The Anatomy of the Real Estate Sector in Lesotho: Reviewing an Appropriate House Price Index Methodology

By Refiloe Tšephe[1]

Abstract

EXCESSIVE ASSET price volatility, especially in real estate markets, has been associated with financial crises. The purpose of this study is to propose a house price index methodology that will be suitable in the case of Lesotho. The study explored several property indices and establishes that the proper methodology that can be adopted in Lesotho is the classified median price index. Data unavailability in Lesotho excluded other house price index methodologies identified in the literature. Therefore, the study recommends that the Central Bank of Lesotho should adopt the median price index methodology in its attempt to develop a house price index for Lesotho. This recommendation leverages on the following advantages of the median price index. First, this methodology reports the average or median price of houses sold in each time period and does not require characteristics on the house sold. Second, it is easy to compute and third, it uses readily available data from mortgage loans provided by the banking sector.

Keywords: House price index, credit, financial stability
JEL classification: E320, E510, G210, R310

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1 INTRODUCTION

THE RECENT GLOBAL financial crisis (GFC) has incited regulators and relevant authorities to focus more on the formulation and implementation of macro-prudential policy. The volatility in the assets prices, especially in real estate markets[1], is perceived to have contributed more to recent financial crises (Case and Wachter, 2005; Diewert, 2007; Hartmann, 2015). The boom-burst episodes of the property markets can have serious ramifications in both the real and financial markets. Therefore, it is essential to develop reliable, timely and consistent measures of real estate price behaviour in order to limit excessive volatility of asset prices in the property markets and promote macroeconomic stability (Case and Wachter, 2005). The International Monetary Fund (IMF) strives to strengthen financial system stability with the development of financial soundness indicators (FSIs) which measure the current financial health and soundness of financial institutions in a country (Heath, 2005). The encouraged-set of FSIs includes real estate prices, aimed to gauge the exposure of banks to acute property price fluctuations. Property investment is financed by credit from banks[2] and used as collateral; and banks can also own real estate (Heath, 2005; IMF, 2006). Consequently, extreme declines in property prices can lead to massive deteriorations in asset quality of deposit takers' which can threaten banks' solvency and financial stability. In addition, weak bank capital may result in reduced credit extension to the real economy and precipitate banking and financial crises.

The Central Bank of Lesotho (CBL) is bestowed with the responsibility of supervising and regulating the financial system in Lesotho to ensure stability and safety. In an attempt to develop

[1] Real estate in this study refers to residential real estate, inclusive of land and buildings (gross acquisition concept).

[2] 'Banks' is inclusive of the central bank of Lesotho since majority of its staff get mortgage loans from the central bank.

the macro-prudential surveillance instruments, CBL is exploring an array of tools that can be used to monitor the built-up of vulnerabilities in the financial sector. Therefore, the purpose of this study is to explore different methodologies in the literature used in constructing real estate price index (REPI) and identify which one(s) can be suitable for the context of Lesotho. According to Case and Wachter (2005), REPIs can reduce the boom-burst episodes of the property market in two ways. First, the price index helps banks and appraisers to correctly calculate the loan-to-value[3] (LTV) ratios to avert basing them on short-term real estate price-booms. Second, excessive volatility in the REPI can be regarded as a signalling indicator of a price-bubble[4] in the market and inform an appropriate response to prevent the build-up of the bubble.

Following this introduction, the rest of the study is structured as follows; section two surveys the literature on property price indices. Section three outlines the methodology adopted in the study and section four outlines a proposal for the real estate index development in Lesotho while section five covers the conclusion and recommendations of the study.

2 SURVEY OF THE PROPERTY INDICESS

Asset prices are innately subject to boom-burst episodes, and real estate markets are no exception. According to Case and Wachter (2005), Hartmann (2015) and Heath (2005), these episodes can first be explained by construction lags in the real estate markets. They elucidate that increasing housing demand will push the price of existing property above levels justified by the housing fundamentals, which will in return entice developers to build more properties. In addition, property development may take years to complete, and the time lag due to delayed supplies of housing stock will leave market clearing prices elevated. This rise in market clearing prices may be followed by a halt, or even a drop, in prices once new supply of stock is forthcoming. Therefore, Case and Wachter (2005) show that lending on the basis of

[3] LTV ratio is calculated as the amount of mortgage lien divided by the appraised value of the property, expressed as a percentage. Assessments with high LTV ratios are generally seen as higher risk and, therefore cost the borrower more to borrow (http://www.investopedia.com/terms/l/loantovalue.asp).

[4] A market 'bubble' can be thought of as an increase in the market-clearing prices that is justified only by expectations that such price increases will continue into the indefinite future, without any support from fundamentals underlying the real estate market.

loan-to-value (LTV) ratio during periods when the demand for construction financing is high may produce a loan portfolio with inflated LTVs when the asset values eventually drop because supply of housing stock has increased. Second, cyclicality in real estate markets is due to the lack of short selling in the market. Third, banks do play a hand in magnifying fluctuations in the real estate markets because they are the main financiers of property (Heath, 2005). Increases in house prices raise the economic value of banks' capital, and thus increase their exposure while at the same time relaxing their lending standards. However, when prices tumble, this might threaten banks' solvency which might result in banks limiting their exposure and restricting credit, which might cause a credit crunch (Case and Wachter, 2005). The European Central Bank (ECB) (2010) states some of the risks inherent to banks exposed to the real estate markets. The first one is credit risk, houses financed through mortgage issuances are used as collateral and a drop in real estate prices will lead to reduced collateral value pledged resulting in increased default of leveraged customers. The second risk is market risk which arises due to the fact that banks sometimes are directly involved in real estate markets and own property, therefore decline in property prices will result in declining asset values in the banks' books.

The behaviour of the real estate market impacts both the business cycle through its effect on aggregate expenditure and the financial system as they affect the profitability and soundness of the financial system (Tsatsaronis and Zhu, 2004). Therefore, understanding the behaviour of real estate prices is of great importance to regulators charged with maintaining price and financial stability. REPIs can be helpful in the property market because they help monitor the price behaviour of real estate to determine when prices are largely straying away from their permanent or long term values. As Case and Wachter (2005) point out, REPIs can assist in reducing pro-cyclicality in property markets in two ways; first, they prevent underestimating of LTV ratios by banks and appraisers as indices of current prices are compared to long-term property values instead of only being solely based on short-term price movements. Second, large disparities between the index of current prices and the long-term prices can act as a warning of a probable formation of a housing price bubble in the market.

2.1 Empirical evidence on the application of real estate price index methodologies

2.1.1 Advanced economies

De Vries *et al.*, (2009) used the sale price appraisal ratio (SPAR) model to construct house price indices for Netherlands. For the hedonic and SPAR index, a total of 111,858 individual sales took place between January 1993 and December 2006, for the repeat-sales index, a total of 32, 496 pairs of repeat sales were used in the study. Testing the reliability of the SPAR model, they contrasted the SPAR index with both the repeat-sales index and hedonic price index for the same transaction data. First, De Vries *et al.*, (2009) discovered that all three indices were above the mean house price in December 2006, implying that the price was increasing faster than the quality of the houses. Second, vibrant oscillations were observed in the hedonic index whereas a more stable pattern was witnessed in the repeat sales and SPAR indices. Third, they established that the SPAR index is not influenced by revisions while the repeat-sales index is adversely affected by revisions. Last, SPAR index was found to be more precise relative to the hedonic index and repeat-sales index.

