Barbados Revenue Authority Data & Authors' Calculations*

Land prices grew steadily between 1990 and 1995, averaging 4.7 percent growth per year and reaching $5.44 per square foot by 1995. Between 1996 and 2001 land prices also drifted higher resulting in average growth rate of 4.5 percent per year. However, an almost exponential growth rate occurred between 2002 to 2008 – growth averaged 13.4 percent per year and resulted in land prices reaching $16.30 per square foot. Surprisingly, after 2008, land prices continued to rise before peaking in 2011 and stagnating or declining slowly thereafter. Volumetric data (measured in terms of number of transactions) also supports the building boom hypothesis: volumes expanded steadily after 1995 but grew explosively between 1999 and 2006 (Figure 5). Volumes fell fairly sharply after 2006 but were still well above historic level between 2006 and 2008. After 2008, volumes fell steadily and by 2014 the volumes were similar to those of 1996.

A similar story is conveyed for properties with a structure (Figure 10). In this case, due to the much smaller volumes of transactions in earlier periods, we began the analysis from 1996 (39 transactions recorded). Three measures of the index are presented. The first, *median price index (buildings),* does not distinguish between commercial and residential structures in deriving the index. Since this is likely to be distortionary due to the generally unique features of commercial transactions, we further refined the data to include only properties which were classified as at least residential (*median price index (housing res.)).* Finally, a third series was derived which removed what were considered to be outliers (extremely low- or high-valued transactions), non-market transactions or simply errors. This is the preferred indicator (*median price index (housing res. trimmed))* although all three series are briefly discussed. The median price of properties with

a structure (using the preferred measure) in 1996 was $7.14 per square foot[10]. Between 1996 and 2014, the average price rose by 10.5 percent per year to reach $36.63 per square foot. Prices grew erratically except for 2001-2002, 2005, 2011 and 2014, when they declined. The 2001 to 2002 period are unsurprising given Barbados' recession around that time and similar price declines post-2009 were also expected. What is surprising is the magnitude of some of the price increases: between 1996 and 2000 - a period of five years - the price of residential housing essentially more than doubled. Prices again doubled between 2002 and 2010, and then rose by nearly 30 percent between 2011 and 2013 before falling by 11 percent in 2014. Transactions volumes were particularly strong between 1999 and 2006, but tended to decline steadily thereafter. By the end of 2014, transaction volumes were around the 1998 levels (Figure 5).

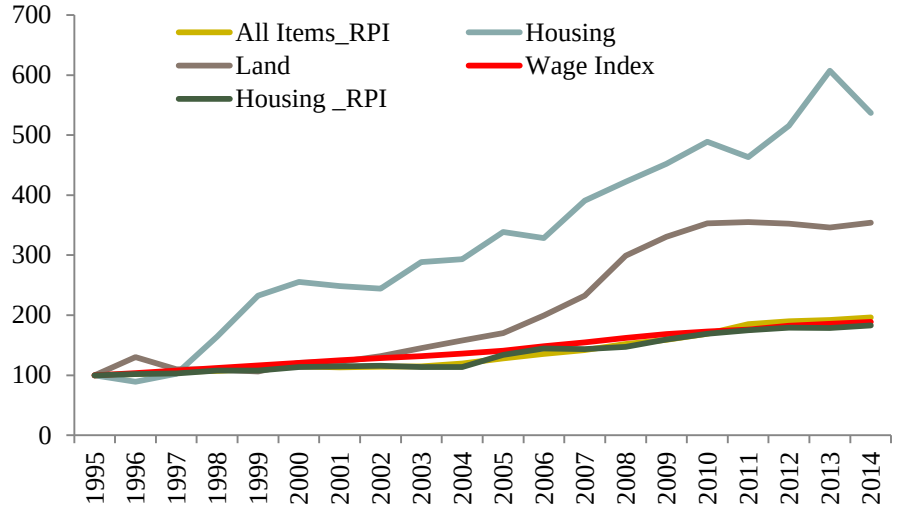
**Figure 10: Estimated Median Prices for All Structures, & Residential Housing (1990-2014)**




