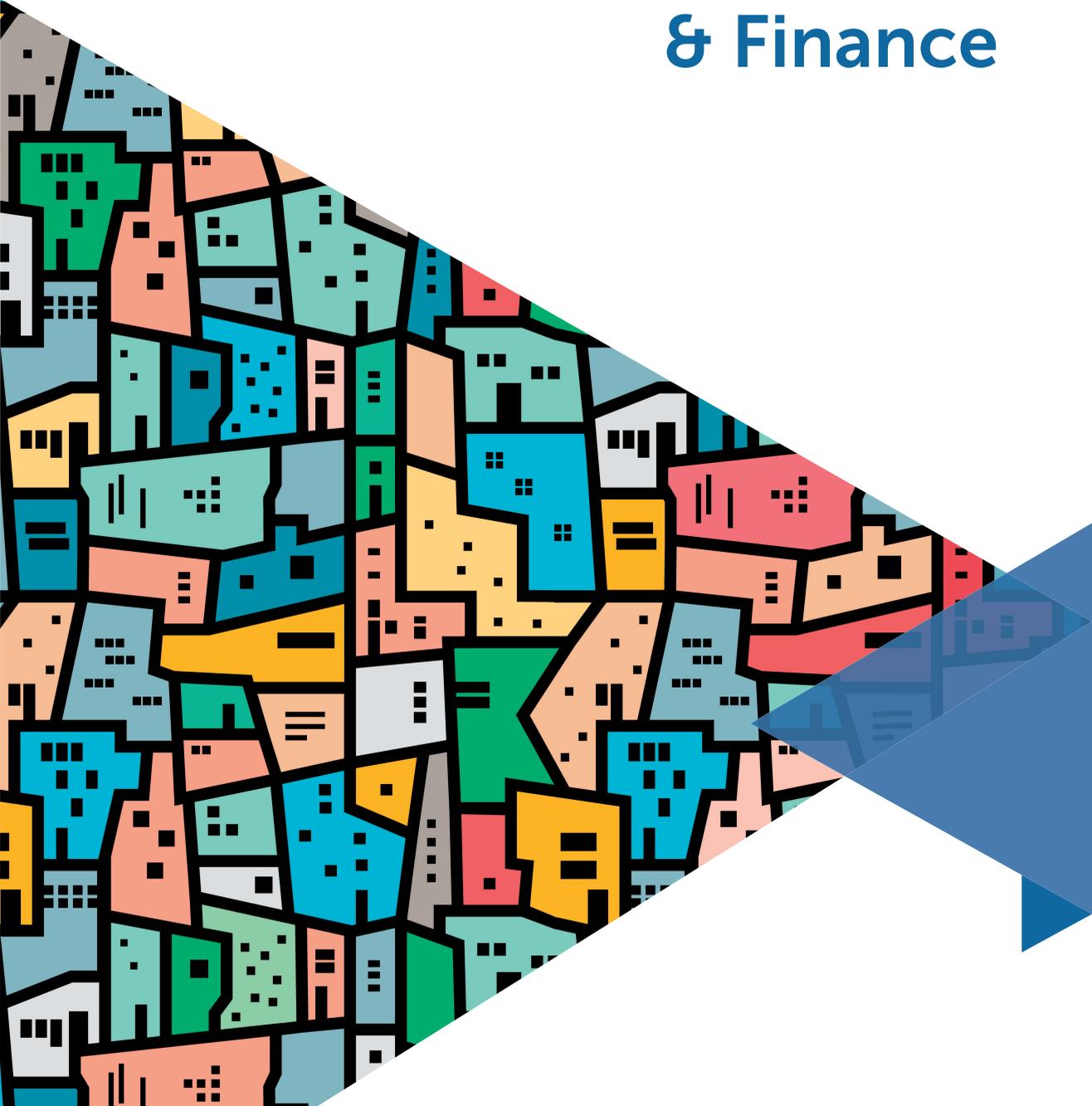


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International real estate research

Information is the religion of the modern world. David Lodge (2011)

When this journal was established at the *Journal of Valuation* back in 1982, all the papers published were from authors based in the UK. It was not an international journal even though the subscriptions included numerous, English speaking, institutions from outside the UK. Indeed, most of these were commonwealth countries and had a shared history of property education and practice.

In total, 37 years on and we are in a very different world. The majority of authors are now from outside the UK and the reach of the journal is now fully international covering all of the five (original) continents. The bulk of our papers now come from continental Europe and Asia with the number of North and South American papers now increasing substantially as well. In time, it is hoped that more African papers will be successful and then our journal will cover all real estate markets around the world.

This is important and the papers in this issue are a good reflection of the changes noted above. We have also just added 13 new members to our Editorial Board, from both academia and industry, reflecting the new geographical penetration of the journal.

On a personal note, this is really rewarding. When, in the early 1980s, I entered academia as a naive 22 year old on the faculty at The University of Reading in the UK, one of my ambitions was to expand the discipline of real estate around the world. Or, to be more precise, I wanted to create forums where academics and practitioners from around the world could present and debate their work on a global stage. I did this, with the support and help of many others, via journals such as *The Journal of Property Investment & Finance* and *The Journal of European Real Estate Research* (which I was also instrumental in establishing) supported by the creation of international societies such as the European Real Estate Society and the International Real Estate Society. We now truly have many international forums and this can only be a good thing to encourage and support the next generation of academics and practitioners/researchers to cement the importance of real estate in the academic literature.

Nick French

Reference

Lodge, D. (2011), *The Campus Trilogy: Changing Places; Small World; Nice Work*, Penguin, p. 390.



Risk assessment in commercial real estate development

Commercial
real estate
development

An application of analytic network process

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Abstract

Purpose – The purpose of this paper is to analyze the commercial property development risk factors from the entrepreneur's point of view against social, economic, environmental, technological and political risk assessment criteria. After that, this study aims to assess the risk factors based on the analytical network process (ANP) model and to prioritize the key risk factors to identify which risk factor is highly affected to the commercial development process.

Design/methodology/approach – The data were collected through face-to-face interviews using a structured questionnaire. The analysis of the risk factors involved the ANP model using super decision software.

Findings – The results revealed that there are five major risk factors such as environmental, social, economic, technological and political risk, and 32 sub-risk factors. According to the super matrix calculation, the synthesized values for three projects were 0.0704, 0.0532 and 0.0431, respectively. It was identified that Ward City was 0.0704, indicating that it is comparatively less risky and, hence, can be categorized as the best development and considering the sub-risk factors; the results show that the highly affected risk factors for the development are: the council approval process, climate changes and natural disaster, and the least affected risk factors are confidence to the market, lifecycle value, investment return and currency conversion factor.

Practical implications – The paper includes implications for the development of commercial properties, risk and risk assessment criteria to make risk management strategies and policy implementation.

Originality/value – The research findings are helpful in improving risk management strategies in the country, and policy formulation should focus on the above identified three risk factors in order to mitigate the risk in every stage and to achieve sustainable project development while increasing the satisfaction of long-term investment goals.

Keywords Entrepreneur, Risk, Risk assessment, Commercial real estate, Analytic network process, Real estate development

Paper type Research paper

Introduction

Real Estate, compared to other industries, has been making a significant contribution to the economy of the country during the last three decades. As a result, Real Estate has been a field of interest of many entrepreneurs. Investors who are keen on real estate development tend to invest on various types of developments irrespective of the risk. Property development is inherently a riskier business, due to the difficulty of predicting the stage at which a developer must face with risk and uncertainty. In the development process, from the conceptual design to construction, stage, letting on rent occupying the building or the handover stage, risk is a common encounter.

In Sri Lankan setting, investors find the knowledge gap created by inadequate research and analyses on the risk factors in commercial development, a shackle in making business decisions. As a result, bridging this gap on risk factors, particularly in terms of urban areas of Sri Lanka, is of utmost importance. Since the majority of such development has taken place in western province – especially in and around the capital of Colombo – the research mainly focuses on analyzing the risks in commercial real estate development in Gampaha Jaela Ekala area from the entrepreneur's point of view, and identifying the best development



in this area, and the highly affected risk factors and the least affected risk factors in the commercial real estate development process.

Risk and uncertainty are common to all real estate development and, therefore, the actual return of the investments will differ from what is expected. In certain cases, it includes the prospect of losing the original investment. However, Pidgeon as cited in Khumpaisal *et al.* (2010) classifies risk into “objective” or statistical risk and “subjective” or perceived risk. In this classification, Pidgeon *et al.* point out that the objective risk, which is unique, substantive and physically measurable, can be determined by quantitative risk assessment methods.

Furthermore, Hargitay and Yu have classified risk into systematic risks and unsystematic risks, which is a different reading compared to the previous one. Moreover Hargitay, Yu, Brown, Matysiak, Baum and Crosby as cited in Khumpaisal *et al.* (2010) had observed systematic risk (uncontrollable risk) caused by external factors that affect all investments; examples include market risk, inflation or purchasing power risk, and interest rate risk. Unsystematic or specific risk refers to risk over which the investor has limited control and is specific to a particular company or investment decision-making process.

In those circumstances, where risk and uncertainty are reported according to the RICS Appraisal and Valuation Manual RICS (1996) as cited in Adair and Hutchison (2005) prescribed standards the profession has been condemned for irregularities and letdowns. To reflect risk and uncertainty in certain valuation assignments such as the pricing of urban regeneration land (Syms, 1996). However, Hutchison and Nanthakumaran as cited in Adair and Hutchison (2005) examine issues relating to market efficiency, individual and market worth, and risk analysis. Indeed, the Investment Property Forum and Investment Property Databank (IPD) 2000 as cited in Razali and Adnan (2015) highlighted the need for more rigorous risk assessment measures within the broad property investment industry, comprising asset and fund managers and advisors.

Furthermore, Huffman (2002) put major risks associated with commercial real estate development into three categories such as financial risks, physical risks and regulatory risks. But Booth as cited in Khumpaisal and Chen (2009) shows that the STEEP factors, namely Social, Technological, Economic, Environmental and Political factors, have been widely used in the business context, but with different names, such as PEST, TESP and STEP. In this regard, PEST is an abbreviation of political, economic, social and technological factors; these factors shall be concerned while the decision making. The real estate developers have to take into account the assessment method; the current practice established is the risk matrix ioMosaic; Kindinger and Rafele as cited in Adair and Hutchison (2005) describe the likelihood and consequences of each risk in a tabular format. It states that the risk can strongly influence each project stage: the project conceptual, project feasibility analysis, design and planning, bidding and tendering construction and execution and handover stage.

Risks are associated with every investment; real estate development, as an investment, is not an exception. Real estate development has its own risks, particularly in relation to the decision-making process of a new development project. Hence, risks affect the entire project management process in terms of schedule delay, cost overrun and quality of products, according to Khallafalah, Flyvbjerg and Gehner as cited in Adair and Hutchison (2005).

According to Khumpaisal and Chen (2009), risks in each commercial real estate development can be identified at the project management level, using brainstorming techniques. Risks are generally defined as events that could arise and affect the critical factors of one project (Khumpaisal and Chen, 2009). Khumpaisal and Chen (2009) had identified many direct or indirect reasons why risks may occur in commercial real estate development, and several normal reasons relevant to the fragment existed throughout a project lifecycle covered by design, construction and facilities management, which are consequences of lack of integration of building elements, communication among project partners, and even misapplication of the building structure and its services systems. With regard to competitive enterprise growth and

sustainable urban development, the influence of those risks to a specific project was also to concentrate on impacts to local, regional and national environment, communities and economies in a long-term perspective under climate change scenario. The most significant risk and uncertainty toward investment return is the income stream. In terms of the possible events that affect the income stream and uncertainties of the probability of the outcomes of these events (Khumpaisal *et al.*, 2010) there are subjective elements to be considered in the risk management process, which cover the following areas:

- tenant risk (multi-tenanted less risky);
- demand and supply of property type;
- demand and supply for properties in different locations (local market conditions);
- economic and property market environment (voids, rental growth, leverage and pricing); and
- illiquidity (it may not be possible to sell certain types of property quickly, except at below-valuation prices).

Traditional approaches to risks assessment depend mostly on the result derived from either the panel discussion or the ranking method, which are at times not convincing enough due to the lack of quantitative measurements using reliable tools or instruments with strong theoretical bases. Developers in commercial real estate development are in need of alternative methods such as Bayesian belief network, Monte Carlo simulation and multi-criteria decision analysis of risks assessment (Chen and Khumpaisal, 2009). Furthermore, based on the idea that “risk” is the combination of uncertainties over the probability of events and their consequences, a list of the main risk is presented as follows:

- financial risk (interest rates, delays, etc.);
- land cost (usability, restrictions, local authorities, etc.);
- construction (late changes, big financial risk, exposure, etc.);
- timing (delays, etc.);
- sale/rents (faulty assumptions may lead to decreased income); and
- socioeconomic (macroeconomics).

Risk assessment criteria

Environmental risk

When it comes to developing commercial real estate or any other development, the environment is affected. In Sri Lanka, as rules and regulations to control environmental impacts, such as environmental law, Coastal Conservation Act, etc., have been imposed, they affect the development of the real estate. The adverse environmental impacts can be measured using a developed quantitative approach called Environmental Impact Index (EII). Chen and Khumpaisal (2009) have identified environmental risk as follows:

- adverse environmental impact; and
- climate changes.

However, this idea has not been considered in this research because of unavailable data from the respective parties. Instead, natural disasters impact was considered as an environmental risk in the particular area.

Social risk

Social risks in commercial real estate development are mostly described in subjective forms, and thus, most developers use qualitative analysis methods to measure and assess

social-related risks (Chen and Khumpaisal, 2009). Furthermore, Danter (2007) as cited in Chen and Khumpaisal (2009) explains that developers should measure workforce availability by employing a consensus method or observation of workforce targets in the project trade area. The cultural compatibility of the project is measured through a marketing survey. Acceptability could be measured using degree of benefits, and public hygiene, using the degree of impacts on local public health and safety as a result of the development of specific projects.

Economic risk

Risks associated with economic and financial uncertainties are the most important factors that could make strong impacts on the project development process, which is why most professionals and academics in the field of real estate pay attention to economic risks caused by the variation in interest rate, loan and developer credit. Sagalyn, Case, Nabarro and Key, Strischeck and Blundell as cited in Chen and Khumpaisal (2009) suggest the following criteria to measure risks and assess their impacts:

- Sector balance score: it measures the fund's structure and indicate the weight scores, which differs from IPD universe structure income return.
- Income return: it calculates the net income receives for each year as a percentage of the capital employed over the year.
- Location concentration: it measures the percentage of each fund's capital value invested in the ten most important locations.
- Development exposure: IPD and LaSalle chose the simple percentage of fund capital value in current developments as a risk measure, which include both pre-let and speculative developments.
- Asset/lot size concentration: this measures the percentage of a fund's capital value that is bound up in five big assets.
- Lease length.
- Tenant Credit worthiness (TICCS stress score) is weighted by the rent for each tenant to form the portfolio stress score.
- Tenant concentration: it measures the percentage of the annual rental payments that accounted from the biggest ten tenants.
- Weighted beta.
- Void rate or vacancy rate.

Interest rate is one of the most significant indicators the developers employ for measuring economic risks, as changes in interest rates can affect their earnings by changing its net interest income, the level of other interest-sensitive income and operating expenses associated with each specific real estate development. According to the Financial Services Authority (2005), the borrowing take is high and the inflation rate is increasing day by day in Sri Lanka; both the rates can be identified as an economic risk.

Economic risk in commercial real estate development is associated with 14 risks, which are interest rate, property type, market liquidity, confidence to the market, currency conversion, demand and supply, purchaseability, brand visibility, capital exposure, lifecycle value, area accessibility, buyers, tenants and investment return.

The measurements of risk assessment criteria can be explained as follows:

- (1) risks related to interest rate are measured using the degree of impact, due to interest changes;

- (2) degree of location concentration is used to assess property type risk;
- (3) the market liquidity risks are measured using the selling rate of the same property in the local market, and confidence to the market is measured using degree of expectation to the same kind of properties;
- (4) the confidence to the market is measured by the confidence level of the developer;
- (5) risk related to currency conversion is measured using the developer's degree of impact due to exchange rate fluctuation;
- (6) risks related to demand and supply are measured using the degree of regional competitiveness in developed property;
- (7) the risk related to the purchaseability is measured using the degree of affordability to the same kind of property;
- (8) the brand visibility is measured using the degree of entrepreneur's reputation in developing each specific commercial property;
- (9) the capital exposure is measured according to the rate of estimated lifecycle cost per 1bn rupees;
- (10) the risks related to lifecycle value are measured using the five-year property depreciation rate;
- (11) risk in area accessibility is measured using the degree of regional infrastructure usability associated with a specific development project;
- (12) risks related to buyers are measured using an expected selling rate of a specific development;
- (13) risks related to tenant are measured using an expected annual lease rate of a specific development; and
- (14) risks related to investment return are measured according to the expected capitalization rate.

Technological risk

Although location selection is an important part in feasibility study, the risks related to site condition are measured using the degree of difficulties in site preparation for each specific development plan (Khumpaisal and Chen, 2009).

Nine risks have been identified under technological risks, i.e. site condition, designers and construction, multiple functionality, constructability, duration, amendments, facilities management, accessibility and evacuation durability. In terms of measuring these risks, the risks related to site selection are measured using the degree of difficulties in site preparation for each commercial development:

- (1) designs and construction risks are measured using an entrepreneur's satisfaction to their professional experience regarding the development plan;
- (2) the site conditions are measured by the degree of difficulties in site preparation for each specific plan;
- (3) multiple functionality of property of risks is measured using the degree of multiple use of the property;
- (4) constructability risks are measured according to the technical difficulties in commercial property development;
- (5) the duration is measured by the total duration of design and construction per 1,000 days;

- (6) amendments are measured by the possibility of amendments in design and construction;
- (7) the risks related to facilities managements are measured using the degree of complexities in facilities management;
- (8) risks of accessibility and evacuation are measured using the degree of easy access and quick emergency evacuation in use; and
- (9) risks related to durability are measured using the probability of refurbishment requirement during building lifecycle.

Political risk

The political risk is assessed by the following sub-criteria as political groups, commercial tax policy and council approval:

- (1) the political groups are assessed on the degree of protest by the urban communities;
- (2) commercial tax policy is measured according to the rate of commercial tax impact; and
- (3) the council approval is measured by the total days of construction, design and approval process by urban council.

Table I presents the risk assessment criteria and sub-criteria and valuation method with references. According to the research findings, the criteria of risk factors are summarized as illustrated in Table I.

Methods

Data and data collection

The primary data were collected using face-to-face structured interview. Three questionnaires used to identify the respective people's opinion about risk in commercial real estate development contained five major risk criteria (social risk, economic risk, environment risk, technological risk and political risk) and 32 sub-criteria. Recorded interviews were evaluated and analyzed for an in-depth understanding of risk factors studied in this research.

Case study area

Situated on the north-eastern part of the capital Colombo, Gampaha is a major town in Gampaha District, western province Sri Lanka. Gampaha municipal council is the main administrative authority in charge of the town area with government offices and various departments. Municipal Council and Divisional Secretariat are also located within its city limit. The city is a transit point with approximately over 200,000 people entering into the city on a daily basis. Ja-Ela is a suburb of Colombo, located approximately 20 km (12 mile) north of the Colombo city center and lies on the A3 road that overlaps with the Colombo Katunayake Expressway at Ja-Ela Junction. The economic activities in Ja-Ela consist of commercial enterprises, office and industrial employment. Ekala situated in Ja-Ela local authority area in Gampaha District is the location for the second industrial city of Sri Lanka. With a very large workforce and about 175 factories, Ekala is a suburb of Ja-Ela situated within a radius of 3 km from Ja-Ela.

Sample

Out of several commercial projects in the town area, three commercial projects from Gampaha (Word City), Ja Ela (Reality Plaza) and Ekala (Orex City) were selected. The selection criteria were being within Gampaha, Ja Ela and Ekala area, being close to the city

(continued)

Criteria	Sub-criteria	Valuation methods	Representative reference
Social risks	Workforce availability	Degree of developer's satisfaction to local workforce market (%)	Danter (2007)
	Community acceptability	Degree of benefits to local communities (%)	Danter (2007)
Technological risks	Cultural compatibility	Degree of business and lifestyle harmony (%)	Danter (2007)
	Public hygiene	Degree of impacts on local public health and safety (%)	NHS Standards
	Site conditions	Degree of difficulties in site preparation for each specific plan (%)	Danter (2007)
	Designers and constructors	Degree of developer' satisfaction of their performances (%)	Khalafallah <i>et al.</i> (2005)
	Multiple functionality	Degree of multiple use of the property (%)	Danter (2007)
	Constructability	Degree of technical difficulties in construction (%)	Lam <i>et al.</i> (2006)
	Duration	Total duration of the design and construction per 1,000 days (%)	Khalafallah <i>et al.</i> (2005)
	Amendments	Possibility of amendments in design and construction (%)	Khalafallah <i>et al.</i> (2005)
	Facilities management	Degree of complexities in facilities management (%)	Moss <i>et al.</i> (2007)
	Accessibility and evacuation	Degree of easy access and quick emergency evacuation in use (%)	Moss <i>et al.</i> (2007)
Environmental risks	Durability	Probability of refurbishment requirements during buildings lifecycle (%)	Chen (2007)
	Adverse environment impacts	Overall value of the Environmental Impacts Index	Chen <i>et al.</i> (2005)
	Climate change	Degree of impacts on use and value due to regional climatic variation (%)	UNEP (2007)
	Interest rate	Degree of impacts due to the increase of loan rate (%)	Sagalyn (1990), Financial Services Authority (2005), Nabarro and Key (2005), Frodsham (2007)
Economic risks	Property type	Degree of location concentration (%)	Adair and Hutchison (2005), Frodsham (2007)
	Market liquidity	Selling rate of same kind of properties in the local market (%)	Adair and Hutchison (2005)
	Currency conversion	Degree of impacts due to exchange rate fluctuation	Morledge <i>et al.</i> (2006), Financial Services Authority (2005), Financial Stability Board (2007)
Demand and supply	Purchaseability	Degree of regional competitiveness (%)	Adair and Hutchison (2005)
	Brand visibility	Degree of affordability to the same kind of properties (%)	www.statistics.gov.uk/
	Capital exposure	Degree of developer's reputation in specific development (%)	Adair and Hutchison (2005)
	Lifecycle value	Rate of estimated lifecycle cost per 1bn pound (%)	D&B (2007), Adair and Hutchison (2005), Gibson and Louragand (2002)
	Area accessibility	5-year property depreciation rate (%)	Blundell <i>et al.</i> (2005), Moore (2006)
Buyers	Tenants	Degree of regional infrastructures usability (%)	Lee (2002), Adair and Hutchison (2005)
	Tenants	Expected selling rate (%)	Adair and Hutchison (2005)
	Investment return	Expected annual lease rate (%)	Frodsham (2007)
		Expected capitalization rate (%)	Booth <i>et al.</i> (2002)
			Sagalyn (1990), Watkins <i>et al.</i> (2004)

Table I.
Risk assessment
criteria

Table I.

Criteria	Sub-criteria	Valuation methods	Representative reference
Political risks	Political groups/activist	Degree of protest by the urban communities (%)	Arthurson (2001)
	Commercial tax policy	Rate of commercial tax impact (%)	Gehner <i>et al.</i> (2006), FSB (2007)
	Local tax policy	Rate of council local tax (%)	LCC (2008)
	Council approval	Total days of construction, design approval process by Liverpool City Council (LCC)	Crown Copyright (2008)
	License approving	Total days of license approval process	Crown Copyright (2008)

Source: Chen and Khumpaisai (2009)

center, being convenient to the researcher which aims to attract back to city center a higher proportion of catchment population currently lost to outer retail shops and shopping centers, and maximize the use of current and future transport facilities, etc.

“World City Commercial Complex” comprises 196 shops and over 12,000 sq.ft of office space, with ten units of escalators, four elevators including two observation lifts, a basement car park and all amenities. The commercial complex is of seven floor levels including the ground floor. Reality plaza is a shopping complex that is consisted with ample parking facilities, and each floor is equipped with a lot of facilities. It is currently occupied by few saloon owners, and the complex is also suitable for jewelry shops, computer shops or any kind of businesses. “Orex City” has over 500 shopping units approximately 200 sq.ft. All the shops will have individual toilets and other common amenities and ample parking.

Data analysis method

The analytic network process (ANP) introduced by Saaty 2005) as a novel approach to risk assessment in commercial real estate development was used in this research to analyze risk factors in commercial real estate development. The ANP was built using Super Decision software. Generally speaking, the management is mostly undertaken based on the three basic steps, which consist of risk identification and initial assessment, response and mitigation and further risk analysis (see other methods in Figure 1). According to Figure 1 (portion colored in red), the first step is to build an ANP model using the software. Then a paired comparison process is conducted to form a super matrix of quantified

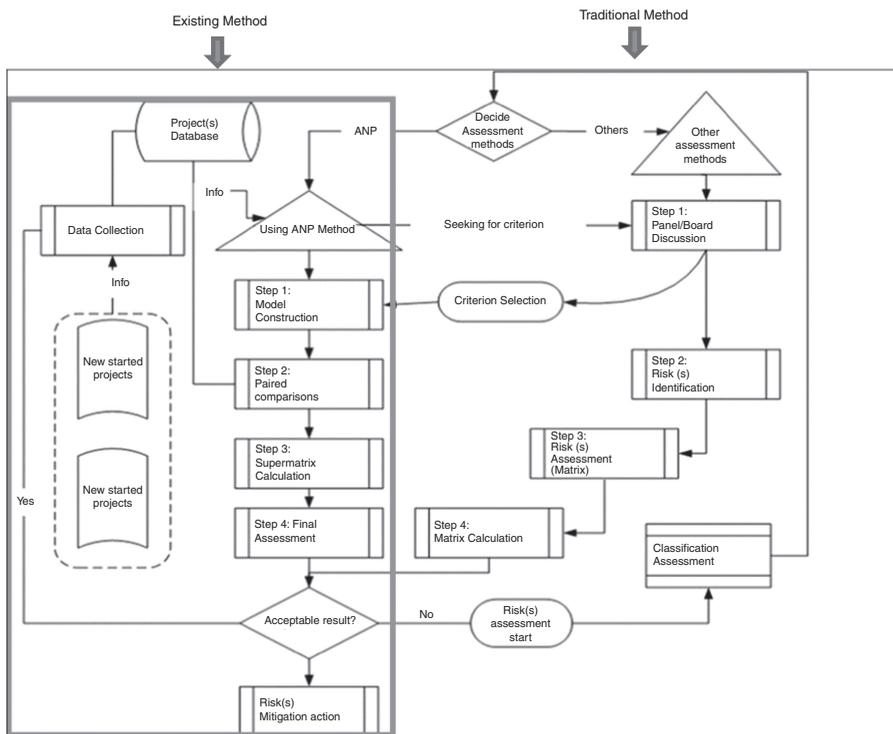


Figure 1.
ANP and existing risk
assessment model

Source: Chen and Khumpaisal (2009)

interdependency between paired criteria and alternatives of development plan. According to the synthesized value, the best development project in Gampaha, Ja Ela and Ekala areas can be identified. The results can also be useful to support risk mitigation action undertaken later. However, the authors noted that the traditional approaches to risks assessment mostly depend on the derived from either panel discussion or ranking method, which are sometimes not convincing enough due to the lack of quantitative measurements using reliable tools or instrument with strong theoretical bases. It is assumed that developers use alternative method such as Bayesian belief network, Monte Carlo simulation, multi-criteria decision analysis, etc. As an existing method of risk assessment, the ANP is used.

According to the literature review, the five major risk factors and 32 sub-risk factors were considered for risk assessment (see Table I). The EII could be considered as environment risk, but it was overlooked in this research because of the unavailability of data from respective parties. Instead, the natural disasters impact was considered as an environmental risk in that area. Especially political risk was considered a risk in commercial real estate development in Sri Lanka because of unstable political condition. All the details were based on the literature review. In this paper, the ANP model is set up based on the author's knowledge about risks assessment criteria, which is used to make judgments in quantifying interdependences for the 32 risk assessment criteria inside Clusters 2–6 except the three alternatives in Cluster 1 (see Figure 2), and specific characteristics of alternative plans (see Table II), which is used to make judgments in quantifying interdependences for alternatives in the study area as mentioned above, although interdependences among 32 risk assessment criteria can be measured based on experts' knowledge. Table II presents assumptions of alternative development plans for ANP evaluation.

