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Unlocking the Potential of Infrastructure in the New Financial and Economic Paradigm

- *Professor Dr Alastair Adair, Dr Martin Haran, Professor Jim Berry, Professor Stanley McGreal, Dr Michael McCord*

Introducing REITs (Real Estate Investment Trusts) to Enhance the Risk Adjusted Returns of the Risky Direct Real Estate Portfolio

- *Dr Ho Kim Hin / David, Dr Christopher Shun Kong Leng*

The Significance and Future Opportunities of the Asian Real Estate Markets

- *Professor Dr Graeme Newell*

Announcement

Notes to Contributors



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Objective

The Journal of Valuation and Property Services is a publication specifically intended for property professionals to keep abreast with the developments in the property industry as well as the real estate profession.

This Special Edition consists of papers presented during the 7th International Real Estate Research Symposium (IRERS) 2014, held in INSPEN on 29-30 April 2014. The theme for the symposium was "Unlocking the Potential of Real Estate".

This journal serves as a platform for the exchange of information and ideas on property issues. It seeks to address areas of major interest and practical relevance to the real estate profession. It create awareness of new theories, techniques and applications as well as related concepts relevant to the real estate profession. It also discuss policy issues and regulations and their implications on the property market.

We therefore welcome articles with theoretical and practical relevance to the real estate industry and profession, property valuation, property management, property investment and market analysis.

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UNLOCKING THE POTENTIAL OF INFRASTRUCTURE IN THE NEW FINANCIAL AND ECONOMIC PARADIGM

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ABSTRACT

New regulatory frameworks introduced in the wake of the global financial crisis and the new economic environment allied with a contraction in risk appetite and capacity of banking institutions, the conventional providers of real estate and infrastructure development finance, have served to constrain the infrastructure development pipeline.

The scale of the funding challenge is demonstrated by McKinsey Global Institute (2013) who forecast that infrastructure investment globally will have to increase by nearly 60% from the prevailing US\$36tn spent from 1995-2012 to US\$57tn over the period 2013-2030 in order to support anticipated global economic expansion.

The global infrastructure challenge is multi-faceted and complex. The new financial paradigm for infrastructure funding allied with a growing acceptance of the inadequacies and deficiencies in infrastructure provision ensure that the need to implement a more systematic response to the challenge is necessitated. Within the new financial paradigm national governments are seeking greater value for money when it comes to infrastructure investment in essence better quality, enhanced output for less input.

This paper examines the emergence of the 'new normal' financing environment on infrastructure delivery through partnership arrangements and the need to align infrastructure provision relative to economic growth strategies in order to harness more effectively the multiplier effects associated with infrastructure investment. Arrangements such as Public Private Partnerships (PPP) have been advocated as one possible solution to the infrastructure 'investment gap'. Predicated on 'value for money', PPPs are now used in over 40 countries and will continue to provide an important method for infrastructure procurement.

1.0 SCALE OF INFRASTRUCTURE FINANCING CHALLENGE

Across the world the demand for infrastructure is increasing following the period of reduced economic growth resulting from the global financial crisis. Infrastructure projects are being undertaken to respond to economic needs, to repair/upgrade existing facilities and to respond to increasing growth in the global economy (Preqin, 2014).

The scale of the challenge of financing such infrastructure is demonstrated by McKinsey Global Institute (2013) who forecast that infrastructure investment globally will have to increase by nearly 60% from the prevailing US\$ 36tn spent from 1995-2012 to US\$57tn over the period 2013-30 in order to support anticipated global economic expansion.

The extent of the global challenge is also recognized by the Organisation for Economic Cooperation and Development (OECD) and Asia-Pacific Economic Cooperation (APEC). Over the last decades, public capital investment in infrastructure has on average declined in OECD countries. The OECD average ratio of capital spent in fixed investment (mainly infrastructure) to GDP fell from above 4% in 1980 to approximately 3% in 2005 (Della Croce and Yermo, 2013). The need for long-term infrastructure investment is one of the main priorities for APEC. APEC Finance Ministers welcoming the G20/OECD High-Level Principles at their September 2013 meeting in Bali asked the OECD to join the new APEC PPP Experts Advisory Panel (OECD, 2013).

There are major economic benefits from undertaking infrastructure development. In relation to economic growth, every US\$1bn spent on infrastructure creates 18,000 jobs, almost 30% more than if the same amount were used to cut personal income taxes. In addition, investment in infrastructure boosts long run productivity by lowering travel times for people and goods, facilitates easier communication and lowers expenditure both in time and money on repairs. Research shows that the construction of a road typically led to an increase in economic activity between three and eight times bigger than the initial outlay within eight years after its completion (Economist, 2013).

Demand for energy, transport, water, education and healthcare improvements increase with the growth in the global population. Allied to demand is the recognition by governments that investment in infrastructure creates jobs and stimulates economic growth. The demand for infrastructure has culminated in an extenuated need to attract new sources of investment and to develop infrastructure investment models which more effectively align institutional investor profiles with project opportunities.

Addressing the infrastructure investment challenge necessitates a bi-lateral approach encompassing the attraction of new sources and formats of finance conducive with the radically transformed financial and economic paradigm and increasing the efficiency and effectiveness of all facets of the infrastructure provision process (Figure 1).

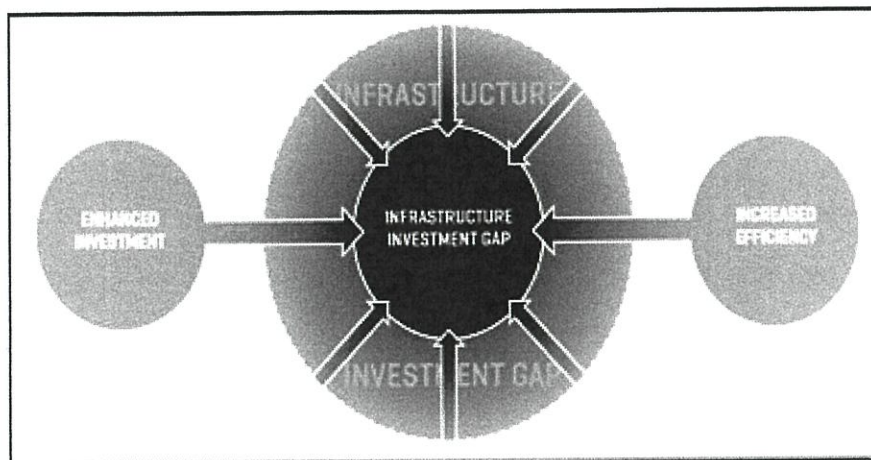


Figure 1: Bilateral Nature of the Infrastructure Challenge

2.0 GLOBAL GROWTH AND INFRASTRUCTURE INVESTMENT TRENDS

The World Bank reports that global growth recorded 2.3% in 2013 and an increase to 3.2% is anticipated in 2014 growing further to 3.5% in 2016. The growth in infrastructure investment broadly mirrors and reinforces the macro-economic picture (IJ, 2014). The twelve months to the end of December 2013 saw a recovery across global infrastructure markets both in terms of value (51% increase to US\$280bn) and number of deals (up 30% to 548 deals reaching financial close). Energy in the form of oil and gas led infrastructure projects (US\$113bn) followed by transport (>US\$50bn) and power (US\$35bn) focused on strong activity in Asia and Pacific (IJ, 2014).

The uplift in infrastructure activity is supported by Preqin (2014) who report that global infrastructure deal flow has grown steadily in recent years, in terms of the number of deals completed and aggregate deal value (Figure 2). In 2009 just 516 infrastructure deals were closed globally due to investor appetite stalling and banks retreating from lending. The upward trend is demonstrated with 668 completed deals in 2010 and a record high of 729 transactions in 2011, an increase of 41% in two years. Deal flow plateaued but remained strong in 2012 and 2013, with 702 and 691 deals closed in these years respectively. By early Spring 2014 a total of 78 deals have been reported.

In terms of deal value, Preqin produces two figures to illustrate how much global capital is invested in infrastructure assets on an annual basis, a reported (based on the sum of all known deal sizes per year) and an estimated (total amount invested in infrastructure including deals where the financial value has not been disclosed) aggregate deal value.

In 2013, US\$292bn of transactions were estimated to have been completed, slightly less than the US\$304bn completed in 2012. So far in 2014, US\$25bn of infrastructure transactions are estimated to have been completed. European infrastructure assets have historically accounted for a higher proportion of deals completed per year than any other region. Of more than 750 infrastructure deals finalized since the start of 2013, European assets account for 44% of the total, while North America is also a prominent market, accounting for 29%. Outside of these two core regions, 11% of deals completed have been

in Asian infrastructure assets, 7% in Australasia and 5% in South America. In terms of industry, core infrastructure sectors are most prominent, accounting for a significant 82% of total deals made since the start of 2013, while social sectors account for 16% (Prequin, 2014).

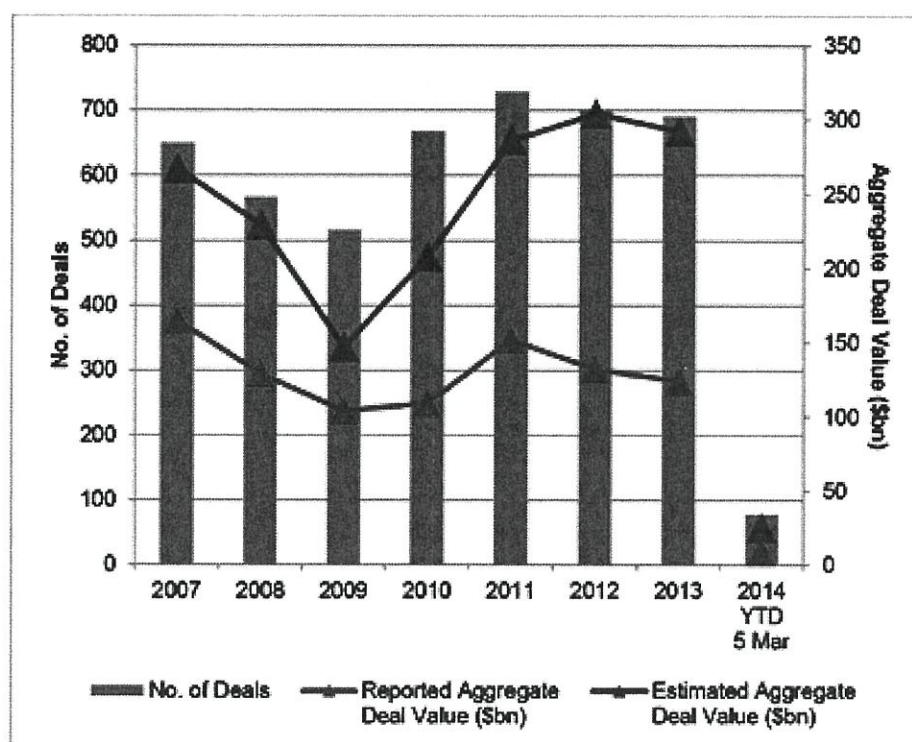


Figure 2: Number and Aggregate Value of Infrastructure Deals Completed Globally, 2007 - 2014 YTD

Source: Prequin (2014)

IJ (2014) report that Asia and Pacific region was the largest geographic market for infrastructure investment with deals totalling US\$67bn whereas Europe was the most active in terms of deal value closing a number of transport, social and renewable energy deals (IJ 2014). In relation to project financing long-term institutional debt finance availability was not a problem in 2013 however a range of funding solutions are found involving government guarantee models, EIB Project Bond Initiative, ING Pebble funding structure and increased capital markets involvement in project finance. Nevertheless the volume of finance for green field projects remains subdued compared with pre-crisis years.

3.0 FLIGHT FROM EUROPEAN TO ASIAN BANKS

In relation to debt finance for infrastructure, European banks have given way to Asian and Australian lenders (IJ, 2014). While Europe has posted a revival Asia & Pacific is the region with the most diverse number of countries bringing oil and gas project deals to a financial close. In 2013 the region was the second largest global market for investment due to the growth of energy infrastructure in Australia, China, Japan, Indonesia, and India and supporting transport links within regional economies.

On past performance Australia is a market leader in project finance investment closing deals worth US\$52bn in 2013. Projects include light rail, roads, ports, prisons, hospitals and LNG facilities worth US\$21bn. Australian pension funds are diversifying overseas into the US market particularly for large value deals in the US energy sector.

In addition 19 countries in the region raised finance for projects last year with Vietnam focusing on the oil and gas refinery sector. Australia, Japan and Thailand are dominant in the renewables sector which has been growing in the region and onshore wind farms raised a total of US\$3.5bn up from US\$626 million in the full year 2013. PV solar saw investment of US\$1.7bn up from US\$203mn over the year.

Other countries with active investment pipelines include Australia, Bangladesh, New Zealand and the Philippines. Social infrastructure in the region has a pipeline worth US\$4bn ranging from hospitals to prisons in Australia, Indonesia, the Philippines, Pakistan and Bangladesh.

India has focused primarily on the energy sector in 2013 however a number of road tenders are also underway. The Indian government's launch of its Infrastructure Debt Funds last year seeks to attract foreign and local institutional investor capital to the country.

4.0 CHARACTERISTICS OF THE 'NEW NORMAL' ECONOMIC ENVIRONMENT

The new economic environment or 'new normal' as described by El-Erian (2010) following the global financial crisis of 2007-08 and the aftermath of the 2008-2012 global recession has questioned the belief of policy makers and economists that industrial economies would return to their pre GFC trends. El-Erian envisaged a new economic environment characterized by permanent weaker activity, employment and profits as the artificial stimulant of excess borrowing was excised. In contrast to the pre-GFC, the new normal offers a view of the world based on hard facts and reality, rather than the simplified versions proffered by ideological economic agendas (Alvarado, 2010). According to Kaletsky (2010) such a view questions the long-term survival of a free-market capitalist system.

In contrast to the view that the new normal will be a period of stagnant living standards, depressed asset prices and weak growth, Kaletsky argued in 2010 that the world economy would be able to achieve a rapid recovery, provided central banks and governments redirect their macroeconomic policies towards growth and keep interest rates at rock-bottom levels. His optimism results from four powerful long-term trends that shape the global economy. Three of these the rise of Asia, globalization, and what he calls the Great Moderation created by the reinvention of Keynesian demand economics continue to operate. Only the fourth trend the revolution in finance has been severely impacted by the GFC.

While the global economy appears to be making a slow rather than a rapid recovery and the new normal theories about permanently low growth have become less credible nevertheless new patterns of finance and partnership arrangements are emerging. These are culminating in an extenuated need to attract new sources of investment and in the case of infrastructure seek more effective alignment of institutional investor profiles with project opportunities.

New regulatory frameworks introduced in the wake of the global financial crisis including Basel III and Solvency II allied with a contraction in risk appetite and capacity of banking institutions, the conventional providers of real estate and infrastructure development finance, have served to constrain the infrastructure development pipeline extenuating the need to attract new sources and forms of investment.

5.0 INSTITUTIONAL INFRASTRUCTURE INVESTMENT: BRIDGING THE GAP

The global financial crisis had a profound effect on project finance for infrastructure at a global level (Preqin, 2014). In the early years of the current recession it was anticipated that the cost of debt would return to a reasonable level and project deal flow would increase. The impact of the GFC has been to reduce the availability of private capital by increasing its cost and restricting its availability (Preqin, 2014). The contraction in debt finance has been accompanied by economic austerity and cutbacks in public expenditure rather than economic growth (Preqin, 2014).

The impact of the GFC has fostered more cautious investment strategies and a greater focus on portfolio risk management in the coming years. On the other hand, the prolonged low-yield environment has heightened the need for return-enhancing strategies, pushing some investors to invest in alternative assets (Della Croce and Yermion, 2013). Consequentially, debt investments for infrastructure by institutional investors were initially perceived in 2011 as a short-term opportunity due to traditional bankers scaling back their activity. Three years later it is now appreciated that project financing will be a longer-term opportunity and one that is more diverse and complicated than originally thought. New banking regulations (Basle III) will negatively affect the ability of banks to provide long-term financing. The emerging long-term financing gap is particularly acute in the infrastructure sector and could slow down the world economy for years to come and abort attempts by emerging and developing economies (EMDEs) to set themselves on a high-growth path (Della Croce and Yermion, 2013).

The role of institutional investors in long term financing is nonetheless constrained by the short-termism increasingly pervasive in capital markets as well as structural and policy barriers such as regulatory disincentives, lack of appropriate financing vehicles, limited investment and risk management expertise, transparency, viability issues and a lack of appropriate data and investment benchmarks for illiquid assets such as infrastructure. A principal challenge for institutional investors is that infrastructure debt does not fit neatly with investors' traditional asset allocation frameworks due to its nature as a hybrid asset class ie it is not quite real estate and not quite fixed-income (IPE, 2014).

Institutional investor appetite for infrastructure nonetheless remains strong according to Preqin (2014). Many institutions have made their maiden investments in the asset class over the course of 2013 with the majority of investors (61%) reporting that they are below their target allocations and 46% anticipate their allocations will increase in the long-term. However, by way of context it is important to recognise that for many institutional investors infrastructure is still a new asset class with 72% of active investors allocating less than 5% of their total assets to infrastructure (Preqin, 2014).

In terms of the medium by which investors have sought exposure to the asset class there has been a dramatic growth of the unlisted infrastructure debt fund market since 2009 and in January 2014 there were 20 funds seeking an aggregate US\$15bn compared to 16 funds targeting US\$9.7bn a year earlier (Preqin, 2014). Research indicates that investors are increasingly adopting direct and co-investment strategies as well as more established placing of capital through discretionary funds. In addition funds are assembling teams with infrastructure investment banking, project finance and private equity experience across a range of sectors and geographical regions (Preqin, 2014).