In studying the representativeness of the commercial real estate price indices, Boudry *et al.*, (2012) deployed a sample of 8864 repeat sales transactions covering the period 1998 and 2010 and recognised that real estate indices do not explain much on individual property price appreciation. In other words, their results cast doubt on the applicability of the real estate indices to correctly predict future price increases and as a means to hedge commercial real estate. Moreover, there are other factors which were found to explain property price appreciation above the repeat sales indices such as the growth rate in the property's cash flow over the holding period. Jansen *et al.*, (2008) used the geometric weighted repeat sales model and data of about 500,000 paired transactions of owner-occupied homes in Netherlands between January 1993 and December 2006. The robustness of the model was tested using the 95 percent confidence interval and observed that accuracy of the model becomes a problem when dealing with small samples. Moreover, revision volatility in the study was found to be of modest impact and there was no evidence suggesting heteroskedasticity in the model. They conclude that the repeat sales method seems to be a perfect index construction methodology given their target and the characteristics of the data set for the Netherlands.

Using single family home sales data from twenty (20) United States of America (U.S.A) metropolitan areas between July 1985 and September 2004, Nagaraja, Brown and Wachter (2010) explored house price index methodologies to determine which factors make an index both practical and representative. They analyse five indices of which four are hybrid models based on traditional repeat sales methodology[5] and the last index is constructed using the autoregressive index[6] which makes use of the paired sales repeat sales methodology, but also includes single sales. The autoregressive index was found to have outperformed other indices in terms of predictive capability. The predictive power among the four other indices cannot be observed as none of the indices seem to outperform others. They further describe three ways to determine what makes a good house price index; usability, statistical properties and representativeness of the overall market. In terms of usability, Nagaraja, Brown and Wachter, (2010) contend that all five indices are easy to implement and update and do not require information on the house physical characteristics. Moreover, when looking at the statistical properties, the Bailey, Muth and Nourse index and autoregressive index perform relatively better than the others. Last, they argue that all repeat sales models are not representative of the overall market, whereas the median index and autoregressive index on the other hand are better representatives of the housing market. They conclude that using the predictive ability as the yard stick of the performance of an index, the autoregressive index is a stand out winner.

Haurin (2005) argues that econometric regressions are easily applied to residential properties than to commercial property due to lack of data as there are few large commercial properties which transact in a particular year. Moreover, he points out that there is insufficient number of paired repeat sales transactions to create a reliable index. Commercial properties have been customarily valued using appraisals. However, appraisal-based indices are prone to biasness due to the use of out-dated and inaccurate appraisals because of insufficient current market data. He states that the alternative method of constructing a commercial real estate price index is the hedonic-price method adjusting for market liquidity. Jiang, Phillips and Yu (2014) developed a hedonic method using ordinary least squares method to construct a REPI in Singapore with the dataset inclusive of both repeat sales and single sale properties. Sale prices for residential

[5] Bailey, Muth and Nourse index, the Case and Shiller method, the Home price index produced by the Office of Federal Housing Enterprise Oversight, the S&P/ Case-Shiller Home Price Index.

[6] *Autoregressive index*: this index combines information from both repeat and single sales, with the former being given a higher weight (Nagaraja, Brown and Wachter, 2010: 3).

property covering the period from the first quarter of 1995 to the second quarter of 2014 were used. They argue that this hybrid-hedonic model is less susceptible to mis-specification errors than standard hedonic methods and point out that it is computationally efficient. They further disaggregated the data set into two categories forming two indices, one using all transactional prices and the other deploying single-sales transactions only. Their results indicated that both indices outperformed the S&P/Case-Shiller index in predicting prices of single-sales homes out-of-sample, while they underperform the S&P/Case-Shiller index in forecasting the price of repeat sales homes out-of-sample.

Ahmad, Daud and Esha (2014) explore several methodologies in an effort to adopt a suitable one in constructing the commercial property index in Malaysia. They maintain that hedonic price methodology is best suited to the Malaysian commercial property market due to the following factors. First, there are few paired sales in the commercial property market due to the illiquidity of the market, hence ruling out the repeat-sales method. With respect to using the appraisal method, it was deemed infeasible because there is lack of transparency and openness from building owners in providing the correct valuations of their properties. Moreover, the appraisal based method requires conducting a survey on properties to determine the base year value, and the exercise is quite lengthy and indices may not represent the current market situation. Therefore, Ahmad, Daud and Esha (2014) conclude that hedonic price method is best suited for Malaysia because there is already a database with property and location attributes together with sales prices. Fuerst, Liu and Lizieri (2016) develop a transaction based index in Beijing to complement the existing valuation-based index and mark the turning points in the market. They establish that the two methodologies produce indices that are not significantly different from each other. However, there is more volatility in the data points when using transactional data relative to valuation-based indices.

Forgarty and Jones (2010) compare the hedonic, repeat sales and hybrid indices on infrequently traded varied goods such as objects, premium wines or houses. They contrast these methodologies using Australian premium wine sales covering the period from 1988 to 2000. Their results indicates that the most efficient estimates are obtained using the hybrid approach, with repeat sales producing higher return estimates in comparison to hedonic and hybrid methods. Olowofeso *et al.*, (2013) contrasted methods of residential property price

indices construction in Nigeria. They state that due to the nature and characteristics of their database, econometric methods such as hedonic and repeat sales cannot be used and they suggest the use of the central price tendency and the sale-based stratification methods.

Rambaldi and Rao (2013) use time-varying hedonic functions to construct the imputed price indices for Australia, Brisbane covering the period 1985 to 2005. They discover that the time-varying hedonic model with spatially correlated errors is superior, in terms of its predictive power, to the rolling window approach which is advocated for in the literature. Deng, McMillen and Sing (2011) use a matching technique to construct samples of private residential sales in Singapore for January 1995 to May 2010. They argue that the repeat sales technique can be used as a special case of the matching model where sales in the base period are paired to similar sales from another samples, not necessarily having to match the sale of a dwelling to itself. This special case repeat sales method increases the sample size relative restrictive repeat sales model. An, Deng and Fischer (2011) construct a commercial real estate rental index using a dynamic panel data econometric modelling approach using quarterly rent of 9066 properties from the second quarter of 2001 to the second quarter of 2010. They point out that the new technique improves on the constant-quality assumption of the simple average approach and the restrictive error term problem faced by repeat sales index approach. Moreover, they highlight that their model benefits from the same characteristics of panel data models such as increased degrees of freedom, identification of dynamic coefficients, and improved estimation efficacy.

Kaya *et al.*, (2012) document the experience of the central bank of Turkey in gathering and developing a HPI in Turkey. They employed the stratified median price methodology for all mortgage financed houses in Turkey covering the period 2010 to 2012. The methodology was chosen because of its limited data requirements due to Turkey facing a problem of an incomprehensive housing database. Moreover, their study used appraisal values as proxies for the sales prices due to the lack of consistent records of transaction prices. Their study found out that the house price index for Turkey (THPI) and new housing price index for Turkey (TNHPI) show increasing trend over the sample chosen. However, Kaya *et al.*, (2012) further realised that there was high inflation prevalent in Turkey during the sample period and in real terms; there was no evidence of a house market bubble formation in Turkey.