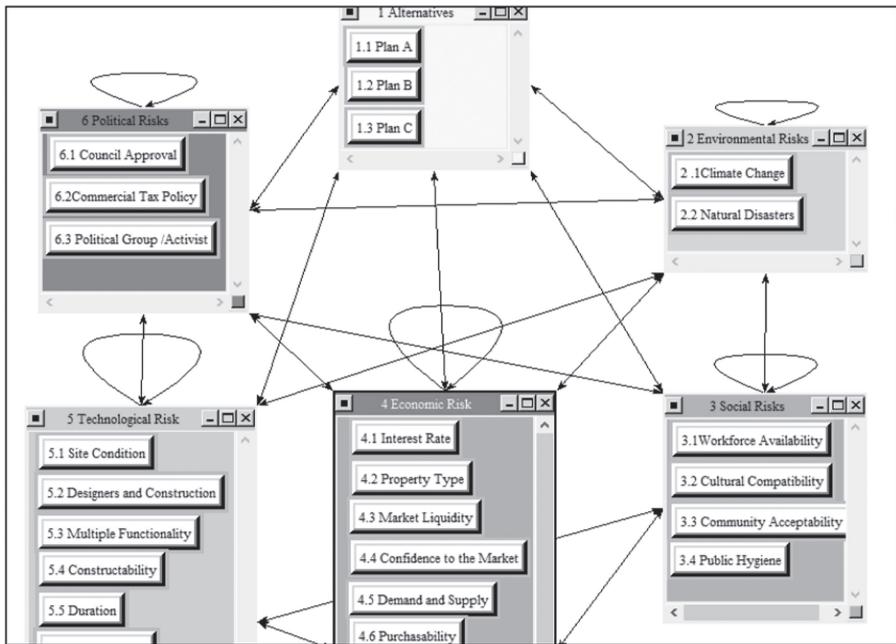


Figure 2.
ANP model for
commercial real estate
development risk
assessment

Source: Compiled by author

Sub-criteria	Valuation methods	Unit %	Plan A (%)	Plan B (%)	Plan C (%)
2.1. Climate changes	Degree of impacts to use and value due to regional climatic variation	%	60	30	40
2.2. Impact of natural disasters	Degree of impacts due to natural disaster	%	60	30	40
3.1. Workforce availability	Degree of developer's satisfaction to local workforce market	%	60	50	60
3.2. Cultural compatibility	Degree of benefit for local communities	%	80	90	80
3.3. Community acceptability	Degree of business and lifestyle harmony	%	80	85	75
3.4. Public hygiene	Degree of impacts to local public health and safety	%	25	20	25
4.1. Interest rate	Degree of impacts due to increment of loan rate	%	40	60	40
4.2. Property type	Degree of location concentration	%	65	60	65
4.3. Market liquidity	Selling rate of same kind of properties in the local market	%	80	80	80
4.4. Confidence to the market	Degree of impact due to exchange rate fluctuation	%	20	40	20
4.5. Demand and supply	Degree of regional competitiveness	%	50	60	50
4.6. Purchaseability	Degree of affordability to the same kind of properties	%	80	60	80
4.7 Brand visibility	Degree of developer's reputation in specific development	%	85	80	85
4.8. Capital exposure	Rate of estimated lifecycle cost per 1m rupee	%	90	75	85
4.9. Lifecycle value	5-year property depreciation rate	%	12.5	20	12.5
4.10. Area accessibility	Degree of regional infrastructure usability	%	75	75	75
4.11. Buyers	Expected selling rate	%	80	75	70
4.12. Tenants	Expected annual lease rate	%			
4.13. Investment return	Expected capitalization rate	%	25	30	20
5.1. Site condition	Degree of difficulties in site preparation for each specific plan	%	30	20	30
5.2. Designers and constructors	Degree of developer's satisfaction to their performances	%	75	70	75
5.3. Multiple functionality	Degree of multiple use of the property	%	25	20	25
5.4. Constructability	Degree of technical default in construction	%	30	35	30
5.5. Duration	Total duration of design and construction per 1,000 days	%	146	95	110
5.6. Amendments	Possibility of amendments in design and construction	%	25	25	25
5.7. Facilities management	Degree of complexities in facilities management	%	80	75	80
5.8. Accessibility and evacuation	Degree of easy access and quick emergency evacuation in use	%	60	50	60
5.9. Durability	Probability of refurbishment requirements during buildings lifecycle	%	20	20	20
6.1. Political groups/activists	Degree of protest by the urban communities	%	20	25	20
6.2. Commercial tax policy and local tax policy	Degree of commercial tax policy affect to project	%	20	20	20
6.3. Council approval	Total days of license approval process by urban council	%	40	40	40

Table II.
Assumptions of
development plans for
ANP evaluation

Source: Compiled by author

Risk assessment model (Step 1)

The risk assessment model was constructed using super decision software. Figure 2 illustrates the ANP model for commercial real estate development.

Figure 2 illustrates that the ANP model is based on the 32 defined risks. What is intriguing of ANP method is that it provides an effective mechanism for decision makers to

quantitatively evaluate interrelations between either paired criteria or paired sub-criteria, and this makes it possible for decision makers to reuse expertise for commercial real estate development in terms of the assessment of all defined risks (Table I). As illustrated in Figure 2, the ANP model consists of five clusters, including alternatives, environmental risks, social risks, economic risks, and technological risks and political risks. There are 32 nodes in total inside the ANP model, out of which three nodes are inside the alternative cluster, i.e., Plan A, Plan B and Plan C. They are alternative plans for a specific commercial real estate development in Gampaha, Ja-Ela and Ekala in an experimental case study in this research to demonstrate the effectiveness of using ANP in finding the most appropriate plan. The other 32 nodes are located in other five clusters. In addition, two-way and looped arrow lines in Figure 2 describe the interdependences that exist between paired clusters as well as nodes (Saaty, 2005); in other words, fixed interrelations between paired clusters are observed. Similar fixed interrelations are noticed between paired nodes inside one cluster as well as from two different clusters. To quantitatively measure all interrelations inside the ANP model, questionnaire survey to comparison of relative importance between paired clusters as well as nodes is required. The questionnaire survey is helpful to apprehend experts' knowledge in each specific domain and concentrate it into the ANP model. This result in the ANP model being applicable as a decision-making support tool based on knowledge reuse.

The structure of the ANP model is shown in Figure 2. However, the pair-wise comparison is adopted using subjective judgments made in regard to the fundamental scale of pair-wise judgments (Saaty, 2005). Table II gives a general description of how to conduct the pair-wise comparison between paired clusters as well as nodes in regard to their interdependences defined in the ANP model (Figure 2), and relative importance based on their specific characteristics and experts' knowledge. In this paper, the ANP model is set up based on the authors' knowledge about risk assessment criteria, which is used to make judgments in quantifying interdependence for 32 risk assessment criteria inside Clusters 2–6 except the three alternatives in Cluster 1 (Figure 2) and specific characteristics of alternative plans which is used to make judgment in quantifying interdependence for alternatives in case study. Table III is shown the scale of pair-wise comparisons.

Paired comparison (Step 2)

In order to quantify all the possible interdependent relations inside the model, the pair-wise comparison is adopted using subjective judgments made in regard to the fundamental scale of pair-wise judgments (Saaty, 2007). Table III gives a general description as to how to conduct the pair-wise comparison between paired clusters as well as nodes defined in the ANP model (Figure 1). The relative importance is based on the specific characteristics and expertise knowledge.

Scale of pair-wise comparisons

Notes

- (1) The fundamental scale of pair-wise judgments: 1 – not important; 2 – not to moderately important; 3 – moderately important; 4 – moderately to strongly important;

Clusters/nodes	±1	±2	±3	±4	±5	±6	±7	±8	±9
Cluster I	x	x	x	x	x	↘	x	x	x
Cluster J									
Node I _i	x	x	x	x	x	↘	x	x	x
Node J _j									

Source: Chen and Khumpaisal (2009)

Table III.
ANP judgment
between paired
clusters/nodes

- 5 – strongly important; 6 – strongly to very strongly important; 7 – very strongly important; 8 – very strongly to extremely important; and 9 – extremely important.
- (2) The symbol “x” denotes item under selection for pair-wise judgment, and the symbol “√” denotes selected pair-wise judgment.
 - (3) I and J denote the number of clusters, while i and j denote the total number of nodes.
 - (4) The symbol “±” denotes importance initiative between compared nodes or clusters.

Super matrix calculation (Step 3)

After pairing comparison to form a two-dimensional super matrix for further calculations, the calculation of super matrix is required to acquire useful information for development plan selection. The calculation of super matrix is conducted through three steps: transform an initial super matrix or un-weighted one based on pair-wise comparison to a weighted super matrix and then to a synthesized super matrix. The result from the synthesized super matrix is given in Table AI.

Final risk assessment (Step 4)

According to the results, Plan A is identified as the most appropriate plan for the specific development, because it indicates the highest synthesized priority weight among the three alternatives. According to Table IV, the synthesized values for three projects were 0.0704, 0.0532 and 0.0431, respectively. It was identified that Ward City was 0.0704, indicating that it is comparatively less risky and, hence, can be categorized as the best development. As a result, Plan A which is Word City development project is selected by the ANP model for the regeneration project in Gampaha.

Types of risk prioritization

Prioritization of the key risk factors affecting to the commercial real estate development process is important in making decisions, as it helps to comprehend as to what risk factors are the highly affected and the least affected risk factors in the commercial real estate development process. Table V demonstrates the risk type and prioritized value.

According to Table V, the minimum affected risk factors are confidence to the market, lifecycle value, investment return, currency conversion and the like. The highly affected risk factors being council approval process, the natural disaster impact, climate changes, cultural compatibility, community acceptability and the like are also considered other affected risk factors. Those factors are helpful to all the real estate developers to manage some risk factors.

Risk management

After assessing the risk some risk cannot be avoided, thus risk management is an important concept. If organizations are attempting to manage the corporate real estate risk, then they need a framework to identify the sources of risk in a similar way to that developed for strategic business risk by Simons 1999 cited in Frodsham (2007); Simons

Results	Plan alternatives		
	Plan A	Plan B	Plan C
Synthesized priority weights	0.0704	0.0532	0.0431
Ranking	1	2	3

Table IV.
Comparisons of
alternative
development plans
based on ANP
modeling

Source: Compiled by author

Name	Risk Type	Normalized By Cluster
4.4 Confidence to the Market	Economic Risk	0.01304
4.9 Lifecycle value	Economic Risk	0.01462
4.14 Investment Return	Economic Risk	0.01631
4.11 Currency Conversion	Economic Risk	0.01814
4.1 Interest Rate	Economic Risk	0.02405
5.9 Durability	Technological Risk	0.02425
4.5 Demand and Supply	Economic Risk	0.02636
5.6 Amendments	Technological Risk	0.03103
5.3 Multiple Functionality	Technological Risk	0.03468
3.4 Public Hygiene	Social Risk	0.03973
5.4 Constructability	Technological Risk	0.04258
4.2 Property Type	Economic Risk	0.04501
5.1 Site Condition	Technological Risk	0.05544
4.6 Purchasability	Economic Risk	0.07303
5.8 Accessibility and Evacuation	Technological Risk	0.07434
4.13 Tenants	Economic Risk	0.07544
5.2 Designers and Construction	Technological Risk	0.11323
4.10 Area Accessibility	Economic Risk	0.13160
4.12 Buyers	Economic Risk	0.13199
4.3 Market Liquidity	Economic Risk	0.13671
4.8 Capital Exposure	Economic Risk	0.14581
3.1 Workforce Availability	Social Risk	0.14716
4.7 Brand Visibility	Economic Risk	0.14787
6.3 Political Group /Activist	Political Risk	0.17403
6.2 Commercial Tax Policy	Political Risk	0.19128
5.7 Facilities Management	Technological Risk	0.22240
5.5 Duration	Technological Risk	0.40207
3.2 Cultural Compatibility	Social Risk	0.40579
3.3 Community Acceptability	Social Risk	0.40732
2.1 Climate Changes	Environmental Risk	0.5
2.2 Natural Disaster	Environmental Risk	0.5
6.1 Council Approval	Political Risk	0.63469

Highly affected Risk Factors

Table V.
Risk
prioritization table

Source: Compiled by author

conducted a survey into risk management practice and disclosed that, while investing in the commercial real estate assets, it will deliver a return in the form of an income stream, but the income stream is uncertain to forecast as well as any events which would affect the income stream. On the other hand, Strischek (2007) suggested that some

mandatory data should be added into risks measurement criterion, including original appraised value, bank-adjusted appraised value, capitalization rate from appraisal and loan to value at inception.

Conclusion and recommendation

The results revealed five major risk factors, i.e. environmental, social, economic, technological and political risk and 32 sub-risk factors. According to the super matrix calculation, the synthesized values for three projects were 0.0704, 0.0532 and 0.0431, respectively. Ward City being 0.0704 indicates that it is comparatively less risky, and hence, can be categorized as the best development. Considering the sub-risk factors; the results show that the highly affected risk factors for the development are: the council approval process, climate changes and natural disaster, and the least affected risk factors are confidence to the market, lifecycle value, investment return and currency conversion factor. Duration, cultural compatibility and community acceptability moderately impact on commercial development. Therefore, policy formulation should focus on minimizing the risk in the highly affecting risk factors in Sri Lanka. Further researchers should concentrate on improving different network structures using the ANP model with regard to risks.

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Considerations for the design and management of property database in opaque markets

Viewpoints from Lagos, Nigeria

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Design and
management
of property
database

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Abstract

Purpose – Earlier studies have suggested the creation of a central database of concluded property transactions as a panacea to the property data debacle. It is in this regard that the purpose of this paper is to examine the perception of potential users of centralised property database on the consideration for the design and management of such database.

Design/methodology/approach – Questionnaires were administered on 190 property practitioners (referred as estate surveying and valuation firms) in Lagos property market. Frequency index, frequency distribution and percentage were employed for data analysis.

Findings – The result showed that respondents preferred a web-based databank and free access to the information in the databank by those who recorded their market data in it. They also preferred uniform recording standard in the databank, an interface that must be user friendly and secure to prevent unauthorised user from gaining access, amongst others. The practitioners also preferred that their professional body manage the databank when it is created.

Practical implications – The paper provides useful insights into creating a property database that will improve accessibility to property data in opaque markets.

Originality/value – There is still little or no empirical research on framework/end-users' requirements for the creation of property transaction database in emerging property markets.

Keywords Valuation, Database, Lagos, Data debacle, Market data, Opaque market

Paper type Research paper

1. Introduction

Unlike the stock markets where data on current market prices of shares are easily accessible by simply consulting the pages of newspapers, calling a broker, logging into a website or watching TV news, property market data are scarce. Data concerning sale prices, lease terms and any other agreements, which are part of a transaction, are usually not available to individuals who are not party to the transaction (Fisher and Martins, 2007; Olapade and Olaleye, 2018, 2019). This, coupled with infrequent transaction and heterogeneity of property, makes it difficult for participants in the property market to acquire information on the market (Huges, 2015). The market participants are thereby constrained from searching and analysing the necessary property data due to the lack of reliable and accessible sources of information (Yang *et al.*, 2015).

The challenges of data accessibility in the property market have been blamed on the lack of centralised database of property transactions, and the solution suggested to remedy this situation was to improve property data management practice particularly as it relates to accessing and disseminating property data (Rowley *et al.*, 1998a; Ajibola and Oloyede, 2010; Olapade and Olaleye, 2018, 2019). For example, The Mallinson Report (RICS, 1994) advised members of the Royal Institute of Chartered Surveyors to co-operate in the production of central database of property transactions. Rowley *et al.* (1996) also supported this view by advocating the combination of transactional data of surveyors in the UK and pooling it into



a central platform known as National Valuation Evidence Database (NVED). Again, Olapade and Olaleye (2018, 2019) opined that the professional bodies of property practitioners should create repository for data assemblage and encourage members to record their concluded transaction data in the repository.

Advances in technology, particularly the digital technology have changed the way real estate data are managed (retrieved, analysed, transmitted, reported and stored) in recent years in the developed property market of America and Europe (Cirincione and Bacharach, 2007). This has made the use of centralised database a commonplace in developed property market (Tomson, 2016). However, this is not the case in some emerging property markets like Nigeria where there is still no centralised database of property transactions (Olaleye, 2004, 2017; Olapade and Olaleye, 2018, 2019). Studies such as Olaleye (2004), Ajibola and Oloyede (2010) and Olapade and Olaleye (2018, 2019) in emerging opaque property markets where there are no centralised databases were unanimous in recommending the creation of central database as a panacea to the problem of inaccessibility of data. This is because access to property database will provide information on comparable necessary for evidenced-based valuation and investment analysis (Anim-Odame, 2018). However, the considerations in the design and operation of database for property were unclear from the findings of these studies. Meanwhile, accessibility to property data is necessary to improve market transparency and reduce information asymmetry problem in the property market (Eichholtz *et al.*, 2011; Newell, 2016).

An improvement in market transparency will mean an improvement in the efficiency of the market with its attendant consequences for better property investment decision making in the property sector. The close link between real estate and the general economy suggests that not only will an efficient property market have consequences for property investment decisions, but also it will impact on the general economy of a country (Olowofeso *et al.*, 2013; Olapade *et al.*, 2018). The real estate sector in Nigeria, for example, contributed 6.4 per cent to the real gross domestic product in the fourth quarters of 2018 (Nigeria Economic Submit Group, 2019). Therefore, with improvement in data accessibility, market transparency and opportunity for better investment decision making, it is expected that the real estate sector will contribute more to the growth of the country's economy. In addition, adequate access to property data is necessary for professional property practitioners to render near accurate professional valuation and investment analysis (Olapade and Olaleye, 2018, 2019). It also promotes performance analysis of properties and framework for the generation of indices and other property-related benchmark (Anim-Odame, 2018). Besides, the creation of such database would enable the formulation of return enhancing investment decision in the property as investors, most especially at the institutional level, who are usually concerned with the outcomes of their investment decisions, would be provided with metrics upon which sound investment decisions could be predicated. The foregoing, therefore, underscores the need to examine the perception of the potential users of centralised property transaction database on the consideration for its design and management. This is the focus of this study.

2. Literature review

Data are collections of facts, concepts or instructions in a formalised manner suitable for communication or processing by human beings or by computer (Intra-governmental Group on Geographic Information, 2005). Data, as used in this study, relate to property data and, in particular, transactional data, which include the sales price and rent of property and other information in concluded transactions. Databank/Database, however, is the collection of data arranged for ease and speed of search and retrieval. It relates to a collection of property transactional data on a web-based computer application arranged for ease and speed of search and retrieval (Boyce *et al.*, 2006; Gordon, 2007). The presence of a centralised database of

property transactions will no doubt increase the availability of comparable evidence needed in valuation and investment analysis (Rowley *et al.*, 1998a). The consequence of this is improvement in the quality of services being rendered to clients by practitioners.

The problem of database in the property market has been a subject of intense academic research around the world, especially in the developed countries. Available studies have shown that efforts were concentrated on many aspects of this issue. These included the importance of database (Olaleye, 2004; Ajibola and Ogungbemi, 2011; Rowley *et al.*, 1996), examination of constraints to data assemblage (Rowley, 1998; Rowley *et al.*, 1998a; Olaleye, 2004; Olapade, D.T., 2014), willingness of property practitioners towards property data sharing and assemblage (Rowley *et al.*, 1998a, b, Olapade and Olaleye, 2018, 2019), and comparative database framework (Tomson, 2016). However, studies that focussed on the design consideration for database in the property market have been limited.

Rowley *et al.* (1998b) developed a closed on-line comparable evidence database system referred as NVED. In designing the database, the study identified the requirements essential for the database to include, software format familiarity to users, easy to use and self-explanatory user interface. The entry of comparable data must be quick, efficient and simple but provide for the comprehensive recording of all factors influencing value. The database must facilitate the uniform recording of data items through the use of standardised data entry techniques. The database must permit fast and effective use of query searches to retrieve relevant comparable evidence and finally metadata must be available to the user to allow an assessment of the quality of the comparable evidence/data. Although the study suggested basic requirements that a database must meet, it did not consider the perception of potential users of the database on such criteria.

In a similar vein, Yang *et al.* (2015), using Feng County in China as case study, designed and implemented a service-oriented geographical information system (GIS) and web-based property database that provide spatial and benchmark land price-related information. The system was developed based on a four-level Browse Server (B/S) architecture that included interface tier, web services tier, business logic tier and data tier. The interface tier provides client with visualisation of land price information, whereas the web services tier acts as a gate between the client and the server and connects the interface tier and the business logic tier. The business logic tier is the core of the system, where land price analysis models are carried out when there is a request from the web browser. The fourth level, the data tier, is where the spatial and non-spatial database are stored. Again, Anim-Odame (2018) provided information on the development of a property database being employed by the Lands Commission in Ghana for valuation. The desktop database records property description, property size and sale and rent data. It could also search for comparable data and use for automated valuation. Although the studies partly provided operational framework for the design of central database, they did not empirically identify users' requirements for the database.

The indigenous studies in Nigeria that have examined issues related to the creation of central database include Olaleye (2004), Obembe and Ogundele (2009), Ajibola and Oloyede (2010) and Usman (2010). Olaleye (2004) studied the need for property database in Nigerian property market revealing that majority of the practitioners believe that there is need for database in the Nigeria property market. The study did not, however, focus on the design requirements of such database. Similarly, Ajibola and Oloyede's (2010) study revealed that about 85 per cent of the practitioners surveyed agreed to subscribe to a central database if available. Again, the study of Olapade and Olaleye (2018, 2019), which examined the willingness of property practitioners to support property data assemblage/creation of centralised database, discovered an overwhelming support by property practitioners for the creation of a centralised database. These studies, however, did not consider framework for the design and management of the central database and user's requirement for such design.

Meanwhile, the design of framework for a web-based database system in Nigeria was the focus of study in Obembe and Ogundele (2009) and Usman (2010). However, the databases designed in the studies were not particularly for property data assemblage. Obembe and Ogundele's (2009) study was based on database for the management of healthcare data, whereas that of Usman (2010) was on land title management. Thus, there is still little or no empirical research on framework/end-users' requirements for the creation of property transaction database in emerging property markets.

In addition, the perception of property practitioners on the construction and operationalisation of a central database for the management of property market data has not been documented in emerging African property markets. Meanwhile, the provision of this information has potentials to lead the ways towards tapping into the huge potential for cross-border real estate investment by institutional investors. This study intends to bridge this gap by investigating the design considerations and requirements of a centralised property transaction database from the perspectives of property practitioners in the Lagos property market, Nigeria. The choice of Lagos is influenced by its status as a first-tier property market where vast amounts of the property investment and development activities take place (Dugeri, 2011).

3. Methodology

The survey research design was used for this study. The studied population consisted of the professional property practitioners referred to as estate surveyors and valuers in Nigeria. The choice of the population was because they are the main users of property data and one of the potential users of the database when developed. Questionnaires were administered on estate surveying and valuation (ESV) firms to obtain relevant information relating to the objectives of the study. To access the ESV firms, this study made reference to the 2015 directory of corporate individual members and registered ESV firms of the Nigerian Institution of Estate Surveyors and Valuers (NIESV). The directory revealed that 382 registered ESV firms had their head offices located within the Lagos property market. This figure, therefore, represented the sample frame. From the sample frame of 382 firms, a total of 191 firms in the study area were selected, representing approximately 50 per cent of the sample frame. The choice of the fraction of the sample size was in line with the submission of Watson (2001) that suggested a sample of 50 per cent of the population for a homogenous population above 100. The identified offices were physically visited, and the survey instruments were administered to each firm. Although cumbersome and resource consuming, this approach ensures data reliability and enables the researcher to clarify ambiguities and difficulties respondents might encounter in completing the questionnaire.

Learning from previous studies such as Rowley *et al.* (1998a, b) and Tomson (2016) as well as the approach employed by international property data generation agencies such as JLL and CBRE, the respondents were presented with questions regarding considerations in the design of database. The respondents were asked to rank the variables as identified in the literature on a five-point Likert scale as follows: "strongly agree", "agree", "not sure", "disagree" and "strongly disagree". The categorical data were later assigned scores of 5–1, and the relative significance index (RSI) was calculated. RSI was evaluated by adapting Bageies and Fortune's (2009) expression:

$$RSI = \frac{A}{B+C}, \quad (1)$$

where RSI is the relative significance index, A the total score (the addition of the product of the numbers of responses to each of the variables and the weight value attached to each rating), B the highest response option (5 in this case), and C the total number of responses.

The index, thus, ranges from 0 to 1, and the higher the RSI or the closer the value to 1, the higher the level of agreement of the respondents to the particular question enquired.

In addition, questions were also presented to the respondents on the management of central database and options were provided to them to choose from and frequency distribution and percentage were employed to analyse the data. Out of a total of 191 questionnaires distributed, 135 questionnaires were retrieved and found useful for analysis. This represents about 71 per cent of the administered questionnaire.

4. Findings and discussions

The result of the research is presented in this section. It is divided into three parts: the first part is on the background information of the respondents, whereas the second part focusses on the consideration in the design of the central database. The last part of this section examines the management of the central database.

4.1 Background information and profile of respondents

Information on the profiles of the respondents was obtained to establish their suitability for the study. The information obtained included academic and professional qualifications and post-graduation experience of respondents. These pieces of information are presented in Table I.

From Table I, 18 (13.3 per cent) respondents did not possess a first degree, whereas 92 (68.2 per cent) had first degree in estate management as their highest qualification. Also, only 25 (18.5 per cent) possessed a post-graduate degree. This shows that more than 87 per cent of the practitioners, in Lagos property market, had at least first degree education. Similarly, the professional qualifications of the respondents are also displayed in Table I. According to Table I, 55.6 per cent (75) were probationer members, 20.7 per cent (28) were of the associate grade, 22.2 per cent (30) were registered estate surveyors in addition to being of associate grade of the NIESV the umbrella professional body of practising surveyors in Nigeria. Again, the post-graduation experience of Lagos market practitioners is displayed in Table I.

The analysis reveals that about 45.2 per cent (61) of the practitioners had 1–5 years of experience, 20.7 per cent 28 had between 6 and 10 years of experience, 17.8 per cent had between 11 and 15 years of experience, whereas 9.6 per cent 13 of the practitioners had between 16 and 20 years of experience. The result suggests that majority of the practitioners

Background information	Characteristics	Number of respondents	
		Number of respondents	Percentage
Academic qualification	Below 1st degree	18	13.3
	1st degree (HND, BSc/B.Tech)	92	68.2
	Post-graduate/2nd degree (PGD, MSc, MBA, MA)	25	18.5
	Above 2nd degree	0	0
	Total	135	100
Post-graduation experience	1–5 years	61	45.2
	6–10 years	28	20.7
	11–15 years	24	17.8
	16–20 years	13	9.6
	No response	9	6.7
	Total	135	100
Professional qualifications	Probationer	75	55.6
	ANIVS	28	20.7
	ANIVS and RSV	30	22.2
	No response	2	1.5
	Total	135	100

Table I.
Background information of respondents

in the Lagos property market were fairly experienced. The analysis of the result of the level of professional and academic qualifications and post-qualification experience of the respondents validates the data collected from this study to be reliable. This is because the respondents were expected to be familiar with issues relating to design of central database in the property market and, therefore, should be able to provide reliable information in this regard.

4.2 Consideration in the design of the central database

As stated earlier, the respondents were presented with some factors to be considered in the design of the central database and were asked to rank their level of agreement with the factors. Table II presents the RSI of the factors to be considered when designing the central database as ranked by the practitioners.

According to Table II, the respondents assigned high scores to all the variables (factors) to be considered in designing the property database. This connotes that their level of agreement to the consideration is high. The factors in their order of agreement by respondents include the database should be web-based, free access to the information on the database by those who record their market data on the database, uniform recording standard in the database, interface of the database must be user friendly, availability of security features that will prevent unauthorised user from gaining access, allowing query search using address of property and/or other criteria, recording of data on factors influencing value of property, and metadata. These findings underscore the willingness of property practitioners to the development of a web-based property database that could improve upon their service delivery and also enhance sound investment decision making in Nigeria.

The choice of a web-based application for the database could be as a result of its benefits. A web-based application is an application that resides on a company's web server, which any authorised user can access over a network, such as the World Wide Web. Such application has three layers: web browser, content generation technology tool such as Java servlets or Active Server Pages, and the company database. In the application, the web browser makes the initial request to the middle layer, which, in turn, accesses the database to perform the requested task, either by retrieving information from the database or by updating it. A web-based application is robust and can allow multiple users at the same time. It allows interconnectivity among users. Possible computer programmes that can be employed in the design of a web-based application includes: PHP (PHP: Hypertext Preprocessor), MySQL (My Structure Query Language), Ajax (Asynchronous JavaScript and XML) and jQuery among others (Olapade, D., 2014). The result somehow differs from that of Rowley *et al.* (1998b) where a non-web-based programme (Microsoft Access 97) was suggested for development the software.