The strong rise in these real estate asset prices can be compared to the retail price index for goods and services over the period. All series were indexed to 1995 to achieve a common base year, (Figure 11). Whereas the retail price index rose by 100 percent between 1995 and 2014, the land prices rose by over 350 percent and housing prices rose by over 500 percent. The sub-component of the retail price index capturing housing cost *(housing_RPI)* conveys a similar story as the general retail price index. However, the wide divergence suggests that the RPI housing sub-index may not accurately reflect the housing cost faced by the population while the wage index also lags the apparent growth in housing cost.

[10] All currency is reported in local Barbados dollars.

**Figure 11: Barbados' House, Land & Retail Price Index Compared**




*Source: Barbados Revenue Authority, Authors' Calculations & Barbados Statistical Service*

As with other developing countries, the issue of housing affordability in Barbados remains central to Government's ability to meet the basic demands of its constituents. In addition to historic inequities arising from Barbados' colonial past, the rapid rise of land and housing prices in the 1990s in Barbados relative to average wages continues to present a powerful rationale for some mode of intervention in the provision of affordable housing in Barbados. The issue may not be one of only housing production but also of housing affordability. As noted in McHardy and Donovan (2016), the vast majority of households in six Caribbean countries, including Barbados, cannot afford even the cheapest units produced in the formal private sector or most public sector housing. These authors argued that whereas the population increase in Barbados was 5.8 percent between 1990 and 2010, housing units increased 14.6 percent and unoccupied units increased 117.9 percent over the same period. Thus they concluded that the problem is not unmet demand, but that the supply of housing has been inappropriate for the type of housing demanded.

## 6. Conclusions

Given the importance of the real estate market to the health of the financial system and overall economic activity, this study sought to estimate a real estate price index for Barbados. Due to inadequate repeat sales, and the limitations of the data as it relates to the characteristics of properties transacted, a median price index was determined to be most appropriate.

Improving the estimates provided in this paper will require greater capture of the characteristics of the housing units captured in the Land Registry and Barbados Revenue Authority's database and improved consistency in the recording of data fields. This would allow researchers to address potential biases that may emerge in the use of simple, non-clustered median indices. Using appraisal data could also be explored if that data is provided by the tax authorities. In spite

of the limitations of simple median price indices, the results strongly support the notion that residential real estate prices rose rapidly during the building boom years of the 2000s and also rose immediately after the Barbadian economy went into recession in 2009. However, prices have since started to fall.

We would argue that while cognisant of the limitations of the data and methodology employed, the results reinforce the need to monitor real estate prices separately from the general price index as there emerged some degree of evidence of a real estate bubble in terms of the growth in prices of these assets. In Barbados' 2015 Financial Stability Report, it was noted that an increasing proportion of these NPLs are in fact mortgages making the value of the underlying collateral crucial in terms of the eventual resolution of these loans. Furthermore, much of the collateral pledged for non-mortgage loans is real estate based.

The trend in the indices for both housing and land prices suggests that while an increasing proportion of wealth in Barbados is tied to the health of the real estate market, the recent low levels of transactions makes the underlying security of that wealth more tentative. The resistance of prices to declines in transaction volumes is somewhat surprising but specific characteristics of the Barbadian market (high population density relative to the island's size, easy accessibility to real estate by foreign buyers, and the reported long foreclosure procedures) may ameliorate a more rapid price adjustment. That said, two countervailing trends would be the increasing proportion of houses which are unoccupied (and presumably either abandoned or investments), and the low transaction volumes of recent years. While prices have held up well, the volume of transactions has shown itself to be markedly more sensitive to changes in the market suggesting that consistently monitoring this metric would be useful in terms of analysing the health of the real estate market. However, whether the current low volumes imply a further in fall prices rather than the stagnation or modest decline seen to date, remains to be seen.

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