2.1.2 Selected countries in emerging market economies

Singh (2015) states that there are two HPIs for India, the NHB RESIDEX and the RBI House Price Index, constructed by the National Housing Bank (NHB) and Reserve Bank of India (RBI) respectively. NHB deploys both the hedonic regression and the Laspeyres weighted index models for constructing the HPI in India. India does not have a comprehensive database on housing prices; therefore, data was collected from the real estate property dealers, private builders, development agencies, municipal corporations and resident welfare associations. Data from mortgage loans from housing finance companies and commercial banks was also used. On the other hand, the RBI House Price Index deploys the Laspeyres weighted average method to measure house prices, where data was stratified into three categories; small, medium and large houses and different geographical zones (RBI, 2012). The median price approach to averaging was preferred to the mean pricing method. Gothi and Kumar (2013) reviewed the RESIDEX methodology in the case of Bhopal[7], comparing it to Chennai and Delhi cities and established that RESIDEX method indicated that house prices in Bhopal showed a minimal increase in 2011-2012, whereas Chennai and Delhi evidenced tremendous increases in house prices. According to the RBIs bulletin (2012), the overall house prices in India increased by about 77 percent in a period covering the last quarter of 2008-09 to the last quarter of 2011-12. On the other hand, the year on year price increases was at around 20 percent.

Olowofeso *et al.*, (2013) conducted a survey in six (6) urban cities in Nigeria on house prices. Their study was attempting to estimate the Nigerian Residential Property Price Indices between 2010 and 2012. They iterate that there is incomprehensive housing data in Nigeria, thus limiting the usage of econometric methods such as the repeat-sales and hedonic methods of constructing HPI. Therefore, Olowofeso *et al.*, (2013) deployed the central price tendency and sales-based stratification methods. The central price tendency was used to monitor changes in the median prices of residential houses from one period to the other, while the sales-based method measures the year-on-year growth rate of residential price indices. The Fisher Ideal Price Index established volatility of about 22 percent and 34 percent in 2011 and 2012, respectively. On the other hand, the Tornquist-Theil Ideal price index showed a much higher volatility for 2011 at 56 percent and a lower volatility for 2012 at 28 percent.

[7] A city in India.

South Africa, like many other African countries, faces a problem of an incomprehensive housing database due to the housing landscape[8] prevailing in the country. This resulted in there being no national HPI. Rather, commercial banks offering mortgage loans have developed HPI on their mortgage financed houses. For instance, FNB house price index is developed using the mean value of houses financed by FNB. The ABSA-HPI is also based on total purchase price of houses, using the average price of houses in different segments while Standard bank HPI is based on the Median house price of a broader range of house prices[9] using a five moth moving average (Fenwick, 2013).

In Uganda, the Bank of Uganda (BOU) and Uganda Bureau of Statistics (UBOS) collaborated in compiling and developing a property price index in Uganda covering the period from September 2009 to June 2014. Property was divided into three components, the land price index (LPI), residential property price index (RPPI) and the commercial rent index (CRI). The indices cover the areas of Kampala, Wakiso, Entebbe and Mukono characterised by high trading volumes and values[10]. Moreover, the LPI and CRI are calculated using the Laspeyres formula while the RPPI employs a hedonic regression method. In determining the price volatility in the property markets, BOU and UBOS discovered that the LPI increased by 223.5 percent and RPPI increased by 115.3 percent over the sample period, while CRI declined by about 34.2 percent between July-September 2012 to June 2014.

The Kenyan Bankers Association proposed the Kenyan Bankers Association house Price Index (KBA - HPI) framework, which details the methodology that will be adopted in calculating the KBA – HPI on a quarterly basis (Osoro and Muriithi, 2015). It is established as a support tool for risk management and to provide mark-to-market for residential prices held by financial institutions in Kenya. KBA – HPI deploys a hedonic methodology that accounts for price and quality changes in the construction of an index. Data utilised in constructing the KBA – HPI represents over 80 percent of mortgage portfolio of banks and data from the National Housing Corporation.

[8] The difficulty in constructing an RPPI in South Africa is mainly due to the lack of acceptable estimates on housing s tock and price information on informal and traditional dwellings" (Fenwick, 2013: 134).

[9] Due to Standard-bank's large market share, it is considered as a good proxy for the national HPI.

[10] Bank of Uganda (2014), Financial Stability Report June 2014.

In an attempt to monitor price volatility in real estate property markets in Morocco, the central bank of Morocco and the land registry office compiled, developed and published REPI in 2010 (El mahmah, 2013). The Methodology adopted in compiling the REPI is the repeat sales method because it addresses the heterogeneity in properties. Data constraints could not allow the use of hedonic models. El mahmah (2013) shows that there are three distinct growth phases in the Moroccan housing market. First, property prices grew at 1.3 percent between 2006 and 2008. Second, prices began a downward trend thereafter but reversing in the first quarter of 2010. Last, property prices rebounded in 2010 recording growth rates of about 2.3 percent.

3 METHODOLOGY

An appropriate methodology in calculating the REPI is chosen on the basis of factors such as the characteristics of the available dataset[11], intended purpose and the expected use of the index. In other words, no single method may expose all aspects. However, suitability depends on the purpose being addressed (Rappaport, 2007). Therefore, data availability will dictate the methodology that the study will use in constructing the REPI in Lesotho. The methodology in the study comprises two steps. The first step identifies a basket of price index methodologies applicable in various countries. The second step assesses each of the methodologies using five (5) criteria selection method in order to determine which methodology is most applicable in the context of Lesotho. The elements of the criteria are contained in Table 1.

4 PROPOSAL FOR THE REAL ESTATE INDEX FOR LESOTHO

4.1 Motivation for the most applicable method in the context of Lesotho

Housing in Lesotho, especially in the rural areas is owner financed or inherited, with about 23 percent of households living in houses they built themselves while 19.7 percent live in houses they inherited from relatives[12]. Most of the population in towns and villages collect building

[11] http://www.bankofgreece.gr/Pages/en/Statistics/realestate/default.aspx; Silver (2014).

[12] http://www.housingfinanceafrica.org/country/lesotho/

materials overtime and ultimately construct their own dwellings. In addition, real estate market in Lesotho is also characterised as highly illiquid as most households acquire their dwellings with a purpose to live in and not for sale. Also, limited data availability on house prices and housing records in Lesotho somehow implicitly excludes other index construction methodologies like repeat sales and hedonic price indices as shown in Table 1. Table 1 shows that the median price method and SPAR methods are the easiest to compute since they do not require any econometric modelling and data sampling because they use all the available data unlike the other methodologies explored in the literature. Of all the qualities and data requirements, median price methodology[13] possesses the most key attributes than any other index construction methodology in the context of Lesotho. This method is used by Countries' characterised by a large number of informal[14] and traditional[15] dwellings, such as South Africa, Turkey and Nigeria (Fenwick, 2013; Olowofeso *et al.*, 2013; and Kaya *et al.*, 2012).

Table 1 Suitability of the House Price Indices for Lesotho

	Methods				
Suitability	**SPAR**	**Hedonic-price**	**Repeat-sales**	**Median Price**	**Hybrid**
1. Data availability	×	×	×	✓	×
2. Liquidity of the real estate sector	×	×	×	×	×
3. Simplicity	✓	×	×	✓	×
4. Information on quality	×	×	×	×	×
5. Uses all sample data	✓	✓	×	✓	✓
6. Usability	×	×	×	✓	×
Score	**33%**	**17%**	**0%**	**67%**	**17%**

✓ Indicates presence of an attribute × Indicates absence of an attribute

Source Authors' own assessment.