With regard to recording of property data on the database, the practitioners favoured that the database be designed in a manner that will allow for uniform recording of property data and allow comprehensive data recording of factor influencing property value. This is perhaps because the recording of property data that will be used as comparable should be as efficient as possible to allow comparability. In this regard, a standardised data entry should

Table II.
Consideration
in the design of
central database

Design considerations	RSI	Rank
The database should be web based and easily accessible on the internet	0.90	1st
Free access to information on the database by those who record their market data on the database and minimal charges by other users	0.89	2nd
Database should allow uniform recording standard	0.85	3rd
It must possess security features that will prevent unauthorised user from gaining access	0.83	4th
Query search using address of property and/or other criteria should be allowed on the database	0.80	5th
Database must allow recording of data on factors influencing value of property	0.75	6th
Allows the user to obtain information about data recorder and data accuracy checks	0.71	7th

be provided in the databank that will allow comprehensive recording of property data. This could be through a combination of standard data entry lists and inability to submit recorded data until all required information is completed. The standard lists could be presented in the form of drop-down menu, which contains all common entries to the data field, thereby reducing typing and preventing omitting relevant information to be recorded in the database. Again, the information content in the existing database in developed property market such as those of MSCI, CBRE, JLL could also be a guide in this regard.

In similar vein, the respondents' high consideration for the inclusion of query search in the database is possibly to allow for search of comparable records that match certain criteria that relates to the subject property during valuation exercise. The database could, therefore, be designed to permit query searches using location, type of property and other information such as date of transaction among others.

In addition, the consideration that the database must possess security features that will prevent unauthorised user from gaining access is to make it a closed user's application. The reason for this might be attributed to the confidentiality attached to property data in opaque market as discovered by Olapade and Olaleye (2019). Making the database a closed user's application might be able to relieve the fears of practitioners that might be sceptical in releasing their data to the database. Creating a closed user application involves all users of the database to register their details such as name, e-mail, which are verified by the administrator before an account which will be operated with a password is created. This will also allow the users of the database to obtain information about data recorder and be able to do data accuracy checks using the information supplied during creation of the account of the data recorder. The check is allowed by incorporating metadata features in the database that will link the property data recorded with the data recorder.

Furthermore, on the issue of access to information on the database, the preference of the respondents for free access to the database for those who must have recorded their market data on the database is in line with the findings of Olapade and Olaleye (2018, 2019). Free access to the database will serve as incentives for practitioners to store their data on the databank and thereby ensuring sustainability of the database.

The creation of a database with these identified features will enable the storage and retrieval of property transactional data for investment analyses. Such data could be available in annual, quarterly and monthly forms for different property types. However, mechanisms for the enforcement of ethical considerations are essential for the functionality of this database.

4.3 Management of a central database of concluded transactions

Again, the respondents were asked who in their opinion should manage the central database when created. Four options were provided for respondents to choose from, these are the professional body of property practitioners, NIESV, private organisation, professorial seat/academia and a trustee comprising all the other three options. The result as revealed in Table III shows that majority of the respondents (71.4 per cent) favour the NIESV to manage the database. This is followed by support for trustee comprising NIESV, private organisation,

Bodies	Frequency	Percentage
Nigerian Institution of Estate Surveyors and Valuers (Professional body)	90	71.4
Private organisation	9	7.1
Professorial seat/academia	4	3.2
Trustee	23	18.3
Total	126	100

Table III.
Management of the central database of concluded transactions

professorial seat/academia (18.3 per cent), private organisation (7.1 per cent) and lastly the academia (3.2 per cent).

The reason for this result might be that the practitioners are of the view that their professional body would safeguard the database for the use of the entire profession because the professional body practically understands its importance to their service provision. Perhaps, ethical considerations on confidentiality, accuracy and adequacy regarding the operationalization of property database are best enforced by the professional body with understanding of the collective benefits of such facility. This result shows the wide disparity between the practitioners and academia community. For example, only 3.2 per cent of the respondents agreed that the database should be managed by the academia. This underscores the dichotomy between the academia and real estate practitioners in Nigeria suggesting the lack of collaboration between academia and practice. It is, therefore, imperative that the “gown should be brought to town”.

5. Conclusion

Access to property data improves transparency and reduces the problem of information asymmetry in the property market. It also improves the quality of valuation and investment analysis services in the market. However, the nature of property makes access to data difficult. The creation of a central database of concluded transactions has, however, been identified as a panacea to resolving the data availability and accessibility problem that property market participants in emerging market grapple with. In a bid to enhance property data assemblage and storage, through the creation of a centralised database, this study examined the design consideration and management for such database. The result shows that the respondents favour an on-line central database into which property practitioners could record details of transactions and from which any practitioner could retrieve these transaction details thereby resolving the data availability constraints and opaque classification of the Nigerian property market. This will enable scientific-based property analysis with potential for increased cross-border investment into the Nigerian real estate market that will consequently allow the real estate sector to contribute more to the growth of the country's economy. It will also improve the quality of valuation and investment analysis services provided by property practitioners. Meanwhile, the design of the property database without the consideration for the preferences of the practitioners who will be the major potential users of the database might affect the acceptability and sustainability of the database when designed. The design considerations should, therefore, be emphasised when designing the database.

Also, the practitioners favoured that their professional body, the NIESV, manages the database when it is created. This is consistent with the submission of RICS (1994) that only the professional bodies can generate the necessary drive and direction for creation of central database. The professional body, NIESV, should, therefore, take the driving seat in the creation of the central database by commissioning the design of web-based application/software in line with the consideration in this study that will serve as a platform for recording and assemblage of concluded transaction in the Nigeria property market. The findings of this study could be the framework for the design of the central database by the professional body. It would also serve as a useful policy tool for the NIESV and other professional association in emerging opaque market in their quest for the creation of a central database geared towards the provision of accurate and reliable data upon which sound real estate investment decision could be predicated.

Although this study has examined the perceptions of practitioners regarding their considerations in the design and management of a centralised property database, it could be extended to capture the views of other stakeholders such as policy makers, financial institutions, property owners and regulatory bodies.

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A study on the mediating effect of residential loans on total real estate loans of banks in India

Mediating
effect of
residential
loans

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Abstract

Purpose – The purpose of this paper is to examine the impact of residential and commercial loans on total real estate sector loans by using partial least square–structured equation modelling (PL–SEM) method. The residential loans as a mediator have been used to know the mediation effect between commercial and total real estate loans of banks in India. The residential loans as a mediator govern the relationship between commercial loans and total real estate loans in India. Real estate sector development is a lucrative opportunity for India. The real estate sector plays a major role in shaping economic conditions of the individuals, firms and family.

Design/methodology/approach – The research is descriptive in nature. The study on residential loans, commercial loans and total real estate loans has been taken into consideration, and on the other hand the measurement and structural model have been employed to the study the impact of residential loans and commercial loans on total real estate loans in India by using PL–SEM. The residential loans as a mediator have been taken to study the mediation effect of the relationship between commercial loans and total real estate loans in India.

Findings – The outcome of the structural model that is bootstrapping technique shows that there is an impact of residential and commercial loans by public and private sector banks on total real estate sector development in India. The residential loans show the full mediation effect between commercial loans and total real estate loans as the value of variation accounted for (VAF) is more than 1.93 which shows residential loans govern the nature of variable between commercial loans and total real estate loans.

Practical implications – The public and private sector banks are contributing to the real estate sector development in India which increases the economic growth of the country. The mediation analysis shows that residential loans are an important aspect between commercial and total real estate loans in India as the demand for residential housing is more in India. The increasing role of banks in the real estate sector strengthens the financial capability in the real estate sector market, and the property buyers will be able to purchase more property which leads to increasing demand for real estate sector.

Originality/value – The research paper is original, and PL–SEM has been used to find the results.

Keywords Real estate loans, Public sector banks, Private sector banks, Path diagram, Residential financing, Commercial financing

Paper type Research paper

Introduction

The real estate sector is the largest component of our economy. It develops the economic conditions of the families and firms. The resources of the real estate affect the community ability to attract and support the business profitability as well as to provide a secure, convenient and affordable business environment for its citizens. The adequacy of the housing stock and public infrastructure including roads, bridges, dams, airports, schools and parks affects the quality of life in a region (LLP, Associates and ASA, 2015).

The Indian real estate is the premium sector of our economy. It is becoming the critical sector as the demand for the real estate sector is increasing because of the large volume of the population in India. The various reforms have been launched by the Prime Minister Narendra Modi like Real Estate Investment Trust and Real Estate Regulation Act, Pradhan Mantri Awas Yojana (PMAY) to support in the development of real estate sector in India (Tunde and Aluko, 2012).

Real estate is the property. The property is defined as anything that can be owned or possessed. Property can be a tangible or intangible asset. The assets which are tangible



include physical things, such as automobiles, clothing, land or buildings. Intangible assets are not physical and include the contractual rights (e.g. mortgage and lease agreements), financial claims (e.g. stocks and bonds), interests, patents or trademarks (CRISIL, 2010).

The real estate sector is one of the lucrative and fastest-growing markets in the world (LLP, Associates and ASA, 2015). It is being recognised as the infrastructure service which drives the economic growth engine of the industry. The Indian real estate market size is expected to touch \$175bn by 2020.

The real estate sector comprises of different segments which include residential real estate, commercial real estate, retail real estate, hospitality real estate and special economic zone (SEZ). Residential real estate includes families which are available for occupation and non-business purposes. Commercial real estate includes land and building which provides the rental gain and capital gain. Retail real estate refers to the last stop in the manufacturing chain where the merchants sell the products to the consumers, hospitality real estate includes the broad categories which take into account lodging, theme parks and hotels, and SEZs refers to the designated areas within the country with the special economic regulations that differ from the other areas in the same country (CRISIL, 2010).

The real estate sector is one of the lucrative and fastest-growing markets in the world. It is being recognised as the infrastructure service which drives the economic growth engine of the industry. This sector contributes about 5–6 per cent of the country's gross domestic product. According to the leadership in environment and environment design (LEED) which is the rating system for guiding the construction, operations and maintenance of green buildings, India ranks the third for the most LEED space on the global ground. Real estate sector is growing significantly provided the much-needed infrastructure for India's growing needs (Prasad *et al.*, 2015).

The public and private sector banks include residential financing and commercial financing. Residential financing refers to the financing/loan that one or more persons get in order to build the house or for the residential property in which they live. The loan is basically secured by the lien on the property or the borrowers pay over the specified period of time. On the other hand commercial financing refers to a way of offering loans to business for commercial real estate development (office purpose, for BPO development, etc.). It is generally offered by banks or other lenders.

The housing sector plays a pivotal role in the economy, and the transactions related to residential loans have been increasing in the current scenarios. As the buyers of the residential properties are young and educated, so they have the knowledge that how much they can take risk and different ways are available that what is the source available for getting loans related to housing and commercial properties (Mamata and Kumar, 2010).

There is the housing shortage in India because of which the role of the banks is increasing for giving finance related to residential and commercial real estate in India.

Partial least square-structured equation modelling (PL-SEM) helps in using multiple variables and criteria variables construct the unobserved (latent variables) and also helps in constructing model errors in the measurement of observed variables. Mediation effect shows that mediator governs the nature of the relationship between the other two variables. As residential loans have been taken as a mediator between commercial loans and total real estate loans, so residential loans govern the nature of the relationship between commercial loans and total real estate loans by banks in India.

The residential loans are considered as an important source for the mediating factor as these loans play the major role between commercial loans and total real estate loans. The public and private sector banks are providing a higher amount of loans to the residential real estate sector as compared to the commercial real estate sector. So the study related to residential real estate loans by banks has been taken into consideration as it plays a major role in influencing the relationship between commercial real estate loans and total real estate loans.

The study of residential loans shows how much there is a mediating effect between commercial loans and total real estate loans. The residential sector is the most important part of the real estate sector because the houses or shelters are required by each and every family whether they are rich, middlemen or poor. India is already facing the problem of shortage of houses by people so the main focus of this paper is on residential lending by public and private sector banks to know that the banks are supporting the residential real estate sector by providing the sufficient amount of finance or not. So, the problem of the shortage of houses in India due to the lack of finance has been reduced (Gabrielli, 2018). This will help to know that there is an impact of residential real estate lending on the total real estate sector development in India by using PL-SEM and mediation analysis.

Characteristics of real estate markets (Gyourko, 2009): first, heterogeneous products: the real estate market tends to be heterogeneous which means that each property has its unique features. Second, immobile products: it is immobile, as it is impossible to move the products from one location to another which is generally infeasible. Third, localised markets: it tends to be local. The potential users lie within a short distance of one another. Fourth, segmented markets: the markets are highly segmented due to the heterogeneous nature of the products. It is also segmented by the product price. Finally, privately negotiated transactions with a high cost: the property interest to be conveyed cannot be standardised and must be carefully assessed to determine the rights it actually contains.

Review of literature

The study focuses on the determinant of real estate prices dynamics in the case of Saudi Arabia. The regression shows that stock market returns move with real estate prices in bullish markets (Dohiman, 2017). How real estate investment affects Chinese economic growth which has a positive impact on economic growth both at national and regional levels. There is changing real estate market transparency in the European real estate markets. The study of real estate market transparency from 2000 to 2014 shows the improved real estate market in a global context (Gramene, 2016). The analysis has been made on the performance and evaluation of banks in India which shows that performance is good for the consolidated operations of public and private sector banks in India (Yadav, 2016). The report shows the study on real estate sector in India which reflects that the Indian real estate market is one of the most globally recognised sectors. The growth of the real estate sector is mainly due to the large population base, rising income level and rapid urbanization (LLP, Associates and ASA, 2015). The regression analysis as a statistical tool has been applied both to public and private sector banks on banks capital buffer and business cycle which shows business cycle is having an insignificant impact on the capital buffer but with different signs (Durafe and Singh, 2015). The real estate loans sector reflects the regional banking, economic conditions and examines state-banking industry which is specific, as well as there are regional economic determinants for real estate lending of commercial banks across 52 states (Ghosh, 2015). The role of central bank or any banking authority related has the responsibility that there is a safe and secure banking system related to a bank stress test of loan quality which is useful (Barth *et al.*, 2013; Marcelo *et al.*, 2008). The commercial real estate lending has reached a level which leads to the outcomes that are unexpected in the situation of a downturn (Lu and Whidbee, 2013; Rioja *et al.*, 2014). The study has been conducted related to the centres of the economy in the Asia-Pacific region: cities in the shadow of Tokyo and Beijing. The weights have been used to show the position of the cities in the Asia-Pacific markets (Cosmos, 2013). The study of Deb (2012) based on the management in prices of real estate, particularly, residential housing is important to the market economy as well as individual household. The emerging markets of China, India and Brazil exhibit characteristics of markets such as accelerating market growth, an industrial potential which shows the investment opportunity in these markets. Mamata and Kumar (2010) highlight certain areas of the banker and customer in specific to the State Bank of India in

housing finance in comparison with competitors in the housing industry and they also focus on the recovery system followed by the State Bank of India (Mamata and Kumar, 2010). The real estate industry overview provides information about the consumer's expectations of higher quality as India's integration is increasing with the global economy (CRISIL, 2010). The difference between commercial real estate and housing has been analysed by the use of correlation. The correlation between commercial real estate annual rates and commercial real estate vs owner-occupied houses shows real price growth on income-producing properties which is positively correlated with real estate house price appreciation (Gyourko, 2009). The commercial real estate lending is riskier than residential real estate lending because commercial real estate prices show more volatility historically (Igan and Pinheirp, 2010). The performance of real estate market reflects inter-state correlations of the potential significant portfolio diversification benefits for the real estate sectors. Real estate markets in China: the study shows that international real estate managers are likely to increase attention in the Chinese real estate markets for investment in both direct and indirect real estate markets (Newell and Kamineni, 2007). The banks have the high liquid assets share which reflects the safer assets portfolio and involved in less risky projects. The high liquidity helps in reducing bank lending (Kashyap and Stein, 2000). The banks which are highly profitable have fewer incentives to engage in risky activities which shows that profits are expected to impact negatively the real estate lending. There are real estate opportunities abound in the global market. The technological advances may create a global marketplace but the fundamental difference amongst nations and their business environment will continue to exist (Clark, 1992).

Objectives of the study

The research paper focuses on the impact of residential and commercial loans by public and private sector banks on total real estate sector in India and, on the other hand, focuses on the study of mediation effect of residential loans between commercial loans and total real estate sector loans. This study helps to know the impact of residential loans and commercial loans on development of real estate market.

Research methodology

The research is descriptive in nature. The data are collected from the research papers. The data are based on secondary sources. The sample banks include public and private sector Banks. The public sector banks include the State bank of India, Punjab National Bank (PNB), Canara Bank, Industrial Development Bank of India (IDBI) and Indian Bank. On the other hand, private sector banks including HDFC Bank, Industrial Credit and Investment Corporation of India (ICICI) Bank, Axis Bank, DCB Bank, Yes Bank and which provide residential and commercial loans for the development of real estate sector have been taken into consideration for the study.

Statistical tools

The measurement model and structural model assessments have been employed to study the impact of residential and commercial loans by public and private sector banks on the total real estate sector in India by using PL-SEM. The mediation technique has also been used in modeling PL-SEM in which residential loans are taken as a mediating variable (Figure 1):

- H₀*. There is no impact of residential loans, commercial loans by public and private sector banks on total real estate sector development in India.
- H₁*. There is the impact of the of residential loans, commercial loans by public and private sector banks on the total real estate sector in India.

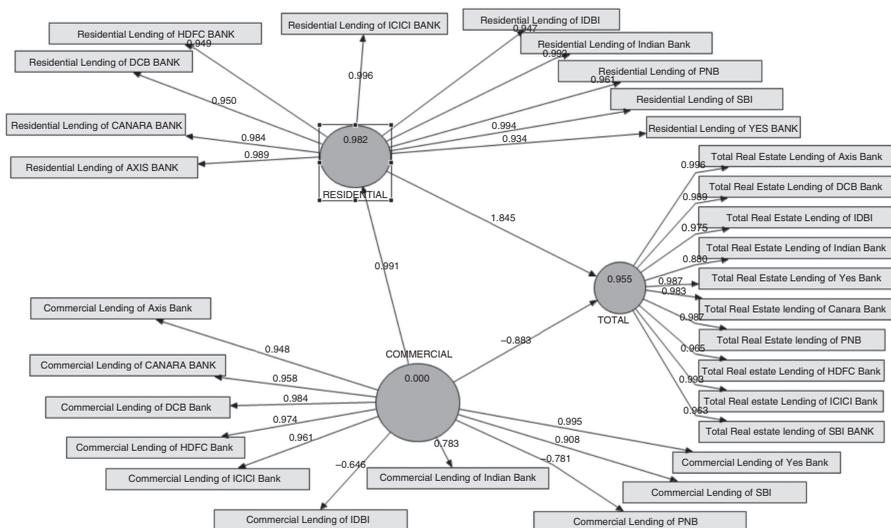


Figure 1. Partial least square structured equation modelling (PL-SEM) output showing a relationship between residential loans and commercial loans on total real estate sector development in India

Interpretation

The residential loans and commercial loans are exogenous variables, and total real estate loans is endogenous variable. This graph is showing the relationship between exogenous and endogenous variables for strengthening the impact of real estate development in India.

Interpretation

The outer model was first assessed by values of composite reliability (to assess internal consistency) and average variance extracted (AVE) (to assess convergent validity). Cronbach’s α (Hair *et al.*, 2013) shows all indicators to be equally reliable. Table I shows that the values of the composite reliability (0.9514, 0.9937, 0.9554) are greater than the prescribed value of 0.70 (Hair *et al.*, 2006) and the values of AVE (0.846, 0.9929, 0.9935) are found to be greater than 0.50. Cronbach’s α values of commercial lending, residential lending and total real estate lending are 0.9514, 0.9937, 0.9943 and all are greater than 0.70, which shows that the model is the perfect fit. The communality and redundancy of commercial lending, residential lending, and total real estate lending are 0.8111, 0.9408, 0.9457 and 0, 0.924, -2.3126, respectively.

Interpretation

Table II demonstrates that the square root of the average variance expected (AVE) values for all the correlations was higher than the inter-construct correlations (Fornell and Larker, 1981), thus establishing the discriminant validity (Table III).

Variables	Average variance expected	Composite reliability	R ²	Cronbach’s α	Communality	Redundancy
Commercial	0.8111	0.9514	0	0.846	0.8111	0
Residential	0.9408	0.9937	0.9819	0.9929	0.9408	0.924
Total	0.9457	0.9943	0.9554	0.9935	0.9457	-2.3126

Source: Authors’ own compilation

Table I. Reliability and validity

Interpretation

The loadings of the individual category like commercial lending (0.948, 0.9578, 0.9843, 0.9737, 0.9614 and 0.9018), residential lending (0.9887, 0.9842, 0.9545, 0.9846, 0.996, 0.9469, 0.9922, 0.9612 and 0.9944) are found to be higher than the respective cross-loadings which provide the additional evidence for discriminant validity. The loadings are also higher than the value of the 0.6 which has been prescribed (Nunnally, 1978). Some indicator items from the variables have loadings less than 0.6 or even negative like commercial lending of IDBI, commercial lending of PNB and should be dropped so that it would result in more improved reliability and validity of the model (Table IV).

Table II.
Correlations

Variables	Commercial	Residential	Total
Commercial	1	0	0
Residential	0.9909	1	0
Total	0.9453	0.9702	1

Source: Authors' own compilation

Table III.
Cross-loadings

Variables	Commercial	Residential	Total
Commercial lending of Axis Bank	0.948	0.9629	0.9824
Commercial lending of Canara Bank	0.9578	0.9804	0.9864
Commercial lending of DCB Bank	0.9843	0.9962	0.9662
Commercial lending of HDFC Bank	0.9737	0.9797	0.9106
Commercial lending of ICICI Bank	0.9614	0.9475	0.9502
Commercial lending of IDBI	-0.6464	-0.5643	-0.5638
Commercial lending of Indian Bank	0.7825	0.7646	0.5963
Commercial lending of PNB	-0.7808	-0.7342	-0.7245
Commercial lending of SBI	0.9078	0.8905	0.7566
Commercial lending of Yes Bank	0.9947	0.9891	0.9298
Residential lending of Axis Bank	0.9788	0.9887	0.9888
Residential lending of Canara Bank	0.9677	0.9842	0.9885
Residential lending of DCB Bank	0.951	0.9505	0.8548
Residential lending of HDFC Bank	0.9232	0.9486	0.9374
Residential lending of ICICI Bank	0.9859	0.996	0.9816
Residential lending of IDBI	0.9234	0.9469	0.9659
Residential lending of Indian Bank	0.9859	0.9922	0.9381
Residential lending of PNB	0.9576	0.9612	0.9719
Residential lending of SBI	0.9922	0.9944	0.9473
Residential lending of Yes Bank	0.9443	0.9342	0.8225
Total real estate lending of Axis Bank	0.9362	0.9618	0.9964
Total real estate lending of DCB Bank	0.9363	0.9618	0.9885
Total real estate lending of IDBI	0.9136	0.946	0.9755
Total real estate lending of Indian Bank	0.6914	0.7439	0.8802
Total real estate lending of Yes Bank	0.9736	0.9828	0.9872
Total real estate lending of Canara Bank	0.939	0.9665	0.9831
Total real estate lending of PNB	0.943	0.9573	0.9873
Total real estate lending of HDFC Bank	0.9617	0.9781	0.9653
Total real estate lending of ICICI Bank	0.9614	0.9751	0.9929
Total real estate lending of SBI Bank	0.9036	0.9342	0.9632

Source: Authors' own compilation

Structural model assessment

Interpretation. The inner model was assessed to test the relationship between the exogenous and endogenous variables. The path coefficients were obtained by using non-parametric, bootstrapping routine technique (Vinji *et al.*, 2010). In this, the four exogenous variables commercial lending, indirect lending, real estate advances, and residential lending have R^2 ranging between 0.9819 and 0.9554, which shows the sufficient accuracy of the structural model. Since t -values (11122.5337, 97.4109 and 205.6594) are greater than 1.96 it reflects that alternative hypothesis is accepted that there is impact of residential loans, commercial loans by public and private sector banks on total real estate sector development in India. Since the relation between residential loans, commercial loans and total real estate loans is greater than t -value (1.96), so the alternate hypothesis is accepted.

Interpretation

Table V shows that value of Q^2 (Geisser, 1974; Stone, 1974) is greater than 0 which reflects that the predictive relevance of the model and the alternate hypothesis (there is impact of residential loans and commercial loans on total real estate loans of public and private sector banks in India) is accepted and the null hypothesis (there is no impact of residential loans and commercial loans on total real estate loans of public

Variables	Original sample (O)	Sample mean (M)	SD	SE	t -statistics ($O/STERR$)
Commercial → residential	0.9909	0.9908	0.0001	0.0001	11122.5337
Commercial → total	-0.8827	-0.8774	0.0091	0.0091	97.4109
Residential → total	1.8448	1.8396	0.009	0.009	205.6594

Source: Authors' own compilation

Table IV.
Bootstrapping
technique path
coefficients (Mean, SD
and t -values)

Total	SSO	SSE	Q^2 1-SSE/SSO
Residential	80	11.7347	0.8533
Total	80	11.2839	0.859
Case 1	SSO	SSE	1-SSE/SSO
Residential	8.1692	0.8851	0.8917
Total	14.2284	1.3189	0.9073
Case 2	SSO	SSE	1-SSE/SSO
Residential	9.375	1.4035	0.8503
Total	15.3486	2.2909	0.8507
Case 3	SSO	SSE	1-SSE/SSO
Residential	10.1348	1.9164	0.8109
Total	8.8791	2.5249	0.7156
Case 4	SSO	SSE	1-SSE/SSO
Residential	14.0543	1.9946	0.8581
Total	8.3647	0.7262	0.9132
Case 5	SSO	SSE	1-SSE/SSO
Residential	13.1901	1.4789	0.8879
Total	8.1978	1.918	0.766
Case 6	SSO	SSE	1-SSE/SSO
Residential	18.4657	3.1059	0.8318
Total	10.7699	1.0218	0.9051
Case 7	SSO	SSE	1-SSE/SSO
Residential	6.6109	0.9504	0.8562
Total	14.2116	1.4832	0.8956

Table V.
Blindfolding technique

and private sector banks in India) is rejected. It reflects that the structure of the model is also correct. Table I provides the value of R^2 (included) of residential, commercial and total real estate lending, and Table V provides the value of Q^2 (included) of residential and total real estate lending. The final assessments of the f^2 and q^2 effect sizes. These values are computed manually because smart PLS software does not perform them. Values of R^2 included and R^2 excluded are required for calculating f^2 values and, on the other hand, the values of Q^2 included and Q^2 excluded are required for calculating q^2 values. The formula for:

$$f^2 \text{ (effect size)} = \frac{R^2 \text{ included} - R^2 \text{ excluded}}{1 - R^2 \text{ included}},$$

$$q^2 \text{ (effect size)} = \frac{Q^2 \text{ included} - Q^2 \text{ excluded}}{1 - Q^2 \text{ included}}.$$

The values of R^2 and Q^2 included have been derived from the overall estimation of the model which has been taken from Tables I–VI.

Calculation of R^2 and Q^2 excluded

The R^2 and Q^2 values excluded are determined from the re-estimation of the model after deleting the specific predecessor of the endogenous latent variable. In Case 1 residential lending has been deleted and the model is again estimated, and on the other hand in Case 2 commercial lending has been deleted to get the R^2 and Q^2 excluded value (Tables VII and VIII).

Interpretation

Cohens f^2 was calculated at all significant paths to assess the effect size (Cohens, 1988). The recommended values for the small, medium and large effect sizes are 0.02, 0.15 and

Table VI.
 R^2 and Q^2
included values

Variables	R^2 included	Q^2 included
Commercial	0	
Residential	0.9819	0.8533
Total	0.9544	0.859

Source: Authors' own compilation

Table VII.
 R^2 and Q^2
excluded values

Cases	R^2 excluded	Q^2 excluded
Case 1: (residential lending has been deleted)	0.9007	0.8297
Case 2: (commercial lending has been deleted)	0.9444	0.8622

Table VIII.
Calculation of effect
size (f^2) and relative
predictive relevance
(q^2 effect size)

Path	f^2	q^2
Residential lending – total real estate lending	$0.9544 - 0.9007 / 1 - 0.9544 = 0.0537 / 0.0456 = 1.17$	$0.859 - 0.8297 / 1 - 0.859 = 0.0293 / 0.141 = 0.207$
Commercial lending – total real estate lending	$0.9544 - 0.9444 / 1 - 0.9544 = 0.01 / 0.0456 = 0.219$	$0.859 - 0.8622 / 1 - 0.859 = -0.0032 / 0.141 = -0.0226$

0.35, respectively (Chin, 2010). Each determinant relative predictive relevance (q^2) was calculated for its endogenous construct. Table IX shows that the effect size (f^2 of both paths) and path (residential-total lending) predictive relevance (q^2) exceeded the specified criteria of 0.02 but the predictive relevance (q^2) of path (commercial-total lending) does not meet the criteria. The effect size (f^2) is considered large (1.17) for residential lending and medium (0.21) for commercial lending on total real estate sector development in India. On the other hand, the predictive relevance (q^2) shows medium for residential lending (0.219) is and for commercial lending (-0.226), there is no effect in the relationship. Further blindfolding technique shows that all variables have Q^2 value greater than zero which shows predictive relevance of the model. It shows that the endogenous construct has predictive relevance in the model.