Reasons for investors' interest in infrastructure include de-correlated returns, long-term stable cash flows, security over valuable assets, a socially useful purpose, and potentially an inflation hedge. In the past only equity investment in infrastructure was an option for institutions as banks dominated the debt market. A consequence of the global financial crisis has been the opening up of infrastructure debt to a broad range of investors for the first time (IPE, 2013).

Research by Sequoia Investment Management of a side-by-side comparison of infrastructure equity and debt indicates that historically, infrastructure equity has returned 11% (net IRR) and senior debt 4.5%. However, debt yields are higher since the crisis and equity yields have fallen so the gap in returns between infrastructure debt and equity is now much narrower (IPE, 2013).

Interestingly the research demonstrates that absolute returns should not be the main focus but rather returns in the context of risk and capital. Investments in infrastructure debt are significantly more predictable than equity with standard deviation of 0.9% on a single infrastructure investment, compared with 7.5% for an equity fund. Consequently infrastructure debt has attractive risk-return characteristics (IPE, 2013).

The returns on infrastructure debt have increased considerably in recent years due primarily to supply and demand rather than a change in risk profile. Many banks have exited long-term infrastructure lending or are just focusing on domestic markets leaving gaps in the market. While some institutions such as Allianz, MetLife and Blackrock have started lending to infrastructure projects, they have not yet come close to replacing the lost financing capacity.

6.0 RESEARCH ON GLOBAL INFRASTRUCTURE AND PPP

The global infrastructure challenge is multi-faceted and complex. The new financial paradigm for infrastructure funding allied with a growing acceptance of the inadequacies and deficiencies in infrastructure provision ensure that the need to implement a more systematic response to the challenge is necessitated. Within the prevailing financial paradigm national governments are seeking greater efficiency when it comes to infrastructure investment in essence better quality, enhanced outputs for less cost.

To assist policy formation the Royal Institution of Chartered Surveyors (RICS) sponsored research on partnership based infrastructure procurement to ensure that the advice RICS provides to governments and other key stakeholders is supported by a timely and credible evidence base (RICS, 2013). The scope of the investigation covered five key PPP markets at different levels of maturity namely the UK, Australia, Canada, India and the US and focussed on efficiency in the procurement process and attracting new and enhanced levels of investment.

The methodology comprised stakeholder interviews and forum based discussions across the five key markets involving the public (local and central government, government advisors) and private sectors (contractors/service providers, banks and investment institutions). In addition quantitative evidence was obtained from Infrastructure Journal (IJ) and Prequin databases.

Public Private Partnerships (PPP) are now used in over 40 countries providing an important method for infrastructure procurement. As the share of government investment in infrastructure has declined that of the private sector has increased, with privatisations being an important driver. Since the 1990s national policies of many countries have sought to increase private sector participation in the financing and implementation of new projects notably through "project finance (Della Croce and Yermion, 2013). New business models with private sector participation, variants of public private partnership models (PPPs), often using project finance technique, have been increasingly used particularly in OECD countries, offering further scope for unlocking private sector capital and expertise. Global Project Finance stood at US\$382bn in 2012, a 6% decrease from the US\$406bn recorded in 2011. Asia Pacific accounted for 50% of global project finance in 2012. EMEA's share was 26% while the America's made up 24%. Since 2007, Asia Pacific's share of global project finance has increased from 19% share while EMEA's has decreased from 56%. America's proportion has increased steadily since 2010 (RICS, 2013).

7.0 PPP: ENSURING GREATER EFFECTIVENESS AND VALUE FOR MONEY

In making infrastructure delivery or procurement more efficient there is no globally recognised/accepted definition of efficiency in terms of Value for Money (VfM). A principal reason is the lack of robust and credible data provision resulting in the inability to benchmark projects on a like-for-like basis.

One of the key drivers behind the international roll out of the PPP model is the premise that partnership based procurement is inherently more 'efficient', minimises large cost overruns and delays endemic within traditional design and build or design-bid-build public procurement and as a consequence delivers better VfM. The underpinning ideology is that private sector participation in asset and service provision can maximize VfM for governments by expediting financing, facilitating innovation, providing better risk management, and integrating life-cycle management. Numerous studies have continuously demonstrated advantages and disadvantages employing PPPs, with a number of policy documents in the UK alone advocating the utilisation of the PPP model (NAO, 2011). However, the lack of robust quantifiable evaluation has resulted in partnership based procurement being left open to criticism.

Quantifiable analysis of PPP projects relative to other infrastructure procured using a traditional approach on a 'like-for-like basis' incorporating the 'lifecycle' and whole life cost dimension remains problematic as it is unlikely that two projects are 'identical' which makes comparison inherently difficult. The deficiency of adequate benchmark data and the time taken to undertake value testing are key barriers for robust VfM analysis. Scrutiny between procurement approaches is perceived as difficult as data generally exists at a high level only, with limited data publicly available for analysis on the range of costs and charges that are included in the PPP deal (design costs, construction costs, technical, legal, financial and transaction costs). Equally, there is limited data relating to public authorities actual costs to provide, operate, finance and maintain an asset procured conventionally and funded directly with public funding over the lifecycle.

The perceived advantages and disadvantages that PPP delivery exhibits in comparison to other procurement routes has been succinctly summarised by Graham (2010) in Table 1.

Table 1: Summary of PPP Advantages and Disadvantages

	Traditional Procurement Methods				
	PPP	Design & Construct	Alliance/ Partnering	Design, Construct & Maintain	Managing Contractor
Time taken to award contract	✓	✓✓	✓✓✓	✓✓	✓✓✓
Time to deliver asset	✓✓✓	✓	✓✓	✓✓	✓✓
Transaction cost	✓	✓✓	✓✓✓	✓✓	✓✓✓
Cost certainty	✓✓✓	✓	✓	✓✓✓	✓
Whole life maintenance	✓✓✓	x	x	✓✓✓	x
Budget certainty	✓✓✓	✓	✓	✓✓	✓
Project due-diligence	✓✓✓	✓✓	✓	✓✓	✓
Environmental approvals	✓✓	✓✓✓	✓	✓✓	✓
Change in performance requirements	✓	x	x	✓	x
Design innovation	✓✓✓	✓	✓✓	✓✓	✓✓✓
Construction innovation	✓✓✓	✓✓	✓✓	✓✓✓	✓✓
Commissioning/ Decanting	✓✓✓	✓	✓	✓✓✓	✓✓

Source: Adapted from (Graham, 2010)

A VfM assessment is often called for at all stages of a project's life cycle, including the study of project feasibility, project delivery, and at post-project evaluation. However, assessing VfM within PPP projects relative to projects procured through conventional procurement is usually only undertaken up to the end of financial close. Therefore, confirming VfM of PPP projects currently in the operational phase remains problematic. In the UK, guidance was issued by NAO in 2006 to assist procurers identify, challenge and confirm if VfM was being achieved in delivery of infrastructure assets through a PPP procurement.

A key finding of the interview evidence was that VfM can be improved by public equity co-investment in future projects to ensure better alignment of objectives, greater transparency and improved VfM. Interviewees suggested that enhanced long-term planning will improve accelerated delivery ensuring procurement is faster and cheaper than in the past, with improved public sector procurement capability.

This finding is a key point in terms of the enabling process as planning has a role to play in addressing inefficiency, in addition to more flexible service provision, together with a gain share mechanism for any surplus lifecycle funds; significantly increasing the level of capital grant that authorities can make to projects, without disrupting the transfer of risk to the private sector; and encouraging the assessment and use of a greater range of debt financing sources to secure affordable, value for money long-term debt finance.

For the purposes of the research infrastructural provision was premised upon four distinct phases:

- i. Planning and development (from inception or assessment of need/demand to advertisement of the project opportunity)
- ii. Procurement (placement of notices seeking requests for participation through to contract financial close)
- iii. Construction/Service Implementation (site commencement to asset handover/or availability for use/operation)
- iv. Operation/Use (the operational phase through to completion of PPP contract and hand back of the asset or facility to the client).

Each phase has a series of key dynamics which are deemed essential for consideration to ensure the successful delivery of PPP projects as well as understanding/enhancing VfM over the lifecycle of the PPP contract. These 'critical success factors' depicting the basis for VfM assessment can be evidenced through consideration of a value proposition framework (Figure 3).

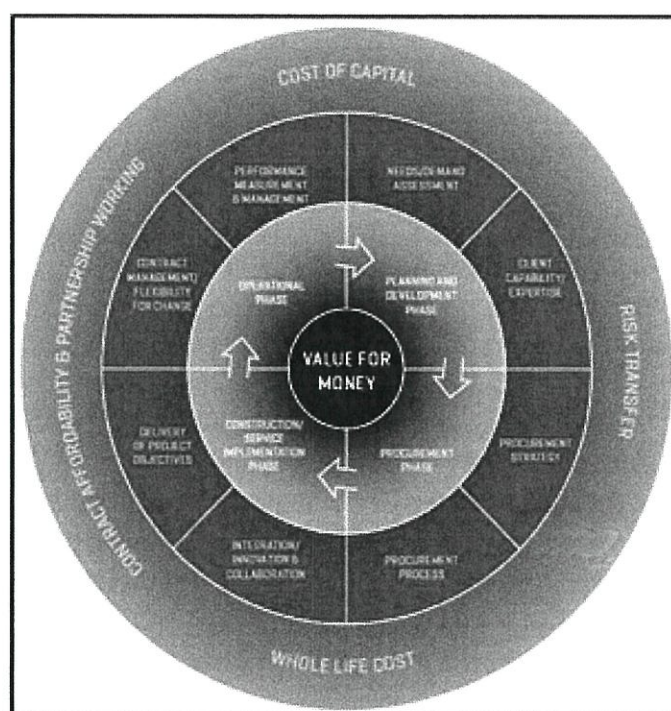


Figure 3: Value Proposition Framework

Source: rics.org (2013)

8.0 ENHANCING INFRASTRUCTURE INVESTMENT AND PROCUREMENT

The research highlights a number of areas for improvement in the delivery of infrastructure procurement and investment.

A more 'Systematic' Approach to Infrastructure Provision: addressing a perceived inherent bias (often political in the West) towards new build infrastructure. There is a requirement to make more effective use of existing infrastructure and to embrace new technologies/strategies which permit more effective management of infrastructure demand. If 'new build' is justified, and in light of budgetary constraints, there is a requirement to 'maximise' and demonstrate both the economic and societal impacts of infrastructure investment. Moreover, emphasis should be placed on an 'area' based rather than 'project' based approach to enhance the 'societal impacts' potentially within the confines of a wider regeneration/renewal programme.

Opportunities for cross-departmental collaboration or a 'portfolio' based approach also need to be explored as this will enhance VfM and investment opportunities moving forward. The 'Infrastructure Route Map' developed by Infrastructure UK serves as a credible platform to the development of a more coherent approach to assessing and building an effective delivery environment premised on best practice. RICS embraced this route map in preparing its *Developing an Appropriate Procurement Strategy and Route Guidance* for its members published in July 2013.

Sustain Government's Commitment to Infrastructure Investment: wholesale inadequacies in infrastructure related policies have served to undermine the economic competitiveness of many of the world's leading economies. As such there is a need to 'ring fence' infrastructure investment levels as a percentage of GDP and to more effectively align infrastructure investment programmes with economic growth strategies. This will provide a sustained commitment to infrastructure investment and reinforce the strong synergy between economic competitiveness and the quality of infrastructure provision on the part of national governments. A 'clear' commitment to infrastructure investment will also serve to stimulate greater private sector commitment. Paradoxically, the absence of government commitment will be construed as enhanced 'political risk' and will serve to curtail the participation of the investment community.

Educate Stakeholders (Uniformed/Misinformed) on the Benefits of PPP: there is a need to 'educate' stakeholders including the wider public on what PPP actually is, what and where the costs are - more importantly where savings or efficiency gains can be achieved by the use of PPP. Paradoxically, that education process is not confined to new/emerging PPP markets. In what could be considered more 'mature' markets there is a need to communicate more effectively the 'benefits' and VfM attainment in order to generate a more 'balanced' PPP debate.

Improve 'Capacity' and 'Competence' within the Public Sector: whilst the levels of public sector competence have improved markedly over the course of the last decade it is apparent that competence levels vary significantly across the jurisdictions and within different infrastructure sectors.

Indeed, even within 'mature' PPP markets such as the UK, deficiencies in client capability across different phases of the PPP procurement timeline are serving to detract from VfM. As such, there is a need to develop 'client capability' in a number of areas including needs assessment, whole-life costing and contract management/enforcement. Additionally, the research identifies the need to improve public sector competence in 'preparing' deals for market readiness to ensure deals are 'packaged' conducive to investment. Within these confines it is important for the public sector to recognise and appreciate the role of 'deal makers' in matching projects and investors.

Establish a Robust and Credible Data Framework for PPP Projects: the 'data vacuum' pertaining to PPP deals requires urgent redress if 'public' confidence in the model is to be 'established' or 'restored' (dependent on market maturity). Over the course of the research the extent of deficiencies and limitations in key data sets pertaining to operational performance were acutely apparent. Specifically, more needs to be done to improve the transparency of project performance and the returns being generated by investors. The lack of transparency and relative absence of robust quantifiable performance data has culminated in misguided opinion and often unwarranted criticism pertaining to PPPs.

Facilitate Greater Contract Flexibility and Promote 'Mutually Advantageous' Life-cycle Innovation: forecasting infrastructure need/demand over the lifetime of a PPP contract is problematic as the timeline will invariably encompass different phases in the economic cycle. There is a requirement for greater flexibility in the PPP contract to explore and implement innovative concepts/techniques to enhance value for money over the life time of the PPP contract. At present the rigidity of the contractual structure is not conducive to asset/ service 'lifecycle innovation'. Moreover, it is apparent that opportunities for innovation and efficiency savings need to be 'mutually advantageous' and not a means of enhancing private sector profits – which has often been the case historically.

Improve the 'Enabling Environment' for Investment in PPP: a proactive approach is required on the part of national governments in order to improve the 'enabling environment' for investment in PPP projects. Legislative and political risks were routinely identified as the single greatest barriers to enhanced levels of (institutional) investment. Additionally, innovative investment platforms/ models (both direct and indirect) which are conducive to prevailing financial paradigms for infrastructure projects and which afford more proficient liability matching (investor with opportunity) in order to enhance levels of investment from the private sector. Finally, there is a need to educate investors currently not in the infrastructure space and lacking specialist infrastructure expertise on the investment potential as well as the risks offered by different forms of infrastructure.

9.0 CONCLUSIONS

The GFC had a profound impact on the landscape for infrastructure debt. Bank lending has been curtailed as a consequence of constraints on lending capacity in tandem with a marked contraction in risk appetite. Additionally, the cost of borrowing for infrastructure projects has moved out markedly in the last five years – a consequence of diminished competition amongst lenders. Pertinently, the implications of the financial crisis are likely to have long-term as well as immediate impacts for infrastructure finance as a result of regulatory transformation. Basel III introduced to stabilise the banking sector will have unintended but potentially profound consequences for infrastructure lending. Specifically, stability and liquidity ratios present significant challenges given the large scale, capital intensive nature of infrastructure projects. A number of infrastructure specialist debt funds have sought to avail of the opportunities being manifest as a result of the large-scale exodus of conventional lenders (predominantly banking institutions). Default rates on infrastructure loans are less pronounced than for other sectors of industry whilst reduced completion in the market has resulted in more favourable lender margins on deals that are transacting.

Addressing the infrastructure investment challenge necessitates a bi-lateral approach encompassing the attraction of new sources and formats of finance conducive with the radically transformed financial and economic paradigm and increasing the efficiency and effectiveness of all facets of the infrastructure provision process. One model increasingly advocated in response to the infrastructure investment challenge has been Public Private Partnership (PPP). The PPP model is premised upon the attainment of 'Value for Money' (VfM) and amidst prevailing budgetary constraints the global PPP market had been expected to continue to expand unabated. The GFC has nonetheless proven to be a 'watershed' for PPP markets around the world. A number of prominent banking institutions have exited the PPP market whilst the increased cost of debt post 2008 has served to reignite the debate on 'affordability' (over the life time of the contract) and VfM attainment relative to other procurement options.

In an investment environment governed by risk aversion, the 'tangibility' of infrastructure assets combined with comparatively stable and robust returns has served to enhance the appeal of infrastructure within the investment community. Nonetheless, in order to move the institutional investment community from a position of 'awareness of the potential' to 'committed investment', a number of potential barriers need to be addressed. Firstly, there is a pertinent need to improve the transparency of infrastructure markets in order to facilitate performance benchmarking relative to other asset classes. The work of Infrastructure Journal (IJ) and PreQuin has been instrumental in driving the market transparency agenda and significant strides have been made over the course of the last five years in developing market sophistication. Whilst it is clear that there is a strong appetite for infrastructure investment within the institutional investment community there is a requirement for more effective liability matching including better alignment of investor profiles relative to project investment opportunities in order to expedite investment flow. Additionally, there is requirement for greater collaboration between the providers of infrastructure and the institutional investment community in order to develop mutual appreciation and understanding of positions and to initiate exploration of innovative funding models for the provision of essential infrastructure going forward in conformance with new legislative principles including the Solvency II Directive.