The median price is favoured relative to the average price because of the skewness of the prices in property markets; fluxes in sales volume among expensive properties have a small bearing on median selling prices while on the other hand, strongly influences the average selling prices

[13] Refer to Appendix 2 for calculation of the methodology.

[14] Unplanned settlements and areas where housing is not in compliance with current planning and building regulations (Fenwick, 2013).

[15] Includes huts, rondavels, to name a few, and often made of clay, mud, reeds or other locally available materials (Fenwick, 2013).

(Case and Wachter, 2005). Therefore, the study proposes the classified median price method. Like in Kaya *et al*., (2012), the classes will be chosen by geographical location and the housing market will be divided into regional units. The median unit price for each regional classification will be weighted[16] to construct the national overall HPI for Lesotho. The median price method only requires selling prices of the dwellings in different locations to construct a price index.

5 WAY FORWARD

5.1 Study recommendations

The study's aim was to propose a HPI methodology that can be applicable in the context of Lesotho. First, the study explored the housing market landscape in Lesotho such as laws governing acquisitions of land, building and developing of land and any general housing laws or policies (see appendix 1). The study discovered that there is no housing policy in Lesotho. Second, the study also explored various HPI methodologies in the literature and discovered five (5) commonly used methodologies namely; mean/median price methodology, hedonic-price method, repeat-sales method, hybrid repeat-sales/hedonic methodologies and SPAR method. A suitability criterion was developed and used to assess each methodology in the context of Lesotho. The criterion indicates that the median price index methodology is the most suitable methodology for constructing the HPI for Lesotho.
On the way forward, the study recommends:

- The use of the classified median price method to compile and develop a HPI in Lesotho, due to its ease of use and the fact that it can be constructed using readily available data.
- CBL engagement with all the relevant stakeholders in the housing market such as Lesotho Housing, Habitat for Humanity Lesotho, Maseru City Council and Land Administration Authority to request data on a monthly frequency and establish the terms of engagement and whether there is a need for formal memorandum of understandings (MOUs) that will allow the CBL to acquire the necessary data.

[16] The region with the highest number of observations will carry the most weight while the opposite is true for the region with the smallest number of observations.

- Engagement with the ministry of local government to discuss the importance of a housing policy, which should be targeted or designed according to different income levels, to guide housing delivery and development in Lesotho.

5.2 Issues on Data Sources

Most of the properties in the rural and towns around Lesotho are not formally registered in the deeds office. As a starting point, the study proposes to use data on formal housing prices obtained from the banking sector as the most significant providers of mortgage loans. From a stability point of view, a bubble forming in the real estate market and its subsequent burst would be more perilous in credit financed houses than in the cash financed ones. A bursting bubble in the mortgage financed housing market could result in financial instability as this will affect banks profitability and quality of their assets in their balance sheets. In continuation for future research, possible ways of obtaining data on traditional and informal housing such as questionnaires could be examined. In Lesotho, there is readily available data on formal, mortgage based houses and their location which can easily be sourced from banks since they are under the guidance of the Central Bank of Lesotho (CBL). Data can also be sourced from Deeds registry office at the LAA, and other various valuation companies that are employed by commercial banks to help in providing mortgage loans to consumers. Moreover, additional data on final house transaction prices can be sourced from insurance companies because all mortgage financed houses have to be insured. Therefore, the classified median price method is the appropriate methodology in the context of Lesotho given the housing landscape and data constraints.

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Appendix I | The Architecture of the Real Estate Sector in Lesotho

1 REGULATORY AND LEGAL ENVIRONMENT

The land tenure system in Lesotho is dual, with customary and statutory systems both operative. That is, land is owned by the people in trust by the king. This system resulted in ineffectiveness in land ownership and major land reform programmes being instigated in Lesotho. Developments in land legislative programmes in Lesotho include the following acts; Land Administration Act 2010 and the Land Act 2010, the Land Regulations and Land court Regulations of 2011 and the Draft Sectional Titles bill of 2011. The Land Act 2010 has taken land allocation powers away from rural chiefs to local councillors. The National Strategic Development Plan (NSDP) aims to reinforce land administration and physical planning to enable the delivery of basic infrastructure to better the construction outputs, encourage densification and regularisation of property markets, establish housing finance and land markets and identify suitable housing solutions for the low income households. The lack of an appropriate and comprehensive framework for urban development in Lesotho has been basically credited to the absence of the housing policy[17]. The NSDP proposes, among other deliverables, the development of a national housing policy. On the other hand, there is no obligation from the government to provide housing to individuals in Lesotho[19].

1.1 Land Administration Authority

The Millennium Challenge Account (MCA) compact between the government of the United States of America (USA) and Lesotho led to the establishment of the Land Administration Authority (LAA) as an independent organisation by the Land Administration Authority Act of 2010. The objective of the act is to "provide for the grant of titles to land, the conversion of titles to land, the better securing of titles to land, the administration of land, the expropriation of land for public purposes, the grant of servitudes relating to land, systematic regularisation and adjudication, and for connected purposes."

[17] See Box 1.

[18] https://issuu.com/unhabitat/docs/lesotho_urban_housing_profile_web.

The mandate of LAA is to reform and advance land administration services, reduce land transaction costs and the turnaround time to acquire or dispose of a leasehold title to land. Moreover, it is tasked with advising the Government of Lesotho on land administration laws and policies. The LAA has merged former government departments that dealt with cadastre, national mapping and deeds registration into one parastatal agency. The office of the commissioner of lands, the Registrar of Deeds and the chief surveyor also now fall under the LAA umbrella. The deeds registry system in Lesotho was laid down in the Deeds Registry Act of 1967. However, the cost of administering land recording, through the cadastre and plot registration is deemed costly for many households, thus motivating households to not register their property. Statutory limits on land allocation stand at 1000m2 for residential purposes and 10 000m2 for industrial use.

LAA also oversees private surveyors and ensure that they act according to the Land Survey Act of 1990 and the Land Survey Regulations of 1982. The Land Survey Act of 1990 and the Land Regulations of 1982 put forward the procedures for licencing and employment of private surveyors and verification of their work by the chief surveyor. All surveyors should be registered with the chief surveyor. The valuation Act of 1980, states that the valuation roll in Lesotho is determined according to the size of the plot and its use. It also takes buildings erected on the plot into consideration.

1.2 Lesotho Electricity and Water Authority (LEWA)[19]

LEWA is a body that oversees the electricity and water sectors. It was established in terms of the Lesotho Electricity Authority (LEA) Act no. 12 of 2002 which was amended in 2011 to incorporate the water sector to form the Lesotho Electricity and Water Authority Act of 2010. The authority regulates the electricity sector as well as the water sewerage services subsector. It also approves fees and tariffs charged as well as regulate the standards of services provided by water services and sewerage providers (Lesotho Electricity Authority Act, 2011).

[19] http://www.lewa.org.ls/about/default.php.