Mediation analysis

Mediation analysis was carried used by calculating the variation accounted for (VAF) (ratio of indirect effect to total effect) for the following conditions (Hair *et al.*, 2013, p. 224):

Condition	No	Partial	Full
Calculate VAF (= Indirect Effect/ Total Effect)	$0 < \text{VAF} < 0.2$	$0 \leq \text{VAF} \leq 0.8$	$\text{VAF} > 0.8$

$$\text{VAF} = (p12 \times P23) / (p12 \times p23 + p13).$$

Tables X and XI show the residential loans as a mediator between commercial loans and total real estate loans. For the commercial-total real estate loans relationship via residential loans as a mediator, the value of $\text{VAF} = 1.933765$. This indicates full mediating effect of residential loans between commercial loans and total real estate loans. So the residential loans govern the nature of the relationship between commercial loans and total real estate loans in India.

Path	Effect size (Cohens f^2)	Relative predictive relevance (q^2)	Table IX. Effect size and predictive relevance values
Residential lending – total real estate lending	1.17	0.207	
Commercial lending – total real estate lending	0.219	-0.0226	

Variables	Original sample	Table X. Mediation effects of residential loans between commercial loans and total loans
P12 (commercial, residential)	0.9909	
P23 (residential, total)	1.8448	
P13 (commercial, total)	-0.8827	
Indirect effect (P12 (commercial, residential) × P23 (residential, total))	1.828012	
Total effect (indirect effect + P13 (commercial, total))	-0.8827	

Exogenous variable	Indirect effect	Total effect	Variation inflation factor (VAF)	Mediation	Table XI. Mediation effects of residential loans between commercial loans and total loans
Residential loans	1.828012	-0.8827	1.933765	Full mediation	

Conclusion

The Indian real estate market of India is one of the fastest-growing markets in the world. The real estate sector has been transformed from being unorganised to the dynamic and organised sector over the past decade. The real estate market is the second largest employer after agriculture. The PL-SEM shows that there is an impact of residential and commercial loans on total real estate sector development in India as the t -values (11122.5337, 97.4109, 205.6594) are greater than 1.96 by using bootstrapping technique, and blindfolding technique shows that Q^2 is greater than 0 and values of f^2 (1.17, 0.219) and q^2 (0.207, 0.226) justify that there are relative predictive relevance and the structure of the model is correct. Residential loans are important so that that people are more willing to purchase the residential property (single-family housing, multi-family housing and mobile homes) of their own choice and, on the other hand, commercial loans are important for the construction of medical centres, malls, farms and warehouses which play an important role in the economic development of country. So, the objective is justified that there is an impact of residential and commercial loans on total real estate sector development in India. The residential loans show full mediation effect between commercial loans and total real estate sector loans in India as the value of VAF is 1.933765. So the residential loans govern the nature of the relationship between commercial loans and total real estate loans as a mediator. It reflects that residential loans are the major factor for total real estate loans. The demand for residential housing is more and the launch of PMAY has lead to an increase in the role of residential loans in India. This is because there is a shortage of houses in India and the residential lending by public and private sector banks shows that they are supporting in the real estate sector development in India. It shows that banks are providing an adequate amount of finance for developing residential real estate sector, and there is no problem of lack of finance for the housing sector in India. So, the objective residential lending as a mediator variable between commercial and total real estate loans justifies that residential loans govern the nature of finance in real estate sector development in India as a mediating variable. As India is a developing economy so the development of real estate sector is critical for the development of the economy as a whole, and the support of the banking sector increases the financial capability of India which leads to an increase in the demand for real estate market in India.

Suggestions

The banks should provide specialised services to their customers to increase their customer base like proper guidance to them regarding the processing of loans for both residential lending and commercial lending, especially for the customers who are illiterate. The builders should be given proper finance to complete their projects and the government will support them with the help of banks so that the people will be able to get their houses on time. The banks like the State Bank of India and ICICI is contributing more for real estate sector development in India which shows that these banks help in real estate sector development in India more as compared to other banks. There should be prompt disbursement of loans for real estate sector customers so that the customer will be able to buy the houses on time and which helps the banks in creating a good image in the market. The banks should maintain their teaser rates for lending for the real estate sector as property buyer faces problems in the future for paying the instalments due to their financial problems. The customers will not face financial problems and there are fewer chances of default of loans.

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Residential lending of SBI	Residential lending of PNB	Residential lending of IDBI	Residential lending of Canara Bank	Residential lending of Indian Bank	Residential lending of HDFC Bank	Residential lending of ICICI Bank	Residential lending of Axis Bank	Residential lending of Yes Bank	Residential lending of DCB Bank
114,199.4	21,972.26	21,109.96	8,471.04	5,855.95	19,661.85	45,316.52	20,646.94	27,652	526.79
125,992.4	24,605.66	26,089.91	8,204.55	6,235.93	14,263.76	49,131.41	30,774.98	170,765	598.94
150,166	29,171.91	24,811.02	9,705.36	7,137.91	16,890.83	60,756.9	41,550.75	325,506	650.94
156,145.8	37,361.48	31,486.5	14,210.2	8,191.77	19,683.42	75,209.62	52,684.54	452,222	660.56
183,082.2	41,603.5	31,774.97	18,019.93	8,664.33	24,678.81	94,586.21	63,757.61	678,937	823.34
206,765.4	40,794.03	33,148.99	22,367.96	9,888.81	32,245	115,530.6	74,755.77	1,095.177	1,264.99
251,386.9	46,939.77	35,784.09	26,092.64	12,283.29	42,401	136,162.5	89,904.42	1,727.991	1,617.34
303,188.6	51,737.07	38,472.84	28,392.8	15,079.83	41,460	157,308.4	102,152	3,789.513	2,589.16

Table AI.
Residential lending
of banks

Table AII.
Commercial lending
of banks

Commercial lending of SBI	Commercial lending of FNB	Commercial lending of IDBI	Commercial lending of Canara Bank	Commercial lending of Indian Bank	Commercial lending of HDFC Bank	Commercial lending of ICICI Bank	Commercial lending of Axis Bank	Commercial lending of Yes Bank	Commercial lending of DCB Bank
14,011.31	16,243.11	5,009.2	1,398.15	3,095.34	6,454.23	25,094.81	9,029.16	1,935.799	133.09
12,674.38	16,119.23	5,329.18	1,875.12	2,472.08	6,146.9	23,790.01	11,292.31	2,458.481	282.03
14,973.37	12,037.31	3,534.1	1,617.88	1,930.96	8,115.58	27,803.68	11,356.68	5,751.984	445.65
17,503.82	13,566.31	4,606.93	2,828.19	2,076.64	9,891.87	30,021.51	18,101.75	6,601.466	604.97
20,761.65	11,860.8	3,549.75	3,601.96	2,673.28	11,471.8	35,645.14	20,834.52	9,855.195	879.11
27,364.6	13,916	3,537.28	4,081.85	2,668.14	17,118.59	35,180.85	25,240.95	13,235.2	1,107.21
36,915.86	11,804.01	4,369.16	5,052.65	3,420.28	22,877.26	36,560.94	25,330.23	16,611.72	1,674.65
82,807.89	11,092.36	3,492.47	5,447.02	6,054.15	32,185	40,070.37	29,328.94	25,487.92	2,002.67

Total real estate lending of SBI Bank	Total real estate lending of PNB	Total real estate lending of IDBI	Total real estate lending of Canara Bank	Total real estate lending of Indian Bank	Total real estate lending of HDFC Bank	Total real estate lending of ICICI Bank	Total real estate lending of Axis Bank	Total real estate lending of Yes Bank	Total real estate lending of DCB Bank
269,060.2	85,372.86	40,766.43	32,890.74	19,302.6	60,097.78	154,634.7	78,802.62	4,662.093	1,371.42
289,162.2	96,948.32	48,979.99	35,367.95	24,619.6	49,731.12	162,090.8	105,460.8	7,139.284	1,801.09
346,565.7	107,189.5	49,393.67	31,358.97	23,880.55	60,007.64	192,296.5	124,041.8	16,450.64	2,253.78
532,813.8	125,507	58,718.49	53,108.95	29,987.22	73,780.1	228,812.5	163,110.4	19,060.18	2,737.1
446,162.5	129,783.8	56,320.48	58,860.41	32,730.65	92,443.98	281,439.2	193,849.2	25,502.06	3,791.24
526,451.5	139,991.6	61,621.18	76,160.16	37,450.71	127,773.9	328,815.5	224,312.1	32,555.23	5,110.75
637,419.6	149,461.8	67,999.05	81,821.87	40,229.27	145,763.9	364,189	280,866.8	41,825.77	6,271.11
653,025.7	156,523.9	69,367.39	88,431.13	30,803.03	161,405.1	379,828.2	266,566.7	45,510.11	5,935.49

Table AIII.
Total real estate
lending of banks

Characteristic points of Auckland commercial property cycles

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470

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Abstract

Purpose – The purpose of this paper is to expand our understanding of processes governing commercial property cycles, and to provide tools, which enable identification of property cycles' turning points' location.

Design/methodology/approach – This paper is divided into three parts. The first looks at the demand-supply dynamics and the location of two characteristic cyclic points, the market bottom and the cycle commencement. In the second part a property relevant formula for entropy is derived, and its relation to the cycle overheated stage and the market peak is studied. In the third part, we discuss still another characteristic point of the cycle, which relates to the stage when developers elect to undertake new projects. This analysis is done by employing the chaos theory, and its relation to the cyclic evolution.

Findings – It is found that some markets cycle, while others fluctuate only. A clear method for distinguishing among these is provided. The bottom of a cycle may overlap or be time separated from the start of a subsequent cycle. Market peaks are characterised by a sharp decrease in financial component to entropy for top quality building grades. A cycling market is characterised by crossing of a distinct vacancy rate during the cycle progression.

Practical implications – The tools developed in the paper allow for clear characterisation of the market types and their cyclic behaviour. This in turn allows for timely characterisation of the market state and for short time-frame forecasting. The depth of a cycle may be calculated and the subsequent correction level estimated.

Originality/value – The paper utilises cross-field approach by taking methods from both physics and mathematics and applying them to property markets. It breaks new ground both in property research and in applied mathematics by showing how the current frontier in pure mathematics may be applied to property.

Keywords Property cycles, Cycle turning points, Entropy, Chaos, Oversupply of space, Space competitiveness

Paper type Research paper

Introduction

The purpose of this paper is two-fold. First, we would like to expand our understanding of processes governing commercial property cycles. Second, we would like to provide tools, which enable reasonably precise identification of property cycles' turning points location. The work expands on the one done by Szweizer (2018, 2019), which compares a commercial property cycle to a process described in physics. We start with a short presentation of the cycle described in that work and provide a precise definition of cyclic processes as applicable to the commercial property markets.

This paper is divided into three parts. The first looks at the difference between the accumulation of space supply and the accumulation of absorption during a cycle. This allows for the location of two characteristic cyclic points, namely the market bottom and the cycle commencement. The second part looks at entropy, and its relation to the cycle overheated stage and the market peak. Finally, in the third part, we discuss an additional characteristic point of the cycle by employing the chaos theory, and its relation to the cycle development. In this part, we find the point of inflexion, which relates to the stage when developers elect to undertake new projects.

The topics entertained in this paper have a reputation for being of considerable complexity. Therefore, we intentionally present the discussion in an easily approachable manner.

Literature review – property

This work expands findings presented by Szweizer (2018) in relation to property markets being modelled through the techniques available in Physics. The assumed basic structure of



a property cycle, which is compared to a thermodynamical cyclical process, is repeated here. While the work presented by Szweizer provides for a structural understanding of a property cycle as modelled in this way, it does not deliver any precise method for locating of characteristic cyclic points. A collection of such methods is described here.

Most models presented in literature utilise a set of difference equations which rely on a selection of exogenous and endogenous variables, some lagged and some adjusted through elasticity factors. Szweizer (2019) argues that taking a cumulative approach to parameters, when constructing a model, has distinct advantages over the discrete point modelling. First, this approach allows for the treatment of a cycle as a distinct entity with the accumulation running along the cyclic progression. Second, the accumulation provides data smoothing, very much like a running average, creating a low-pass filter.

There are five characteristic points analysed in the current work. In the first part of the paper we examine the two turning points associated with the market bottom. This is done through the analysis of supply-demand dynamics.

The supply-demand dynamics enters as a major parameter to virtually any attempt at property cycles modelling. It is usually married with financial and economic parameters like rents and employment. Wheaton (1999) provides a comprehensive analysis of the major building blocks of a property market modelling with attention placed on the parameters generating fluctuation effects in the model.

He stresses that not all markets oscillate in correlation with economic turns and observes that while apartments and industrial space in the major American metropolitan centres appear to correlate with economic cycles, office and retail do not. Further, he observes that some types of real estate markets do not exhibit an intrinsic cycle or oscillation, but merely react to national and regional economic shocks. Consequently, he provides a definition of a real estate cycle, which is set to be an oscillatory effect due to a single economic shock.

Further, he provides a stock-flow model driven by asset durability which is subject to both supply and demand elasticity parameters, varied to obtain different model behaviour. It is stressed that if the elasticity of supply is less or equal to that of demand, the modelled market response always displays a stable convergence pattern.

Grover and Grover (2013) look at the property cycles modelling techniques employed over the last century. As in the case of Wheaton above, they provide a definition of a property cycle and note that markets differ with respect to the cyclic activity, with some cycling because of endogenous stimulation, while others showing fluctuations due to weak adjustment mechanisms to exogenous impulses. They look closely at the forces influencing cyclic activity. The most important are: population and employment change, technological and innovation progress, demand-supply dynamics affecting rents and vacancies, financial accelerator and the ability to raise finance which includes banking and financial sector performance, developer expectations and finally the general economic growth.

Literature review – physics and mathematics

Entropy is one of the building components of thermodynamics. The concept was introduced in the nineteenth century by Clausius and then Boltzmann and Gibbs as a part of the research on heat and other forms of energy. At the macroscopic level, it relates to the non-productive loss of energy in any process. At the microscopic level, it relates to the system order. See Müller (2007) and Jaynes (1965) for detail. The concept of entropy was expanded to include information entropy by Shannon (1948).

Nowadays, some physicists recognise entropy as a primal force which is understood to act through the directly measurable physical interactions (Roos, 2014; Vilenchik, 2017). There are attempts to measure entropy directly, for example in experiments involving polymers Taylor and Tabachnik (2013). The field of entropic force is in the development stages with numerous obstacles found on the way. Some of these include the interpretation

of the findings. There are also efforts being made to provide alternative formulations to the way entropy could be measured (Tsallis, 1988; Rathie and Da Silva, 2008).

Complex systems, with high degree of unpredictability due to sensitivity to initial conditions, may be investigated through the means of the chaos theory. One may argue that the complexity of the property markets, with the non-uniform behaviour of individual property owners and the sensitivity of the system to the exogenous and endogenous shocks could be a good candidate for such an approach. The understanding of chaotic systems was greatly enhanced through the work of Feigenbaum (1983), whose one of the numerous contributions to the field was the invention of the attractor charts employed in this paper.

Data source

Data were provided by CBRE and consists of Auckland CBD office series since 1998, and Auckland industrial series since 2001. The space series has been collected through biannual on-site surveys. The financial series was generated through in-house quarterly assessments. The data are split by building quality, with office data representing premium, Grade A, B and C, and limited to space data only in Grade D. The industrial sector is represented by prime Grade A, and secondary Grades B and C.

Rent–vacancy chart and the thermodynamic cycle

This paper builds upon work done by Schweizer (2018). The attention is placed on characteristic points of a property cycle which are assumed to follow a procession based on a thermodynamic model as shown in Figure 1. The figure illustrates the rent–vacancy relationship as postulated for cycling property markets. It is assumed that a cycle starts at Point 1 when the oversupply (if any) due to the previous cycle has been absorbed. Subsequently, the vacancy decreases as a response to the growing demand for space, until Point 2 is reached when there is no more space available to be taken up by the market. The shortage of available space and a continuation of demand creates an overheated market, with rents growing as the vacancy remains constant. At Point 3 the space supply, which is a response to the growing demand, results in oversupply, and the market peaks. Finally, the market relaxes due to an oversupply of space reaching Point 4. If the oversupply of space is

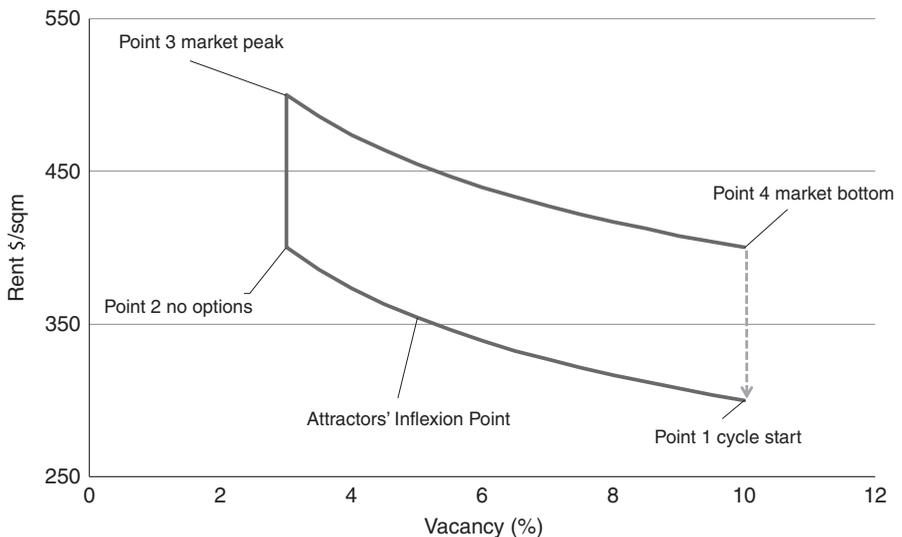


Figure 1. Rent–vacancy chart

still persistent, the market needs to absorb it before a subsequent cycle may start. This is reflected in the dashed line joining Points 4 and 1. The attractors' inflexion point, shown in Figure 1, is explained in detail and elaborated upon, later in the body of this work.

Cyclic processes

All property markets vary over time, moving between some lowest and highest vacancies. Therefore, a relatively rhythmic fluctuation between such values may be labelled as periodic. In this paper, we would like to propose a more precise definition of a cyclic process, so to be consistent with the level of precision provided through the methods developed here. Thus, we call a process to be cyclic only when the fluctuation includes a phase corresponding to an overheated market, that is between Points 2 and 3, as shown in Figure 1.

Part I – supply-demand dynamics – Points 4 and 1 – market bottom

Auckland office cycles

Figure 2 represents the difference between historic cumulative net absorption and cumulative net stock supply for Auckland CBD Prime office stock between 1998 and 2018. The net stock accumulation considers both supply of new space and removals, with a running sum over the period. The absorption accumulation is taken as a running sum of net absorption from the starting date. Subsequently, the difference between the absorption accumulation and the stock increase is taken providing for the main data line.

To find the first derivative, the absorption-supply curve is smoothed with three-point running average and then, the first derivative is approximated through the difference of adjacent points.

The historic development of a cycle may be understood by looking at the inflexion points and the characteristic points of the derivative as follows.

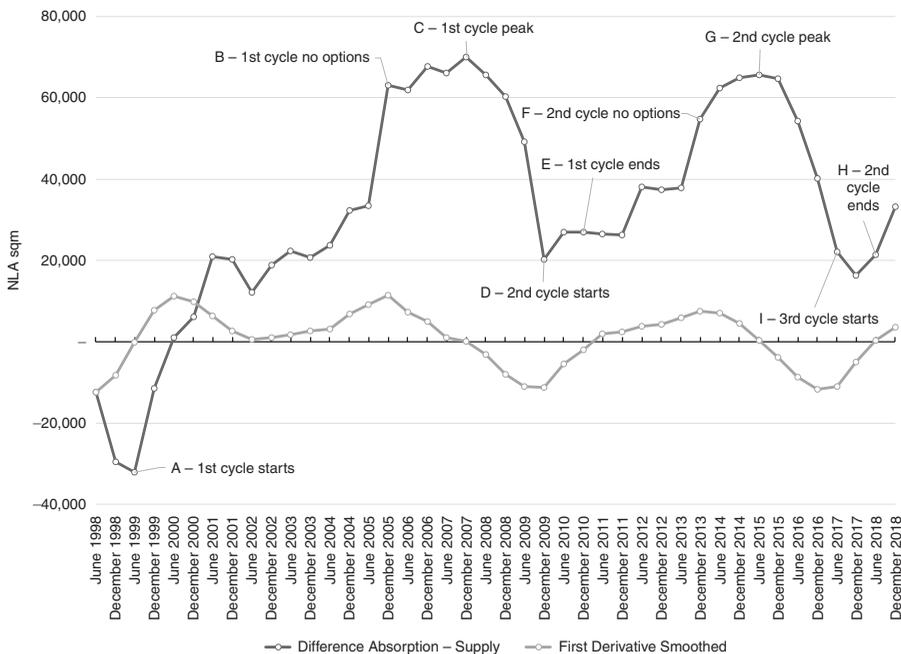


Figure 2.
Auckland Prime
Office absorption
and supply

Point A – June 1999 – the first derivative is zero which coincides with the minimum of the stock-absorption line. The cycle is at the starting point.

In the period between June 1999 and December 2005, the derivative is positive, which correlates with the absorption leading supply. Thus, we see the cumulative absorption being greater than the stock supply.

Point B – December 2005 – the derivative attains its maximum value, corresponding to the second derivative changing sign. Thus, December 2005 represents “no-options” point and the vacancy is expected to attain its minimal value.

December 2005–December 2007 period – represents the overheated market with rental growth set against minimal vacancy rates. Here, absorption cannot grow in any other way but only through the take up of newly constructed buildings. Therefore, the derivative is decreasing, until it reaches the zero value in December 2007, corresponding to the market peak (Point C).

December 2007–December 2009 – the market is contracting due to decreasing absorption and oversupply through completions of new constructions. This is represented by the first derivative of the stock-absorption curve becoming strongly negative.

December 2009–December 2010 – this is a boundary region between two overlapping cycles. When we look at the derivative, it attains zero in December 2010 (Point E), therefore, one would expect the end of the GFC cycle to be at that time. However, the growth in absorption began in December 2009 (Point D), a year prior, which shows that the subsequent cycle started prior to the previous one bottoming out. In this case, there were three large buildings delivered in the 2009–2010 period. These buildings constitute the final phase of the GFC cycle oversupply and were only partially occupied in 2009 but fully tenanted in the subsequent two years.

The second cycle attains maximal growth in December 2013 (Point F), which is followed by the no options stage between December 2013 and June 2015 (Point G), when the cycle attains its peak, and the first derivative is 0.

The bottom of this cycle is reached in June 2018 (Point H), but again like in the GFC case, the recovery is present since December 2016, therefore an overlap between the end of the second cycle and the beginning of the subsequent one is manifested (Point I).

In the period considered, the Auckland CBD Prime office cycles are set against a robust growth of the New Zealand economy, with the average annual GDP growth of 2.8 per cent since 2010. A considerable portion of the growth happens in Auckland, which is stimulated by large immigration, most of which settling in that city. As an effect, new constructions, which are a result of the previous cycle peaking are relatively quickly leased on or after completion. Thus, the subsequent cycles are jump-started through new, leased constructions arriving on the market. Hence, we see cycles overlapping.

Auckland industrial cycles

Figure 3 presents the Auckland industrial Prime grade behaviour between December 2001 and 2018. The chart plots the difference between cumulative net absorption and the cumulative net stock supply over that period. The derivative is obtained in a similar manner as with the office chart, with three-point smoothing over adjacent points for each value. There is a clear difference between Figures 2 and 3. The office chart consists of a smooth line displaying a clear cyclic tendency. The industrial line is jagged, and the presence of cycles is not obvious. Another problem of the industrial market is that the line is asynchronous with respect to the GFC cycle. Thus, the industrial market peaked in June 2005, two years prior to the GFC peak. Therefore, we find ourselves with a question. Is the industrial sector cycling or just fluctuating? We elaborate on this later in the paper. The points of interest in Figure 3 are as follows:

- Point A – December 2001 is assumed to be the historic cycle origin, with the derivative at zero.

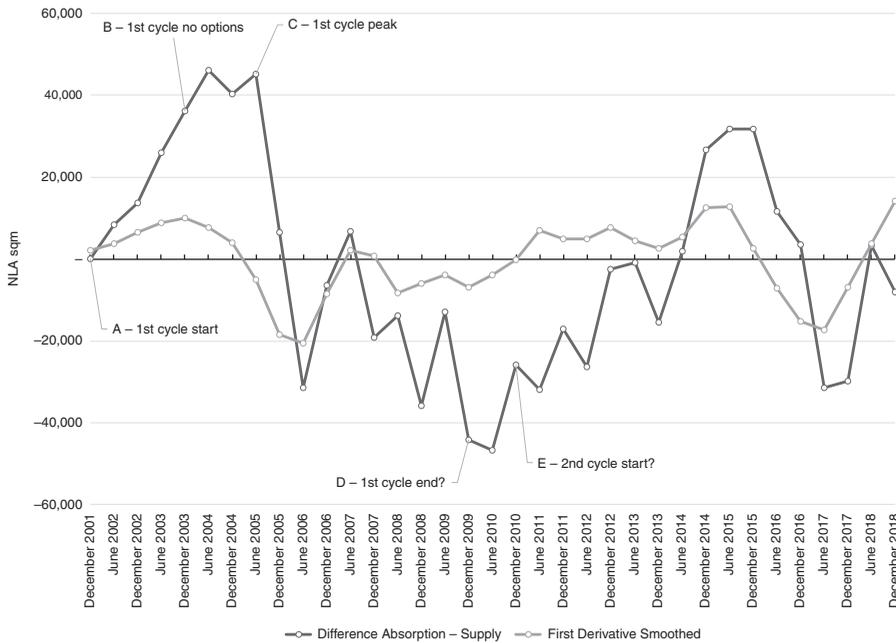


Figure 3.
Auckland prime
industrial absorption
and supply

- Point B – December 2003 is a no options point for the historic cycle. At that stage, the prime industrial vacancy dropped below 1 per cent, and this relates to the maximum of the derivative.
- Point C – the historic cycle peak is achieved between December 2004 and June 2005, when the derivative crosses the horizontal axis. In June 2005, the vacancy was at 0.5 per cent while staying below 0.8 per cent throughout the overheated phase of the cycle.
- Point D – in June 2007 the derivative returned to zero signalling the end of the historic cycle. However, the derivative failed to cross the axis properly and moved back to the negative territory, signalling that the subsequent cycle has not commenced at this stage. The crossing of the axis happened in December 2010 (Point E), where one may look for the second cycle to begin. The period between June 2007 and December 2010 represents a cyclic pause when the oversupply generated by the historic cycle is not being absorbed in full by the market. This prevents the subsequent cycle from eventuating.

Auckland office and industrial cycles comparison

The most striking difference between the office and the industrial cycles is the relative positioning of the start-end points of each cycle. In the office market, we see overlapping of cycles, indicating that the market demand jump-starts the next cycle even before the previous one has time to absorb the overburden of supply.

The other difference is the depth of each cycle, with industrial vacancies moving between 0.42 and 3.40 per cent at cyclic extremes, while the office cycles vacancies move between 1.2 and 15.9 per cent. The large vacancy swings in the office cycles result in developers being very cautious when embarking on new projects, effectively stopping them from stock oversupplying when the danger of vacant completions is apparent. Contrasting this is the industrial developers, who are almost sure to find a tenant even if embarking on

speculative developments. This is also the reality we see currently, with a large proportion of industrial buildings in Auckland being developed speculatively, with the overwhelming majority of which being leased on completion, while the office projects are started when a substantial portion of a building is pre-leased.

The effect of the above illustrates an apparent paradox. The industrial sector, with low vacancy rates, tends to suffer from long periods of oversupply, and subsequent cyclic gaps. While the office sector, with possible large swings in vacancy, sees cycles being jump-started even before the previous cycle has a chance to unload its oversupply.