Given the unremitting budgetary pressure confronting national governments and the continued demand for efficiency and allocated resources, there has been a collective will to promote the use of the PPPs as a means of effective delivery of public services. The achievement of Value for Money within infrastructure procurement remains a foremost policy concern. Research has constantly questioned whether infrastructure procurement delivered through private capital truly represents VfM for the taxpayer.

Evaluations of PPPs relative to other procurement routes remain largely unquantified and lack a robust and tangible performance measurement evidence base. In this regard, quantifiable analysis of PPP relative to other publically procured infrastructure on a 'like-for-like' basis incorporating whole life costing remains problematic. There is a requirement to undertake full lifecycle costing and measurement of PPPs throughout all phases of the project lifecycle. Furthermore, there remains considerable scope for expediting the pre-contractual agreement phase of PPP contracts to enhance VfM. Risk transfer remains a key mechanism through which PPPs can deliver improved VfM. The increase of PPP as a standardised procurement route will undoubtedly improve risk allocation and the achievement of more optimal VfM.

Nonetheless, challenges exist as to the competitive nature of the PPP bidding process. Limited skills and financial prudence required to set up PPPs can restrict potential bidders, reducing open market competition. Finally, the use of the Public Sector Comparator (PSC) for assessing VfM relative to PPP remains challenging and plagued with methodological difficulties. This presents significant challenges and indeed opportunities to improve and monitor the PPP model in order to deliver more timely and cost effective VfM.

The PPP model will continue to occupy a 'pivotal' role in the provision of global infrastructure going forward. Public Private Partnerships have proven themselves flexible and adaptable transcending international borders and cascading different infrastructure forms. As the model has evolved and matured there is consensus that the benefits of partnership based procurement are more evenly apportioned across the public and private sectors. Nonetheless, even the strongest advocates of PPP recognise the scope for further refinement and streamlining across all phases of the PPP lifecycle in order to further improve efficiency and enhance VfM. It is imperative that the public and private sectors work together to facilitate refinement and reformation of the PPP model conducive to the paradigm shift in the financial landscape in order to explore innovative avenues to reduce the cost of capital for essential infrastructure provision whilst continuing to harness the recognised benefits of whole life costing and scheduled maintenance programming in preserving asset value.

Finally, and in light of budgetary constraints there is a requirement to ensure investment in the provision of essential infrastructure effectively harnesses wider multiplier effects in terms of societal improvements and economic expansion. Aligning national infrastructure investment programmes including PPP projects alongside economic growth strategies enhances the investment decision making process in terms of infrastructure need as well as informing the sequencing of projects to ensure optimal economic and social benefits).

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INTRODUCING REITS (REAL ESTATE INVESTMENT TRUSTS) TO ENHANCE THE RISK ADJUSTED RETURNS OF THE RISKY DIRECT REAL ESTATE PORTFOLIO

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ABSTRACT

This paper reveals that the efficient frontier of risk-adjusted returns for direct real estate portfolio is enhanced by introducing REITS. The portfolio comprises Pan-Asian office and industrial real estate markets for thirteen major Asian cities, to which Asian REITS are added. Direct real estate total return data is in its 'smooth' form while the REIT data is 'de-smoothed' under the 1st and 4th order autoregressive model. The efficient frontier is first constructed under the strategic asset allocation (SAA) model, incorporating the Analytic Hierarchy Process (AHP) approach. Secondly, the Markowitz quadratic-programming tactical asset allocation (TAA) model is adopted to obtain a geographically and real estate sector diversified portfolio. The resulting efficient frontier with the de-smoothed data reveals a higher overall TR for every corresponding standard deviation as compared to the smoothed data. The TAA for the de-smoothed returns would lie on the efficient frontier at the maximum Sharpe ratio of 1.44 with a TR on 15.30% and a standard deviation of 7.31%. Conversely, the TAA for the smoothed returns would lie on the efficient frontier at the maximum Sharpe ratio of 1.31 with a lower TR of 14.2% and a standard deviation of 7.18%.

1.0 INTRODUCTION

This paper's contribution is in the enhancement of the efficient frontier of risk-adjusted returns for a Pan Asian direct real estate portfolio by introducing Asian REITS (real estate investment trusts). The real estate portfolio comprises Pan-Asian office and industrial real estate markets of thirteen major Asian cities, to which Asian REITS are introduced. The direct real estate total return data is in its 'smooth' form while the REIT data is in its 'de-smoothed' form. Initially the efficient frontier for the Pan-Asian real estate portfolio is constructed and examined under the strategic asset allocation (SAA) model, incorporating the Analytic Hierarchy Process (AHP) methodology. Then a Markowitz quadratic-programming tactical asset allocation (TAA) approach is adopted to adduce a geographically risk adjusted diversified Pan Asian real estate portfolio. The efficient frontier is re-constructed with the 'de-smoothed' direct real estate total return data. As the original smoothed real estate data underestimates the true volatility of direct real estate data, the required de-smoothing under Geltner and Miller (2007)'s 1st and 4th order autoregressive model ensures that the temporal lag error problem is minimized for both the direct real estate and REIT return data.

Three different datasets are utilized in this paper. Two datasets that require de-smoothing are the Jones Lang LaSalle Real Estate Intelligence Service-Asia (JLL REIS-Asia)'s office and industrial real estate for thirteen major Pan-Asia cities. These cities include Beijing, Shanghai, Taiwan, Hong Kong, Seoul, Tokyo, Manila, Jakarta, Singapore, Kuala Lumpur, Bangkok, Bangalore and Mumbai. The de-smoothed JLL REIS-Asia dataset, which is regionally reputable and internationally respected, and the MSCI (Morgan Stanley Composite index) Asia real estate capital index for publicly traded global REITs or REIT equivalent structures in the Asia Pacific region, are both utilized in the Markowitz modern portfolio theory (MPT) mean-variance, constrained quadratic programming (QP) optimization model for the efficient frontier construction.

Another contribution of this paper is that the real estate markets in the Asia Pacific region are still on a positive trajectory and they have attracted growing interest from international investment funds that are seeking high enough risk-adjusted yields than those in the traditional Western real estate markets. This paper attempts to address the question of whether an integrated AHP-SAA model and Markowitz QP TAA model that utilize de-smoothed data would produce an investment strategy, which further optimizes the risk-adjusted return of the pan-Asian real estate portfolio? The next section of this paper discusses the related literature and explains the theoretical framework of the integrated AHP-SAA model, the required de-smoothing and modern portfolio theory (MPT) for the TAA. Finally the results, findings and implications are discussed.

2.0 LITERATURE REVIEW

The Analytic Hierarchy Process (AHP) Model

Multi-criteria decision analysis (MCDA) is aimed at supporting decision makers faced with making numerous and conflicting evaluations. One key MCDA model includes the analytic hierarchy process (AHP) model. The AHP developed by Saaty in the 1970s and easily adopted by individuals working on complex problems, involving human perceptions and judgments, whose resolutions have long-term repercussions (Bhushan & Kanwal, 2004). AHP has produced meaningful results in relation to alternative selection, planning, resource allocation, and priority setting (De Steiguer *et al.*, 2003). They extend beyond the real estate context. Ong & Teck (1996) explore the AHP in translating expert judgment into 12-month forecasts of the Singapore private residential market. Bender *et al.* (2000) examine the AHP in a comparative study of the perceptions of the environmental quality of residential real estate in the three distinct regions of Geneva, Zurich and Lugano. HO *et al.* (2005) adopt the AHP to model strategic asset allocation model and find that the SAA-AHP model accurately reflects expert judgment among a cohesive group of real estate investment experts.

The AHP model has two key features, namely, the decomposition of a complex unstructured problem into its component parts or variables into a hierarchic order; and the assignment of numerical values to expert judgment to determine those decision variables of the highest priority that have to be acted upon to influence the outcome. An AHP hierarchy consists of an overall goal, a group of options or alternatives for reaching the goal, and a group of factors or criteria that relate the alternatives to the goal. The hierarchy can be depicted in Figure 1. Nevertheless, there are critics of the model. McCaffrey (2005) mentions that since there is no theoretical basis for constructing the hierarchies and that AHP users can construct different hierarchies for identical decision situations, potentially producing different solutions. AHP rankings are claimed to be arbitrary because they are based on subjective opinions under a ratio scale. There are flaws in the techniques of combining individual weights into composite weights and the AHP model has no sound underlying statistical theory. Proponents argue that in spite of these concerns, the AHP model works well in practice and is extremely popular among decision-makers in the private and public sectors, as posited by De Steiguer *et al.* (2003).

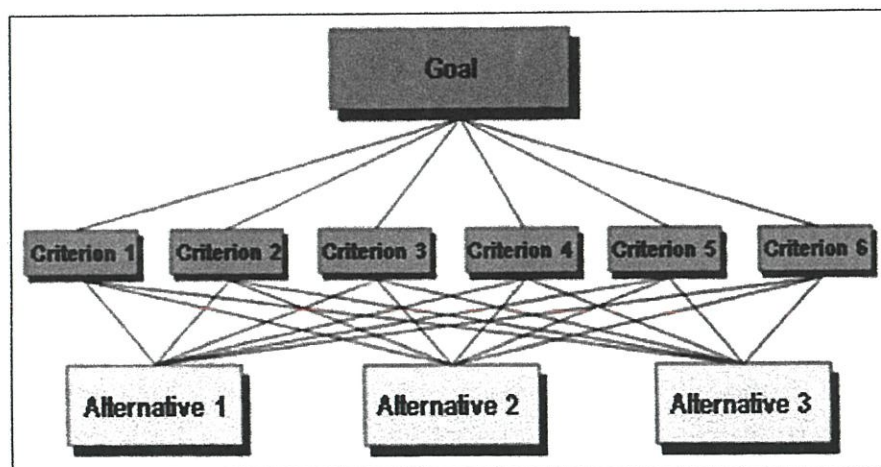


Figure 1: The AHP Hierarchy

Source: Authors (2014)

The AHP model primarily calls for pair-wise judgments to develop its structured hierarchy that is manipulated analytically to produce a final matrix, representing the overall priorities of the alternatives relative to each other. One can then make logical decisions based on the pair-wise comparisons made between the alternatives and the criteria being used in decision-making. Expert judgment from the investor's perspective is pivotal in formulating the AHP strategic asset allocation (SAA) model. Thus, a thorough real estate market analysis must be conducted to obtain in-depth understanding of the thirteen Asian markets, with the help of JLL market reports, reviews and forecasts. The AHP methodology is outlined below:

Step 1:

Completely define the problem and develop a hierarchy, which accurately represents the problem using the following guidelines:

Level 1 - Final goal or objective

Level 2 - Criteria used to judge alternatives

Level 3 - Alternatives

Step 2:

Develop matrices that compare the criteria with themselves (within the Level 2) and the alternatives with each criterion (between Level 2 and 3). Use a scale of relative importance.

Step 3:

Compute priority of weights of each matrix using the Eigen values

Step 4:

Compute composite priorities of the alternatives by linearly adding the priority weights.

Step 5:

Calculate a consistency ratio, which determines the consistency of the decision, and reveal the possible need of revisions to the judgments.

Pair-wise Comparison

For ease of understanding, AHP's step-wise approach is narrowed to three key steps. These comprise the pair-wise comparisons, consistency ratio estimation and the factor weight determination (HO *et al.* 2005). The decision maker starts by laying out the overall hierarchy of the decision. This hierarchy reveals the factors to be considered and the various alternatives in the decision. Then, a number of pair wise comparisons are conducted, that result in the determination of factor weights and their factor evaluations. The alternative with the highest total weighted score is selected as the best alternative. The decision maker needs to compare two different alternatives under a linguistic scale that ranges from equally preferred to extremely preferred, as in the e.g. below (NB. numbers denoting the scale followed by a description). For any pair-wise comparison matrix to be constructed, values of "1" are placed down the diagonal from the upper left corner to the lower right corner of the matrix.

A linguistic scale

- 1) Equally preferred.
- 2) Equally to moderately preferred.
- 3) Moderately preferred.
- 4) Moderately to strongly preferred.
- 5) Strongly preferred.
- 6) Strongly to very strongly preferred.
- 7) Very strongly preferred.
- 8) Very to extremely strongly preferred.
- 9) Extremely preferred.

Rationale for De-smoothing

For any real estate portfolio, the reliability of the portfolio depends on the accuracy of the data. Yet several studies have shown that there exists a smoothening of valuation based indices that could underestimate the true volatility of the returns. A study by Matysiak, (1995) show that valuation smoothing and temporal aggregation are factors that contribute to the inaccuracy of the measures of volatility in a portfolio. Specifically, the observed variance of the appraisal-based returns has been established to be much lower than the true variance. The main source of this problem is due to the underlying nature of valuation itself. Real estate has lengthy holding periods and infrequent transactions, thus capital values of properties are often estimated by valuers using comparison based valuation. This leads to the effect of smoothening in valuation based indices at the disaggregation level to temporal aggregation and the seasonality of reappraisals.

Evidence in smoothening exists for high first-order serial correlation of 0.8 and 0.6 for U.K monthly and U.S quarterly indexes respectively which are significant till the fourth order lag as posited by Matysiak, (1995); Geltner, (2007); The high serial correlation is an additional feature of temporal aggregation. Likewise, the result is an index that has been smoothed over time but does not truly reflect the changes in the market. The JLL-REIS Asia dataset itself does not contain pure transaction based values. Instead, its dataset uses derived valuation based values to establish the index. The occurrence of lagging of the real estate values in the index was previously established by HO (2007). As such and to derive more accurate values, the index would have to be de-smoothed. Our paper adopts the autoregressive de-lagging model of Geltner and Miller (2007) to de-smooth the direct real estate total returns that are subject to temporal aggregation and the seasonality lag review.

Modern Portfolio Theory (MPT)

Markowitz (1959) developed MPT and reiterated the trade-off between risk and expected return. He establishes the concept of an "efficient portfolio," postulating that rational investors select their investment portfolios to yield the highest possible return for a specified level of risk or minimal level of risk for a specified rate of return. These two sets of portfolios are optimally efficient and lie along the efficient frontier of mean-variance portfolios. The investment decision involves not only the type of assets to own but also the allocation of the investor's wealth amongst them, also known as asset allocation. The model portrays diversification as a powerful means of reducing risk. Studies show that asset allocation

decisions are more important than decisions related to asset selection or market timing. The depiction of the Markowitz efficient set of portfolio in Fig 2 represents the boundary of the set of feasible investment portfolios. No portfolio exists above the frontier and the efficient portfolio is preferred over any portfolio below the frontier. The three main components of MPT, return, portfolio risk and correlations of assets are provided for reference purposes in Appendices 2-4.

The Markowitz QP tactical asset allocation (TAA) model

The Markowitz QP TAA model is the initial step in forming the tactical asset allocation. However, the adoption of this optimization model for private and direct real estate markets may well involve potential difficulties like changing the investment weightings in the Asian cities, because the direct real estate market is less information efficient and liquid than either the equity or bond markets. Lack of liquidity makes it difficult to achieve the forecast returns suggested by the model, as it is impossible to be fully invested in the desired positions for short time frames. Likewise, it is not possible to significantly reduce exposure if required without significant costs. To resolve this difficulty, the TAA portfolio optimization should be conducted at the end of every 12 months while the associated SAA (strategic asset allocation) portfolio optimization be conducted at the end of every 36 months (or 3 years). The achievable returns do not factor in transaction costs in this paper. The optimization is constrained by city tactical bands set around the SAA to determine a city-direct-real-estate centered allocation, which minimizes overall portfolio risk while achieving a targeted rate of return, on a risk-adjusted basis via the Sharpe ratio.

The pan-Asian asset allocation adopts the Markowitz QP TAA mode as the starting point. A real estate sector approach in building a portfolio is to be undertaken to ultimately develop a real estate investment strategy. Total returns (TRs) are forecasted for the office and industrial real estate sectors of each city in local currency terms, on a pre-tax and unleveraged (i.e. an all private equity) basis. TRs are then de-smoothed via adopting the autoregressive de-lagging model of Geltner and Miller (2007). TR forecasts are provided as an integral part of the JLL REIS-Asia dataset. JLL REIS-Asia prepares its TR forecasts via deploying a combination of economic time-based OLS multiple regression models and qualitative consensus-surveys within their JLL network of Asian regional offices. JLL proprietary property data and relevant data from official sources are utilized to calibrate the JLL REIS-Asia forecast models. As the *ex-ante* TR returns are derived from the JLL REIS-Asia dataset, it would be consistent to use their forecasts. The de-smoothed TR forecasts are examined in their respective real estate market analyses to reflect that the soundness of their direct real estate sectors to be in competitive equilibrium, and of their ability to generate high enough risk-adjusted returns.

The Markowitz QP TAA model utilizes *ex post* and *ex ante* direct real estate returns in US\$ terms and their forecast correlations. This is to accord even handed attention to historical real estate market dynamics and their expected market conditions. The model is constrained via tactical bands around the AHP-SAA benchmarks and it is solved via MS Excel's Solver Optimization model, albeit an inherent resolution inaccuracy problem exists when >20 investment or real estate markets (sectors) are involved.

The results are adjusted to allow for the expected cyclical positions of the direct real estate markets over the 4-year period ahead, i.e. 2008-2011, as illustrated in Fig 2, and for the qualitative differences between sectors within a city's direct real estate market.