1.3 Maseru City Council (MCC)[20] and Other Local councils

MCC was established under the Urban Act of 1983 and became operational as a local authority in 1989. The mandate of MCC is to contribute to the achievement of environmentally sustainable and socially inclusive urban development and management. MCC supervises the activities pertaining to developing and building on land. There are two acts which govern the development[21] and building on Land. First, Town and Country Planning Act of 1980 confer a mandate to MCC as follows: "To provide for orderly development of land and to preserve and improve the amenities thereof; to promote efficiency and economy in the process of such development; and connected purposes." Second, there is also a Building Control Act of 1995 which provides for the promotion of uniformity in the law relating to the erection of buildings in Lesotho for the prescribing of building standards; and incidental matters.

These laws imply that there has to be approval from the planning authority[22] before any development can transpire which would have assessed the plan to ensure it conforms to other laws such as the Building Control Act of 1995. In other districts in Lesotho, local authorities are delegated the duty of controlling buildings in their respective jurisdictions through a building control officer. There are also underlying codes which augment the Town and Country Planning Act of 1980. The Development Control Code of 1989, which focuses mainly on the relation of individual buildings to their apportioned plots and other surrounding buildings, and concentrates solely to new development. In addition, there are Development Regulations of 1991, which regulate land and building use and last, the planning standards of 1990, which set minimum standards for development. On the other hand, the Building Code is focused on the structural facets of buildings. It has been argued that there is lack of enforcement between planning and development control regulations in urban Lesotho[23]. That is, there is no cooperation between the physical planning activities and the LAA as there are instances where leases are granted to sites which block, for instance, public roads.

[20] http://www.mcc.org.ls/laws/.

[21] "…Development means the carrying out of any buildings, engineering or other works or operations in, on, over or under land, or the making of any material changes in the use of land or buildings or the subdivision of land…" (Town and Country Planning Act, 1980).

[22] Commissioner of Lands.

[23] https://issuu.com/unhabitat/docs/lesotho_urban_housing_profile_web.

1.4 Support and facilitation services

1.4.1 Banking sector

Property is mostly acquired through mortgages financed through the banking sector. Lesotho has a very small banking sector, comprising of three foreign-owned commercial banks and one government owned post bank. According to the Centre for Affordable Housing Finance (CAHF) in Africa (2015), mortgages represented about 12 percent of the total banking industry loan portfolio as at December 2014 and it more than doubled to 26 percent in March 2016[24]. There are no other mortgage loan providers except banks in Lesotho, therefore, banks have a big room to raise interest rates charged based on their profit objectives and raise the purchase price of houses. Moreover, expatriates and high income individuals are the most active participants in the real estate market and increase demand for expensive houses, and generally increasing the rates charged on mortgage loans.

1.4.2 Land Administration Authority (LAA)

LAA helps in administering and providing land title lease agreements, registration of land deeds of transfers, mortgages and for land or cadastral surveying and mapping. LAA requires people engaging in the sale to assert the fair market value at which the property is being traded or exchanging hands. This transfer of property is subject to levies termed stamp duty and transfer duty. It is law for property transactions to be registered and possess lease agreements. Therefore, property which is sold with the lease certificate readily available may be priced higher than one which does not have a lease certificate as the buyer will have to incur administrative costs in acquiring the lease such as surveyors' costs. That is, the liquidity brought about by lease agreements is factored in the house price.

[24] CBL, Financial Stability Watch June 2016.

1.4.3 Maseru City Council (MCC) & Local Councils

Mainly charged with inspecting sites for lease applications and maintaining and building the council's infrastructure, planning and development. It is also tasked among other objectives, with validating organised development of the city; arranging land required for planning and segregation of plots which will ultimately be sold to the public. In addition, some of the responsibilities of MCC include collection of waste, creating and maintaining of streets and access to roads. In the other districts of Lesotho, local councils are tasked with some of the duties similar to MCC's. MCC and local councils offer building permits before any construction can commence. A developer or house owner first needs to obtain the services of a building control officer, to evaluate the plans and proposed structure of the building, site where development is proposed to be and determine if it will not distort the ecosystem in the neighbouring places. All these services are factored in on final house prices. Moreover, areas where the councils (especially in Maseru) engage in services like collecting waste around the neighbourhoods, maintain streets and roads have their houses priced higher.

1.4.4 Lesotho Electricity and Water Authority (LEWA)

LEWA's mission is to provide water and electricity to industries and businesses, households, public and government consumers, private education and health institutions in a cost effective manner. Houses which have access to electricity and water services are priced higher than houses without these essential services. For illustration, sites already connected to sewer lines are priced higher than sites which are not. Therefore, the high priced sites ultimately feed into higher house prices.

1.5 The real estate market in Lesotho

1.5.1 Key Players in the market

Lesotho's real estate market key players consist of banking sector and construction companies involved in both developing and constructing buildings. Banks are the main source of mortgage

financing, and have much discretion to exploit clients by charging high mortgage rates to suit their profit objectives with competition close to non-existent. Players such as Matekane Group of Companies (MGC), LSP Construction, and Sigma construction to name a few, develop and construct properties for themselves and can also be contracted for third parties. They influence cost prices of inputs used in construction of buildings and thus raise house prices ultimately. Real estate agencies such as Creative Properties sell or lease houses on behalf of the owners and charge a fee for their services as a mark-up on price that owners were willing to accept. Households with small contractors use informal constructors who charge below normal market prices. These households also construct their houses through savings and accumulating building material over time, resulting in cheaper houses for these households. Moreover, these households usually erect minor buildings and are exempted from obtaining building permits[25] Organisations such as Lesotho National Development Corporation (LNDC), Lesotho Housing and Land Development Corporation (LHLDC), Millennium Challenge Account (MCA) and Habitat for Humanity Lesotho (HHL) engage construction companies to build factory shells, stock of houses and construction of roads to their designated areas marked for development, and they also influence the cost prices of building materials.

1.5.1.1 Matekane Group of Companies (MGC) Properties

MGC properties is a division of MGC which aims to address the demand for both commercial and private property investment in Lesotho[26]. MGC properties' portfolio includes MGC park, a 6 floor office block and Mpilo estates, a 20 units upmarket Tuscany design houses and a 4 star hotel, Mpilo Boutique.

1.5.1.2 Creative Properties

Creative Properties concentrates on trading and leasing of residential and commercial properties in Lesotho and advertising professionals and suppliers of services related to the property development industry. For instance, Sigma construction in partnership with First

[26] http://www.mgcproperties.co.ls/.

National Bank Lesotho (FNBL) has embarked on MASOWE affordable housing development. Creative Properties also manage the leasing of Thetsane office park houses and Thetsane office park offices to name a few.

1.5.1.3 LSP construction

LSP is one of the contractors heavily linked to development and construction of real estate in Lesotho. It has developed to name a few; Willows estate, Golf view estate, 252 Kingsway housing complex, Bowker estate, Setsoto stadium, 'Matanki office park, Polihali – Gauging weir, Domiciliary health clinics, National University of Lesotho – science labs, South African High Commission building, Pioneer shopping Mall – phase 1 & 2, Letšeng Diamonds office block, Lesotho Communications Authority office complex, Metolong electrification lot 1, Liqhobong line and Letšeng coarse final recovery plant at Letšeng Diamond Mine.

1.5.1.4 Households with small contractors

Most households engage a local informal sector contractor to build their dwellings. Households can either save or borrow money and collect building materials overtime and begin with construction once the majority of the building materials have been accumulated.