Part II – entropy and its’ financial and space-related components – Points 2 and 3

The concept of entropy was introduced in the nineteenth century as a part of thermodynamics development and is closely related to the formulation of the second law of thermodynamics. In physics entropy is understood to relate to the amount of order in a system, with a highly ordered system having low entropy. Since its first formulation, the concept of entropy has been extended to numerous other fields, these include information, where Shannon’s work introduced a quantitative measure of information through entropy. In property, we introduce entropy as relating to market conditions, with depressed markets having high entropy and strong markets, characterised by high demand for space, as having low entropy.

Property market entropy, as presented here, consists of financial and space-related components. The financial component is derived from the generalised gas law formula. The space component relates to the probability distributions of systems’ microstates and is based on Boltzmann–Gibbs formula which was later expanded by Shannon.

Financial component of entropy

In Physics, entropy change between some arbitrary Points 1 and 2, for a macroscopic system with non-zero compressibility, is expressed through entropy departure (Potter and Somerton, 2013, p. 275), as in the following equation:

$$S_2 - S_1 = R \int_{P_1}^{P_2} \left[(Z-1) - T \frac{\partial Z}{\partial T} \right] \frac{dP}{P}, \quad (1)$$

where S stands for entropy, R for ideal gas constant, P for pressure, T for temperature and Z for compressibility.

By substituting compressibility with yield, pressure with rent, temperature with capital value, and using the initial yield definition to evaluate the derivative we arrive at the following equation:

$$S_2 - S_1 = \Omega \int_{R_1}^{R_2} \left[(y-1) - C_v \frac{\partial y}{\partial C_v} \right] \frac{dR}{R} = \Omega \int_{R_1}^{R_2} (2y-1) \frac{dR}{R}, \quad (2)$$

where R stands for rent, y for yield, C_v for capital value, and the gas constant has been replaced with Ω , a constant to be determined later. Formula 2 may be integrated with respect to rent giving:

$$S_2 - S_1 = \Omega(2y_2 - 1) \ln R_2 - \Omega(2y_1 - 1) \ln R_1, \quad (3)$$

Formula 3 expresses entropy change between any arbitrary Points 1 and 2. It is a function of financial parameters only and does not depend on any space-related quantities.

Space component of entropy

When calculating entropy under the classical micro-level approach, one needs to run a sum over all possible vacancy and tenancy arrangements. This requires the knowledge of all possible historic tenancy states, which in general is not feasible to obtain. Instead, we assume, that the summation may be approximated by taking historic vacancy rates, which are readily available. Therefore, extending Boltzmann, Gibbs and Shannon approaches, the formula for space-related entropy component is proposed to be:

$$S_{\text{space},j} = -v_j \ln(v_j), \tag{4}$$

where j is the survey index and v represents the vacancy at that survey.

When the market is in a reasonably stable state, there is no apparent reason why both types of entropies should differ. This is particularly true during the first phase of a cycle when rents are related to vacancies through a one-to-one smooth relationship. Therefore, the coefficients S_1 and Ω in (3) are determined by finding the best fit between both types of entropy over the period. The resultant coefficients are shown in Table I.

From Table I we observe that for top quality stock, the coefficients Ω are similar and large, showing a substantial contribution of the financial entropy component to the overall entropy. With the quality of stock decreasing, the financial component contribution decreases rapidly, making the overall entropy depending predominantly on vacancy fluctuations.

The formula for total entropy at some arbitrary Point 2, while the measurement started at any given Point 1, is given by the following equations:

$$S_{\text{total at 2}} = S_1 + \Omega(2y_2 - 1) \ln R_2 - \Omega(2y_1 - 1) \ln R_1 - v_2 \ln(v_2), \tag{5}$$

$$\text{That is: } S_{\text{total at 2}} = S_1 + S_{\text{financial 1 to 2}} + S_{\text{Space at 2}}. \tag{5a}$$

Figure 4 shows the total Auckland CBD Office market entropy, as calculated with Formula 5, drawn against the Auckland CBD total office market absorption and supply accumulation difference. One would expect that the market peaks and the associated low vacancy due to high absorption are correlated with the highly ordered state, that is low entropy.

Many Physicists consider entropy as the primal force of nature. Not in the sense of classical forces, which can be measured directly, but rather as a hidden agent which manifests its presence through the four fundamental forces which can be measured directly. In this sense, entropy constitutes the decisive agent, effectively influencing the entire physical world through the means of the forces we observe.

Another way to look at entropy is by observing that it is closely related to probability. Low probability states relate to low entropy. One could say that through the actions of the visible forces, entropy pushes such states to higher probability arrangements or to higher entropy, which with this understanding are equivalent.

In property, being a shadow agent, entropy implements its desire to increase through various methods, which are case dependent. Thus, an overstressed market may relax through any combination of the forces, indicated in the literature review for Grover and Grover above.

Grade	Ω	S_1
Premium	0.454	0.222
A	0.428	0.211
B	0.121	0.242
C	0.031	0.270

Table I.
Auckland CBD office
entropy parameters

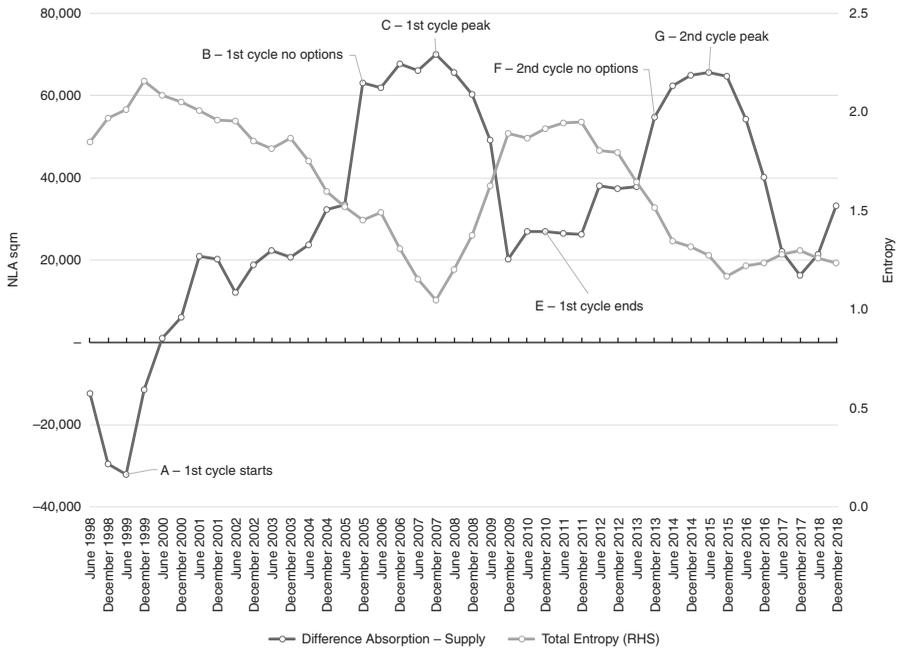


Figure 4.
Auckland office
supply cycle
and entropy

To estimate the location of Point 2 (no options) one observes that during the cycles' first phase entropy is driven by decreases in vacancy. That is, the space take up both, reduces vacancy and stimulates rental growth. During the second phase, space take up has no more room to progress, and the entropy decreases through the sharpening of the financial components. Therefore, while searching for the location of Point 2 we look for the financial component of entropy to become prevailing. However, when Figures 2 and 6 are compared a discrepancy of one surveying period is observed, therefore a call needs to be made when deciding on this point's location. Another way to estimate the placement of Point 2 is to look at the ordinary vacancy charts, where it is observed that the premium grade vacancy becomes negligible at that point. In Auckland, premium grade vacancy drops below 1 per cent at Point 2, and this feature is evident during all recent cycles.

Figure 5 illustrates the entropy variation over the surveyed period for the Auckland CBD office space. Clearly, the ability to cycle increases with building quality.

Figure 6 shows the proportion of financial entropy to the overall entropy in the Auckland CBD office by building quality. The most striking feature of this chart is the huge decline displayed by the premium grade financial entropy prior to the GFC. One could expect entropy to respond to this massive dip through a violent correction, which is represented by the sudden increase in entropy following Point 3.

There is also a large dip during the latest cycle, positioned at June 2016. However, following the latest dip in entropy, the relaxation of the financial entropy component is not as drastic. This may be understood through the observation that the current financial state of the market is highly managed, especially through the local and international reserve banks' interventions.

Part III – chaos theory, limits, attractors and property markets

In mathematics, an infinite sequence of numbers may converge to a specific value, called a limit. A precise definition of a limit was provided by Augustin-Louis Cauchy. The definition

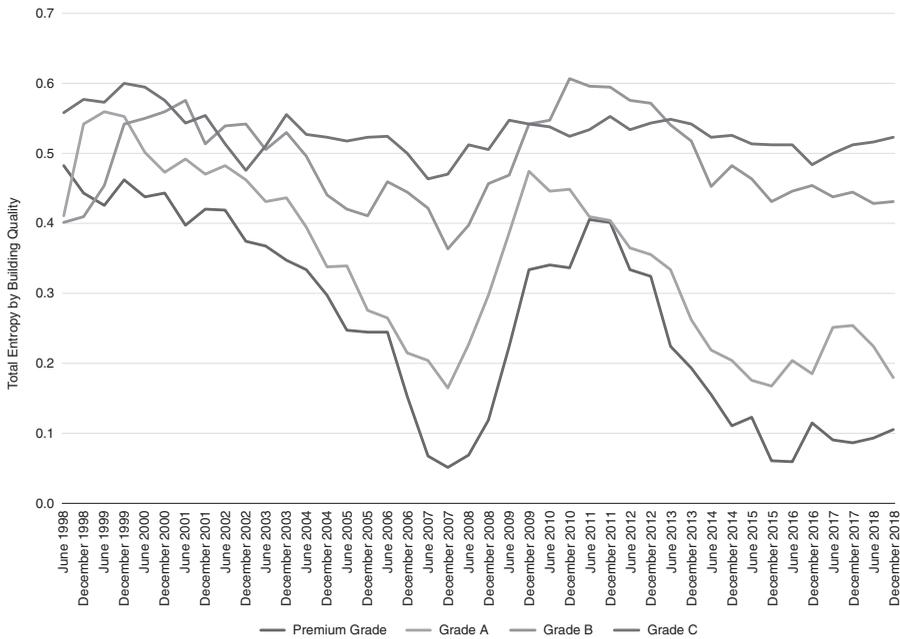


Figure 5.
Auckland CBD office
total entropy by
building quality

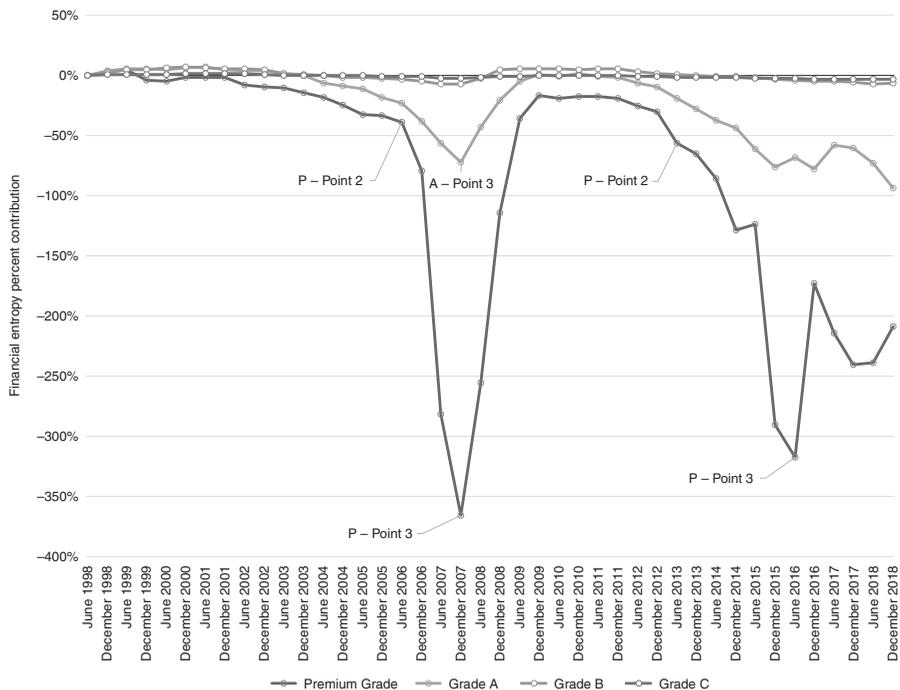


Figure 6.
Auckland CBD office
financial entropy
per cent contribution

assumes that a limit, if it exists for a given sequence, is always a singular number. One of the roots of chaos theory is in the observation that a sequence of numbers may tend to more than one limit, alternatively jumping from one to the next as the sequence progresses. To avoid confusion with the concept introduced by Cauchy, the collection of such limiting numbers is called attractors, as if to say that these numbers attract the sequence for large n .

Attractors occur in some feedback sequences, with Formula 6 for entropy being one of them:

$$p_{n+1,m} = -kp_{n,m} \ln(p_{n,m}) \quad k \in (0, e), \tag{6}$$

where p stands for the probability of finding a vacancy during the surveying period m , and k is a parameter ranging between zero and the Euler's number e .

The function $p \times \ln(p)$ attains a maximum at $p = 1/e$, with the maximum equal to $1/e$. Therefore, the value of parameter k must range between 0 and e so to recover RHS of the sequence as representing probability, that is ranging from 0 to 1.

To obtain Figure 7, for each equally spaced k in the range $(0, e)$, Formula 6 is iterated over 2,000 steps. The initial values of the sequence are discarded, and the final 200 values plotted on the chart. In this way, the value of each attractor is estimated. From the chart, it is clear, that when k is less than 2, the final 200 points overlap, generating a single point attractor. When k is in the $(2, 2.386)$ range the final points of the sequence split into 2 distinct attractor values and subsequently split into 4 when k is being increased. Finally, when k is larger than 2.494 the last 200 points of the sequence become randomly distributed.

Let us compare Formulae 4 and 6. Since Formula 4 represents space-related entropy component, Formula 6, while functionally similar, is scaled up through the parameter k , so to recover probability while the iteration is performed. Therefore, at the end of the iteration process, we scale back the results of 6 by the Euler's number so to express the result in terms of entropy. After scaling back, the attractor corresponds directly to the vacancy rate, as the probabilities in 4 correspond to the vacancy at a given survey.

As vacancy increases with increasing k , the parameter k is a measure of market depression, with low values of k corresponding to a strong, robust market, and large k

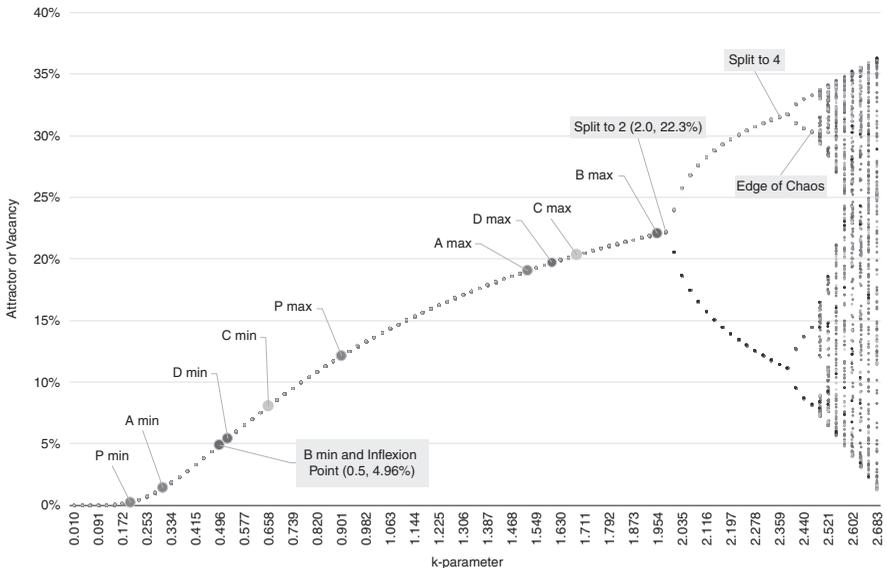


Figure 7.
Auckland CBD office
attractor

corresponding to a weak, depressed market. At the same time, the attractor represents the most probable vacancy rate for a given market strength represented by the parameter k .

Figure 7 shows the entropy attractors superimposed with each grade historic vacancy extreme values. The vacancy extremes are of the entire data set, which comprises of several business cycles. It is presumed that the point representing the current market state moves along the attractor curve. For a cycling grade, the cycle initial point is near the maximum vacancy rate. Subsequently, when the market improves, the attractor travels leftward along the curve, that is the value of k decreases until it reaches the minimum vacancy rate as indicated. After the market peaks, the attractor moves to the right, along the curve, corresponding to the increasing value of k . When parts of the market are heavily depressed, the movement representing these properties continues through the attractor split, towards the right. The suggested interpretation of the chart and attractor ranges is given in Table II.

The attractors' inflexion point

The point of inflexion is the point where the curvature of the attractor line changes. This change indicates the second derivative switching sign. Therefore, the first derivative attained a maximum at that point. In other words, during the first phase, when the cyclic process travels from larger k -values to the lower portion of the branch, the rate of vacancy change attains a maximum at this point. This change is dramatic enough to be easily observed by the market, subsequently stimulating developers to commit to new projects.

As an example, in Auckland, at the end of 2012, premium grade vacancy attained the inflexion point, resulting in two major property developers, Precinct Properties and Mansons TCLM to commit to the construction of premium quality office towers at the City centre. In Auckland, such a move represents a major decision, as usually one such project is undertaken per decade.

k -parameter	Suggested interpretation of market behaviour
0-0.5	Robust to overheated market condition with very low vacancies and rents increasing rapidly
0.5	The attractor curve inflexion point, when the curve shape changes from convex to concave. The crossing of this point distinguishes among markets which cycle from those that fluctuate only
0.5-2.0	The market is in the lower portion of the cycle either after the market has peaked for cycling markets, or just in depressed occupancy for fluctuating markets
2.0-2.386 attractor split (first bifurcation)	The attractor has split, (this is called bifurcation or period doubling), into two branches while responding to the depressed state of the market The top branch relates to the incentive offering portion of the market, hiding vacancy in this way through rent-free periods (the effective vacancy is still rising; therefore, the curve moves up) The lower branch corresponds to the portion of the market which withdraws buildings for refurbishments as a response to high vacancy rates. The effective vacancy is lowered as an effect, but the overall market remains depressed
2.386-2.494 second split	The attractor has split again, in this case into four branches, as the market depression deepens The top branch splits into two, with the upper line corresponding to market offering even more aggressive incentives in the form of increased rent-free periods. The lower branch corresponds to other forms of incentives, all requiring an investment in the property. For example, by improving tenancy furnishings or covering some of the operational costs The lower branch split relates to more refurbishments (lower line) and building conversions to other uses (upper line)
2.494-2.718 Chaos	The is a state labelled as chaotic, with the unpredictable behaviour of the market. These may include all actions listed above plus building demolitions, etc.

Table II.
 k -parameter and
entropy attractors

A similar effect was observed with respect to Grade A buildings. A decrease in vacancy during the post GFC recovery below the inflexion point resulted in the commencement of numerous projects. Moreover, when vacancy decreases below the inflexion point, an indication is provided, that the grade will overheat later, creating a cyclic process.

Competitiveness factor η

The attractor analysis with respect to the grade behaviour allows for the introduction of a measure of grade competitiveness. Each grade has a specific appeal to tenants. A more desirable space withstands market downturns better than space with the lesser appeal. To measure this, we introduce a competitiveness factor η (eta), which is calculated as a ratio of the k -value at the first attractor split, to the k -value at the highest vacancy attained by a grade:

$$\eta = \frac{k_{\text{attractor first split}}}{k_{\text{grade max vacancy}}} \tag{7}$$

The competitiveness factor is used to rescale all respective vacancies, so to place each grade maximal vacancy at the location of the attractor's first split. The rescaling of vacancies, which is a form of normalisation, allows for a direct comparison of grades' behaviour against each other. The process of rescaling also moves the lowest vacancies along the curve upwards. The rescaled lowest vacancies are then compared to the location of the attractor's inflexion point, so to infer if a grade is cyclic. The rescaled vacancy ranges are shown in Figure 8.

The inflexion point performs several functions. It acts as a trigger for developers to commit to new projects, and therefore it also indicates subsequent oversupply. If the grade's vacancy moves below it, a likelihood of a market overheating phase and the subsequent peak is indicated. It also divides property grades into two groups. Those whose vacancies decreased below it, become cyclic in behaviour. Those whose lowest vacancy stayed above it, experience vacancy fluctuations but not an overheated state. In fact, the non-cyclic grades experience very little new supply, if any.

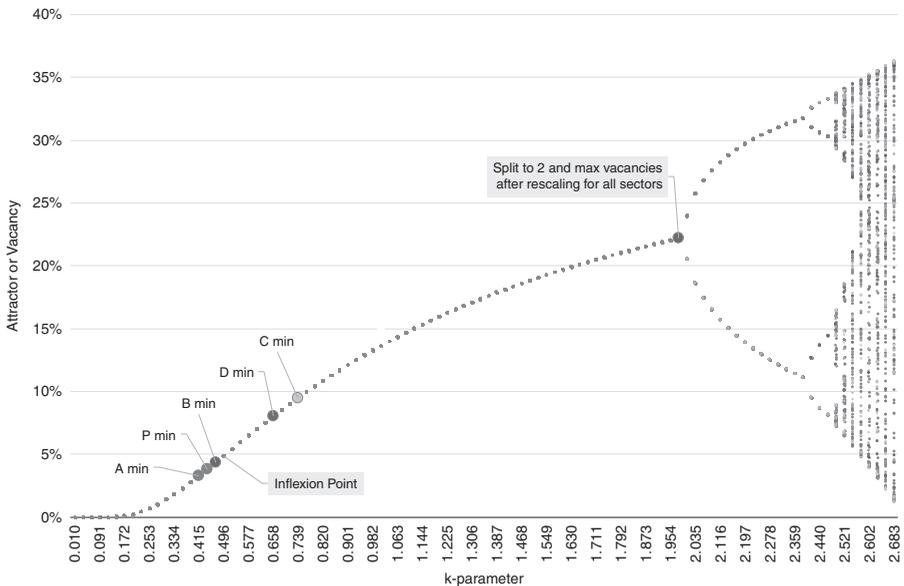


Figure 8.
Auckland CBD office
attractors rescaled

Figure 8 illustrates Grade A as being the most cyclic in the Auckland CBD office environment. It is followed by the premium grade. The D and C grades never cycle.

Table III illustrates the cyclic characteristics of the Auckland CBD office sector. For a grade to cycle its rescaled value of k ($\eta \times k_{\min}$), which relates to the lowest vacancy, needs to be less than the attractor’s inflexion point’s k , which is 0.5. Grades A and P cycle, while Grade B is on the boundary, theoretically allowing for the grade to cycle.

To find the vacancy at which a grade crosses the inflexion point a simple proportionality ratio is found as in 8, which when solved leads to 9:

$$\frac{V_{\text{split}} - V_{\text{inflexion}}}{V_{\text{split}} - V_0} = \frac{v_{\text{max}} - v_{\text{inflexion}}}{v_{\text{max}} - v_{\text{min}}}, \tag{8}$$

$$v_{\text{inflexion}} = v_{\text{max}} - 0.7775(v_{\text{max}} - v_{\text{min}}), \tag{9}$$

where in 8 LHS corresponds to the characteristic vacancies of the attractor curve, and the RHS represents the grade vacancies.

Another way of calculating the inflexion point is by taking ratios of the characteristic values of the k -parameter:

$$\frac{K_{\text{split}} - K_{\text{inflexion}}}{K_{\text{split}} - K_0} = \frac{k_{\text{max}} - k_{\text{inflexion}}}{k_{\text{max}} - k_{\text{min}}}, \tag{10}$$

$$k_{\text{inflexion}} = k_{\text{max}} - 0.75(k_{\text{max}} - k_{\text{min}}), \tag{11}$$

The inflexion vacancies obtained through Formulae 9 and 11 differ somewhat since the attractor dependence on k is not symmetrical with respect to vacancy.

In Table III the values of η illustrate high competitiveness of the premium grade, followed by Grade A. The competitiveness of these two grades is due to both being desirable, upmarket spaces, providing high prestige accommodation. Competitiveness of the lower Grades C and D is due to those tenants who look for the cheapest possible space, like for example educational providers, whose choice of accommodation is primarily influenced by financial considerations. Grade B space, even though from the rental point of view sits in the mid-range, is found to be the least competitive in this group. Thus, competitiveness is not represented through quality but rather corresponds to the effectiveness of finding tenants.

Table IV illustrates the same methodology applied to the Auckland industrial space. It shows that while Grade A industrial space is more than twice as competitive (η) as the office premium grade, the industrial grade does not cycle, but rather fluctuate in response to the

Grade	Vac. _{min} (%)	Vac. _{max} (%)	k_{\min}	k_{\max}	η	$\eta \times k_{\min}$	Vac.Inf.(%)	Cyclic
P	0.27	12.49	0.20	0.90	2.22	0.44	2.99	Yes
A	1.74	19.01	0.31	1.50	1.34	0.41	5.58	Yes
B	4.89	22.16	0.47	1.95	1.02	0.48	8.73	Maybe
C	7.92	20.45	0.63	1.68	1.19	0.75	n/a	No
D	5.45	19.81	0.52	1.60	1.25	0.65	n/a	No

Table III.
Auckland office cyclic behaviour

Grade	Vac. _{min} (%)	Vac. _{max} (%)	k_{\min}	k_{\max}	η	$\eta \times k_{\min}$	Cyclic
A	0.42	3.40	0.20	0.42	4.82	0.96	No
B	0.49	11.04	0.23	0.82	2.44	0.55	No
C	0.71	11.08	0.25	0.82	2.44	0.62	No

Table IV.
Auckland industrial cyclic behaviour

general economic condition in New Zealand. Therefore, the industrial grade does not overheat nor is ever oversupplied, even though a large pipeline of projects is being delivered annually for some time now.

Table IV addresses the question posed in Part I in relation to the industrial sector cyclic behaviour. Here, we see that the rescaled minimal values of k , ($\eta \times k_{\min}$) never decrease below 0.5, therefore the lowest vacancy of any grade never crosses the threshold required to create the overheated stage of a cycle. The closest to this boundary is Grade B, but the rescaled $\eta \times k_{\min}$ is still too large for a cycle to eventuate. Thus, we conclude that the industrial space in Auckland fluctuates depending on the general economic conditions without becoming a part of the cyclic process.

Conclusion and discussion

The analysis presented here subdivided the Auckland property market into three groups. These include high-quality space that cycles (Prime Office), high-quality space that does not cycle (Prime Industrial), and lower quality space that does not cycle (both office and industrial). The main differences between the Prime Office and the Prime Industrial space are the construction cost and the completion lag, with the office buildings drastically more expensive and slower to build than industrial. Thus, we conclude that the main reasons for a property sector to cycle are associated with construction time lag and the cost.

It is postulated here, that entropy constitutes the primal force influencing overall market behaviour. This influence is expressed through visible market forces, composition of which is case dependant and differs among individual cycles. The possibility of expressing entropy through space and financial components allows for identification of the main channel through which the market evolution is corrected. Thus, when the entropy is decreased through the vacancy drop, the market corrects through overbuilding. On the other hand, if the decrease is attained through financial component, the market corrects through a financial relaxation.

The competitiveness parameter provides a good measure of tenants' demands, allowing for an easy identification of the degree of interest in each type of space. As a side effect, it also indicates yield movement. Historically, in the Auckland office market it correlated with the yield compression, and in the industrial market with a dramatic Prime yield sharpening.

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Another look at property market maturity framework and its application to Lagos property market, Nigeria

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Abstract

Purpose – The purpose of this paper is to re-examine the framework for determining property market maturity by including the economic characteristics of a country in the measure.

Design/methodology/approach – The examination was done in Lagos property market, which was stratified into Mainland and Island markets. A total of 181 estate surveying and valuation firms and 87 property development companies, as represented by top-level managers, participated in the survey. Data were collected on their perception of property market maturity attributes that included market openness, presence of professionals, level of transparency and state of the economy, among others. The data were analyzed using mean rating and mean deviation.

Findings – The result showed that “diversity of real estate products and forms” was ranked highly and had reached a mature stage in Lagos Mainland, Island and the aggregated Lagos market. Contrarily, the state of the economy was still at immature stage in Lagos and its sub-markets. Overall, the results showed that the Lagos property market was emerging and that the inclusion of economic features in the maturity framework reduced the level of maturity of the market when compared with previous studies.

Practical implications – The study implied that the assessment of the state of economy of a country, as part of the attributes for measuring property market maturity, will impact on the result and should be taken into consideration.