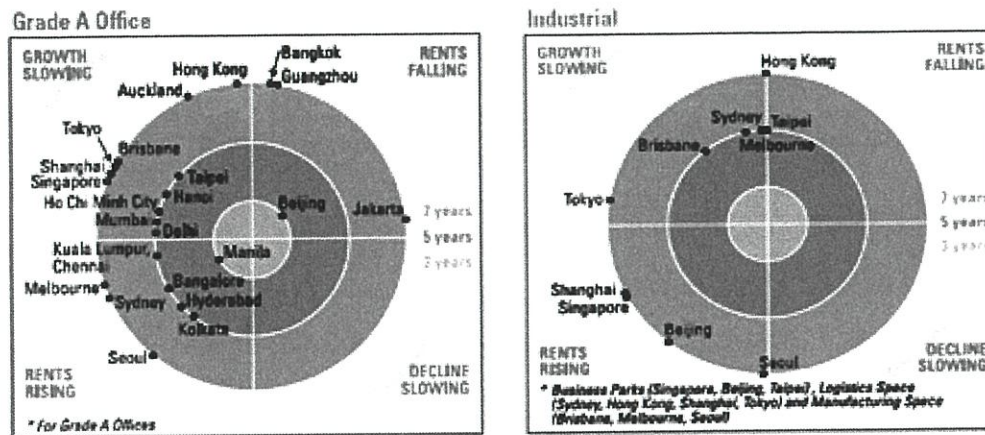


Figure 2: Real Estate Market Cycle Positions
Source: JLL Real Estate Investment Analysis Report (2007)

3.0 THE MODEL ESTIMATIONS

The Intuitive SAA Model Using GDP

An intuitive approach to strategic asset allocation (SAA) can be envisaged whereby the economic size indicator in GDP per capita terms would rise to the forecast levels by the end of 2012 from 2006. This a long enough forward period that is constrained by the availability of the consensus forecast data.

Table 1: Matrix and Pair-wise Reciprocal Relationships among 13 Pan-Asia Cities

Country		2005 Nominal GDP per Capita* (US\$ pc)	2012 Nominal GDP per Capita* (US\$ pc)	2012 SAA Neutral Weights (%)
China	BJ	3,749	6,532	2.55%
China	SH	7,678	13,379	5.22%
Taiwan	TPE	30,084	40,861	15.95%
Hong Kong	HKG	33,479	45,778	17.87%
South Korea	SLE	20,590	28,234	11.02%
Japan	TYO	30,615	33,877	13.23%
Philippine	MNL	1,750	2,400	0.94%
Indonesia	JK	4,459	6,642	2.59%
Singapore	SG	28,368	38,016	14.84%
Malaysia	KL	11,201	16,278	6.36%
Thailand	BKK	8,368	12,207	4.77%
India	BG	3,737	5,956	2.33%
India	MBY	3,737	5,956	2.33%
	Total		256,116	100%

Source: Authors (2014)

From Table 1, the SAA neutral weights recommend that the major proportions of the new investment capital should be invested in the real estate markets of Hong Kong (18%), Taiwan (16%), Singapore (15%), Tokyo (13%), Seoul (11%), China (8%), principally in the two key cities of Shanghai (5%) and Beijing (3%); then followed by Kuala Lumpur (6%). Much smaller proportions are recommended for Bangkok (5%), India (4.6%), principally in the two key cities of Bangalore (2.3%) and Mumbai (2.3%), Jakarta (2.6%) and Manila (1%).

Estimation of the 3-factor AHP-SAA model

The AHP approach is reliant on an *ex ante* assessment of alternative asset allocation strategies on the basis of expert judgment of the macroeconomic environment and the pan-Asian cities. This is because the required product of a factor weight and the associated factor evaluation of an Asian city, under the AHP, would produce a set of total weighted evaluations for all the thirteen Asian cities. Market vacancy is derived from the JLL-REIS Asia dataset while market transparency is obtained from the LaSalle Investment Management transparency index. Among the three key factors, the economic growth prospect factor is envisaged to be a primary macroeconomic factor that is forward-looking while the other two factors are real estate specific factors:

- 1) Economic growth prospects: expansion outlook of investor performance.
- 2) Market transparency: market depth of agents for transacting and managing properties as well as technology.
- 3) Market vacancy: real estate market disequilibria.

Figure 3 depicts the AHP's structured hierarchy comprising the above three key factors, in arriving at the factor weights and factor evaluations of the various pan-Asia markets. Corresponding pair-wise comparisons among the real estate markets in the thirteen Asian cities are presented in Table 1. The table's matrix is to be completed for illustration purposes, on the basis of the authors' own expert judgment and experience, pertaining to their assessment of the real estate markets in the Asian cities.

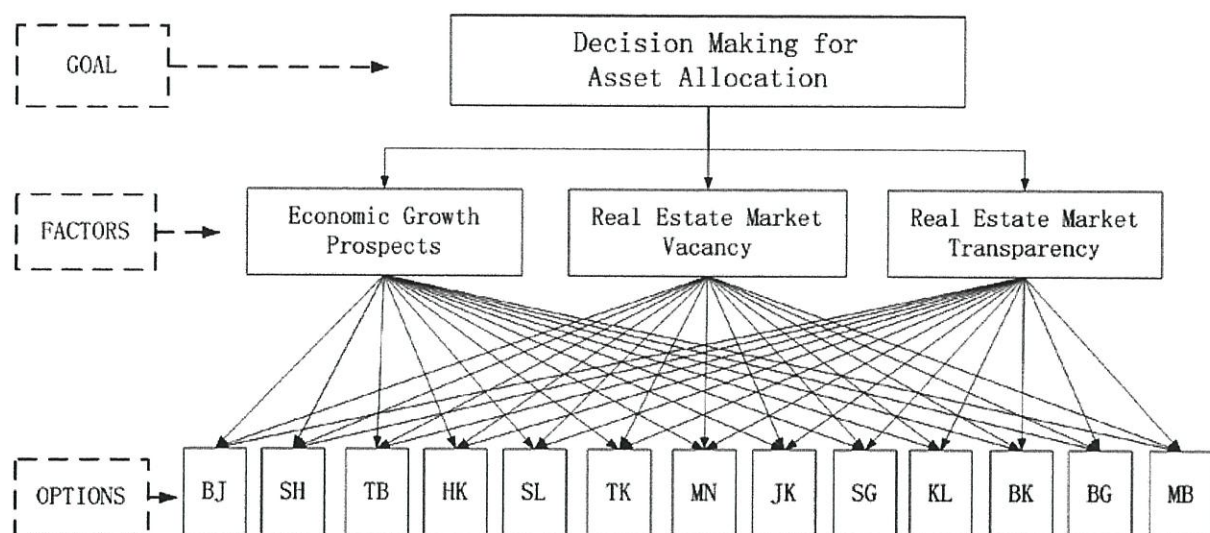


Figure 3: The Pan-Asian AHP Structured Hierarchy

Source: Authors (2014)

From Table 1, we readily find the following observations:

Beijing city (BJ) is comparatively assessed to be:

- i. Equally to moderately preferred to Shanghai, Seoul and Tokyo (a factor of 2)
- ii. Moderately to strongly preferred to Singapore, Bangalore and Mumbai (a factor of 4)
- iii. Very strongly preferred to Taiwan (a factor of 7)
- iv. Very extremely strongly preferred to Hong Kong (a factor of 8)
- v. Extremely preferred to Manila, Jakarta, Kuala Lumpur and Bangkok (a factor of 9).

Shanghai city (SH) is comparatively assessed to be:

- i. Equally to moderately preferred to Seoul and Tokyo (a factor of 2)
- ii. Moderately to strongly preferred to Singapore, Bangalore and Mumbai (a factor of 4)
- iii. Very strongly preferred to Taiwan and Hong Kong (a factor of 7)
- iv. Extremely preferred to Manila, Jakarta, Kuala Lumpur and Bangkok (a factor of 9).

Taiwan (TPE) is comparatively assessed to be:

- i. Equally preferred to Hong Kong, Seoul and Tokyo (a factor of 1)
- ii. Equally to moderately preferred to Manila, Jakarta, Singapore, Kuala Lumpur, Bangkok, Bangalore and Mumbai (a factor of 2).

Hong Kong (HKG) is comparatively assessed to be:

- i. Equally preferred to Seoul, Tokyo and Singapore (a factor of 1)
- ii. Moderately preferred to Bangalore and Mumbai (a factor of 3)
- iii. Very extremely strongly preferred to Manila and Jakarta (a factor of 8)
- iv. Extremely preferred to Kuala Lumpur and Bangkok.

Seoul (SLE) is comparatively assessed to be:

- i. Equally preferred to Tokyo and Singapore (a factor of 1)
- ii. Moderately preferred to Bangalore and Mumbai (a factor of 3)
- iii. Very extremely strongly preferred to Kuala Lumpur and Bangkok (a factor of 8)
- iv. Extremely preferred to Manila and Jakarta (a factor of 9).

Tokyo (TYO) is comparatively assessed to be:

- i. Moderately to strongly preferred to Bangalore and Mumbai (a factor of 4)
- ii. Strongly preferred to Singapore (a factor of 5)
- iii. Very extremely strongly preferred to Manila, Jakarta, Kuala Lumpur and Bangkok (a factor of 8).

Manila (MNL) is comparatively assessed to be:

- i. Equally preferred to Jakarta, Singapore, Kuala Lumpur, Bangkok, Bangalore and Mumbai (a factor of 1).

Jakarta (JK) is comparatively assessed to be:

- i. Equally preferred to Singapore, Kuala Lumpur, Bangkok, Bangalore and Mumbai (a factor of 1).

Singapore (SG) is comparatively assessed to be:

- i. Strongly preferred to Bangalore and Mumbai (a factor of 5)
- ii. Very extremely strongly preferred to Kuala Lumpur and Bangkok (a factor of 8).

Kuala Lumpur (KL) is comparatively assessed to be:

- i. Equally preferred to Bangalore and Mumbai (a factor of 1)
- ii. Very strongly preferred to Bangkok (a factor of 7).

Bangkok (BKK) is comparatively assessed to be:

- i. Equally preferred to Bangalore and Mumbai (a factor of 1).

Bangalore (BG) is comparatively assessed to be:

- i. Equally preferred to Mumbai (a factor of 1).

In arriving at the consistency ratio for the economic growth prospect factor (EGP), Table 3 finds the EGP to be consistent (being ≤ 0.10). The row average is estimated through first transforming the matrix of Table 2 by dividing each element in a column by the column's own "Column total"; and secondly, through taking the average of the resulting values for each row of the matrix of Table 2. The estimated consistency vector is obtained by dividing the weighted sum vector of SH for example by the row average for SH. Lambda is the average of the consistency vectors for all the office markets. The weighted sum vector is obtained by multiplying each row under its label into the row average of Table 2.

Table 2: Matrix and Pair-wise Reciprocal Relationships among 13 Pan-Asia Cities

City	BJ	SH	TPE	HKG	SLE	TYO	MNL	JK	SG	KL	BKK	BG	MBY
BJ	1.0	2	7	8	2	2	9	9	4	9	9	4	4
SH	0.5	1.0	7	7	2	2	9	9	4	9	9	4	4
TPE	0.1	0.1	1.0	1	1	1	2	2	2	2	2	2	2
HKG	0.1	0.1	1.0	1.0	1	1	8	8	1	9	9	3	3
SLE	0.5	0.5	1.0	1.0	1.0	1	9	9	1	8	8	3	3
TYO	0.5	0.5	1.0	1.0	1.0	1.0	8	8	5	8	8	4	4
MNL	0.1	0.1	0.5	0.1	0.1	0.1	1.0	1	1	1	1	1	1
JK	0.1	0.1	0.5	0.1	0.1	0.1	1.0	1.0	1	1	1	1	1
SG	0.3	0.3	0.5	1.0	1.0	0.2	1.0	1.0	1.0	8	8	5	5
KL	0.1	0.1	0.5	0.1	0.1	0.1	1.0	1.0	0.1	1.0	7	1	1
BKK	0.1	0.1	0.5	0.1	0.1	0.1	1.0	1.0	0.1	0.1	1.0	1	1
BG	0.3	0.3	0.5	0.3	0.3	0.3	1.0	1.0	0.2	1.0	1.0	1.0	1
MBY	0.3	0.3	0.5	0.3	0.3	0.3	1.0	1.0	0.2	1.0	1.0	1.0	1.0
Column total	4.0	5.5	21.5	21.1	10.1	9.2	52.0	52.0	20.7	58.1	65.0	31.0	31.0

Source: Authors (2014)

In the same manner as in Table 2, the pair-wise comparison matrix and reciprocal relationships are then each developed for the following two real estate specific factors among the thirteen Asian office markets:

- i. Market transparency: market depth of agents for transacting and managing direct real estate assets as well as technology.
- ii. Market vacancy: real estate market disequilibria

The rest of the row average and consistency ratio for each of the three real estate specific factors are presented in Tables 4 and 5.

Table 3: Derivation of the Consistency Ratio for Economic Growth Prospect

City	Weighted Sum Vector	Row Averages	Consistency vector	Lambda	CI	CR, Consistency Ratio
BJ	3.4892	0.2175	16.0439	14.90792	0.1590	0.098753841 =<0.1
SH	3.0979	0.1901	16.2967			
TPE	0.8671	0.0562	15.4158			
HKG	1.4119	0.0924	15.2742			
SLE	1.5618	0.1052	14.8484			
TYO	1.8705	0.1221	15.3210			
MNL	0.3284	0.0220	14.9257			
JK	0.3284	0.0220	14.9257			
SG	1.0907	0.0746	14.6210			
KL	0.3693	0.0259	14.2588			
BKK	0.2411	0.0177	13.6497			
BG	0.3832	0.0272	14.1111			
MBY	0.3832	0.0272	14.1111			

Source: Authors (2014)

Table 4: Row Averages and Consistency Ratio for Market Vacancy

City	Weighted Sum Vector	Row Averages	Consistency vector	Lambda	CI	CR, Consistency Ratio
BJ	3.3211	0.2101	15.8108	14.92360	0.160	0.099565632 =<0.1
SH	3.1190	0.1902	16.3959			
TPE	0.8994	0.0589	15.2817			
HKG	1.4382	0.0931	15.4433			
SLE	1.5840	0.1056	14.9956			
TYO	1.8932	0.1225	15.4502			
MNL	0.3322	0.0223	14.8678			
JK	0.3322	0.0223	14.8678			
SG	1.1087	0.0748	14.8320			
KL	0.3928	0.0273	14.3903			
BKK	0.2431	0.0180	13.5187			
BG	0.3862	0.0274	14.0764			
MBY	0.3862	0.0274	14.0764			

Source: Authors (2014)

Table 5: Row Averages and Consistency Ratio for Market Transparency

City	Weighted Sum Vector	Row Averages	Consistency vector	Lambda	CI	CR, Consistency Ratio
BJ	2.2455	0.1444	15.5525	14.66698	0.138	0.086282822 =<0.1
SH	2.3823	0.1558	15.2932			
TPE	1.0897	0.0684	15.9260			
HKG	1.9054	0.1128	16.8940			
SLE	1.8363	0.1090	16.8511			
TYO	2.2410	0.1309	17.1182			
MNL	0.4156	0.0267	15.5729			
JK	0.4156	0.0267	3.8135			
SG	1.6454	0.1017	16.1778			
KL	0.6573	0.0418	15.7433			
BKK	0.4061	0.0307	13.2404			
BG	0.3650	0.0256	14.2440			
MBY	0.3650	0.0256	14.2440			

Source: Authors (2014)

The two real estate factors are found to be consistent. In determining the factor weights, pair-wise comparisons are carried out between the economic growth prospect factor and each of the two real estate factors, as presented in Table 6.

Table 6: The Factor Weights Determination

FACTOR	EGP	MV	MT
EG Prospect (EGP)	1	3	5
MKT Vacancy (MV)	0.3333	1	5
MKT Transparency (MT)	0.2000	0.2000	1
Column total	1.5333	4.2	11

Source: Authors (2014)

The table is also based on the authors' expert judgment and experience with these factors for illustration purposes. From Table 6, the economic growth prospect factor (EGP) in turn is comparatively assessed to be:

- i. Moderately preferred to Market vacancy (MV) (a factor scale of 3)
- ii. Strongly preferred to Market transparency (MV) (a factor scale of 5).

The market vacancy factor is strongly preferred to market transparency (a factor scale of 5). The corresponding row average and consistency ratio for each of the three factors (EGP, MT and MV) are then presented in Table 7. All three factors are found to be consistent.

Table 7: The Row Averages and Consistency Ratio for EGP, MV and MT

	Weighted Sum Vector	Row Average	Consis- tency vector	Lamda	CI	CR, Consistency Ratio
EG Prospect (EGP)	1.9653	0.6070	3.2377	3.1377	0.0689	0.001187628 =<0.1
MKT Vacancy(MV)	0.9539	0.3033	3.1448			
MKT Transparency(MT)	0.2717	0.0897	3.0308			

Source: Authors (2014)

In deriving the total weighted evaluations for each of the thirteen pan-Asia office markets, the factor evaluations for EGP, MT and MV that correspond to each office market are first presented in Table 8. These factor evaluations are earlier obtained from the row averages of Table 3, Table 4 and Table 5, and they are then multiplied into the factor weights of Table 8. (The row averages for the office market factors, already imputed in Table 9, represent the factor weights of Table 8).