1.5.1.5 Lesotho Housing and Land Development Corporation (LHLDC)[27]

LHLDC is a state-owned developer, a result of a merger between lower income housing company and Lesotho Housing Corporation in 1988 under the LHLDC order No 12 of 1988 as amended. LHLDC raises finance, builds and maintains housing inventory with most of the construction localised in Maseru (UN-Habitat, 2015). It has three broad mandates which are; *developing serviced sites, providing rental accommodation and home ownership*. LHLDC's aim is to assist in meeting the shelter needs for all Basotho by providing a range of housing sites as well

[27] http://www.lesothohousing.org.ls/.

as home ownership and rental accommodation options to cater for a wide spectrum of income levels in the most cost effective manner available.

1.5.1.6 Lesotho National Development Corporation (LNDC)[28]

LNDC is established under the Lesotho National Development Corporation Order of 1990, which was amended to form the Lesotho National Development Corporation Act 2000. LNDC is a wholly owned institution by the Government of Lesotho (GoL) and it is authorised to device the country's industrial development policies. In an attempt to improve the country's industrial competitiveness, LNDC constructs factory shells and provides services such as roads, water and electricity as an incentive to lure investors to invest in Lesotho. The property management division manages 170 properties , with 144 being factory buildings, 6 office blocks, 8 residential units and 12 units in retail and commercial outlets located in various districts of Lesotho. It has been stated that the property portfolio mainly contributes to the corporations' revenue and it is also influential in providing employment for Basotho.

1.5.1.7 Millennium Challenge Account (MCA)[29]

The MCA's health sector programme has helped construct and renovate among others; 138 health centres, 14 hospital's outpatient departments, 1 new laboratory, 1 new blood transfusion service centre and new residences for 120 students and 6 tutors. Queen 'Mamohato memorial hospital was built in Maseru with estimated costs of M1 billion in a public-private partnership between Netcare and Lesotho Government. There is a proposed phase 2 of the MCA compact in Lesotho and it will likely have an impact in the real estate market.

[28] http://www.lndc.org.ls/legislation

[29] http://www.housingfinanceafrica.org/country/lesotho/

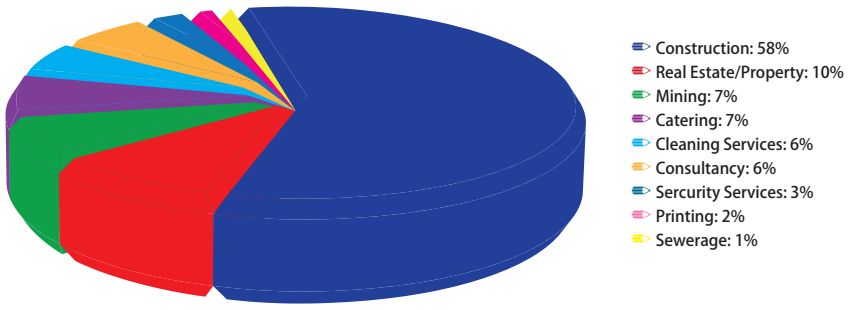
1.5.1.8 Habitat for humanity Lesotho (HHL)

HHL is a non-profit Christian charity organisation which began its operations in Lesotho in 2001. HHL targets orphaned and vulnerable children (OVC) and their families by providing them with simple, decent and reasonably priced houses. In addition, it also increases awareness on legal issues surrounding housing, property ownership and inheritance rights[30]. The mandate of HHL is to provide safe and decent two-roomed house, access to improved ventilated pit latrines, providing safe drinking water and sensitising basic hygiene skills.

1.6 Width and breath of the real estate market

Difficulties in obtaining land by property developers has been deemed as the main discouraging issue hindering the development of the formal real estate market in Lesotho (UN-Habitat, 2015). Construction and real estate/property management companies make up to about 68 percent of the registered companies as at 06th November 2016 as shown in Figure 1.

Figure 1 Top 10 registered companies by industry (November 2016)



Source: One-stop business facilitation Centre, Lesotho[32]

[30] https://www.mcc.gov/where-we-work/program/lesotho-compact

[31] http://www.hfhl.org.ls/habitat/

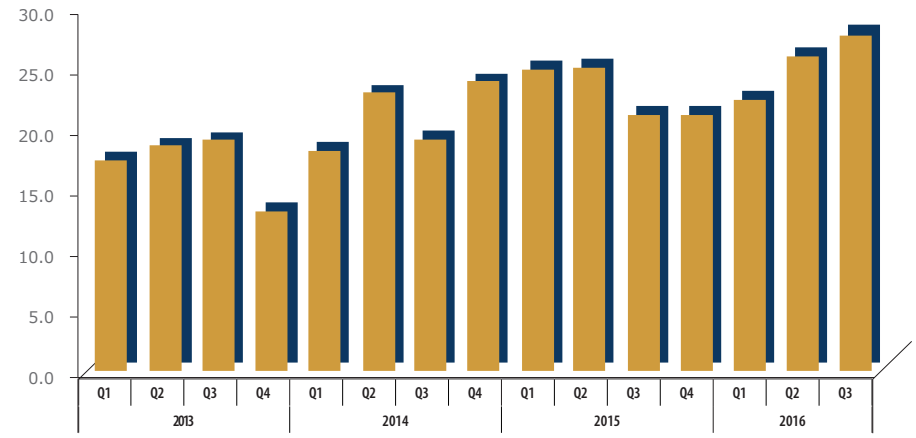
Housing in Lesotho, especially the rural areas is owner financed or inherited, with about 23 percent of households living in houses they built themselves while 19.7 percent live in in houses they inherited from relatives[31]. Most of the population in towns and villages collect building materials overtime and ultimately construct their own dwellings. The formal real estate market is still underdeveloped, with the IMF estimating it to account to about 9 percent of the gross domestic product (GDP) in 2014[32]. The housing market in Lesotho is characterised by owner occupied houses and renting, which is common especially in Maseru and other small towns. This implies that households buy houses to live in for years and pass them on to future generations, not for the purpose of reselling (UN–Habitat, 2015). The illiquidity of the housing market creates a problem in Lesotho for constructing real estate price indices. However, there is increasing demand of formal property estates from foreign non-governmental organisations (NGOs), expatriates, higher-income communities and diplomatic missions and thus increasing pressure on property markets. Moreover, demand has also increased from the lower end of the property market because of Lesotho's high rate of urbanization. The lack of an appropriate and comprehensive framework for urban development in Lesotho has been largely credited to the absence of the housing policy. The National Strategic Development Plan (NSDP) is charged among other deliverables to develop a national housing policy.

According to UN-Habitat[33] (2015), mortgage-granting sector is very small and issues about 400 loans annually to Basotho earning at least US$900 a month. Mortgages are usually restricted to salaried workers and high-income individuals; therefore, most of the housing construction is carried out through owner's savings with approximately 70 percent of housing supply being informal. Moreover, the lack of a recognised market detains banks from granting loans because they cannot regain their assets if a mortgage defaults on their loan payments. However, credit extension to the real estate property markets has increased tremendously in the previous three years. Credit extended to the real estate sector relative to credit extended to other business sectors grew by 10 percentage points from 17 percent recorded in the first quarter of 2013 to 27 percent in the third quarter of 2016. Credit extended to the real estate sector has been on a growing trend as covered in Figure 2.