Originality/value – The study adds to the previous studies on property market maturity by assessing the impact of the economic characteristics of a country on the measure.

Keywords Developing economies, Lagos property market, Maturity framework, Application

Paper type Research paper

1. Introduction

The contributions of the property sector to economy of nations cannot be overemphasized. For instance, property sector accounts for an average of 20.2 percent since 1998 in China (Nie and Cao, 2014); constantly contributed 22.5 percent in Dubai annually until the time of global financial crises (Falade-Obalade and Dubey, 2014); and according to British Property Federation (2016), commercial property market contributed an average of 5.4 percent to the total UK economy in 2016. These contributions appear to have resulted in the increase in cross-border investments overtime (Baum and Murray, 2011); and created a need for gathering dependable information on different country’s property markets. This is important because where this information is unavailable, investors hold off from such markets. To an investor, information on risks, uncertainties and expected return are of great importance and determine the level of attractiveness of a country’s property market.

Therefore, the need for information in the property market has propelled studies on market performance frameworks such as maturity, transparency, potential and attractiveness (See e.g. Keogh and D’Arcy, 1994; Lee, 2005; Chin and Dent, 2005; Jones Lang LaSalle, 2010). Such studies on market performance and framework are important for investors to make accurate investment decisions so as to reduce subjectivity and deal with risk and uncertainties in property investment decision making. Particularly, study on property market maturity is important because it describes the openness of a particular market and the level of information available for accurate investment decision making (Keogh and D’Arcy, 1994).



This paper focuses on re-examining the framework for determining property market maturity, with particular attention on developing economies. The pioneer authors, such as Keogh and D'Arcy (1994), Chin *et al.* (2006) and Jones Lang LaSalle (2010) have developed frameworks for measuring property market maturity. These frameworks include components such as accommodation of a full range of use and investment objectives, short- and long-run flexible market adjustment, presence of a quality property profession with its associated institutions and networks and market openness to mention few. However, it is certain that due to peculiar characteristics of property market from country to country, a generalization of the framework may be misleading. This is because the frameworks appear not to have captured the peculiarities of developing property market like Nigeria and did not include the economic characteristics of a country. Meanwhile, as opined by Akinbogun (2012) and Thontteh (2013), it is certain that the level of economic development of any country will bear relevance to the level of market maturity of that particular country.

Previous studies such as Dugeri (2011), Thontteh (2013), Akinbogun *et al.* (2014) that have examined property market maturity in Nigeria built on the Keogh and D'Arcy's (1994) framework but included some others factors that suit the Nigerian property market. However, the studies did not include the economic characteristics of the country. There is therefore the need to have another look at the framework used to measure property market maturity by including the country's economic characteristics. This is because the condition of an economy tells a lot about its maturity especially in emerging economies like Nigeria (Akinbogun, 2012; Thontteh, 2013). It is certain that an investor will look first at the wider economic performance of a country before considering the specific market.

To this end, the study seeks to develop a maturity framework that takes into consideration the economic characteristics of a country. The framework was applied by examining the Lagos real estate market maturity in Nigeria. This market was considered because, apart from Lagos been the hub of the country's commercial activities, it is also used as a basis measuring the country's investment attractiveness overtime (Jones Lang LaSalle, 2010).

2. Literature review

Keogh and D'Arcy (1994) developed a comprehensive tool for measuring real estate market maturity. The author opined that there was need to provide a more specific and explicit tool, apart from only economic investigations, in determining the performance of a property market. The market maturity performance variables propounded by the author were: accommodation of full range of use and investment objectives, market flexibility in both short run and long run, availability of professional institutions, research activities and information flow, openness of the market, standardization of property right and market practice. This framework achieved its purpose, but did not take into account the economic characteristics of the case study areas. This might be attributed to the fact that the markets were developed, hence studying the specific characteristics of property market was of greater importance.

The framework used by Chin *et al.* (2006) to examine the maturity of South-east Asian property market built on the work of Keogh and D'Arcy (1994). The framework used were market openness, property professional level, the presence of property intermediates, user and investor opportunities, realistic market values and market stability, property investment flexibility, market information, development stability and the urban design and quality of property products. Even though the study concluded that market maturity was a starting point for making investment decision, such decision might not be concrete if the economic characteristics of the wider market is not examined.

Another study by Rothacher focused on determining real estate market maturity in Tanzania and South Africa. The study adopted the JLL maturity benchmark. The benchmark

pinpointed that a mature market should have a transparent real estate sector, connect with international capital market, domestic and international corporate basis and commercial building offer. The author established that analysis of real estate market maturity can be used as a benchmark for investors rather than solely using the economic situations of countries as benchmarks which cannot be generalized. This indicated that country's economic situation was an important measure of market performance in the past. Therefore it should not be totally discarded but rather inculcated into the current market maturity framework.

Furthermore, Jones Lang LaSalle (2010) investigated the China real estate market with respect to its maturity. The study measured the market maturity using the following benchmarks: transparency of the real estate market which was deduced from high quality and free flowing market information, robust regulatory enforcement and fair transaction process; high connectivity with cross-border property market; commercial building offer that is equipped for future generation of corporations and robust international and domestic corporate base in form of depth of activities and functions, leading-edge firms, headquarters and higher order activities.

Other authors that have examined property market maturity, especially in Nigeria, included Dugeri (2011), Akinbogun (2012), Thontteh (2013) and Akinbogun *et al.* (2014). Dugeri (2011) relied on the work of Keogh and D'Arcy (1994), Chin and Dent (2005) and Chin *et al.* (2006) in developing a framework for the Nigerian property market. The framework developed considered market openness, levels of professionals present in the market, level of transparency, the extent of information available in the market, the level of capital liquidity in the market, the stability of property value, effect of institutional forces on market, standardization and quality of market and diversity of real estate product. The framework was tested on Lagos, Kano, Abuja and Port-Harcourt property markets. The author stressed the importance of property market transparency in determining the market maturity owing to the fact that Nigeria is a developing economy. The author examined the economic feature of the specific market but did not analyze that of the wider economy.

Furthermore, Akinbogun (2012) examined the maturity of the Nigerian residential property market theoretically. The measurement was based on the following benchmark. The analysis of extensive information flow and research activities, high level of compliance with master plan, state of the economy, accessibility to adequate residential finance, existence of sophisticated profession with its associated institution and networks, flexible market adjustment in both short and long run, market openness in spatial, functional and sectoral terms and standardization of property right and market practice. The author emphasized mainly on the activities in the specific property market as a determinant of the market maturity.

Thontteh (2013) evaluated market maturity and issues important to be considered in the Nigerian real estate market. The author also adopted Keogh and D'Arcy (1994) framework with an improvement. Hence, the study measured property market maturity using: market openness, professionalism, the presence of property intermediaries, information availability and standardization, development stability, flexibility, quality of products, impact of institutional framework and user's investor's opportunities. The author described maturity as an investment decision making tool that puts into consideration the development of the market, its evolution, economic, institutional and social conditions. This implies that economic condition of a country is of great importance in the analysis of property market maturity.

The work of Akinbogun *et al.* (2014) built on Keogh and D'Arcy (1994) property maturity framework. The author studying the residential property market of Nigeria adjusted the adopted framework by excluding flexible market adjustment in both long and short run but including other factors specific to residential property market. The author measured

property market maturity using the existence of sophisticated professionals, standardization of property rights and market practice, information flows, accommodation of full range of use and investment objectives, market openness in spatial, functional and sectoral terms, effectiveness of planning and accessibility to adequate housing finance.

From the foregoing review of literature, the following can be deduced:

- majority of the past studies built on the framework developed by Keogh and D'Arcy (1994), which, however, did not include economic characteristics of markets or countries;
- Dugeri (2011) was able to put up a framework for the Nigerian property market;
- most of the past studies focused on either the commercial property market or the residential property market and there was little or no attention on both;
- the past studies have shown that information on property market maturity is important when investment comes to mind;
- furthermore, it has been established by Dugeri (2011) that the framework used in developed economies cannot be generalized and used for developing economies like Nigeria;
- all studies carried out in Nigeria showed that the country has evidence of an immature property market; and
- Akinbogun (2012) and Thontteh (2013) emphasized on the importance of economic characteristics in the analysis of property market maturity.

In view of the foregoing, this paper adjusted the maturity framework of Dugeri (2011) by including the features of the wider economy as one of the major factors affecting property market maturity especially in an emerging market like Nigeria. Although the work of Akinbogun (2012) stated the importance of state of economy in residential property market maturity, the study lacks in empirical evidence. This current study examined both the residential and commercial property markets in Lagos, Nigeria.

3. The new framework for property market maturity

Having submitted that the characteristics of the wider economy need to be included in the measurement of property market maturity, the current study is hinged on the following indicators as shown in Figure 1 and discussed in the paragraph that follows.

3.1 Property market openness

A matured property market should be characterized by openness. The evidences of an opened property market includes: freedom of market entry and exit by local and international investors; flexibility of investors within markets sectorally and spatially as well as highly facilitated participants activities in terms of change and flexibility of use.

3.2 Presence of professionals in the market

The extent of maturity of a property market can also be determined by the level of professionals present in such market. This is measured by availability of high number of professionals in the market commensurate to the size of the property market; fluidity of information and high quality of data; high level of specialization among different professionals in the market and high quality of service rendered by market professionals.

Figure 1.
New property
maturity framework



3.3 Level of capital liquidity

Another determinant of property market maturity is the level of capital liquidity in a market. This can be determined by presence of various investment medium, creation and disposition of property assets, investors ease to access credit and lack of credit restrictions by financiers.

3.4 Level of information in the market

Information is important to any investment decision. Therefore the level of information acquired about a property market can determine the investment returns. To determine the level of information factors like availability of market information, great extent of information standardization, availability and appreciation of research activity in the market and high application of research findings by market participants are of great importance.

3.5 Types of products in the market

This can also be known as the diversity of real estate products and the forms of real estate product available in the market. This can be determined by various services required by professionals and the availability of various real estate products.

3.6 Institutional forces toward market activities

This is measured by the institutional factors that affect the investment activities in a particular market. This includes promptness in delivery of services by public agencies, promptness in the processing of land permit, high quality of ethical conduct, presence of standards, transparency in market reports and prompt legal and regulatory processes.

3.7 Stability of property value

The stability of value in a property market is of great importance to its maturity. In determining property value stability, information about the growth and stability of capital and rental value of residential and commercial property market is necessary.

3.8 *Level of transparency*

The level of transparency in a market also determines its level of maturity. According to Jones Lang LaSalle (2014), investment performance measurement, market fundamental information, standardized and efficient reporting of listed vehicles, and fair and efficient legal and regulatory system are the characteristics of a transparent market. Others are open and fair transaction process, lease term, attitude of land operators/operations on land market, term of trade between investors and developers and institutional framework.

3.9 *State of the economy*

Factors required to analyze a country's economic features include: favorable and stable economic condition, growth of the economy meeting with international standards, low level of bureaucracy in terms of all forms of taxation, variation in the level of tax from a specific product and service to another and supportive trade and market cycle. In the same vein factors such as encouraged international trade, high naira strength compared to other currencies, increasing and stable employment rate, low and stable exchange rate, low and stable inflation rate, low and stable inflation rate, high level of exportation, high level of productivity, growth of local industries, numerous sources of internal finances and increasing internal cash flow of the country can also tell about a country's economic state.

4. **Research method**

Primary data were obtained from professionals' in Lagos property market through questionnaire administration. Information collected included professionals' perception of market openness, level of capital liquidity and market information, types of products in the market, format of investment activities among others. The primary data were sourced from two groups of respondents. These are the estate surveying and valuation (ESV) firms and Property Development Company registered under the professional bodies of Nigerian Institution of Estate Surveyors and Valuers (NIESV) and Real Estate Developers Association of Nigeria (REDAN), respectively. This choice was informed by the recognition and relevance of the two groups to the aim of the study.

In administering the questionnaire, 362 ESV firms and 87 property development companies were identified from Nigerian Institution of Estate Surveyors and Valuers Directory (2015) and Real Estate Developers Association of Nigeria Directory (2015), respectively. This totaled 449 professionals sampled. For the respondents to be well represented, the study area was stratified in two zones, namely, Lagos Mainland and Lagos Island. In Lagos Mainland, there were 200 and 40 ESV firms and property development companies, respectively; while in Lagos Island 162 and 47 ESV firms and property development companies were identified, respectively. The study selected 50 percent of the ESV firms both in Lagos Mainland and Island, while total enumeration was adopted for the property development companies. This totaled 181 ESV firms; that is, 100 and 81 ESV firms in Lagos Mainland and Lagos Island, respectively, and 87 property development companies; which represent 40 and 47 in Lagos Mainland and Lagos Island, respectively. The samples were selected using simple random sampling without replacement. The selection of sample size was informed by the submission of Watson (2001), who opined that for population above 100, sample size could be selected at 50 percent and for population below 100, total enumeration should be adopted.

The data collected were analyzed using mean ratings. The representative (preferably the head of the company) of the sampled ESV firms and property development companies were asked to rank the variable components of the framework on a five-point Likert scale. A total of nine variables with 48 sub-variables were ranked by the respondents. Scores of 1–5 was assigned to each of the variables ranks, with 5 representing strongly agree and

1 strongly disagree. Thereafter, the Relative Agreement Index (*RAI*) was calculated using the following equation. Statistically:

$$RAI = \frac{SWV}{\sum_{i=1}^5 xi} \tag{1}$$

where *SWV* is the summation of weight value and *xi* is the number of respondents rating a particular variable's effect.

Explicitly, *SWV* is expressed as:

$$SWV = \sum_{i=1}^5 xiyi \tag{2}$$

where *xi* is the number of respondent rating a particular variable's effect and *yi* is weight value assigned to each variable.

For further analysis, the mean deviations (*MD*) of each of the variables were deduced by finding the difference between the individual variable means (*RAI*) and their average means denoted as ($\overline{RAI}_{1,9}$); mathematically expressed as follows:

$$MD = RAI - \overline{RAI}_{1, \dots, 9} \tag{3}$$

The average means of the nine variables denoted as ($\overline{RAI}_{1, \dots, 9}$) were placed on the maturity index to measure the extent of maturity of each variables before the overall average mean denoted as Lagos Maturity Index (*LMI*) was calculated.

4.1 The property maturity scale

The maturity scale used in this study hinges on the maturity scale of Dugeri (2011). The author developed a three level property market maturity scale for the Nigerian market as follows: for mean score/ratings of 3.50–5.00, 2.50–3.49 and 1.00–2.49, the market was regarded as “mature,” “emerging” and “immature,” respectively. This study improved on this maturity scale by using a five level property maturity scale/rating as indicated in Table I.

This adjustment was informed to ensure uniform range of measurement and to create extreme situations for the market, i.e. very mature and very immature property market. In summary, where the mean score is 4.50–5.00, “factor/attribute exists in a highly sufficient quantity and the market is judged very mature”; for 3.50–4.49, “factor/attribute exists in a sufficient quantity and the market is judged mature”; for 2.50–3.49, “factor/attribute exists in somewhat sufficient quantity and the market is judged emerging”; for 1.50–2.49, “factor/attribute exist in an insufficient quantity and the market is judged immature”; and for 1.00–1.49, “factor/attribute exist in a highly insufficient quantity and the market is judged very immature.”

Level	Mean rating	Measurement scale
1	4.50–5.00	Very mature property market
2	3.50–4.49	Mature property market
3	2.50–3.49	Emerging property market
4	1.50–2.49	Immature property market
5	1.00–1.49	Very immature property market

Table I.
Property maturity
scale of measurement

5. Results/findings

The research results were presented under two headings. First, the profiles of the respondents were presented to establish the reliability of the data collected; and second, the analysis of the level of maturity of the Lagos property market was given.

5.1 Profiles of the respondents

In order to establish the dependability and reliability of the information provided by the ESVs firms and the property development companies, questions were asked on their professional designation, years of experience and professional qualifications. The summary of the analysis is presented in Table II.

Table II showed that in Lagos Mainland, 37.90 percent of the respondents were heads of department, while in Lagos Island, most (42.70 percent) of the respondents were senior officers in their respective firms. Putting together the analysis, majority of the respondents sampled in Lagos property market were managers, heads of department and senior officers which represented 16.10, 33.90 and 39.60 percent of the respondents, respectively. Another important profile is the respondents' years of experience. As presented in Table II, majority of the respondents had 6–10 years of experience in their respective fields. Although in Lagos Mainland, 45.60 percent had 1–5 years professional experience and 43.70 percent had 6–10 year experience. The result was different in Lagos Island where 49.40 percent of the respondents had 6–10 years work experience, while 32.60 percent had 1–5 years work experience. In the same vein, analysis of result on the professional qualifications of the respondents established that majority of the respondents were members of their respective professional bodies. As shown in Table II, 45.70 percent of the respondents were probationer

Respondent's profile	Lagos Mainland		Lagos Island		Lagos State	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
<i>Professional designation</i>						
Branch head	5	4.90	4	4.50	9	4.70
Partner	4	3.90	3	3.40	7	3.60
Director	0	0.00	4	4.50	4	2.10
Manager	17	16.50	14	15.70	31	16.10
Head of departments	39	37.90	26	29.20	65	33.90
Senior officer	38	36.90	38	42.70	76	39.60
Total	103	100	89	100	192	100
<i>Years of experience</i>						
1–5	47	45.60	29	32.60	76	39.60
6–10	45	43.70	44	49.40	89	46.40
11–15	7	6.80	11	12.40	18	9.40
16–20	1	1.00	1	1.10	2	1.00
21–25	3	2.90	4	4.50	7	3.60
Total	103	100	89	100	192	100
<i>Professional qualification</i>						
ACCA	0	0.00	2	2.20	2	1.00
ANIVS	22	21.4	19	21.3	41	21.4
PROBATIONER	47	45.7	41	46.1	88	45.8
GRADUATE	32	31.1	27	30.3	59	30.6
IPMP	2	1.90	0.00	0.00	2	1.00
Total	103	100	89	100	192	100

Notes: *n*, number of respondents; %, percentage; ACCA, Association of Chartered Certified Accountants; ANIVS, associate member of the Institution of Estate Surveyors and Valuers; IPMP = international project management professionals

Table II.
Profile of
sampled respondents

members, while 31.10 percent were graduate members in Lagos Mainland. In Lagos Island, 46.10 percent of the respondents were probationers, while 30.30 percent of the respondents were graduate members.

Putting together the analysis, the result implies that the respondents were competent enough to answer questions relating to Lagos property market. The respondents were established to be vast in the area of their professional callings, had necessary years of experience and professional qualifications. Hence, the information provided by them can be depended on.

5.2 Level of maturity of Lagos property market using the new framework

In Section 3 of the paper, it has been argued that economic feature of a country is very important to the maturity of the property market. This current study therefore tested the new framework which added economic characteristics as an important feature in examining property market maturity. As earlier stated, a matured property market is characterized by market openness, presence of professionals in the market, level of information in the market, level of capital liquidity, diversity of real estate products and forms, property value stability, institutional forces disposition toward market activities, level of transparency and a robust state of economy. To achieve the aim of the study, respondents were asked their perception of the 49 sub-indicators that determines a mature market. Using a five-point Likert scale (5 = strongly agreed to 1 = strongly disagreed), the respondents were asked to rate the sub-indicators as regarding to the Lagos property market. Their responses were analyzed using mean rating. The result of the analysis is presented in Table III.

As seen in Table III, "diversity of real estate products and forms" was ranked as the most matured attribute of Lagos property market. This implies that the market was characterized with various real estate products and forms in a sufficient quantity as evidenced from the mean scores. The mean scores for Lagos Mainland, Island and Lagos property markets were 3.72, 3.80 and 3.76, respectively. The result further showed that "there was availability of variety of real estate products in the market" with *RAI* and *MD* 3.76 (0.04) and 3.93 (0.13) for Lagos Mainland and Island, respectively. This implies that most of the respondents opined that the markets were characterized by several real estate products. Also, Table III showed that most of the respondents in Lagos Mainland and Island strongly disagreed that "there was diversity of services required by property professionals" as indicated by *RAI* and *MD* of 3.68 (-0.06) and 3.67 (-0.13), respectively.

Putting together the foregoing, it is evidenced that majority of the respondents agreed that the Lagos property market was characterized by "availability of variety of real estate products in the market" with a mean score of 3.84 (0.08), while most of the respondents disagreed that "there was diversity of services required by property professionals" with mean score of 3.67 (-0.09). This result was expected because Lagos State has been established as the hub of all business activities and these activities require real estate products. This result, however, does not corroborate the findings in Dugeri (2011) which might be due to time difference of the current research.

Further results showed that the perception of the respondents on the "presence of professionals in the market" suggested that the attribute was matured. The aggregated mean score (\overline{RAI}_2) of the attribute for Lagos Mainland was 3.60, Island was 3.72 and Lagos property market was 3.65. The result implies that there were sufficient numbers of professionals in the markets. Explicitly, the findings revealed that most of the respondents in Lagos Mainland, Island and Lagos property market agreed that "there were high numbers of professionals in the market" as indicated from their respective *RAI* and *MD* of 3.92 (0.32); 3.97 (0.25) and 3.94 (0.29), respectively. With respect to the services rendered by the professional in the market the result of the analysis opined that "the professionals in the real estate market offers high quality of services" respondents in Lagos Mainland, Island

Characteristics of a matured property market	Lagos Mainland		Lagos Island		Lagos State		Rank
	RAI	MD	RAI	MD	RAI	MD	
<i>Diversity of real estate products and forms</i>							
There is diversity of professional services required by property professionals	3.68	-0.06	3.67	-0.13	3.67	-0.09	
There is availability of variety of real estate products in the market	3.76	0.04	3.93	0.13	3.84	0.08	
\overline{RAI}_1	3.72		3.80		3.76		1
<i>Presence of professionals in the market</i>							
There are high numbers of professionals in the real estate market	3.92	0.32	3.97	0.25	3.94	0.29	
The real estate market is characterized with fluidity of information and high quality of data	3.18	-0.42	3.34	-0.38	3.26	-0.39	
There is large extent of specialization among the different advisers operating in the market	3.60	0	3.75	0.03	3.68	0.03	
The professionals in the real estate market offer high quality of services	3.68	0.08	3.80	0.08	3.73	0.08	
\overline{RAI}_2	3.60		3.72		3.65		2
<i>Level of transparency</i>							
There is an increased level of transparency in terms of real estate capital value and rental value	2.83	-0.27	3.90	0.04	3.32	-0.13	
Professionals in the real estate market share information among themselves	3.28	0.18	4.24	0.38	3.72	0.27	
Market information is available for international investors	3.20	0.10	3.43	-0.43	3.31	-0.14	
\overline{RAI}_3	3.10		3.86		3.45		3
<i>Property market openness</i>							
There is absence of entry restrictions to local and international participants into the market	2.86	-0.42	2.85	-0.50	2.86	-0.46	
There are available opportunities and flexibility of operations sectorally and spatially	3.63	0.35	3.75	0.40	3.69	0.37	
The participants' activities in terms of change of use and flexibility of use is highly facilitated	3.34	0.06	3.46	0.11	3.40	0.08	
\overline{RAI}_4	3.28		3.35		3.32		4
<i>Level of capital liquidity</i>							
The market is flooded with variety of investment media.	3.57	0.41	3.87	0.62	3.71	0.51	
There is high response of participants to market conditions through creation and disposition of real estate asset	2.98	-0.18	3.22	-0.03	3.09	-0.11	
There is ease in the assessment of credit by market participants	2.78	-0.38	2.82	-0.43	2.80	-0.40	
There is existence of restrictions to credit by way of taxes, surcharges, etc. by financier in the market	3.29	0.13	3.07	-0.18	3.19	-0.01	
\overline{RAI}_5	3.16		3.25		3.20		5
<i>Level of information in the market</i>							
Information is highly available in the real estate market	3.37	0.29	3.40	0.25	3.39	0.27	
There is high level of market standardization	3.01	-0.07	3.00	-0.15	3.01	-0.11	
Research activities are available and well appreciated within the real estate market	3.14	0.06	3.31	0.16	3.22	0.10	

(continued)

Table III.
Testing the new
property market
maturity framework

Characteristics of a matured property market	Lagos Mainland		Lagos Island		Lagos State		Rank
	RAI	MD	RAI	MD	RAI	MD	
High application of products of research findings by market participants	2.80	-0.28	2.89	-0.26	2.84	-0.28	6
<i>RAI</i> ₆	3.08		3.15		3.12		
<i>Property value stability</i>							
The growth rate of capital value and rental value of residential real estate asset is stable overtime	2.97	-0.04	3.07	-0.13	3.02	-0.08	7
The growth rate of capital value and rental value of commercial real estate asset is stable overtime	3.24	0.23	3.37	0.17	3.30	0.20	
The growth rate of rental and capital value of assets in the residential real estate market increases overtime	3.26	0.25	3.52	0.32	3.38	0.28	
The growth rate of rental and capital value of assets in the commercial real estate market increases overtime	3.19	0.18	3.78	0.58	3.46	0.36	
The growth rate of rental and capital value of assets in the residential market decreases overtime	2.77	-0.24	2.75	-0.45	2.76	-0.34	
The growth rate of rental and capital value of assets in the commercial market decreases overtime	2.62	-0.39	2.69	-0.51	2.65	-0.45	
<i>RAI</i> ₇	3.01		3.20		3.10		
Institutional forces disposition toward market activities							
There is delivery of prompt services by public agencies concerning real estate matters	2.94	0	2.88	-0.08	2.91	-0.04	
There is prompt processing of land permit by public agencies	2.57	-0.37	2.70	-0.26	2.63	-0.32	
The quality of ethical conduct in the market is high	2.78	-0.16	3.06	0.10	2.91	-0.04	
The market is characterized by availability of market standards	2.99	0.05	3.16	0.20	3.07	0.12	
There is promptness in the market as regarding regulatory processes	3.23	0.29	3.03	0.07	3.14	0.19	
The reports prepared and presented in the market is highly transparent	3.11	0.17	2.92	-0.04	3.02	0.07	
<i>RAI</i> ₈	2.94		2.96		2.95		
<i>State of economy</i>							
The economic situation of the country is favorable	2.43	0.22	2.17	0.01	2.31	0.12	8
There is stability in the trend of the country's economy	2.40	0.19	2.13	-0.03	2.28	0.09	
The country's economy is growing in same pace with overseas economies and trends	2.17	-0.04	2.00	-0.16	2.09	-0.10	
There is low level of bureaucracy as regarding general taxation issues in the country	2.47	0.26	2.62	0.46	2.54	0.35	
The level of taxation varies from specific products/ services to another	2.58	0.37	2.99	0.83	2.77	0.58	
The country economic conditions support market and trade cycles	2.55	0.34	2.56	0.40	2.56	0.37	
The economic condition of the country encourages international trade	2.58	0.37	2.45	0.29	2.52	0.33	
The Naira has strength compared to currencies of other country	1.98	-0.23	1.72	-0.44	1.86	-0.33	
The country's employment rate is on the increase as population increases	1.79	-0.42	1.87	-0.29	1.82	-0.37	
The Naira/Dollar rate is low and stable overtime	1.64	-0.57	1.75	-0.41	1.69	-0.50	
The level of inflation in the country is decreasing overtime	1.75	-0.46	1.87	-0.29	1.80	-0.39	

Table III.

(continued)

Table III.

Characteristics of a matured property market	Lagos						Rank
	Mainland		Lagos Island		Lagos State		
	<i>RAI</i>	MD	<i>RAI</i>	MD	<i>RAI</i>	MD	
The country's interest rate is low and attracts investment	1.83	-0.38	1.94	-0.22	1.88	-0.31	
The country's export to import ratio is high	2.02	-0.19	1.80	-0.36	1.92	-0.27	
The production level of industries in the country is high	2.08	-0.13	2.06	-0.10	2.07	-0.12	
The country encourages establishment of local industries	2.61	0.40	2.40	0.24	2.52	0.33	
The country has various sources of internal finance	2.61	0.40	2.35	0.19	2.49	0.30	
The country's internal cash flow is increasing overtime	2.07	-0.14	2.00	-0.16	2.04	-0.15	
\overline{RAI}_9	2.21		2.16		2.19		9
Total	139.22		143.28		141.18		
\overline{MI}	2.84		0.92		2.88		

Notes: MD, mean deviation, *RAI*, relative agreement index (mean) $\overline{RAI}_{1...9}$, aggregated means or group means

and Lagos property market with *RAI* and MD of 3.68 (0.08); 3.80 (0.08) and 3.73 (0.08), respectively. Furthermore, attributes with lower *RAI* and negative MD for Lagos Mainland, Island and Lagos market were: "there was large extent of specialization among the different advisers operating in the market" with respective *RAI* and MD of 3.60 (0.00); 3.75 (-0.03) and 3.68 (-0.03) and "the real estate market was characterized with fluidity of information and high quality of data" with respective *RAI* and MD 3.18 (-0.42); 3.34 (-0.38) and 3.26 (-0.39). The scores resulted from the fact that many of the respondents disagreed to the assertions. In summary, the overall findings might be due to the presence of various professional bodies in Nigerian property market that guides and conducts their activities for instance NIESV and REDAN.