Table 8: The Total Weighted Evaluations

Factor evaluation	EG Prospect (EGP)	MKT Vacancy (MV)	MKT Transparency (MT)
BJ	0.2175	0.2101	0.1444
SH	0.1901	0.1902	0.1558
TPE	0.0562	0.0589	0.0684
HKG	0.0924	0.0931	0.1128
SLE	0.1052	0.1056	0.1090
TYO	0.1221	0.1225	0.1309
MNL	0.0220	0.0223	0.0267
JK	0.0220	0.0223	0.0267
SG	0.0746	0.0748	0.1017
KL	0.0259	0.0273	0.0418
BKK	0.0177	0.0180	0.0307
BG	0.0272	0.0274	0.0256
MBY	0.0272	0.0274	0.0256
Column Total	1	1	1

Source: Authors (2014)

Table 9: The Factor Weights

Factor	Factor Weight
EG Prospect (EGP)	0.6070
MKT Vacancy(MV)	0.3033
MKT Transparency (MT)	0.0897

Source: Authors (2014)

Finally, the total weighted evaluations for each of the thirteen Asia office markets are obtained through multiplying each column of Table 8 into each column of Table 9 to produce each row of Table 10. Each individual row of Table 10 should add up to the total weighted evaluation for each of the thirteen Asian cities, and expressed in percentage terms. The respective percentages would total to 100 per cent.

Table 10: The SAA Total Weighted Evaluations under the AHP SAA Model

RE Market	Weighted Evaluations			Total Weighted Evaluation		SAA Portfolio
	EGP	MV	MT			Composition by City
BJ	0.1320	0.0637	0.0129	BJ	0.20867	20.9%
SH	0.1154	0.0577	0.0140	SH	0.18706	18.7%
TB	0.0341	0.0179	0.0061	TB	0.05813	5.8%
HKG	0.0561	0.0283	0.0101	HK	0.09447	9.4%
SLE	0.0638	0.0320	0.0098	SL	0.10566	10.6%
TYO	0.0741	0.0372	0.0117	TK	0.12301	12.3%
MNL	0.0134	0.0068	0.0024	MN	0.02252	2.3%
JK	0.0134	0.0068	0.0024	JK	0.02252	2.3%
SG	0.0453	0.0227	0.0091	SG	0.07708	7.7%
KL	0.0157	0.0083	0.0037	KL	0.02774	2.8%
BKK	0.0107	0.0055	0.0028	BK	0.01892	1.9%
BG	0.0165	0.0083	0.0023	BG	0.0271	2.7%
MBY	0.0165	0.0083	0.0023	MB	0.0271	2.7%
Total						100.0%

Source: Authors (2014)

It is noteworthy that the AHP-SAA's ranking is not absolutely right but that the ranking is relevant and acceptable by consensus among real estate asset/or investment managers. The ranking is subject to objective assessment and it enables the AHP-SAA to be as objective as an SAA that is based on merely on economic size indicator like the real GDP per capita per city (in *ex post* and *ex ante* terms). The important implication is to compile and analyze the informed assessments of real estate asset/or investment managers concerned into a ranked score; thereafter to statistically derive a ratio that is validated by a consistency ratio. This makes the AHP-SAA readily applicable to achieve greater precision by changing the variables or including more variables.

Model Estimation of Total Returns

Prime office annual total returns are obtained for the thirteen Asia real estate markets, namely, Singapore (the Raffles Place CBD), Beijing, Shanghai, Hong Kong (the Central & major business districts), Bangkok, Manila (Makati CBD), Kuala Lumpur and Jakarta. The TR dataset covers the period between 1997 and 2007 in US\$ terms. It includes a total of 240 prime CBD (central business district) office buildings of international quality grade, on the basis of 90 such buildings per city. The Singapore-based JLL REIS-Asia) is the sole service provider that maintains a reliable valuation-based database for the thirteen Asia office markets. In addition to office market TR datasets, JLL REIS-Asia industrial TR data sets for Singapore and Hong Kong markets are utilized. The MSCI Asia Pacific/REIT Index and currency forecasts from 2008-2011 are obtained from Bloomberg. Such a MSCI Asia real estate market index is an integral part of the MSCI ACWI/REITs Index, which is a market capitalization-weighted index that currently includes publicly traded global REITs or REIT equivalent structures. For a 5-year period ending 31 May 2006, its real estate indices generally posted better risk-adjusted performance than the selected US domestic and international equity indices.

Ex post total returns from 2003 and 2007 are summarized in Table 11. The *ex post* total returns for the 13 different geographical locations are de-smoothed subsequently in the following section to obtain a more accurate measure of the TR.

Table 11: Estimation of *Ex Post* Total Returns

	2003	2004	2005	2006	2007
BJ	1.69%	7.53%	5.97%	18.88%	7.32%
SH	3.92%	9.17%	7.99%	29.52%	18.62%
TPE	-11.02%	-6.73%	10.30%	8.50%	6.56%
HKG	-17.76%	-6.07%	57.56%	42.17%	4.17%
SL	19.56%	15.79%	26.19%	24.27%	24.12%
TYO	-14.30%	-5.24%	21.47%	45.27%	52.64%
MNL	-6.41%	1.21%	9.28%	46.87%	30.96%
JK	7.52%	9.25%	6.06%	25.59%	12.64%
SG	-9.13%	-2.38%	4.17%	10.88%	71.93%
KL	3.06%	6.90%	-2.41%	14.30%	12.10%
BKK	8.16%	39.54%	40.75%	27.95%	20.78%
BG	12.06%	13.29%	27.99%	25.06%	3.19%
MBY	-6.94%	8.98%	34.72%	34.56%	51.48%
SG ID ¹	-5.00%	-3.00%	51.86%	30.23%	14.53%
HK ID ²	-9.00%	-5.00%	5.81%	8.57%	13.28%
Asia Index ³	-18.32%	28.90%	25.87%	25.88%	30.20%

¹Singapore Industry

²Hong Kong Industry

³MSCI Capital Index for Asia Pacific Listed Property Company

Source: Author (2014) and JLL REIS-Asia Data Set (2007)

De-smoothing the JLL REIS Total Returns

The autoregressive de-lagging model of Geltner and Miller (2007) is applied to obtain the de-smoothed returns for the office sector of 12 geographical locations, the Singapore and Hong Kong Industry returns. The dependent variables and the coefficients used are shown in Table 11, using equations 3 & 4 of Geltner & Miller (2007) and the JLL REIS-Asia data, 1992Q3 – 2007Q2.

Table 12 can be expressed in equation (EQ) 1 for the de-smoothed total returns of the Singapore office sector.

$$SGO = 0.018293 + 1.067(SGO01) - 0.191(SGO04) + 0.495(RESID01 - SGO) \quad \text{EQ(1)}$$

Equation 1 can be simplified as equation 2.

$$r_t = 0.0682 + 1.067r_{t-1} - 0.191r_{t-4} - 0.495e_t \quad \text{EQ(2)}$$

where r_t = Singapore Office Total Returns in quarter t ; r_{t-1} = Singapore Office Total Returns lagged by 1 quarter; r_{t-4} = Singapore Office returns lagged by 4 quarter and e_t = the "residuals" of the auto-regression (zero mean and autocorrelation).

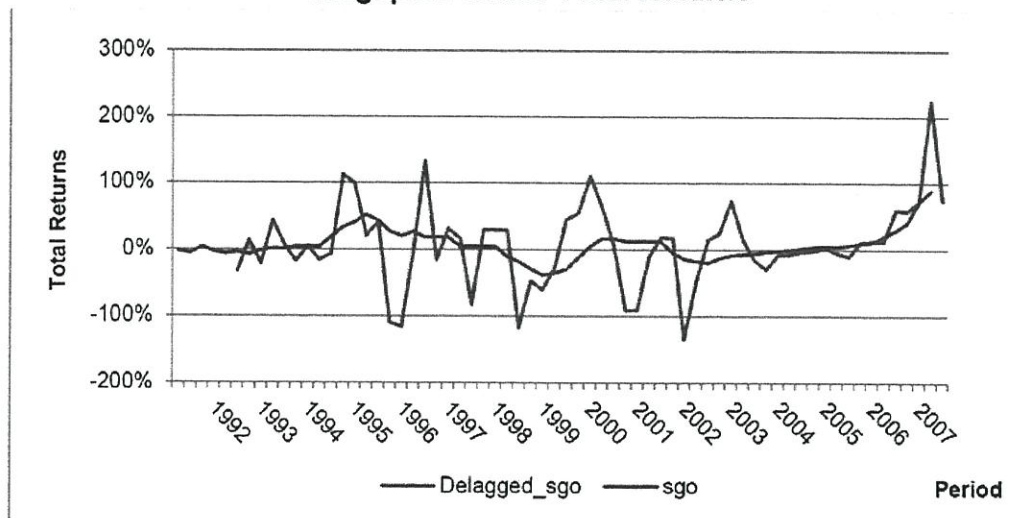
The estimation output of the equation displays a relatively high adjusted R^2 of 90.8% with the appropriate Durbin-Watson statistic of 2.00 and significant t-ratio for r_{t-1} and partial significant t-ratios for r_{t-4} and the constant. The de-smoothed total returns for the Singapore office sector are corrected for the relevant lags as shown in Figure 4. As shown, the de-smoothed TR data shows more volatility and is a more accurate measure as compared to the smoothed TR data. This trend was reflected in all the other pan-Asian cities.

Table 12: Estimation of the De-smoothed Total Returns

	Coefficient	1 Quarter Lag (01)	4 Quarter Lag (04)	Residual	R- squared	Durbin- Watson stat
BGO (Bangalore)	0.160286	0.599159	-0.463994	0.158149	0.638483	1.981469
BJO (Beijing)	0.001685	0.806697	0.165993	-0.464355	0.483213	2.118923
BKO (Bangkok)	0.024222	0.883611	-0.066763	-0.029062	0.695353	1.983310
HKO (Hong Kong)	0.048827	0.883387	-0.251967	0.125790	0.794434	2.052022
SGO (Singapore)	0.018293	1.067481	-0.190902	0.495270	0.908386	1.944272
SHO (Shanghai)	0.039395	0.774267	-0.100249	0.120524	0.584784	1.924918
SLO (Seoul)	0.082155	0.723765	-0.047677	-0.160233	0.359716	2.246243
TBO (Taipei)	0.009840	0.997042	-0.183896	0.108458	0.912296	2.057912
TKO Tokyo	0.014325	1.181853	-0.318357	-0.008129	0.926999	1.958698
JKO (Jarkarta)	0.020192	0.915785	-0.103167	0.162304	0.819092	2.081880
KLO (Kuala Lumpur)	0.014248	1.010185	-0.219666	-0.382270	0.591573	1.983562
MBO (Mumbai)	0.059151	0.812412	0.152870	0.178893	0.739263	1.883436
MNO (Manila)	0.017365	0.977336	-0.095888	-0.020373	0.866405	1.620734
HKI (HK Industry)	0.183667	-0.185135	-0.048944	0.106316	0.999928	3.177700
SGI (SG Industry)	-0.021430	1.550851	-0.181945	-0.526041	0.786674	1.919088

Source: Authors, 2014 and Eviews Ver.6, 2014

Figure 4: Comparison between Smoothed and De-smoothed Singapore Office Total Returns



Source: Authors (2014) and Eviews Ver.6 (2014)

The De-Smoothed Ex-Post Total Returns for the 12 Asian Cities

Table 13 provides the descriptive statistics and summaries of the de-smoothed total returns for the respective cities. As expected, total returns are not normal and the volatility of true returns has been understated. Looking at the statistics, the office markets of Mumbai and Seoul have the highest office returns with means of over 25%. In contrast, the Taipei office market has the lowest returns with a mean of 3.3% in the 4-year period. Nevertheless, the Taipei market has one of the lowest volatility with a standard deviation of 12.4%, second to the Bangalore office market which has a standard deviation of 6.2%.

Table 13. Descriptive Statistics of the De-smoothed Ex Post Total Returns

City	Period (Total Return)	Observations	Total Returns (US\$)		Skewness	Kurtosis
			Mean	Std. Dev.		
BG	2003Q3 – 2007Q3	17	17.7%	6.2%	-0.097	2.353
BJ	1999Q3 – 2007Q3	33	10.4%	30.6%	2.23	10.366
BKK	1996Q2 – 2007Q3	46	11.5%	67.1%	-0.418	5.34
HKG	1989Q3 – 2007Q3	73	13.4%	38.2%	0.538	4.608
JK	1989Q3 – 2007Q3	73	13.1%	73.0%	2.19	15.316
KL	1999Q2 – 2007Q3	34	7.3%	19.8%	-0.302	3.183
MBY	2003Q3 – 2007Q3	17	27.8%	233.6%	0.346	3.101
MNL	1998Q2 – 2007Q3	38	5.7%	75.1%	-1.158	7.95
SG	1992Q3 – 2007Q3	61	6.8%	62.6%	0.353	4.657
SH	1999Q2 – 2007Q3	34	10.4%	18.0%	0.515	3.251
SLE	2001Q2 – 2007Q3	26	26.1%	21.4%	0.715	3.086
TPE	2003Q2 – 2007Q3	18	3.3%	12.4%	0.23	3.187
TYO	2002Q2 – 2007Q3	22	18.1%	57.3%	0.195	2.533
HKInd	2006Q2 – 2007Q3	6	13.1%	3.3%	-0.826	2.471
SGInd	2004Q3 – 2007Q3	13	9.0%	5.4%	0.847	4.227

Source: Authors (2014) and Eviews Ver.6 (2014)

Lag Serial Correlations

Within the calendar year, a city's direct real estate markets tend to move in tandem although the markets may move out of balance between calendar quarters. From the underlying rents and capital values (CVs) of the JLL REIS-Asia dataset, very high correlation between the current quarter's industrial (warehouse) rents and the office rental lags is observed. This is shown in the cases of Singapore and Hong Kong in Tables 14 and 15 respectively. It is readily observed that in the Singapore real estate market, the industrial rent is most correlated to a 2-quarter office lag (0.955), and that in the Hong Kong real estate market the industrial rent is most correlated to a 1-quarter office lag (0.993). The implication is the limited real estate sector diversification between the office market and the industrial real estate market within the same city like Singapore and Hong Kong. It can be inferred that a city's office market may well be a reliable proxy of the industrial real estate market and of the overall market.

Table 14. The Singapore Office and Industrial Real Estate Markets (Sectors)

	<i>ERSI to</i>	<i>ERSO t-1</i>	<i>ERSO t-2</i>	<i>ERSO t-3</i>	<i>ERSO t-4</i>
ERSI to	1				
ERSO t-1	0.952	1			
ERSO t-2	0.955	0.983	1		
ERSO t-3	0.892	0.886	0.937	1	
ERSO t-4	0.587	0.571	0.672	0.856	1
	<i>CVSI</i>	<i>CVSO t-1</i>	<i>CVSO t-2</i>	<i>CVSO t-3</i>	<i>CVSO t-4</i>
CVSI	1				
CVSO t-1	0.980	1			
CVSO t-2	0.966	0.993	1		
CVSO t-3	0.931	0.970	0.979	1	
CVSO t-4	0.737	0.815	0.832	0.914	1

Source: Authors (2014) and the JLL REIS-Asia Data Set (2007)

Table 15. The Hong Kong Office and Industrial Real Estate Markets (Sectors)

	<i>ERHI</i>	<i>ERHO t-1</i>	<i>ERHO t-2</i>	<i>ERHO t-3</i>	<i>ERHO t-4</i>
ERHI	1				
ERHO t-1	0.993	1			
ERHO t-2	0.990	0.994	1		
ERHO t-3	0.978	0.984	0.996	1	
ERHO t-4	0.956	0.963	0.984	0.994	1
	<i>CVHI</i>	<i>CVHO t-1</i>	<i>CVHO t-2</i>	<i>CVHO t-3</i>	<i>CVHO t-4</i>
CVHI	1				
CVHO t-1	0.788	1			
CVHO t-2	0.786	0.973	1		
CVHO t-3	0.845	0.885	0.956	1	
CVHO t-4	0.921	0.812	0.872	0.960	1

Source: Authors (2014) and the JLL REIS-Asia Data Set (2007)

4.0 RESULTS AND FINDINGS

The 3-Factor AHP-SAA Model

The set of total-weighted evaluation percentages by city and country, under the 3-factor AHP SAA model, essentially provides a consistently derived strategic asset allocation (SAA) portfolio that represents what an investor desires to achieve over a longer-term investment horizon. The AHP-SAA model portfolio is also geographically diversified. As an appropriate interface, the AHP-SAA model in effect identifies the thirteen Asia cities' markets and the proportions for these markets that would comprise the long-term, desired normal pan-Asia real estate portfolio mix. The subsequent MPT QP TAA model is conducted around the AHP-SAA model portfolio through imposing deviations (i.e. the tactical bands) from the AHP-SAA's normal pan-Asia office portfolio mix of the next subsection.

The Efficient Frontier from the Markowitz QP TAA Model

Using the Markowitz QP, the convex efficient frontier is generated (see Figure 5) using the de-smoothed TRs. The efficient frontier is a graphical representation of the risk-return tradeoff combinations the portfolio could adopt. Consequentially, the TAA model would be developed along the Markowitz efficient frontier generated.