[32] http://www.housingfinanceafrica.org/country/lesotho/

[33] https://issuu.com/unhabitat/docs/lesotho_urban_housing_profile_web

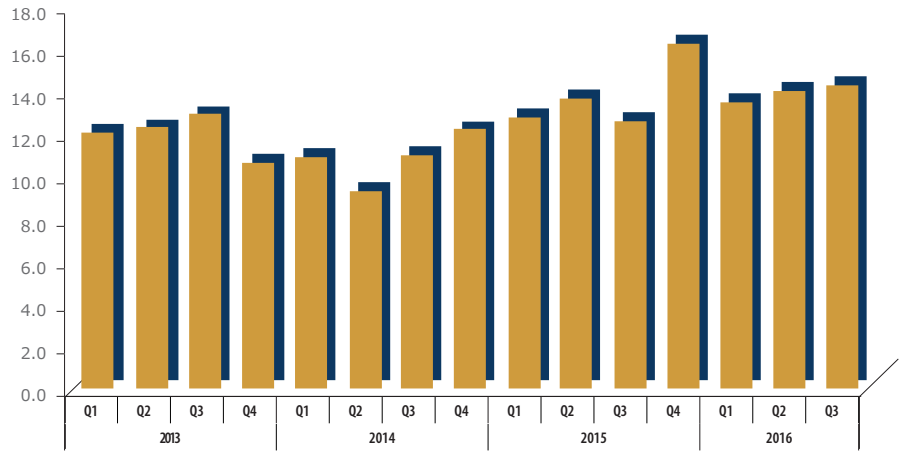
Figure 2 Ratio of Credit extended to real estate sector to total business loans (%)



Source: Central Bank of Lesotho

Mortgage loans over total credit provided by banks grew relatively marginal, by about 2 percentage points, from 12 percent in the first quarter of 2013 to 14 percent in the third quarter of 2016 as covered in Figure 3.

Figure 3 Ratio of credit extended to mortgages to total credit (%)



Source: Central Bank of Lesotho

Credit paths, covered in Figure 2 and 3, indicate the extend of commercial bank's exposure to the real estate market, hence the reason the CBL is attempting to develop price indices to track growth rates of real estate market prices to ensure banks are not overexposed. 1.5.1.10 Habitat for humanity Lesotho (HHL).

Box 1 **Housing policy**

Housing policy: refers to the actions of government, including legislation and program delivery, which have a direct or indirect effect on housing supply and availability, housing standards and urban planning. A national housing policy and strategy has to be a multi-faceted approach towards aiding all sectors of the market with definite prominence on the poor.

What is a comprehensive Housing Policy?

A comprehensive housing policy warrants that a community's policies are harmonised and designed to achieve the stated objectives. A comprehensive housing strategy emphases on housing supply, affordability, and quality to help guarantee suitable housing is accessible and reasonable for families at all income levels and stages of life. A good program should reflect a balance of development needs, policies and programs, and accurate data. The final piece of a comprehensive housing policy is an implementation timeline that details both short and long term metrics to keep track of progress. This helps officials and stakeholders ensure that the execution remains on track and community goals continue to be met (city planners report Maryland, 2013).

A housing policy details issues such as:

Mobilising housing credit: a significant number of households in need of housing can afford to access housing credit, provided that it is available. Such credit is currently not readily accessible to most home seekers. Unlocking housing credit is therefore seen as a fundamental requirement in order to facilitate the on-going improvement of the housing circumstances of such households. Credit supplemented with savings can enable a large proportion of people in need of housing and eligible for State housing subsidies, to acquire access to formal starter housing under a range of tenure options (Department of housing South Africa, 1994).

Box 1[36] Housing policy (continued)

Landbanking & speculation planning application: agents acquire planning permission for land but end up not developing the land and keep the land for speculative purposes to gain when land appreciates in value. The housing policy should detail appropriate controls to prohibit such activities from happening. Controls such as a Land Value Tax on undeveloped land that has planning permission, and 'use it or lose it' measures, can act as disincentives to landbanking and to raise public funds for house-building. Councils should also be allowed to compulsorily purchase (CPO) sites at a fair value if their owners are not developing them (Corbyn, 2015).

Housing and the Economy

The analysis of the intersection of the housing sector with the broader economy can be desegregated into four interrelated areas (Department of Housing South Africa, 1994).

- *Real side linkages*: Real linkages include the effects of housing policy on such macro-economic variables as output, employment, income, consumption, savings and investment, prices, inflation, and the balance of payments;
- *Financial linkages:* Financial linkages deal with the relationship between the financial sector-in particular formal and informal institutions providing housing finance-and the demand for, and supply of, housing;
- *Fiscal linkages:* Fiscal linkages cover the contribution of government to the supply of housing through tax and subsidy policy; and
- *Socio-economic linkages*: Housing policy, through the quantum and quality of housing delivered impact on socio-political stability, productivity and attitudes and behaviour.

[37] hhttp://www.marylandheights.com/Home/ShowDocument?id=7631; https://d3n8a8pro7vhmx.cloudfront.net/jeremyforlabour/pages/106/attachments/original/1438782182/housing.pdf?1438782182

Appendix 2 Summary of the literature review and common methodologies

Technique Employed	Area of Study	Study Period (Inception Year)	Data Analysed	Discussions/Findings	Author
Weighted repeat sales and hybrid technique	Sweden	1981 to 1993	Housing sales in Sweden (Stockholm, Gothenburg & Malmo)	Much of the difference in estimates of price trends can be attributed to the maintained hypothesis of constant house quality and the data limitations inherent in weighted repeat sales	Englund, Quigley
Hedonic approach, repeat sales approach, and hybrid approach	Australia	1988 to 2000	Wine returns (Infrequently traded goods) 14 102 auction sale observations for Australian wine	For the data set considered the results show that the hybrid approach provides the most efficient estimates, repeat sales approach provides significantly higher total return estimates than other two approaches.	Forgarty & Jones (2010
Pseudo repeat sales methodology Hedonic index estimation	China (Chengdu, Sichuan Province)	January 2006 to June 2011 (444, 596 observations	New home sales -price observation pairs used in the regression are not necessarily repeat sales of the same property but instead use all the transaction data.	The pseudo indices cater for omitted variables better than hedonic index estimation.	Guo *et al.*, (2013)
Standard and fractional hedonic transaction-based indices.	Beijing	First quarter of 1997 to the fourth quarter of 2012.	Beijing lease transactions database (Beijing office market)	Hedonic-based methodology has a slightly higher volatility than the valuation-based index which provides more timely information about rental movement.	Fuerst, Liu & Lizieri (2016)
Geometric weighted repeat sales model.	Netherlands	January 1993 to December 2006	House sales of over 500000 owner-occupied houses	They state that their model might have an accuracy problem using smaller samples. However, the model is less susceptible to volatility and shows no evidence of heteroskedasticity.	ansen *et al.*, (2008)

Source: Ministry of Finance and Central Bank of Lesotho.