Result on the "level of transparency" of the markets showed that Lagos Mainland and Lagos property markets were emerging while Lagos Island was matured. This was evidenced from \overline{RAI}_3 of 3.10, 3.45 and 3.86, respectively. The result might have been so because majority of the respondents in Lagos Mainland, Island and Lagos property market agreed that "professionals in the property markets shared information among themselves" with mean score and deviation of 3.28 (0.18); 4.24 (0.38) and 3.72 (0.27), respectively. Also, in Lagos Island, most of respondents agreed that "there was an increased level of transparency in terms of real estate capital value and rental value" as evidenced from the result of the mean score and deviation of 3.90 (0.04) while majority of respondents in Lagos Mainland disagreed resulting from mean score of 2.83 and mean deviation of (-0.27). This resulted to a low *RAI* and MD for Lagos property market as shown in Table III. More so, majority of respondents in Lagos Mainland agreed that "market information was available for international investors" with mean score and deviation of 3.20 (0.10) while reverse was the case in Lagos Island property market as shown from the mean score and deviation of the variable which was 3.43 (-0.43). Putting together the foregoing, the study established that the Lagos Island property market was matured and opened in terms of information to both local and international investors than the Lagos Mainland property market. The finding agrees with Dugeri (2011) and Jones Lang LaSalle (2014).

In Lagos Mainland, Island and the overall Lagos property market, the result of "market openness" showed that the markets were emerging and approaching maturity. The mean score of this characteristic for the markets were 3.28, 3.35 and 3.32, respectively. This implies that, in terms of market exposure, ease of entrance and exit from the markets were approaching maturity. Most of the respondents agreed that "there were available opportunities and flexibility of operations sectorally and spatially" in the market, with mean score and deviation of 3.63 (0.35); 3.75 (0.40) and 3.69 (0.37). Also, "the participants" activities

in terms of change and flexibility of use were highly facilitated' with mean score and deviation of 3.34 (0.06); 3.46 (0.11) and 3.40 (0.08) in Lagos Mainland, Island and the overall Lagos property market, respectively. Furthermore, majority of the respondents in Lagos Mainland, Island and Lagos property market disagreed that "there was absence of entry restrictions to local and international participants into the market" as evidenced from the mean score and deviation of 2.86 (-0.42); 2.85 (-0.50) and 2.86 (-0.46). These findings align with the result of Dugeri (2011).

In terms of "level of capital liquidity," the study established that this attribute was emerging in the Lagos Mainland, Island and Lagos property market as a whole with mean scores of 3.16, 3.25 and 3.20, respectively. This implies that the attribute was evident in the market in a somewhat sufficient quantity. The result of the sub-indicators revealed that most of the respondents agreed that "the market was flooded with variety of investment media" in Lagos Mainland with mean score and MD of 3.57 (0.41), Lagos Island with mean score and MD of 3.87 (0.62) and with aggregated mean score of 3.71 (0.51) for the overall Lagos property market. Furthermore, there was disagreement by most of the respondents that "there was high response of participants to market conditions through creation and disposition of real estate asset" in Lagos Mainland 2.98 (-0.18), Lagos Island 3.22 (-0.03) and Lagos property market 3.09 (-0.11) as shown from their mean scores and MD. In the same vein, the mean score and deviation of the sub-indicator showed that majority of the respondent disagreed that "there was ease in the assessment of credit by market participants" in Lagos Mainland 2.78 (-0.38), Lagos Island 2.82 (-0.43) and Lagos property market 2.80 (-0.40). Also, majority of the respondents in Lagos Mainland agreed that "there was existence of restrictions to credit by way of taxes and surcharges by financier in the market" with mean score of 3.29 (0.13), while majority of respondents in Lagos Island disagreed to the assertion as evidenced from the mean score and deviation of 3.07 (-0.18). The aggregated mean score and deviation for Lagos property market was 3.19 (-0.01).

From Table III, it has been established that the "level of information in the markets" were emerging which implies that the feature was scarcely available in the markets. The mean scores for Lagos Mainland, Island and Lagos property market were 3.08, 3.15 and 3.12, respectively. Furthermore, majority of the respondents in Lagos Mainland, Island and the overall Lagos property market agreed that "information was highly available in the real estate market" with mean scores and deviations of 3.37 (0.29); 3.40 (0.25) and 3.39 (0.27) and that "research activities were available and well appreciated within the real estate market" as evidenced from their high *RAI* and positive MD of 3.14 (0.06); 3.31 (0.16) and 3.22 (0.10). Conversely, majority of the respondents disagreed that "there was high level of market standardization" with mean score and deviations of 3.01 (-0.07); 3.00 (-0.15) and 3.01 (-0.11) in Lagos Mainland, Island and Lagos property market, respectively. Also the respondents disagreed that there was "high application of products of research findings by market participants" with mean scores and deviations 2.80 (-0.28); 2.89 (-0.26) and 2.84 (-0.28) in Lagos Mainland, Island and Lagos property market, respectively.

With respect to "property value stability," the markets were emerging. Their \overline{RAI}_7 were 3.01, 3.20 and 3.10 for Lagos Mainland, Island and Lagos property market, respectively. Majority of the respondents agreed that "the growth rate of rental and capital value of assets in the residential real estate market increased overtime" with mean scores and deviations of 3.26 (0.25); 3.52 (0.32) and 3.38 (0.28), but disagreed that "the growth rate of capital value and rental value of residential real estate asset was stable overtime" 2.97 (-0.04); 3.07 (-0.13) and 3.02 (-0.08) as noted from their *RAI* and MD for Lagos Mainland, Island and the overall Lagos property market. Regarding commercial properties, majority of the respondents agreed that "the growth rate of rental and capital values of assets in the commercial real estate market increased overtime" and stable overtime with mean scores and deviations of 3.19 (0.18); 3.78 (0.58) and 3.46 (0.36) and 3.24 (0.23); 3.37 (0.17) and 3.30 (0.20), respectively in

Lagos Mainland, Island and Lagos property markets. This result was expected because the residential property dominates the Lagos property market and the need for housing was on the increase overtime. This invariably will result to continuous growth in the rental and capital values of residential properties in the markets.

Furthermore, the “institutional forces disposition toward market activities” was also investigated. Result from Table III revealed that in Lagos Mainland, Island and Lagos property market, this attribute was emerging as indicated from the \overline{RAI}_8 which were 2.94, 2.96 and 2.94, respectively. A further analysis of the sub-attributes revealed that majority of the respondents in Lagos Mainland, Island and Lagos property market opined that “the market was characterized by availability of market standards” with RAI and MD 2.99 (0.23); 3.16 (0.17) and 3.07 (0.12), respectively. Also “there was promptness in the market as regarding regulatory processes” their RAI and MD were 3.23 (0.29); 3.03 (0.07) and 3.14 (0.19), respectively. Likewise, majority of the respondents disagreed that “there was delivery of prompt services by public agencies concerning real estate matters” in Lagos Mainland, Island and Lagos property market with RAI and MD of 2.94 (0.00); 2.88 (−0.08) and 2.91 (−0.04), respectively. Also, most of the respondents disagreed that “there was prompt processing of land permit by public agencies” in Lagos Mainland, Island and Lagos property market as evidenced from their RAI and MD of 2.57 (−0.37); 2.70 (−0.26) and 2.63 (−0.32), respectively. Furthermore, majority of respondent in Lagos Mainland disagreed to the assertion that “the quality of ethical conduct in the market was high” with mean score and deviation of 2.78 (−0.16) while majority of the respondents in Lagos Island agreed to the assertion 3.06 (0.10) as evidenced from the RAI and MD . The aggregated RAI and MD for Lagos property market was 2.91 (−0.04). On the other hand, many of the respondents in Lagos Mainland agreed that “the reports prepared and presented in the market was highly transparent” as evidenced from the mean score and deviation of 3.11 (0.17) reverse was the case in Lagos Island with mean score and deviation of 2.92 (−0.04). The sub-attribute aggregated at mean score and deviation of 3.02 (0.07) for Lagos property market. Putting together the foregoing, it appears that the high level of bureaucracy evidenced in the markets was responsible for this result.

Finally, the “state of economy” was examined. The respondents’ perception revealed that this feature was at an immature stage with \overline{RAI}_9 2.21, 2.16 and 2.19 for Lagos Mainland, Island and Lagos property market, respectively. The results established that most of the respondents agreed that “the level of taxation varied from specific products/services to another” with mean scores and deviations of 2.58 (0.37); 2.99 (0.83) and 2.77 (0.58), “the country economic conditions supported market and trade cycles” with mean scores and deviations of 2.55 (0.34); 2.56 (0.40) and 2.56 (0.37), “there was low level of bureaucracy as regarding general taxation issues in the country” as evidenced from the mean score and deviation of 2.47 (0.26); 2.62 (0.46) and 2.54 (0.35) and “the country encouraged establishment of local industries” as seen from the mean scores and deviation of 2.61 (0.40); 2.40 (0.24) and 2.62 (0.33) for Lagos Mainland, Island and Lagos property market, respectively. On the other hand, majority of the respondents disagreed that “the Naira/Dollar rate was low and stable overtime” as shown from the mean scores and deviations of 1.64 (−0.57); 1.74 (−0.41) and 1.69 (−0.50), “the level of inflation in the country was decreasing overtime” with men score and deviation of 1.75 (−0.46); 1.87 (−0.29) and 1.80 (−0.39), “the country’s employment rate was on the increase as population increases” with mean score and deviation of 1.79 (−0.42); 1.87 (−0.29) and 1.82 (−0.37), the Naira had strength compared to currencies of other country” with mean score and deviation of 1.93 (−0.23); 1.72 (−0.44) and 1.86 (−0.33) for Lagos Mainland, Island and Lagos property market, respectively. Putting together the foregoing the findings implies that investors coming into the country especially international ones may be discouraged basically by the state of the Nigerian economy which results in low or no investment in the Nigerian property market because economic friendliness is very important for investment.

Putting together the foregoing, the results revealed that the level of maturity of Lagos Mainland, Island and Lagos property market was immature. The $\overline{M\bar{I}}$ s for the markets were 2.84, 2.94 and 2.88, respectively. Presented in Table IV is the summary of the maturity level of Lagos property market on each of the features considered.

Although the market presented a lot of promising features such as the presence of professionals in the market and presence of different vehicles for investment, the state of economy as well as the institutional forces toward market activities, which were still in low state and these, appear to have placed the Lagos property market in the stage of immaturity as revealed from the findings. This finding agrees with that of Dugeri (2011) and Jones Lang LaSalle (2014). However, if there is an improvement in the state of the country's economy and the institutional forces guiding the property market, the level of maturity of the Lagos property market is expected to improve. The two attributes were ranked below 3.00 by the respondents (see Table IV).

6. Conclusion

The study provided an insight on the importance of state of economy on a country's property market maturity. Variables that determined market maturity in a developing economy as established by previous authors were examined. The variables included diversity of real estate products, presence of property professionals, level of transparency, market openness, level of capital liquidity, level of information and property value stability. This current study included the state of economy in the measure of market maturity with Lagos as the case study. The study established that the country's state of economy had implication on the maturity of Lagos property market. The result found that diversity of real estate products and forms and presence of property professionals were the only mature property market maturity attributes in Lagos property market. Furthermore, the state of economy was found to be the only immature property market maturity attributes in Lagos property market. Property market attributes such as level of transparency, market openness, level of capital liquidity, level of information and property value stability were

Property maturity attributes	Mean rating			Score/ Stage	Implication
	Lagos Mainland	Lagos Island	Lagos Market		
Diversity of real estate products and forms	3.72	3.80	3.76	Mature	Exists in a sufficient quantity
Presence of property professionals	3.60	3.72	3.65	Mature	Exists in a sufficient quantity
Level of transparency	3.10	3.86	3.45	Emerging	Exists in a somewhat sufficient quantity
Market openness	3.28	3.35	3.32	Emerging	Exists in a somewhat sufficient quantity
Level of capital liquidity	3.16	3.25	3.20	Emerging	Exists in a somewhat sufficient quantity
Level of information in the market	3.08	3.15	3.12	Emerging	Exists in a somewhat sufficient quantity
Property value stability	3.01	3.20	3.10	Emerging	Exists in a somewhat sufficient quantity
Institutional forces disposition toward market activities	2.94	2.96	2.95	Emerging	Exists in a somewhat sufficient quantity
State of economy	2.21	2.16	2.19	Immature	Exists in an insufficient quantity
$\overline{M\bar{I}}$	2.84	2.92	2.88	Emerging	Exists in a somewhat sufficient quantity

Table IV.
Summary of maturity attributes for Lagos property market

still emerging in Lagos property market. However, the market presents a promising future in terms of market maturity.

The inclusion of the state of economy in the maturity framework for Lagos property market reduced the level of maturity of the market when compared with results from previous studies. Therefore, to improve the level of maturity of Lagos property market, it is paramount to ensure that the property market is transparent and able to accommodate other professionals' especially international ones. Also, it is important that data bank for available products in the market be created. This will enable accessibility to information about the market by prospective investors. The harmonization of professional practices with international standards will go a long way to improve the maturity of the Lagos property market.

The findings of this study have policy implications with respect to its provision of a new measure of property market maturity in a developing economy. The new maturity framework suggests that local and international investors' should include the condition of the economy of prospective country when investment comes to mind. The measure of property market maturity should not be overshoot so as to avoid misinformation. Also, property market professionals should ensure that their practices should be that which can attract other professionals/investors into the market.

However, the study has its limitations. First, it tested the new framework only in Lagos property market. There are other major Nigerian property markets that were excluded. These include Abuja, Kano and Port-Harcourt. Future studies in this line should include these markets. This will contribute to the body of knowledge and also help in providing information about the Nigerian Property market. Notwithstanding this limitation, the current study will serve impetus for further study on property market maturity in the developing and even developed world.

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Market transparency and international real estate investment

Market
transparency

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Abstract

Purpose – The purpose of this paper is to provide new empirical evidence on the important role of market transparency in international real estate investment.

Design/methodology/approach – The authors apply the augmented panel regression method (or the correlated random effects approach) by using national panel data from 44 countries from 2004 to 2016.

Findings – Countries with better accessibility to market information and higher enforceability of regulations have less information asymmetry and attract more inward real estate investment. In contrast, the accounting quality of corporate governance is negatively correlated with investment, indicating the possibility that foreign investors enjoy high excess returns by investing in real estate in countries with poor accounting quality.

Practical implications – Countries lacking market transparency can increase inward investments by providing richer market information to foreign investors and by boosting enforceability of regulation to mitigate the uncertainty of returns on investment. Investors and public sectors in countries facing a saturated real estate market may expand investment by investigating less-explored markets and by seeking bilateral negotiations to secure higher predictability of return on investment in targeted countries.

Originality/value – The authors utilize updated multiple transparency indices instead of a conventional aggregate index to examine how the investment is attributed to different aspects of market transparency and employ the augmented panel regression method for investigation of the intra- and international determinants of the investment.

Keywords Transparency, Panel data, Commercial real estate, Between estimator

Paper type Research paper

1. Introduction

The improvement in the availability and comparability of data on developing countries over the past two decades has provided many valuable insights into global markets for not only investors but also researchers. Starting from La Porta *et al.* (1997), who demonstrated the significance of the relationship between the development of the financial market and the legal system, a number of studies on the role of legal systems in financial markets (La Porta *et al.*, 1998, 2002; Graff, 2008) and in economic growth (Levine, 2005; Jappelli *et al.*, 2005; Galindo and Micco, 2004) have accrued. A large number of such studies on the relationship between legal systems and economic growth have sought to understand how markets with diverse legal systems stimulate different types of investments from foreign investors. In particular, international real estate investment, accounting for a large portion of cross-border investment, can play a significant role in economic growth and urbanization in host countries through capital accumulation and efficient land use. Recent studies suggest the importance of the transparency of the real estate market in inward real estate investment (Adair *et al.*, 2006; Eichholtz *et al.*, 2011; Falkenbach, 2009; Farzanegan and Fereidouni, 2014; Fereidouni and Masron, 2013; Lieser and Groh, 2014; Schulte *et al.*, 2005), while



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evidence on the relationship based on a sophisticated empirical analysis is scant. As mentioned in the study of Levine (2005), the determinants of investment should be carefully examined considering various factors, such as legal, social, demographic and natural conditions, as well as endogenous factors inherent in each market.

This paper aims to investigate the role of market transparency in international real estate investment by utilizing country-level panel data to address such various factors and endogeneity issues. It is worth mentioning the literature that relates to our study. Eichholtz *et al.* (2011) analyze the performance, measured by Jensen's α , between internationally operating real estate companies and domestic real estate companies focusing on local markets from 1996 to 2007. They find that international real estate companies underperform in the early period, while underperformance disappears with more transparent conditions in the later years. They argue that the improvement of the transparency of the real estate industry has recently equalized the conditions for foreign investors. Fereidouni and Masron (2013) and Lieser and Groh (2014) use panel data to examine the determinants of international real estate investment. Fereidouni and Masron (2013) use the corruption perceptions index provided by Transparency International as a proxy of market transparency and find that higher transparency is associated with greater investment. Lieser and Groh (2014) collect various socioeconomic and institutional variables across countries covering the period between 2000 and 2009 and conduct an augmented random effect panel regression. They find several factors that may attract international real estate investment, namely, economic growth, rapid urbanization, compelling demographics, higher transparency in the legal framework, ease of administrative burdens and sociocultural challenges and political stability. Other studies examine the relationship between market transparency and aggregate FDI (Drabek and Payne, 2002; Seyoum and Manyak, 2009; Egger and Winner, 2003). Farzanegan and Fereidouni (2014) analyze panel data for 32 countries between 2004 and 2010 and find that the country fixed effects do not show a statistically significant relationship between market transparency and FDI inflows to the real estate sector.

This paper brings new empirical evidence to the literature by focusing primarily on the role of market transparency in determining the volume of inward real estate investment, using updated country-level panel data covering 44 countries from 2004 to 2016. We follow the methodology taken by Lieser and Groh (2014) and introduce new explanatory variables, such as interest rate, house price growth, land productivity and market transparency indices, in our analysis. Key variables are the market transparency indices that are provided for this research by JLL and LaSalle Investment Management, a world consultancy company specializing in property services and investment management. This paper differs from other studies using the transparency index by JLL and LaSalle Investment Management (Eichholtz *et al.*, 2011; Farzanegan and Fereidouni, 2014; Newell, 2016; Sharp, 2013) in that we use an updated transparency index constructing panel data with a longer time dimension, utilize multiple transparency indices instead of just an aggregate index to examine how the investment is attributed to different aspects of market transparency, and employ the augmented panel data method (or "correlated random effects approach" as in Wooldridge, 2015) for intra- and international investigations of the determinants of the investment.

The estimation result suggests that countries with higher market transparency receive more investment from foreign countries than countries with lower market transparency, with other factors, such as economic size and growth, being constant. In particular, better accessibility to fundamental information on the real estate market and higher enforceability of real estate-related regulations are associated with greater inward investment. However, the accounting quality of corporate governance is negatively correlated with investment, implying that investors prefer investing in real estate in countries with poor accounting quality, which generates greater excess returns for real estate investment. We also find that investment is positively correlated with higher house price growth and lower land

productivity, which suggests the possibility that foreign investors seek regions with potential for future demand in the market.

The following section describes the data used in the analysis. Then, the empirical model and results are demonstrated. Finally, the last section draws the conclusions.

2. Data

We collected country-by-every-second-year unbalanced panel data of 44 countries, in the period from 2004 to 2016. In this subsection, we introduce three types of variables used in our analysis: inward commercial real estate investment, real estate market transparency indices and a set of control variables selected from those used in the study of Lieser and Groh (2014) as explanatory variables.

2.1 Inward real estate investment

The data on the inward real estate investment were prepared by a real estate advisory company, Cushman & Wakefield (hereinafter, C&W). As mentioned in the study of Lieser and Groh (2014), the data provided by C&W are considered the highest quality database on international real estate investment[1]. In particular, we use country-level panel data on inward commercial real estate investments as a dependent variable in our analysis. The same database was used in the study of Lieser and Groh (2014), covering the period from 2000 to 2009.

Figure 1 shows the time trend of global inward real estate investment in US\$ billion from 2004 to 2017[2]. The investment was increasing until the start of the rapid decline due to financial crisis, and then it gradually increased, reaching almost the level prior to the crisis by 2015.

2.2 Real estate market transparency index

The data on real estate market transparency are provided by JLL and LaSalle Investment Management, a world leading property consultancy company specializing in property services and investment management[3]. In 2016, JLL published a report on the ninth edition of the Global Real Estate Transparency Indices (GRET), which measures the real estate market transparency in different countries and is constructed based on a survey of 139 constituent factors[4]. We were provided with the biennial panel data from 2004 to 2016 of the composite score, which is a comprehensive evaluation of real estate market transparency, and 13 transparency subindices ((1) Direct property indices, (2) Listed real estate securities, (3) Unlisted fund indices, (4) Valuations, (5) Fundamental data, (6) Financial disclosure, (7) Corporate governance, (8) Regulation, (9) Land and property registration, (10) Eminent domain, (11) Real estate debt information, (12) Sales transactions and (13) Occupier services). Table AII lists 139 factors composing the 13 indices.

Figure 2 shows the time trends of 14 transparency indices (Composite score + 13 subindices). Each index is a continuum scale ranging from 1 to 5, with a lower value indicating a higher transparency. As shown in the figures, market transparency has been

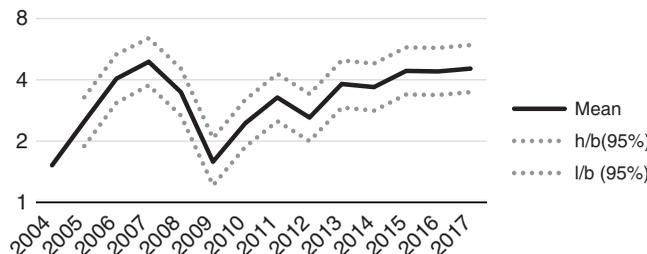


Figure 1.
The trend of inward
real estate investment
(USD billion)

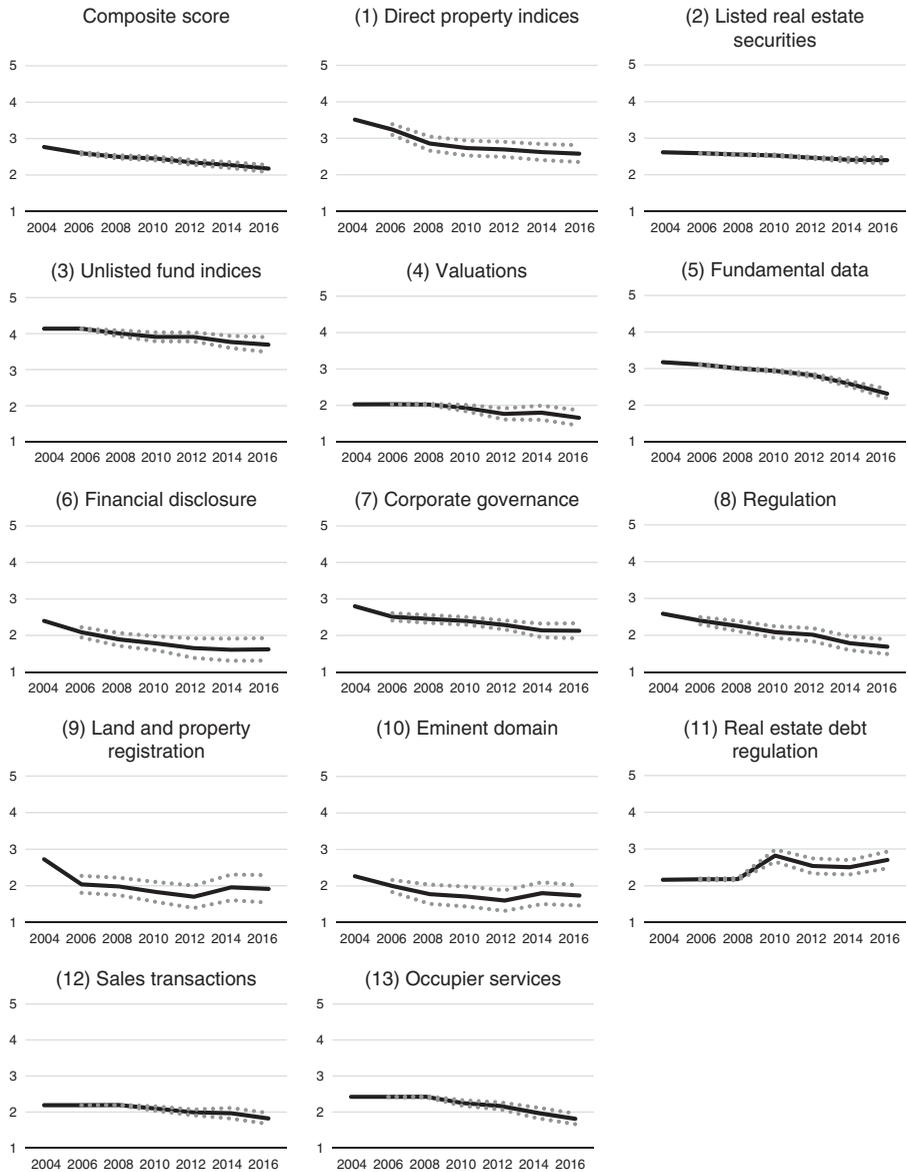


Figure 2.
Market transparency
indices

improved in almost all aspects, except that (9) Land and property registration and (10) Eminent domain became less transparent from 2012 to 2014, and (11) Real estate debt information became less transparent after the financial crisis. These indices indicate degrees of transparency, not strictness of regulations or difficulties of transactional procedures. Therefore, a higher score of (8) Regulation, for instance, indicates lower transparency in and/or weaker enforceability of regulation, not a tighter control on regulation.

The combination of these two data sets on investment and market transparency generates unbalanced panel data of 44 countries for a maximum of seven periods

(biennial from 2006 to 2014)[5]. Figure 3 shows scatter plots of real estate investments against market transparency across countries, where the vertical axis is the time-average real estate investment in logarithmic value and the horizontal axis is the time-average market transparency Composite score. We can observe a clear negative correlation between these variables: the lower the Composite score (i.e. the more transparent the real estate market in a country), the greater the real estate investment is toward the country. Since the volume of real estate investment is not determined solely by market transparency, we need to consider various factors, such as economic size and regulatory strictness, to extract a partial correlation between investment and market transparency.

2.3 Other explanatory variables

The selection of control variables is based on Lieser and Groh (2014). We first excluded variables of constituent factors comprising the JLL transparency indices and then collected as many other variables listed in Lieser and Groh (2014) as possible. However, we were not able to collect all desired variables due to limitations of data accessibility. To retain sufficient numbers of observations in our analysis, we selected two sets of control variables. One set of variables, denoted by \mathbf{Xa} , includes those that are available between 2004 and 2016 for more than 85 percent of the 44 countries. The other set of variables, denoted by \mathbf{Xb} , includes variables that are available from 2004 to 2016 for more than 80 percent of 43 countries.

We also gathered three additional variables not used in the study of Lieser and Groh (2014) that are expected to influence the inward real estate investment: namely, interest rates, house price growth rates and value added in the service sector per urban land area. The interest rate is expected to be negatively correlated with the volume of real estate investment because a higher interest rate yields a greater amount repaid when making a loan to purchase real estate. However, as the investment is often financed in investors' countries, the interest rate in a host country may not have a significant impact on the cross-border investment. Although long-term interest rates may have been more appropriate to capture the impact on the investment, the number of countries for which the data were available was not sufficient, and thus, the money market interest rates were used. The expectation of house price growth may increase the inward investment because the demand for goods/services expands with the number of higher-income consumers in the region and because the appreciation of invested real estate asset value increases collateral value to make further investments. Finally, the

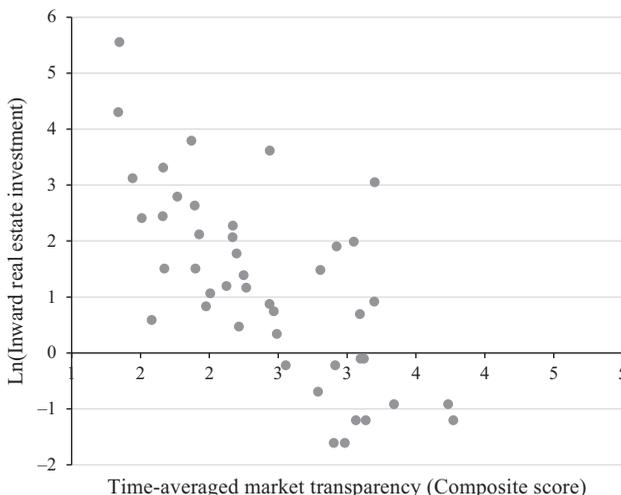


Figure 3.
Inward real estate
investment vs market
transparency

value added of the service sector per urban land area indicates the land productivity of the service sector. The direction of the effect of land productivity on investment is ambiguous. On the one hand, foreign investors may prefer investing in commercial real estate in profitable regions, while on the other hand, some investors may strategically invest in regions that still have room for higher profitability in the future.