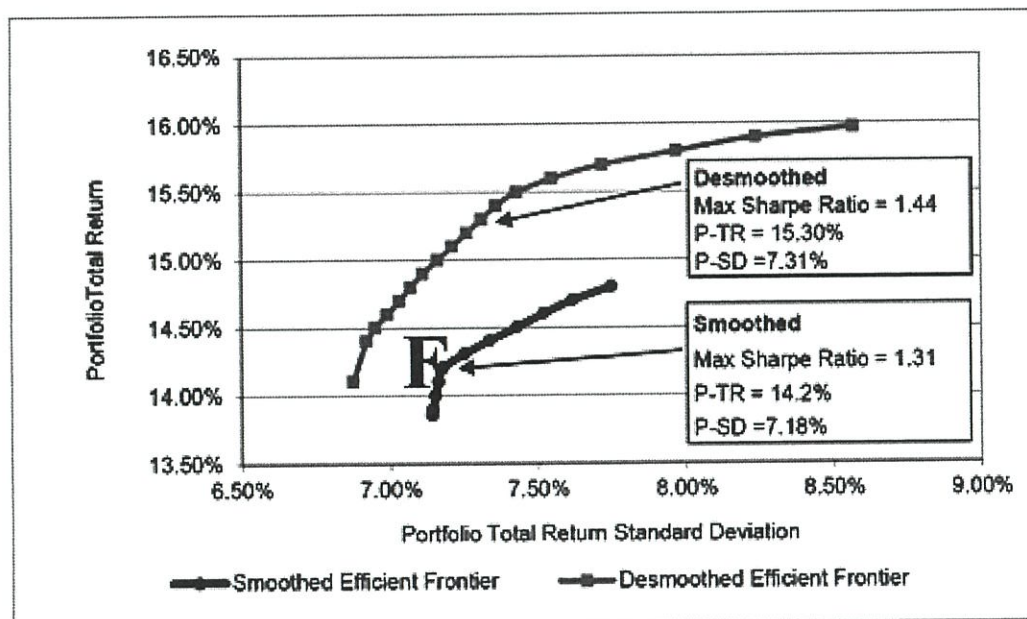


Figure 5: The Resulting Efficient Frontiers from the Markowitz QP TAA Model

Source: Authors (2014); JLL REIS-Asia Data Set (2007)

Figure 5 clearly shows the enhanced efficient frontier of portfolio risk-adjusted returns using the de-smoothed TR data that is plotted against that efficient frontier using the smoothed JLL REIS-Asia dataset in its natural form. Consequently, the efficient frontier with the de-smoothed data clearly shows a higher overall TR for every corresponding standard deviation, as compared to the smoothed data. The TAA for the de-smoothed returns would lie on the efficient frontier at the maximum Sharpe ratio of 1.44 with a TR on 15.30% and a standard deviation of 7.31. Conversely, the TAA for the smoothed returns would lie on the efficient frontier at the maximum Sharpe ratio of 1.31 with a lower TR of 14.2% and a standard deviation of 7.18%.

In comparison, the intuitive SAA GDP model for the Markowitz QP TAA Model would result in an efficient frontier that has higher overall total returns as well as standard deviation (see Figure 6).

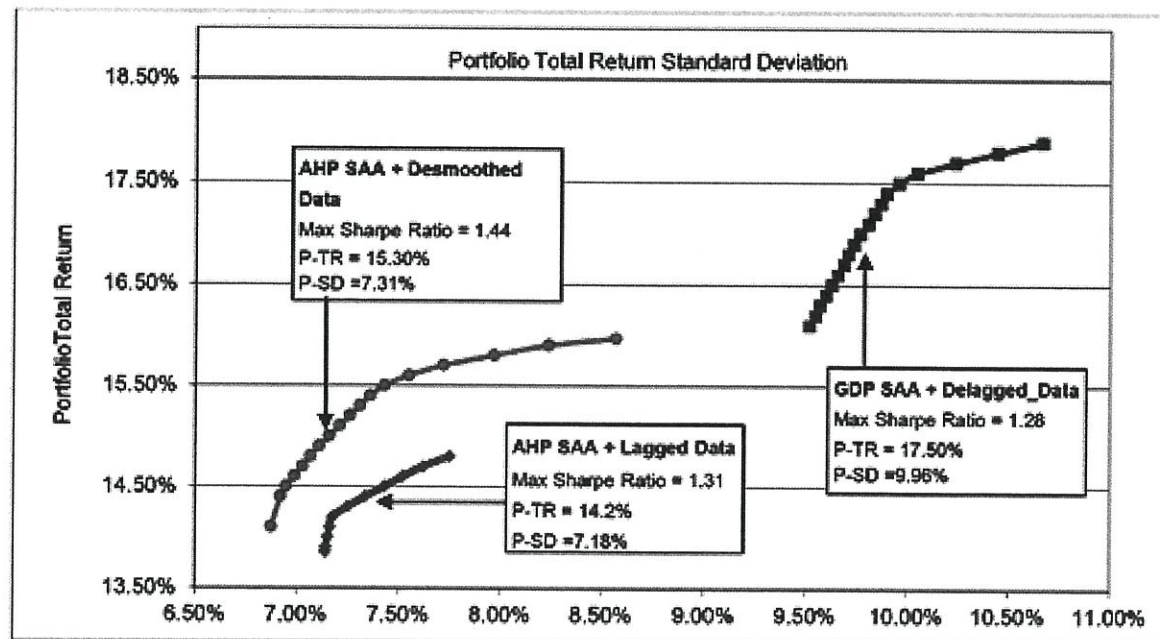


Figure 6: The Resulting Efficient Frontiers from the Markowitz QP TAA Model

Source : Authors (2014), and the JLL REIS-Asia Data Set (2007)

The Markowitz QP TAA Model Using the De-smoothed Dataset

The proposed TAA is located along the Markowitz efficient frontier via the Sharpe-ratio-maximizing portfolio that attains the maximum risk-adjusted TR, in excess of that of a risk less asset for the TAA's risky portfolio. US\$ 10-year treasuries are used in imputing the Sharpe ratio. Variation in asset allocation within portfolios can produce quite different results over time. As observed from Fig 5, the Sharpe ratio is imputed to be 1.31 at point F while the profile of the Markowitz QP TAA proposed TAA portfolio is presented in Table 16.

Table 16: The AHP-SAA Model Portfolio's Neutral Weights

City	AHP SAA Portfolio	Country	AHP SAA Portfolio
	Composition		Composition
BJ	20.9%	}China	
SHG	18.7%	}China	39.6%
TPE	5.8%	Taiwan	5.8%
HKG	9.4%	Hong Kong	9.4%
SLE	10.6%	South Korea	10.6%
TYO	12.3%	Japan	12.3%
MNL	2.3%	The Philippines	2.3%
JKG	2.3%	Indonesia	2.3%
SG	7.7%	Singapore	7.7%
KL	2.8%	Malaysia	2.8%
BKK	1.9%	Thailand	1.9%
BGR	2.7%	}India	
MBY	2.7%	}India	5.4%
Total	100.0%	Total	100.0%

Source : Authors (2014)

Table 16 indicates the relative underweight, overweight or none at all versus the AHP SAA model portfolio. As the weight of the MSCI Asia real estate index is minimal, it is allocated to the Singapore market as allocation by city confers more flexibility for potential investing in South East Asia's highly developed and stable real estate market of Singapore. For reference purposes, Table 17 provides the breakdown of the appropriate real estate investment strategies, the corresponding Markowitz QP TAA proposed portfolio compositions and their profiles pertaining to the office, industrial real estate and Asia index (REITs).

Table 17: The Markowitz QP TAA Proposed Portfolio

Table 11: The Markowitz QP TAA Proposed Portfolio for 2008						
		AHP SAA as the benchmark portfolio by city	Markowitz QP TAA Proposed Portfolio for 2008, Based on Tactical Bands & Sharpe-Maximizing Ratio	Position at the TAA Proposed Portfolio for 2008 With respect to the SAA	TAA's Tactical Bands Tightly Imposed around the AHP SAA Portfolio With Market Dynamics Considered	
Asian Market					Lower	Upper
Beijing	BJ	20.87%	19.71%	Slight Underweight	18%	25%
Shanghai	SH	18.71%	15.00%	Slight Underweight	15%	20%
Taipei	TB	5.81%	3.00%	Slight Underweight	3%	8%
Hong Kong	HK	9.45%	9.00%	Neutral	7%	11%
Seoul	SL	10.57%	14.00%	Slight Overweight	10%	14%
Tokyo	TK	12.30%	9.00%	Slight Underweight	9%	13%
Manila	MN	2.25%	4.00%	Slight Overweight	2%	4%
Jakarta	JK	2.25%	4.00%	Slight Overweight	2%	4%
Singapore	SG	7.71%	8.00%	Neutral	6%	10%
Kuala Lumpur	KL	2.77%	1.00%	Slight Underweight	1%	4%
Bangkok	BK	1.89%	2.29%	Slight Overweight	1%	3%
Bangalore	BG	2.71%	8.00%	Overweight	2%	8%
Mumbai	MB	2.71%	2.00%	Slight Underweight	2%	8%
Total		100.00%	100.00%			

Source: Authors (2014); JLL REIS-Asia Data Set (2007)

The TAA is meant to take advantage of short-run office market disequilibria that may emerge, in respect of the thirteen Asian markets (Francis and Ibbotson, 2001, Geltner and Miller, 2001). It is worthwhile to reiterate that making a tilt (i.e. a TAA) is similar to saying that either the market is not fully efficient or that it is efficient but that the investor believes that he or she has expert insight and that the rest of the market has got the investment themes wrong.

The recommended TAA is developed for the next 12 months and is meant to be reviewed in 12-month periods. Thus, it is evident that the Markowitz quadratic programming model fully diversifies the direct real estate portfolio over time by making yearly tilts around the long term SAA and that the model verifies the second hypothesis.

Table 18: Real Estate Investment Strategy & the Markowitz QP TAA Proposed Portfolio Composition

Three Sectors			Defensive	Low Growth	Balanced	Growth	High Growth
Country							
Office Markets	China	BJ	24.08%	22.82%	22.15%	19.71%	18.71%
	China	SH	15.00%	15.00%	15.00%	15.00%	15.00%
	Taipei	TPE	3.00%	3.00%	3.00%	3.00%	3.00%
	HK	HKG	7.00%	7.00%	7.00%	7.00%	7.00%
	South Korea	SLE	13.48%	14.00%	14.00%	14.00%	14.00%
	Japan	TYO	9.00%	9.00%	9.00%	9.00%	9.00%
	Philippines	MNL	4.00%	4.00%	4.00%	4.00%	4.00%
	Indonesia	JK	4.00%	4.00%	4.00%	4.00%	4.00%
	Singapore	SG	6.00%	6.00%	6.00%	6.00%	6.00%
	Malaysia	KL	1.00%	1.00%	1.00%	1.00%	1.29%
	Thailand	BKK	1.00%	1.00%	1.00%	2.29%	3.00%
	India	BG	5.44%	6.18%	6.85%	8.00%	8.00%
	India	MBY	2.00%	2.00%	2.00%	2.00%	2.00%
Industrial	Singapore	SG	2.00%	2.00%	2.00%	2.00%	2.00%
	Hong Kong	HKG	2.00%	2.00%	2.00%	2.00%	2.00%
Asia Index			1.00%	1.00%	1.00%	1.00%	1.00%
Total Allocation			100.00%	100.00%	100.00%	100.00%	100.00%
Minimum Investment Term			2 years	3 years	5 years	7 years	10 years
Expected TR Over Term			14.50%	14.70%	14.80%	15.30%	15.50%
Expected SD Over Term			6.95%	7.03%	7.07%	7.31%	7.43%
Expected %Loss (-) or worse every 6 years (1 SD)			7.55%	7.67%	7.73%	7.99%	8.07%
Expected %Loss (-) or worse every 44 years (2 SD)			0.60%	0.64%	0.66%	0.68%	0.64%
Investor Objectives & Suitability :							
Secure Short-Term Income			High	Moderate	Low	Not Appropriate	Not Appropriate
Capital Stability			High	Moderate	Low	Very Low	Not Appropriate

Source: Authors (2014); JLL REIS-Asia Data Set (2007)

Investment Strategy

An asset allocation strategy can be applied against three main criteria of the investor profile: risk, tax and time horizon. From the three criteria, it is possible to draw up a general guide to strategic asset allocation such as the one in Table 17. The Table 17 shows the “neutral weightings” for different real estate investment strategic alternatives (i.e. styles). These are the target allocations based on the inherent long-term characteristics of the asset classes, rather than the particular circumstances of markets at any one time. They correspond to the upward sloping and convex efficient frontier under the Markowitz portfolio optimization discussed earlier. The portfolios are points on the efficient frontier. The associated investor profile in terms of the investor objectives and suitability are also shown in the Table 18.

At one extreme the pan-Asia defensive real estate portfolio investment strategic alternative has an expected TR of 14.50% and a high SD of 6.95%, over a short investment term of 2 years. The risk-taking investor is very concerned with securing short-term income, capital stability and moderately concerned with steady growth. This means that a small portfolio gain or loss of 7.55% or worse (i.e. negative TR) can be expected every 6 years; and a portfolio gain or loss of worse than 0.60% every 44 years. At the other extreme would be the pan-Asia high-growth portfolio investment strategic alternative, for the risk-averse investor, with a very much higher expected TR of 15.50% and a relatively small increase in SD to 7.43% but over much longer investment term of 10 years. This means that a high portfolio gain of not exceeding 8.07% can be expected every 6 years; and a more modest portfolio gain of not exceeding 0.64% every 44 years. More of the allocations are diverted to the only the less volatile real estate market. Only wealth accumulation is the primary concern of the investor. The rest of the investment strategic alternatives (styles) lie between the two extremes.

The Recommended Pan-Asia Growth Investment Strategy

The pan-Asia growth investment strategy is recommended for this study, with a portfolio composition that is similar to the Sharpe-optimal tactical asset allocation (TAA) portfolio of Table 20. The recommended Growth Investment Strategy, at Point F on the portfolio efficient frontier of Fig 5, would attain a very high expected TR of 15.30% and a very low SD of 7.31% but over a long investment term of 7 years. This means that a high portfolio gain of not exceeding 7.99% can be expected every 6 years; and a very small portfolio gain not exceeding 0.68% every 44 years. Capital stability is a very low concern while securing short-term income is not a concern at all. This verifies the hypothesis that the AHP-SAA model and the Markowitz- TAA model develop an integrated investment strategy that has an optimal risk-adjusted return, direct real estate pan-Asian portfolio.

5.0 CONCLUSION

This paper indicates that the efficient frontier with the de-smoothed data shows a higher overall TR for every corresponding standard deviation as compared to the smoothed data. The TAA for the de-smoothed returns would lie on the efficient frontier at the maximum Sharpe ratio of 1.44 with a TR on 15.30% and a standard deviation of 7.31. Conversely, the TAA for the smoothed returns would lie on the efficient frontier at the maximum Sharpe ratio of 1.31 with a lower TR of 14.2% and a standard deviation of 7.18%. With the de-smoothing treatment of the direct real estate TR data, the enhancement of the efficient frontier for the risky direct real estate portfolio to which REITs can be introduced, would be readily noticeable and the benefits easily appreciated by real estate investors and practitioners.

The AHP-SAA model is found to be rigorous in forming and estimating the strategic asset allocation (SAA) model portfolio, which geographically diversifies the pan-Asian real estate international portfolio. It objectively and precisely reflects investor-expert judgment through pair-wise comparisons, subject to consistency ratio (CR) checks that are non-conflicting for assessing the macroeconomic and real estate specific factors. The Markowitz QP TAA model produces a proposed portfolio (Table 18) that is diversified along time. Tactical bands, based on real estate market analysis of the pan-Asian cities, can be tightly imposed around the AHP-SAA model portfolio for every 12-month period. The tighter bands tend to minimize or eliminate the potential smoothening of the direct real estate data. The Markowitz QP TAA model enables a diversified portfolio along time through making yearly tilts around the AHP-SAA model portfolio weights. This paper finds the Pan-Asia real estate growth investment strategy to be appropriate for the thirteen pan-Asian cities with a very high, expected TR of 15.3% and an expected standard deviation of 7.31%, on an optimal risk-adjusted portfolio return basis. It has a minimum investment term of 7 years.

The paper establishes an alternative asset allocation process that can be effectively adopted and refined by practitioners and researchers. There is a practicality of approach for asset managers/or investors as it deploys expert opinions and quantifies them into a statistically significant approach in adopting the AHP to develop SAA and the Markowitz QP TAA model in utilizing de-smoothed direct real estate TR data. The primary findings are consistent and extends similar studies undertaken in the Western developed real estate markets. Another contribution of this paper is that it is specific to a Pan Asian direct real estate portfolio of 13 Asian cities together with the introduction of Asian REITS, to provide greater diversification and risk-return benefits of adopting a de-smoothing approach.

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APPENDIX 1 – Total Return

The investment return is measured in terms of total returns received over the holding period and is a measure of two components; capital appreciation/depreciation and the income (i.e. rental) received over the investment period. It is expressed as

$$R_t = \frac{(V_1 - V_0) + I_t}{V_0}$$

Where R_t = total return on asset

V_0 = price of asset at the beginning of period

V_1 = price of asset at end of period

I_t = income received during period

The expected portfolio return is the weighted average of returns of the individual assets

$$E(R_p) = \sum_{i=1}^n W_i R_i$$

, where $E(R_p)$ = expected return on portfolio p

W_i = proportion of investor's fund in asset i

R_i = expected return on asset i

APPENDIX 2 - Portfolio Risk

Overall portfolio risk is a function not only of individual asset means and standard deviations, but also the degree to which their returns are correlated. It is dependent on the degree of covariance between the returns of the assets in the portfolio, especially when the portfolio is big. The covariance is measured in the same units as the asset returns. Thus, it is sometimes difficult to interpret. Therefore, the coefficient of correlation (ρ) of the asset is used. Portfolio risk is represented by the following:

$$\sigma_p = \sqrt{\sum_{i=1}^n W_i^2 \sigma_i^2 + \sum_{j=1}^n W_j^2 \sigma_j^2 + 2 \sum_{i=1}^n \sum_{j=1}^n W_i W_j \rho_{ij} \sigma_i \sigma_j}$$

$$i \neq j$$

Where

σ_p = portfolio standard deviation

W_i, W_j = proportion of funds in investment i and j

σ_i, σ_j = standard deviation of asset i and j

$$SD^2 = \frac{1}{T-1} \sum_{t=1}^T [(R_t - \bar{R})^2]$$

ρ_{ij} = correlation coefficient between return of asset i and j

Subject to $W_i, W_j \geq 0$ and $\sum_{i=1}^n W_i = 1$

There must be no short sales and the total investment proportion must sum up to one.