Appendix 2 Summary of the literature review and common methodologies (continued)

Technique Employed	Area of Study	Study Period (Inception Year)	Data Analysed	Discussions/Findings	Author
Matching procedure, (similar to a repeat sales)	Singapore	January 1995 to May 2010	Residential sales (non-landed private housing sales) Pairs each sale with the sale of comparable property sample sizes.	Find that the distribution of sales prices shifted to high prices than to lower prices for 1995 to 2010, particularly evident in the boom periods of 1996 and 2005 to 2007	Deng, McMillen & Sing (2011)
Dynamic panel data econometric modelling approach	United States (Chicago, Atlanta, Washington DC, Dallas and Los Angeles)	Second quarter of 2001 to the second quarter of 2010	Quarterly rent making 9066 observations.	Rent growth estimates capture commercial real estate market downturns. -Model provides a more accurate risk measure of rental income which is the volatility of the index.	An, Deng & Fischer (2011)
Repeat sales methodology	United States (Los Angeles, New-York)	1998 to 2010	8864 repeat sales data	Majority of the variation in property-level price appreciation is not captured by indices	Boudry *et al.*,(2012)
Repeat sales, hedonic, hybrid and spatial methodologies.	United Kingdom - London	First quarter of 1998 to the fourth quarter of 2009.	1451 sales transactions, 255 repeat sales transactions	Four models estimate the same value trends for the London commercial property sector. -The only difference they established is that the four models differ in determining the peaks and troughs. -Repeat sales index displays a distinct pricing bubble and collapse well before others.	Chegut, Eichholtz & Rodriguez
Repeat sales Methodology	Morocco	2010	Property Transactions registered at the national level.	Information available in databases of the office does not allow the use of the hedonic method because of unavailability of the main characteristics of properties.	El mahmah, A (2013)

Source: Ministry of Finance and Central Bank of Lesotho.

Appendix 2 Summary of the literature review and common methodologies (continued)

Technique Employed	Area of Study	Study Period (Inception Year)	Data Analysed	Discussions/Findings	Author
Weighted repeat sales method	Norway (Oslo, Bergen, Trondheim and Kristiansand)	1819 to 2003	Nominal transaction prices of real property	The nominal house price indices fit well with historical events	Eittrheim and Erlandsen (2004)
Hedonic methodology	Malaysia	2014	Kuala Lumpur office market data registry	Data is readily available and therefore suits the hedonic index construction.	Ahmad, Daud & Esha (2014)
Bailey, Muth and Nourse, Case-Shiller, OFHEO HPI method, the S&P/Case-Shiller Method and the Autoregressive index. (all based on the repeat sales idea)	United States (20 US metropolitan areas)	July 1985 to Sept 2004	Single Family home sales data	None of the indices seem to consistently outperform the others in terms of forecasting power. However, the Autoregressive to be the best model relatively.	Nagaraja, Brown & Wachter (2010)
Central price tendency & sale-based stratification methods	Nigeria	2010 to 2012	Questionnaire distributed capturing relevant characteristics of residential properties	Availability of a range of alternative residential property indices is of importance given that no price index can encompass all possible advantages or exclude all possible disadvantages	Olowofeso et al.,(2013)
Hedonic methodology	Uganda – Kampala, Wakiso, Entebbe and Mukono	September 2009 to June 2014	Real estate survey was conducted and collected data on land price index, commercial rent index and residential property price index	Land price index and residential property price index increased by 223.5 percent and 115.3 over the sample period, while commercial rent index declined by 34.2 percent	Bank of Uganda (2014)

Source: Ministry of Finance and Central Bank of Lesotho.

Appendix 2 Summary of the literature review and common methodologies (continued)

Technique Employed	Area of Study	Study Period (Inception Year)	Data Analysed	Discussions/Findings	Author
Median house price methodology	South Africa	FNB – July 2000 to present Standard bank – January 1995 to present ABSA – 1966 to present-	Commercial bank approved mortgage loans from FNB, ABSA and Standard Banks		Fenwick (2013)
Hedonic method Weighted Laspeyres method	India	Last quarter of 2008-09 to the last quarter of 2011-12	Mortgage data from housing finance companies and commercial banks, real estate agents/ property developers, resident welfare associations.	The overall house prices in India increased by about 77 percent in a period covering the last quarter of 2008-09 to the last quarter of 2011-12. On the other hand, the year on year price increases was at around 20 percent	Reserve Bank of India Bulletin (2012)
Median house price methodology	South Africa	FNB – July 2000 to present Standard bank – January 1995 to present ABSA – 1966 to present-	Commercial bank approved mortgage loans from FNB, ABSA and Standard Banks		Fenwick (2013)

Source: Ministry of Finance and Central Bank of Lesotho.

1.7 Median Price Methodology

An appropriate methodology in calculating the REPI is chosen depending on a number of factors such as the characteristics of the available dataset,[37] intended purpose and the expected use of the index. In other words, there is no single method which is great in all aspects, but suitability will depend on the question being addressed (Rappaport, 2007).

1.7.1 Average or median price methodology

This methodology reports the average or median price of houses sold in each time period. The median price is favoured relative to the average price because of the skewness of the prices in property markets; fluxes in sales volume among expensive properties have a small bearing on median selling prices while on the other hand, strongly influences the average selling prices (Case and Wachter, 2005). This methodology is simple to compute and requires data on selling prices only. However, it also has a number of drawbacks that renders its applicability in constructing REPIs questionable. Since it only uses sales prices, it does not specifically account for changes in quality of properties whose prices were realised in each period. It assumes that all crucial information about the house is contained in the price. However, this assumption fails to account for renovation and depreciation of the property. Therefore, the average or median price overstates the rise in price for houses that had no improvements on their qualities. Moreover, it inflates price increases if in the sample period being observed, expensive properties were mostly transacted and the reverse is true for cheap properties.

The index is computed in a two-step procedure. First, the index must be computed for the base year as follows:

Calculation of the index for the base year

The base year HPI is calculated using the chain Laspeyres Index method.

$$I_{(t,0)} = \left(\left(\frac{\sum w_{(i,0)} P_{(i,t,0)}}{\sum\sum w_{(i,0)} P_{(i,k,0)}} \right) /12 \right) * 100 \qquad (1)$$

[37] http://www.bankofgreece.gr/Pages/en/Statistics/realestate/default.aspx; Silverstein (2014)

$I_{(t,0)}$: Index for the reference month[38] of the base year, ***wi0:*** weight for class i in the base year,

$P_{i.t.0}$: Price for class i for the reference month in the base year,

$P_{i.k.0}$: Price for class i for the month k in the base year.

$W_{i,0}$:Weight for class i in the base year

The second step entails the computation of the chained index using the Laspeyres index method as follows:

Calculating the Chained[39] Index:

$$I_{(t,y)} = \left(\left(\frac{\sum w_{(t,y)} P_{(i,t,y)}}{\sum w_{(i,y)} P_{(i,12(y-1))}} \right) * I_{12(y-1)} \right) * 100 \qquad (2)$$

$I_{(t,y)}$: Index for the reference month in reference month t in year y.

$\sum w_{i,y}$:Weight for geographical class i in the year y.

$p_{i,t,y}$: is the median price for all properties in geographical class i for the reference month,

$p_{i,12(y-1)}$: Price for class i for the 12th month of the previous year

$I_{12(y-1)}$: Index for the 12th month of the previous month

Data that will be fed into the model is data on mortgage loans from commercial banks, which will be used as final sales or transaction prices and will be weighted using geographical classifications.

[38] The month for which the index is calculated for.

[39] Chain-linked from one year to the next in order to create an index series that is continuous and on the same scale.