The basic statistics of real estate investments, market transparency indices, explanatory variables, **Xa**, selected from the study of Lieser and Groh (2014), and the three additional variables are shown in Table I.

3. Empirical analysis

3.1 Estimation model

As with Lieser and Groh (2014), the following augmented panel regression model will be estimated by random effect estimation:

$$y_{it} = u_i + \delta_t + \overline{\text{TI}}_i \alpha^W + \overline{\text{TI}}_i \alpha^B + \overline{X}_{it} \beta^W + \overline{X}_i \beta^B + \varepsilon_{it},$$

where y_{it} is the natural logarithmic value of the annual inward commercial real estate investment to country i from the rest of the world in year t ; u_i the country i 's unobservable fixed effect; δ_t a year-time fixed effect; TI the a vector of market transparency indices; X a vector of control variables that may affect the investment [6]; and ε_{it} an error term. $\overline{\text{TI}}_i$ and \overline{X}_i are the averages of TI_{it} and X_{it} for country i over time; that is, $\overline{\text{TI}}_i \equiv \sum_t \text{TI}_{it} / T_i$ and $\overline{X}_i \equiv \sum_t X_{it} / T_i$, where T_i is the

Variables	Observation	Mean	SD
Inward commercial real estate investments (US\$M)	273	15.80	46.10
JLL transparency index: composite score	173	2.39	0.67
Real GDP (2010 US\$B)	273	1.93	9.44
Real GDP per capita (2010 US\$K)	273	0.98	0.94
Real GDP growth (%)	273	0.34	0.45
Unemployment rate (%)	273	7.43	4.65
CPI (consumer price index) growth (%)	273	3.28	3.38
Urban population (% of total population)	273	72.76	15.88
Telecommunication (Fixed telephone subscription per 100 people)	273	35.78	16.80
Domestic credit provided by banking sector (% of GDP)	273	128.67	64.75
FDI net flows (US\$M)	273	39.70	68.89
Marginal corporate tax rate (%)	208	42.89	12.57
Profit and capital gains tax (%)	208	16.31	7.42
Cost to register property (% of warehouse value)	203	4.54	2.93
Procedures to register property (number)	203	5.44	2.33
Time needed to register property (days)	203	36.05	40.20
Procedures to start a business (number)	231	6.86	3.24
Time needed to start a business (days)	231	19.37	18.25
Cost of business start-up procedures (% of income per capita)	231	7.72	7.99
Minimum capital needed to start a business (% of income per capita)	231	26.12	50.88
Time needed to resolve insolvency (years)	231	2.07	1.39
Cost of resolving insolvency (% of estate)	231	11.24	8.40
Recovery rate (cents on US\$) recouped by creditors through insolvency	231	60.77	26.33
Political stability and absence of violence (indicator)	273	62.39	26.02
Interest rate (% , money market interest rate)	251	3.09	3.47
House price growth (% 2-year average)	186	17.70	23.92
Service-sector value added per urban land area (US\$B per sq. km)	240	30.16	59.52

Table I.
Basic statistics

Sources: Cushman & Wakefield, JLL and LaSalle Investment Management, International Monetary Fund, World Bank

number of years for which the data for country i are available. \ddot{T}_{it} and \ddot{X}_{it} indicate within-transformed variables; that is, $\ddot{T}_{it} \equiv (T_{it} - \bar{T}_i)$ and $\ddot{X}_{it} \equiv (X_{it} - \bar{X}_i)$.

Here, α^W and β^W are within estimators indicating how changes in the independent variables over time affect the investment within a country. On the other hand, α^B and β^B are between estimators indicating cross-border correlations due to differences in the levels of variables and investments across countries[7].

3.2 Estimation results

We first look at the estimation results that use the Composite score with two sets of variables, **Xa** and **Xb**, as explanatory variables (Table II); then, the two sets along with three additional variables are added separately (Table III). Lastly, the result using 13 transparency subindices is described (Table IV).

Table II describes the results using Composite score as an indicator for market transparency. The first two columns show the within estimates and between estimates of a model using **Xa** as control variables. The between estimate of the Composite score is -1.331 , which is statistically significant at the 1 percent level, implying that a country with a one-point higher time-average Composite score is associated with a lower investment by approximately 74 percent ($= e^{-1.331} - 1$) with other factors, such as GDP, urban population and FDI net flows, being constant. On the other hand, the within estimate of the Composite score is not

	Control variables			
	Xa		Xb	
	Estimates		Within	Between
	Within	Between	Within	Between
Ln(GDP)	0.657	0.084***	-0.465	0.131**
Ln(GDP per capita)	-0.156	-0.661**	-0.995	-0.692**
Real GDP growth	0.163	1.056*	0.213	1.502**
Unemployment rate	-0.044*	-0.048***	-0.057*	-0.006
CPI growth	-0.025	0.016	-0.018	-0.052
Urban population	-0.030	0.018*	-0.108***	0.031**
Telecommunication	0.007	0.020*	0.011	0.019**
Domestic credit provided by banking sector	-0.003	0.003	-0.003	0.002
FDI net flows	0.000	0.005*	0.000	0.002
Political stability and absence of violence	0.001	0.006	0.011	-0.014*
Marginal corporate tax rate			0.096**	0.019**
Profit and capital gains tax			-0.084*	0.019
Cost to register property			-0.070	-0.078**
Procedures to register property			-0.006	-0.243**
Time needed to register property			0.007**	0.010**
Procedures to start a business			-0.034	0.145**
Time needed to start a business			-0.010	-0.009
Cost of business start-up procedures			-0.001	-0.062**
Minimum capital needed to start a business			0.001	0.001
Time needed to resolve insolvency			0.068	-0.314**
Cost of resolving insolvency			0.014	-0.034**
Recovery rate from insolvency			0.019	-0.002
TI (Composite Score)	0.003	-1.331**	-0.240	-0.868**
Observations		273		203
Number of countries		44		43
Number of parameters		28		51
R^2 (within)		0.3458		0.4207
R^2 (between)		0.8420		0.9267

Notes: *, **, ***Significant at 0.05, 0.01 and 0.1 percent levels, respectively

Table II.
Estimation results
with Composite score

Table III.
Estimation results
with additional
variables

	Additional variable					
	Interest rate		House price growth (% 2-year average)		Ln(service-sector value added/area)	
	Estimates					
	Within	Between	Within	Between	Within	Between
TI (Composite)	-0.032 (0.346)	-1.262** (0.288)	-0.065 (0.446)	-1.239* (0.563)	-0.363 (0.355)	-1.378** (0.357)
Additional var.	-0.025 (0.025)	0.014 (0.038)	0.018*** (0.005)	0.070 (0.040)	-1.794 (1.201)	-0.376*** (0.213)
Control var.	Xa		Xa		Xa	
Observations	251		186		240	
No. of countries	41		32		40	
No. of parameters	30		30		30	
R ² (overall)	0.3557		0.4077		0.3429	
R ² (within)	0.8339		0.7884		0.8458	

Notes: Numbers in parentheses are robust standard errors. Coefficients for control variables, **Xa**, are not shown in the table. *, **, ***Significant at 0.05, 0.01 and 0.1 percent levels, respectively

Table IV.
Estimation results
with 13 transparency
subindices

	Control variables			
	Xa		Xb	
	Estimators			
	Within	Between	Within	Between
<i>Transparency index (TI)</i>				
(1) Direct property indices	-0.030	-0.690**	-0.028	-0.767**
(2) Listed real estate securities	-0.468	-0.611**	-0.052	-0.252
(3) Unlisted fund indices	-0.245	0.007	-0.114	0.036
(4) Valuations	0.116	0.127	0.105	0.539
(5) Fundamentals data	-0.291	-0.137	-0.078	-0.041
(6) Financial disclosure	0.077	0.405**	0.126	0.230
(7) Corporate governance	-0.137	0.870**	0.058	0.726**
(8) Regulation	0.121	-0.872**	-0.098	-1.605**
(9) Land and property registration	-0.06	-0.613**	0.001	0.339
(10) Eminent domain	0.020	0.521**	-0.117	-0.113
(11) Real estate debt regulation	0.171	-0.212***	0.131	-0.049
(12) Sales transactions	-0.177	0.195	-0.214	0.958**
(13) Occupier services	0.058	-0.178	-0.057	0.399
Observations	273		203	
No. of countries	44		43	
No. of parameters	52		75	
R ² (within)	0.3334		0.4652	
R ² (between)	0.9253		0.9772	

Notes: Coefficients of control variables, **Xa** and **Xb**, are not shown in the table. **, ***Significant at 0.01 and 0.1 percent levels, respectively

statistically significant. These results suggest the possibility that countries that had a head start on facilitating a transparent market were immune to foreign competition and enjoyed a significant increase in inward investment (and/or that countries that enjoyed large inward investments from the early period continuously engaged in facilitating transparency in the market), which makes the between estimate statistically significant, while the marginal gain from improving market transparency diminished since the market transparencies in global real estate markets were gradually leveled, resulting in the non-significance of the within estimate in the sample period of 2004–2016. This explanation is in line with the study of

Farzanegan and Fereidouni (2014), who show that the within effect of transparency on FDI inflows to the real estate sector is statistically non-significant, and with Eichholtz *et al.* (2011), who show that the excess returns between international and domestic real estate companies disappear in the later years of their study period.

Among the control variables in **Xa**, the between estimates show a positive sign for GDP, real GDP growth, urban population, telecommunication and FDI net flows and negative signs for GDP per capita and unemployment rate. The only within estimate showing a significant sign is the unemployment rate.

The last two columns in Table II show the results using **Xb**, which contains variables regarding costs/difficulties of purchasing, registering, starting and ending investment procedures in addition to **Xa**. Although these cost-related variables are not constituent factors of the Composite score, the market transparency can be correlated with these variables, which could affect the coefficients for the Composite score. As shown in the estimation result, the between estimate of the Composite score is -0.868 , whose absolute value is smaller than that of the previous estimation without using cost-related variables. This result implies that the Composite score is positively correlated with the cost-related variables, attenuating the coefficient of the Composite score. The estimation results of both models assure the positive relationship between the volume of inward investment and market transparency across countries.

Now, we include additional variables: interest rate, house price growth rate and service-sector value added per urban land area. Because of data limitations, we run three regressions using each of additional variables separately along with **Xa** and the Composite score as explanatory variables to retain sufficient numbers of observations. Table III shows the estimation results of the coefficients for the Composite score and additional variables. The results of the coefficients for **Xa** are omitted from the table. In general, a decline in interest rate in a country makes it easier for investors to borrow and boosts investments, by which the within estimate for interest rate is expected to show a negative sign. However, the coefficients are not statistically significant. This result may be attributed to the fact that investors finance cross-board investments in their own countries to some extent, reducing the significance of the correlation between investment and interest rate in host countries[8]. Regarding house price growth, the within estimate is positive and significant at the 10 percent level. As the house price appreciates, investors increase investment, expecting future expansion of market demand and increase in the collateral values of real estate. The value added of the service sector per land area can be interpreted as the land productivity of the service sector. The between estimate shows a negative sign at the 10 percent significance level. This sign implies the possibility that investors invest in countries with a greater potential for increasing demand in the market.

Finally, Table IV describes the estimation results using 13 transparency subindices as explanatory variables in place of the Composite score. We do not find any significant sign for the within estimates. The between estimates with significant signs in both regressions are (1) Direct property indices, (7) Corporate governance and (8) Regulation[9].

(1) Direct property indices, composed of six constituent factors[10], measures the accessibility to fundamental information on the real estate market and performance in the targeted country. The positive estimated coefficient suggests that the higher accessibility to and transparency of the fundamental information on the real estate market in the targeted country reduces the information asymmetry between investees and investors across countries, resulting in large real estate investment toward the country.

(8) Regulation, composed of 13 factors[11], measures the availability, enforceability and predictability of various real estate-related regulations in a country. The negative coefficient for Regulation suggests that a high transparency of such factors can reduce the uncertainty and risk of investment and thereby attract foreign investors.

(7) Corporate governance, composed of four factors[12], reflects the audit quality of cooperate governance. Among the above three indices with significant signs, only Corporate governance shows a positive correlation with investment: the higher the index is (i.e. the lower the audit quality of corporate governance), the larger the investment, implying that investors prefer investing in real estate in countries where auditing standards are less strict. This interpretation is supported by the positive sign of (6) Financial disclosure[13], the measure of accessibility and accountability to financial statements, indicating that a lack of accountability for financial statements is associated with a large inward investment. Edelstein *et al.* (2011) show that real estate security returns are negatively correlated with the quality of country-specific corporate governance. Although poor corporate governance is expected to amplify information asymmetries and reduce investment, the increase in excess returns for real estate investment due to poor accounting quality may outweigh the issue of asymmetric information[14]. Egger and Winner (2005) and Glass and Wu (2002) find positive relationships between corruption and FDI in host countries, suggesting that corruption may be beneficial by allowing circumvention of regulatory and administrative restrictions (Leff, 1964).

4. Conclusion

This paper investigates the role of market transparency in international real estate investment. By using updated country-level panel data covering 44 countries from 2004 to 2016, the empirical results confirm the positive relationship between market transparency and international investment. In particular, better accessibility to fundamental information on the real estate market and higher enforceability and predictability of real estate-related regulations are strongly associated with larger inward investment. These factors may attract foreign investors by reducing the asymmetric information between investees and investors across countries. However, we find a negative relationship between the accounting quality of corporate governance and investment. The increase in excess returns for real estate may outweigh the issue of information asymmetry that is generated when corporate governance lacks accountability in a targeted country. We also find that investment is positively correlated with higher house price growth and lower land productivity, which may reflect that foreign investors seek regions with potential for future demand in the market.

Overall, the coefficients for market transparency show significant signs only in terms of between estimates, not within estimates. This result indicates that the countries with large inward real estate investment had facilitated market transparency from an early period that this study did not cover. These countries could have been immune to foreign competition and enjoyed large inward investments from the early period and continuously engaged in facilitating transparency in the market, while the marginal gain from improving market transparency diminished since the market transparencies in global real estate markets were gradually leveled.

That said, there is still a significant gap among countries in terms of market transparency. The results in this paper suggest that, although it may take considerable effort and some time, countries lacking transparency can increase inward investments by two means: consolidating real estate market information to be provided to foreign investors and boosting the enforceability of regulation to mitigate the uncertainty of returns on investment. In particular, constituent factors of (1) Direct property indices and (8) Regulation, listed in Table AII, can serve as effective topics for the government to work on to enhance the potential for growing inward investments. The results also imply that investors and public sectors in countries facing a saturated real estate market may find an opportunity to expand investment in other countries by investigating less-explored markets and by seeking bilateral negotiations to secure a higher predictability of returns on investment in targeted countries. Finally, from a social welfare perspective, leveling the gap of market transparency is essential to promote efficiency in the global market of real estate investment.

Notes

1. Please refer to the C&W website (www.cushmanwakefield.com/en) for details on the company and the data of international real estate investment.
2. Figure 1 was constructed in the following manner. In the following equation:

$$y_{it} = \psi_i + \rho_t + e_{it},$$

where y_{it} is the natural logarithmic volume of investment toward country i in year t ; ψ_i an individual fixed effect of country i ; ρ_t a time fixed effect of year t ; and e_{it} the residuals. Let \bar{y}_i refer to the time average of the logarithmic investment toward country i and \bar{y} be the average of the logarithmic investment across years and countries. Subtracting \bar{y}_i from and adding \bar{y} to y_{it} yields the following equation:

$$y_{it} - \bar{y}_i + \bar{y} = \bar{\psi} + \rho_t + \tilde{e}_{it},$$

where $\bar{\psi}$ is the average of country fixed effects and $\tilde{e}_{it} = e_{it} - \bar{e}_i + \bar{e}$. In Figure 1, the exponentials of OLS estimates of $\bar{\psi} + \rho_t$ of the equation, i.e., $\exp(\hat{\psi} + \hat{\rho}_t)$, were plotted over time as a solid line, with dashed lines representing 95 percent significance intervals calculated based on standard deviations.

3. Please refer to the JLL website (www.us.jll.com/en) for details on the company and the data of the transparency indices.
4. The latest version of GRETI, published in 2018, is based on 186 factors with an additional index, Sustainability.
5. Basic statistics of real estate investments, Composite score, and number of observations by country are described in Table AI.
6. Lieser and Groh (2014) constructed six indices, each of which was composed of four to six row variables, and used them as explanatory variables to estimate the investment equation. On the other hand, we use all available row variables along with transparency indices, for the main purpose of this paper is to examine the relationship between the market transparency and the volume of investment.
7. Please refer to, for instance, Wooldridge (2015) and Mundlak (1978) for further explanations on the augmented panel regression model.
8. The positive sign of the between estimate for interest rate reflects differences in capital accumulations by countries, where a higher interest rate implies a lower capital intensity within country, reflecting a higher marginal product of capital. Such countries with scarce capital stock have a greater potential to grow economically and therefore attract inward investments for new buildings and infrastructure.
9. In Table IV, some between estimates show significant signs either in the model using **Xa** or in the model using **Xb** but not in both. This result implies that these indices are correlated with additional variables in **Xb** or that the impacts are not statistically robust. In this paper, we focus on the three indices that show significant impacts regardless of the choice of control variables to interpret results that can be concluded with conviction.
10. The six factors comprising Direct property indices include existence of a direct property index, reliability of the index and extent to which it is used as a benchmark of performance, type of index, length of national direct property level returns index time series, size of national institutional investment in the real estate market, and market coverage of the direct property index.
11. The 13 factors comprising Regulation include extent to which the tax code is consistently applied for domestic/foreign investors, extent to which real estate tax rates are predictable for domestic/foreign investors, existence/predictability/enforcement of land use rules and zoning, existence/enforcement of building codes and safety standards for buildings, simplicity of key regulations in contract law, efficiency of the legal process, and level of contract enforceability for domestic/foreign investors.

12. The four factors comprising Corporate governance include manager compensation and incentives, use of outside directors and international corporate governance best practice, alignment of interests and shareholder power, and free float share of the public real estate market.
13. Factors comprising Financial disclosure include stringency of accounting standards, level of detail in/frequency of financial statements, and data disclosure by companies.
14. The between estimate of [12] Sales transactions is also positive and significant but only in the model using **Xb**. This subindex is expected to have both positive and negative impacts on investment because the higher transparency in sales transaction is associated with less information asymmetry and better accounting quality. The inclusion of the additional variables in **Xb** may have controlled for the positive impact and resulted in picking up the negative correlation (i.e., showing the positive sign).

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(The Appendix follows overleaf.)

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Country IOC	Observations	Commercial real estate investment (US\$ B)		Market transparency (Composite score)	
		Mean	SD	Mean	SD
AUS	7	22.7	9.2	1.44	0.11
AUT	7	3.2	1.2	2.27	0.13
BEL	7	3.3	1.2	2.13	0.19
BGR	5	0.4	0.4	3.34	0.23
BRA	7	4.4	1.8	2.81	0.29
CAN	3	11.5	3.3	1.66	0.06
CHE	7	4.5	2.7	1.90	0.16
CHN	6	21.1	12.4	3.20	0.34
CZE	7	2.1	1.2	2.47	0.29
DEU	7	44.3	23.3	1.87	0.13
DNK	6	2.9	1.4	2.01	0.13
ESP	7	9.7	5.2	2.17	0.17
FIN	7	4.5	2.1	1.67	0.07
FRA	7	27.4	7.6	1.67	0.20
GBR	7	73.8	27.5	1.34	0.07
GRC	7	0.2	0.2	2.90	0.21
HKG	7	13.9	4.4	1.89	0.08
HRV	5	0.3	0.3	3.07	0.17
HUN	7	0.8	0.4	2.56	0.28
IDN	4	0.3	0.2	3.14	0.30
IND	7	2.5	1.1	3.20	0.36
IRL	6	2.3	2.2	1.98	0.21
ITA	7	7.9	3.6	2.17	0.20
JPN	7	37.1	12.3	2.44	0.27
KOR	7	7.3	4.1	3.05	0.23
MEX	7	2.0	1.4	3.09	0.33
MYS	4	2.4	0.9	2.44	0.13
NLD	7	11.1	4.5	1.51	0.07
NOR	7	5.9	2.6	2.20	0.16
NZL	4	1.8	0.9	1.58	0.05
PHL	4	0.2	0.2	2.99	0.17
POL	7	4.0	1.6	2.25	0.30
PRT	7	1.4	0.9	2.49	0.26
ROU	7	0.9	0.6	3.10	0.52
RUS	5	6.7	2.4	2.92	0.09
SGP	7	8.3	2.1	1.93	0.12
SVK	5	0.5	0.3	2.79	0.27
SWE	7	16.3	3.8	1.77	0.08
THA	5	0.8	0.3	2.91	0.20
TUR	7	0.9	0.5	3.12	0.43
UKR	6	0.4	0.2	3.74	0.20
USA	7	257.7	121.8	1.35	0.07
VNM	4	0.3	0.1	3.77	0.19
ZAF	5	1.6	0.9	2.22	0.10

Table AI.
Basic statistics on
investment and
market transparency
by countries

Indices	Constituent factors
(1) Direct property indices	<ul style="list-style-type: none"> Existence of direct property index Reliability of the index and extent to which it is used as a benchmark of performance Type of index (valuation based vs notional) Length of direct property level returns index time series Size of institutional invested real estate market
(2) Listed real estate securities indices	<ul style="list-style-type: none"> Market coverage of direct property index Dominant type of listed real estate securities (i.e. long-term holders of real estate vs homebuilders and conglomerates) Use of listed real estate securities data on the real estate market Years since the first commercial real estate company was listed Value of public real estate companies as % of GDP Existence of a domestic listed real estate index and its use as a benchmark Existence of an international listed real estate index and its use as a benchmark Length of public real estate index time series
(3) Private real estate fund indices	<ul style="list-style-type: none"> Existence of a domestic fund index and its use as a benchmark Existence of international fund index and its use as a benchmark Length of unlisted fund index time series
(4) Valuations	<ul style="list-style-type: none"> Independence and quality of third-party appraisals Use of market-based appraisal approaches Competition in the market for valuation services Frequency of third-party real estate appraisals
(5) Market fundamentals data	<ul style="list-style-type: none"> Existence and length of time series on property rents (office, retail, industrial, residential) Existence and length of time series on take-up/absorption (office, retail, industrial, residential) Existence and length of time series on vacancy (office, retail, industrial, residential) Existence and length of time series on yields/cap rates (office, retail, industrial, residential, hotels) Existence and length of time series on capital values (office, retail, industrial, residential, hotels) Existence and length of time series on investment volumes (office, retail, industrial, residential, hotels) Existence and length of time series on revenue per available room for hotels Existence and geographical coverage of a database of individual buildings (office, retail, industrial, residential, hotels, alternatives) Existence and geographical coverage of a database of leases (office, retail, industrial, residential, hotels, alternatives) Existence and geographical coverage of a database of property transactions (office, retail, industrial, residential, hotels, alternatives) Proportional coverage of databases on individual buildings (office, retail, industrial, residential, hotels, alternatives) Proportional coverage of databases of leases (office, retail, industrial, residential, hotels, alternatives) Proportional coverage of databases of property transactions (office, retail, industrial, residential, hotels, alternatives)
(6) Financial disclosure	<ul style="list-style-type: none"> Stringency of accounting standards Level of detail in financial statements Frequency of financial statements Availability of financial reports in English
(7) Corporate governance	<ul style="list-style-type: none"> Manager compensation and incentives Use of outside directors and international corporate governance best practice Alignment of interests/shareholder power Free float share of the public real estate market

(continued)

Table AII.
13 transparency
subindices and 139
constituent factors

Indices	Constituent factors
(8) Regulation	<ul style="list-style-type: none"> Extent to which the tax code is consistently applied for domestic investors Extent to which real estate tax rates are predictable for domestic investors Extent to which the tax code is consistently applied for foreign investors Extent to which real estate tax rates are predictable for foreign investors Existence of land use rules and zoning Predictability of changes in land use and zoning Enforcement of land use rules and zoning Existence of building codes and safety standards for buildings Enforcement of building codes and safety standards for buildings Simplicity of key regulations in contract law Efficiency of the legal process Level of contract enforceability for domestic investors Level of contract enforceability for foreign investors
(9) Land and property registration	<ul style="list-style-type: none"> Existence of land registry Accessibility of land registry records to public Availability of title insurance Accuracy of land registry records Completeness of land registry records on ownership Completeness of public records on transaction prices Completeness of public records on liens and easements
(10) Eminent domain/ compulsory purchase	<ul style="list-style-type: none"> Notice period given for compulsory purchase Fairness of compensation to owners in compulsory purchase Ability to challenge compulsory purchase in court of law
(11) Real estate debt information	<ul style="list-style-type: none"> Existence and length of time series on commercial real estate debt outstanding Existence and length of time series on maturities and originations of real estate loans Existence and length of time series of delinquency and default rates of commercial real estate loans Availability of data on loan-to-value ratios for commercial real estate loans Availability of data on margin rates for commercial real estate loans Requirements for lenders to monitor cash flows and collateral value of property with loan facilities Requirements for lenders to carry out real estate appraisals Penalties for non-compliance with requirements
(12) Sales transactions	<ul style="list-style-type: none"> Quality and availability of pre-sale information Fairness of the bidding process Confidentiality of the bidding process Professional and ethical standards of property agents Enforcement of professional and ethical standards of property agents
(13) Occupier services	<ul style="list-style-type: none"> Availability of professional third-party facilities and project management companies Providers of property management services known to occupiers Service expectations for property management clear to occupiers Alignment of occupier and property manager interests Frequency of service charge reconciliation Accuracy and level of detail in service charge reports Ability for tenants to audit landlord's accounts and challenge discrepancies

Table AII. Source: JLL

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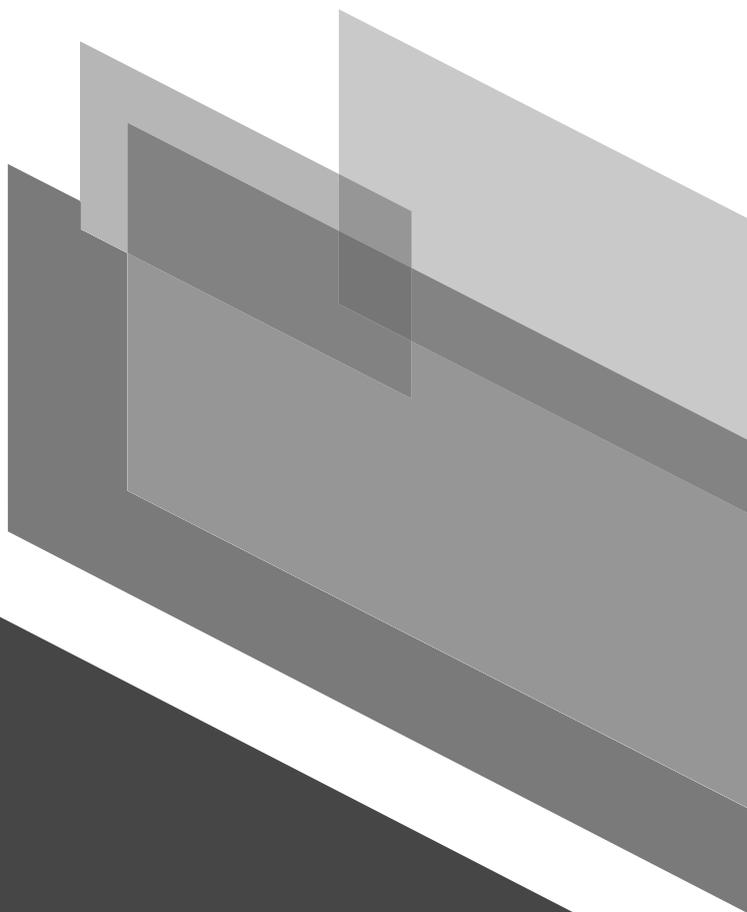


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