APPENDIX 3 - Correlation Coefficient of Assets

$$\rho_{ij} = \frac{(R_i - R_{ei})(R_j - R_{ej})}{\sigma_i \sigma_j}$$

, where

ρ_{ij} = correlation coefficient between asset i and j

R_i, R_j = return on asset i and j

R_{ei}, R_{ej} = expected return on asset i and j

σ_i, σ_j = standard deviation of asset i and j

A correlation coefficient of -1 indicates that the returns of two assets are perfectly negatively correlated. Theoretically, building a portfolio with assets whose returns are perfectly negatively correlated would reduce the portfolio risk to zero. However in practice, it is difficult to find assets which are perfectly negatively correlated.

A correlation coefficient of +1 indicates that assets are perfectly positively correlated. Forming a portfolio with such assets bear no diversification benefits (i.e. no risk reduction). However, assets that have a positive correlation of less than +1 will still provide risk reduction to a portfolio, although less than those with negative correlation. A pair of assets that are completely uncorrelated, correlation coefficient of 0, will also reduce portfolio risk.

APPENDIX 4 - Model Estimation: Autoregressive De-smoothing Model

The Geltner and Miller (2007) 1st and 4th order autoregressive model is applied for de-smoothing the JLL REIS-Asia Total Returns data set. The following are the descriptive statistics from Eviews 6 for the 13 geographical locations and sectors.

Descriptive Statistics for Desmoothed Total Returns Data

	BGO	BJO	BKO	HKO	JKO	KLO	MBO	MNO	SGO	SHO	SLO	TBO	TKO	HKI	SGI
Mean	0.177	0.104	0.115	0.134	0.131	0.073	0.278	0.057	0.068	0.104	0.261	0.033	0.181	0.131	0.090
Median	0.169	0.032	0.188	0.097	0.117	0.096	-0.318	0.038	0.068	0.103	0.248	0.018	0.195	0.138	0.100
Maximum	0.286	1.370	2.191	1.557	4.240	0.531	4.942	1.789	2.240	0.578	0.808	0.270	1.414	0.161	0.225
Minimum	0.065	-0.464	-1.690	-0.778	-1.482	-0.444	-4.469	-2.902	-1.346	-0.249	-0.053	-0.231	-0.835	0.074	0.015
Std. Dev.	0.062	0.306	0.671	0.382	0.730	0.198	2.336	0.751	0.626	0.180	0.214	0.124	0.573	0.033	0.054
Skewness	-0.097	2.230	-0.418	0.538	2.190	-0.302	0.346	-1.158	0.353	0.515	0.715	0.230	0.195	-0.826	0.847
Kurtosis	2.353	10.366	5.340	4.608	15.316	3.183	3.101	7.950	4.657	3.251	3.086	3.187	2.533	2.471	4.227
Jarque-Bera	0.323	101.959	11.835	11.390	519.698	0.563	0.347	47.279	8.250	1.594	2.220	0.185	0.339	0.751	2.369
Probability	0.851	0.000	0.003	0.003	0.000	0.755	0.841	0.000	0.016	0.451	0.329	0.912	0.844	0.687	0.306
Sum	3.012	3.417	5.282	9.800	9.579	2.490	4.732	2.158	4.159	3.522	6.783	0.601	3.980	0.785	1.166
Sum Sq. Dev.	0.061	3.006	20.261	10.503	38.376	1.296	87.308	20.860	23.535	1.074	1.145	0.260	6.892	0.005	0.035
Observations	17	33	46	73	73	34	17	38	61	34	26	18	22	6	13

THE SIGNIFICANCE AND FUTURE OPPORTUNITIES OF THE ASIAN REAL ESTATE MARKETS

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ABSTRACT

The Asian real estate markets have seen increased attention from international and local real estate investors. This is driven by strong economic growth in both the developed and emerging markets in Asia; seeing increased maturity, professionalism and stature by Asian real estate. REITs, listed real estate companies and unlisted real estate funds have also become key players in this Asian real estate landscape. This report examines the significance of the Asian real estate markets, and the size, liquidity and growth prospects of the Asian real estate markets over the next 20 years. Asian real estate capital flows and transactions from 2007-2013 are assessed to place Asia in a global context, as well as drilling into the specifics for Malaysian real estate in this global and Asian real estate context. The on-going real estate implications for Malaysia and Asia are highlighted; particularly the future opportunities.

EXECUTIVE SUMMARY

The Asia-Pacific real estate markets have seen increased attention from international and local real estate investors, driven by the strong economic growth in the Asia-Pacific region. This report details the significance, size, growth prospects and liquidity of the Asia-Pacific real estate markets for more informed real estate investor decision-making.

The Asia-Pacific real estate markets currently account for over \$7 trillion in investable real estate, being 27% of the global real estate market. This Asia-Pacific real estate market share is expected to increase significantly to 39% in 2021 and to 49% in 2031; with the Asia-Pacific real estate market size projected to increase from \$7 trillion to \$45 trillion by 2031. This increase in the Asia-Pacific real estate market share will be driven by the significant role of the developing Asia-Pacific real estate markets, which are expected to see an increase in global real estate market share from 10% to 39% by 2031.

The Asia-Pacific real estate markets are seen to have increased their liquidity in the last three years. Hong Kong, Singapore and Australia are seen as the most liquid Asia-Pacific real estate markets. While the global real estate markets tended to have more liquidity than the Asia-Pacific real estate markets, Hong Kong, Singapore and Australia still figured prominently amongst the most liquid real estate markets globally.

This report has assessed the significance of the Asia-Pacific real estate markets, and the size, growth potential and liquidity of the Asia-Pacific real estate markets. In this international context, the Asia-Pacific real estate markets are expected to play a significant and increasingly important role, with increasing levels of liquidity. This presents a positive investment context for the ongoing role of Asia-Pacific real estate in a diversified real estate portfolio for real estate investors, with these opportunities expected to increase over future years.

1.0 INTRODUCTION

The Asia-Pacific region has seen considerable economic growth in recent years, across the developed markets (eg: Japan, Singapore and Hong Kong) and the developing markets (eg: China and India). The region has become a major global economic growth engine, recovering from the global financial crisis and largely being isolated from the recent US economic uncertainty and the sovereign debt issues in Europe. This sees six of the top 20 most globally competitive business environments being in the Asia-Pacific; namely Singapore (#2), Hong Kong (#9), Japan (#10), Taiwan (#14), South Korea (#19) and Australia (#20) (WEF, 2013).

Importantly, this strong economic growth has been a major stimulus to the real estate markets in the Asia-Pacific region. With real estate being an important asset class for institutional investors and offering attractive investment features in a diversified portfolio, this has seen significant real estate investment opportunities in the Asia-Pacific region in both the listed real estate and unlisted real estate sectors in the developed and developing real estate markets. These real estate investors have included pension funds, sovereign wealth funds, insurance companies, endowments, foundations, family offices and private equity investors. The range of real estate investment vehicles for Asia-Pacific real estate exposure has covered the full landscape of investment vehicles, including unlisted real estate funds, club deals, separate accounts, fund of funds, direct real estate, property companies and REITs, involving core, value-add and opportunistic real estate investments as well as debt products.

A quick snapshot of the expected growth in the global real estate markets over 2011 – 2020 is given in Figure 1.

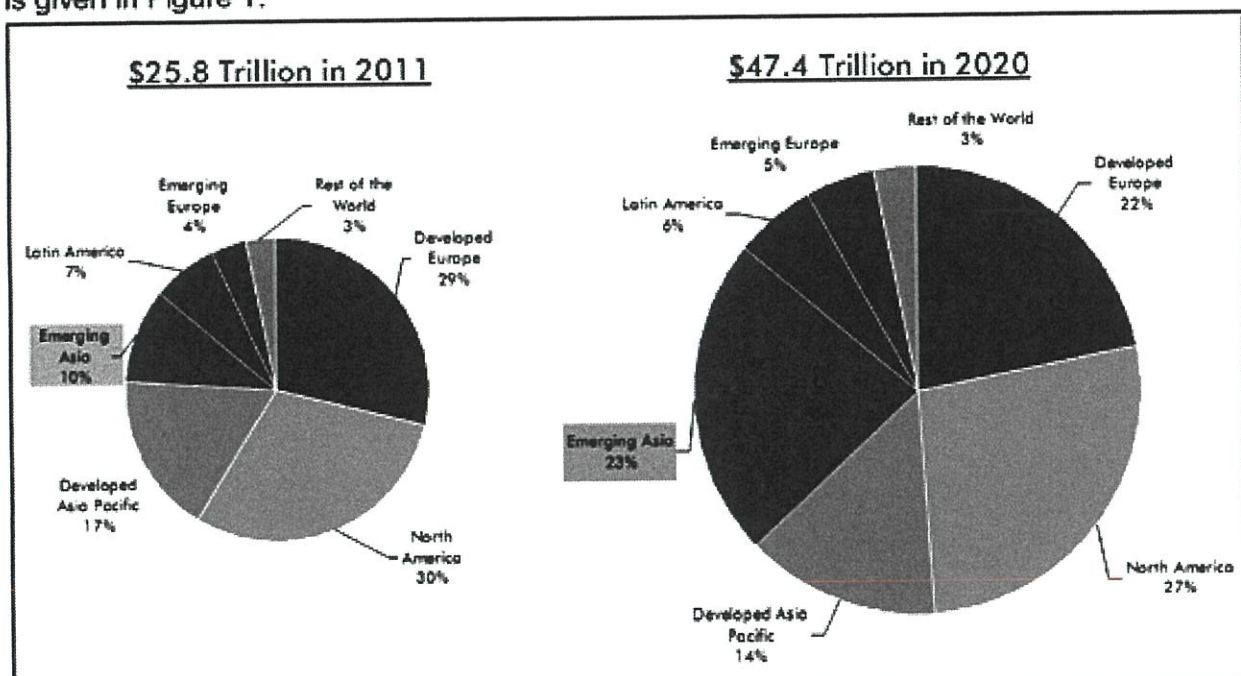


Figure 1: Global Investable Universe of Real Estate

Source: CBRE (2011)

In order for investors to better understand the position of these Asia-Pacific real estate markets in a global real estate market context, a high level of analysis of the size, growth prospects and liquidity of the Asia-Pacific real estate markets is required. As such, this report seeks to enhance the level of information available to institutional investors in their investment decision-making regarding the significance and stature of the Asia-Pacific real estate markets in an Asia-Pacific and global context. Specific objectives are:

- i. Why are the Asia-Pacific real estate markets important?
- ii. What is the size of the Asia-Pacific real estate markets; both in \$ and % terms?
- iii. How is this expected to change over the next twenty years?
- iv. What is the liquidity of the Asia-Pacific real estate markets?
- v. What are the future opportunities?

Importantly, the goal of this report is not to just come up with the “dollar value” for the size of the Asia-Pacific real estate markets moving forward; any such numbers are clearly forecasts which are subject to certain assumptions. The key issue is to position the Asia-Pacific real estate markets in a global real estate investment context, and highlight the context, growth prospects and increasingly significant role for the Asia-Pacific real estate markets in future years.

2.0 THE IMPORTANCE OF THE ASIA-PACIFIC REAL ESTATE MARKETS

Real Estate Market Transparency

A key ingredient for this increased investor confidence in the Asia-Pacific real estate markets has been the improved real estate market transparency in the Asia-Pacific markets in recent years, as shown in Table 1.

Table 1: Asia-Pacific Real Estate Market Transparency*

High transparency	Australia (3), New Zealand (5)
Transparent	Hong Kong (11), Singapore (13), Malaysia (23), Japan (25)
Semi-transparent	Taiwan (29), China-Tier 1 (32), Philippines (35), Indonesia (38), Thailand (39), South Korea (41), China-Tier 2 (46), India-Tier 1 (48), India-Tier 2 (49), India-Tier 3 (50), Macau (53), China-Tier 3 (55)
Low transparency	Vietnam (68)

Source: JLL (2012)

*: Global ranking of each Asia-Pacific real estate market is given in brackets

This sees the developed real estate markets of Australia, Singapore, Hong Kong, Japan and Malaysia classified as “high transparency” or “transparent” by Jones Lang LaSalle, with most of the developing real estate markets classified as “semi-transparent”. Importantly, many of these Asia-Pacific real estate markets have significantly improved their real estate market transparency over the last ten years; particularly the developing markets.

Previous reports have highlighted the added-value benefits of both Asia-Pacific listed and unlisted real estate in an investor's portfolio (eg: Newell, 2010, 2011, 2012, 2013, 2014).

Investors

Table 2 highlights the range of real estate investors in the Asia-Pacific real estate markets.

Table 2: Players In The Asia-Pacific Real Estate Investment Landscape

Local	International
• REITs/PCs • Private equity funds • Sovereign wealth funds • High wealth individuals	• Unlisted RE funds • Pension funds • Insurance companies

These are discussed more fully below.

Pension Funds

With pension funds globally having over \$33 trillion in assets under management, the Asian pension funds are playing an increasingly important role. This sees five of the top 10 pension funds globally being in the Asia-Pacific; this includes:

#1: GPIF: \$1.3T: Japan

#4: NPS: \$368B: South Korea

#12: EPF: \$176B: Malaysia.

Importantly, real estate is seen as a key ingredient in many Asia-Pacific pension fund strategic asset allocations; eg: NPS and EPF. This includes real estate at a local, regional and international level. Other Asia-Pacific pension funds are strategically examining real estate in their portfolio via increasing their allocation to the alternative assets (ie: real estate, infrastructure and private equity).

Other non Asia-Pacific pension funds are also active in the Asia-Pacific real estate markets; eg: CPPIB (#9: \$184B: Canada).

Sovereign Wealth Funds

Sovereign wealth funds (SWFs) have over \$6 trillion in assets under management, with 5 of the top 10 SWFs globally being in the Asia-Pacific. This includes:

#4: CIC: \$575B: China

#8: GIC: \$320B: Singapore

#10: Temasek: \$173B: Singapore

#25: Khazanah Nasional: \$41B: Malaysia.

Importantly, real estate is seen as a key ingredient in many Asia-Pacific SWF strategic asset allocations; eg: CIC, GIC, Temasek. This includes real estate at a local, regional and international level.

Other non Asia-Pacific SWFs are also active in the Asia-Pacific real estate markets; eg: ADIA (#2: \$773B: UAE).

Private Equity Real Estate

With the private equity sector accounting for over \$450 billion in new capital raised in 2013, private equity real estate accounted for \$76 billion; being 17% of the total private equity sector. In the Asia-Pacific, private equity real estate saw \$11 billion raised via 22 new closed funds in 2013; being 14% of the private equity real estate sector. Of the current 452 private equity real estate funds seeking to raise \$162 billion in capital, the Asia-Pacific accounts for 58 funds seeking to raise \$23 billion; being 14% of the private equity real estate sector (Preqin, 2014).

Major private equity real estate players in Asia include Blackstone, Carlyle, LaSalle, CBRE Global Investors, Aetos, Invesco, Fortress, Gaw and Red Fort. These include core, value-add, opportunistic and real estate debt funds in country-specific, pan-Asia and global portfolios, with over \$100 billion in real estate assets under management in these Asia-focused real estate funds. Figure 2 details the various CBRE Global Investor's Asia real estate funds.

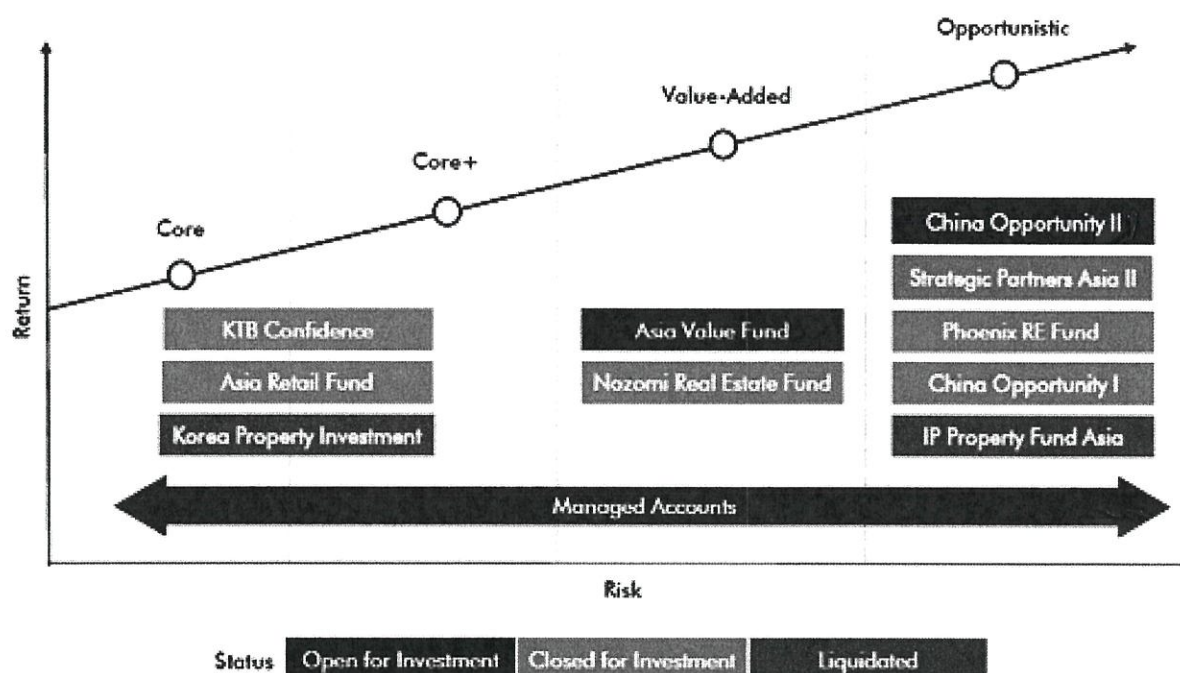


Figure 2: CBRE Global Investors' Asia Funds

Source: CBRE Global Investors (2014)

Listed Real Estate Companies and REITs

Asia-Pacific has over 1,590 listed real estate companies and REITs, with \$1,468 billion in market cap at December 2013. This represents a 48% market share of the global listed real estate securities sector. This sees Asia-Pacific having 4 of the top 5 listed real estate securities markets; ie: Hong Kong (#2), China (#3), Japan (#4) and Singapore (#5), with Australia at #7 largest globally. Five of the top 10 largest listed real estate securities globally are in the Asia-Pacific. This includes Mitsubishi Estate (#2), Mitsui Fudosan (#3), Sumitomo (#5), Sun Hung Kai (#7) and Westfield (#8), with Wharf (#19) and Link REIT (#20) also in the top 20 globally. Amongst the emerging market listed real estate securities, the Asia-Pacific figures prominently, with 4 in the top 10 globally, including China Overseas Land (#1), China Resources Land (#4) and Ayala Land (#6) (EPRA, 2014).

Figure 3 shows the growth in the Asia-Pacific listed real estate securities sector over 2000-2014 (APREA, 2014); particularly highlighting the significant growth in both listed real estate companies market cap and REIT market cap in the post-GFC period.

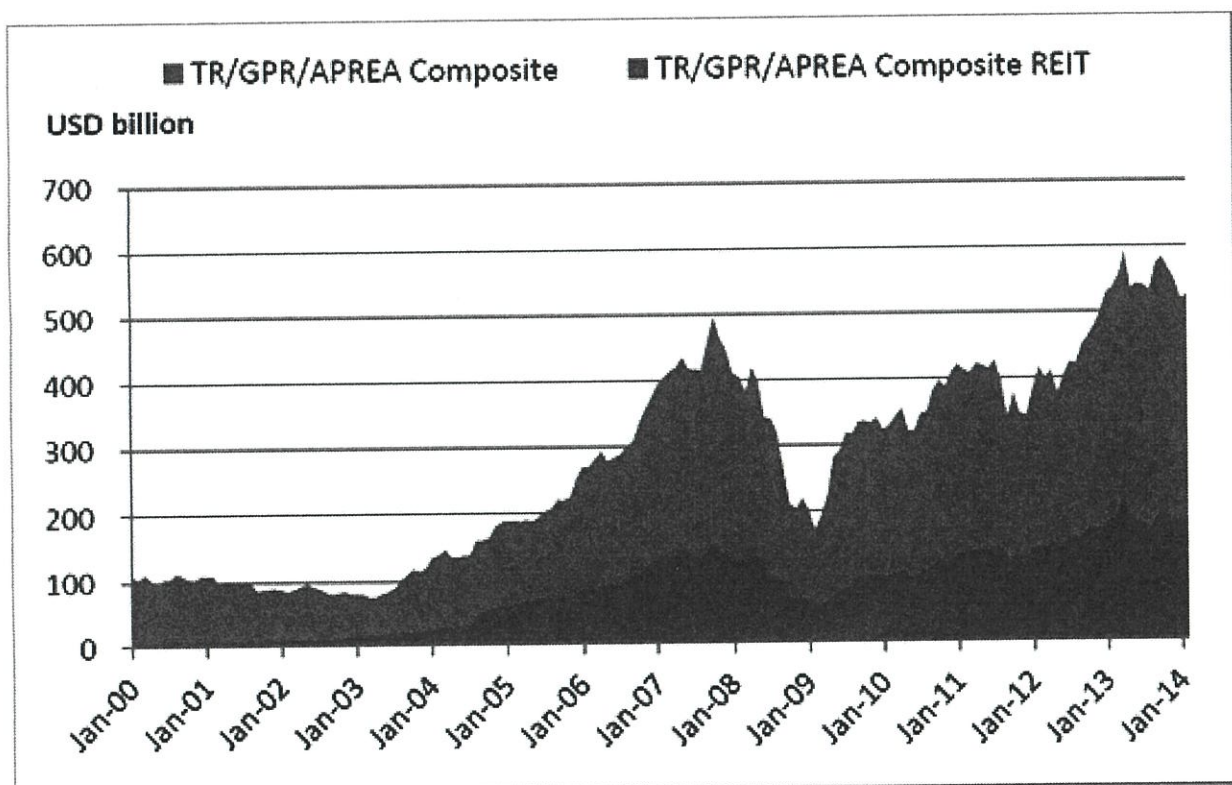


Figure 3: Growth in Listed Real Estate in Asia

Source: APREA (2014)

Real Estate Transactions

Further evidence of the stature and investor acceptance of Asia-Pacific real estate is reflected in the volume of Asia-Pacific real estate transactions in recent years; this includes commercial real estate and development sites (see Table 3).

Table 3: Significance Of Asia-Pacific Transactions*: 2007-2013

Asia-Pacific: \$2,118B; 41% market share
Americas: \$1,692B; 32% market share
Europe/MEA: \$1,390B; 27% market share
Global: \$5,205B

*: includes development sites

Source: Author's compilation from Real Capital Analytics (2014)

The Asia-Pacific region accounted for over \$2,118 billion in real estate transactions over 2007-2013 (Real Capital Analytics, 2014). This represents 41% of global real estate transactions over this period. The significance of the major Asia-Pacific real estate markets in a global context is shown in Table 4, with China and Japan in the top 5 most active global real estate markets over 2007-2013, and other Asia-Pacific real estate markets also playing a significant role in this global context.

Table 4: Asia-Pacific Transactions: 2007-2013

#1: US: \$1.5 trillion @ 29%
#2: China: \$1.4 trillion @ 27%
#3: UK: \$419 billion @ 8%
#4: Germany: \$274 billion @ 5%
#5: Japan: \$228 billion @ 4%
Australia: \$123 billion
Hong Kong: \$118 billion
Singapore: \$96 billion
South Korea: \$56 billion
Taiwan: \$42 billion
Malaysia: \$22 billion

Source: Author's compilation from Real Capital Analytics (2014)

Table 5 also shows the breadth and diversity of the top Asia-Pacific commercial real estate markets, seeing five Asia-Pacific cities represented in the top 20 global commercial real estate markets in 2013.

**Table 5: Ranking Of The Major Global Commercial Real Estate Markets:
Transaction Value**

City	2013	2012	2011	2010
New York	1	1	1	3
London	2	2	2	2
Tokyo	3	3	3	1
Los Angeles	4	4	5	8
San Francisco	6	5	7	10
Paris	7	6	4	4
Hong Kong	8	7	8	5
Sydney	13	17	20	18
Singapore	16	16	9	6
Shanghai	20	22	10	11
Seoul	25	15	13	17
Beijing	27	32	12	9

Source: Author's compilation from Real Capital Analytics (2014)

Table 6 shows the ranking of the major Asia-Pacific commercial real estate markets over 2010-2013 in an Asia-Pacific context, with Tokyo, Hong Kong, Sydney and Singapore being the leading cities.

**Table 6: Ranking of the Major Asia-Pacific Commercial Real Estate Markets:
Transaction Value**

City	2013	2012	2011	2010
Tokyo	1	1	1	1
Hong Kong	2	2	2	2
Sydney	3	5	7	7
Singapore	4	4	3	3
Shanghai	5	6	4	5
Seoul	6	3	6	6
Beijing	7	8	5	4
Osaka	8	11	10	9
Melbourne	9	9	9	8
Brisbane	10	7	11	12
Kuala Lumpur	28	23	13	10

Source: Author's compilation from Real Capital Analytics (2014)

At an individual real estate transaction level, the significance of the Asia-Pacific markets in a global context in 2013 is further highlighted; particularly the role of development sites in China amongst these leading real estate transactions. This includes:

#1: Shanghai development site: \$3.6B

#2: Shenzhen development site: \$1.8B

#3: Tianjin development site: \$1.7B

#4: London office: \$1.6B

#5: Hong Kong development site: \$1.5B

#8: Johor Bahru development site: \$1.4B

#9: New York office: \$1.4B

#10: New York office: \$1.3B

#12: Tokyo office: \$1.2B

#14: Singapore development site: \$1.1B.

This sees the Asia-Pacific real estate markets accounting for 4 of the top 5, 6 of the top 10 and 11 of the top 20 global real estate transactions in 2013, continuing the trend of recent years. Overall, development sites in Asia-Pacific accounted for 9 of the top 20 real estate transactions globally in 2013 and 16 of the top 20 real estate transactions in 2013 in the Asia-Pacific region.

3.0 THE SIZE OF THE ASIA-PACIFIC REAL ESTATE MARKETS

The standard approach to estimate the size of the investable real estate markets is a top-down GDP-based approach. In estimating real estate market size, different adjustments are used for developed markets and developing markets, as well as adjustments for different population densities. This approach is used in this report, with the Pramerica Real Estate Investors' estimates of investable real estate market size used. Further details of this approach are given in Pramerica Real Estate Investors (2012) in assessing the size of 55 global real estate markets.

Table 7 presents the estimates of the size of the investable real estate markets for the major countries in 2011, including 14 Asia-Pacific real estate markets.

Table 7: Size of the Major Global Real Estate Markets: 2011

Country	Investable real estate (US\$)	Global market share	Global rank
United States	\$6,753B	25.4%	1
Japan	\$2,678B	10.1%	2
China	\$1,864B	7.0%	3
Germany	\$1,615B	6.1%	4
UK	\$1,370B	5.2%	5
France	\$1,248B	4.7%	6
Italy	\$990B	3.7%	7
Brazil	\$884B	3.3%	8
Canada	\$784B	3.0%	9
Spain	\$689B	2.6%	10
Australia	\$656B	2.5%	11
Russia	\$620B	2.3%	12
South Korea	\$467B	1.8%	13
Netherlands	\$380B	1.4%	14
Mexico	\$370B	1.4%	15
India	\$350B	1.3%	16
Switzerland	\$284B	1.1%	17
Sweden	\$250B	0.9%	18

Singapore	\$241B	0.9%	19
Hong Kong	\$211B	0.8%	24
Taiwan	\$198B	0.7%	26
Indonesia	\$189B	0.7%	27
Thailand	\$89B	0.3%	40
Malaysia	\$84B	0.3%	43
New Zealand	\$73B	0.3%	44
Philippines	\$48B	0.2%	47
Vietnam	\$21B	0.1%	52
Total	\$26,559B	100%	

Source: Author's compilation from Pramerica Real Estate Investors (2012)

The Asia-Pacific region accounts for over \$7 trillion of the \$26.6 trillion global real estate market. This sees the Asia-Pacific region accounting for 27.0% of the global real estate market, compared with Europe (35.4%) and USA/Canada (28.4%). The leading Asia-Pacific real estate markets include Japan (\$2.7 trillion; #2 globally; 10.1% market share), China (\$1.9 trillion; #3; 7.0%) and Australia (\$656 billion; #11; 2.5%). This compares with the US (#1), Germany (#4), UK (#5) and France (#6).

Importantly, the Asia-Pacific region has two real estate markets in the top ten markets globally and 7 real estate markets in the top 25 markets globally. Of the 27.0% Asia-Pacific real estate market share, this comprises 17.0% for the developed markets and 10.0% for the developing markets in the Asia-Pacific region. This developed market versus developing market split will change significantly over the next 20 years as the developing markets mature and play a far more significant role; this is highlighted in the next section of this report.

In an Asia-Pacific context, Table 8 presents the estimates of the size of the 14 Asia-Pacific real estate markets and their Asia-Pacific rankings.

Table 8: Size of the Asia-Pacific Real Estate Markets: 2011

Country	Investable real estate (US\$)	Asia-Pacific market share	Asia-Pacific rank
Japan	\$2,678B	37.4%	1
China	\$1,864B	26.0%	2
Australia	\$656B	9.2%	3
South Korea	\$467B	6.5%	4
India	\$350B	4.9%	5
Singapore	\$241B	3.4%	6
Hong Kong	\$211B	2.9%	7
Taiwan	\$198B	2.8%	8
Indonesia	\$189B	2.6%	9
Thailand	\$89B	1.2%	10
Malaysia	\$84B	1.2%	11
New Zealand	\$73B	1.0%	12
Philippines	\$48B	0.7%	13
Vietnam	\$21B	0.3%	14
Total	\$7,169B	100%	

Source: Author's compilation from Pramerica Real Estate Investors (2012)

Overall, accounting for 27.0% of the global real estate market, the Asia-Pacific region makes a significant contribution to the global real estate market. This has clearly seen the Asia-Pacific region take on increased significance with global real estate investors seeking high quality and value-adding opportunities in their real estate portfolios.

4.0 THE SIZE OF THE ASIA-PACIFIC REAL ESTATE MARKETS: 2021 AND 2031

Growth in the size of the real estate markets is an important consideration for real estate investors. Using GDP growth estimates, the forecast size of the global real estate markets in 2021 and 2031 is given in Table 9.

Table 9: Size of the Global Real Estate Markets: 2011-2031

Region	2011		2021		2031	
	\$	%	\$	%	\$	%
Asia-Pacific	\$7.2T	27.0%	\$19.1T	39.2%	\$44.9T	48.8%
- Developed	\$4.5T	17.0%	\$6.3T	12.9%	\$9.5T	10.3%
- Developing	\$2.6T	10.0%	\$12.8T	26.3%	\$35.4T	38.5%
Europe	\$9.4T	35.4%	\$13.3T	27.3%	\$20.5T	22.2%
US/Canada	\$7.5T	28.4%	\$11.5T	23.6%	\$18.0T	19.6%
Latin America	\$1.8T	6.7%	\$3.6T	7.5%	\$6.8T	7.3%
GCC	\$0.7T	2.6%	\$1.2T	2.4%	\$1.9T	2.0%
Total	\$26.6T	100%	\$48.7T	100%	\$92.1T	100%

Source: Author's compilation from Pramerica Real Estate Investors (2012)

From \$27 trillion in 2011, the global real estate market size is expected to grow to \$49 trillion by 2021; an increase of 83%. By 2031, this global real estate market size is expected to be \$92 trillion; a further increase of 89%.

Importantly, the Asia-Pacific share in this real estate market growth is even more significant. By 2021, the Asia-Pacific real estate market size is forecast to increase from \$7 trillion to \$19 trillion; an increase of 165%. By 2031, this is forecast to increase to \$45 trillion; a further increase of 135%. Both of these ten-year Asia-Pacific real estate market size increases are well above the respective global rate of increase, as well as being significantly above the equivalent increases in real estate market size forecast for Europe (41% and 54%) and the US/Canada (53% and 56%).

These forecast changes over 2011-2031 will also see a significant change in the Asia-Pacific real estate market share. This will see the Asia-Pacific market share increase from 27.0% to 39.2% to 48.8% over this 20-year period. In contrast, the Europe market share is forecast to reduce significantly from 35.4% to 27.3% to 22.2% over this period. Similarly, the US/Canada market share is forecast to decrease from 28.4% to 23.6% to 19.6% over this period.

The increasing Asia-Pacific real estate market share over 2011-2031 from 27.0% to 48.8% also reflects the major growth in the Asia-Pacific developing real estate markets over this 20-year period. This is expected to see the developing Asia-Pacific real estate markets share increase from 10.0% to 26.3% to 38.5% over this period, while the developed Asia-Pacific real estate markets share decreases from 17.0% to 12.9% to 10.3%. This realignment within

the Asia-Pacific real estate markets reflects the significant growth and real estate investment opportunities in the Asia-Pacific developing markets, including China, India, Indonesia, Malaysia, Vietnam and the Philippines. The dynamics of these changes for the individual Asia-Pacific markets over 2021-2031 are clearly evident in Table 10, showing the size of the investable real estate markets and global market share for the various Asia-Pacific countries.

Table 10: Size of the Asia-Pacific Real Estate Markets: 2021 and 2031

Country	2011		2021		2031	
	US\$	Global %	US\$	Global %	US\$	Global %
Japan	\$2,678B	10.1%	\$3,073B	6.3%	\$4,037B	4.4%
China	\$1,864B	7.0%	\$9,741B	20.0%	\$26,395B	28.7%
Australia	\$656B	2.5%	\$892B	1.8%	\$1,304B	1.4%
Sth. Korea	\$467B	1.8%	\$933B	1.9%	\$1,662B	1.8%
India	\$350B	1.3%	\$1,630B	3.3%	\$5,556B	6.0%
Singapore	\$241B	0.9%	\$546B	1.1%	\$1,128B	1.2%
Hong Kong	\$211B	0.8%	\$353B	0.7%	\$623B	0.7%
Taiwan	\$198B	0.7%	\$378B	0.8%	\$561B	0.6%
Indonesia	\$189B	0.7%	\$752B	1.5%	\$1,967B	2.1%
Thailand	\$89B	0.3%	\$230B	0.5%	\$563B	0.6%
Malaysia	\$84B	0.3%	\$246B	0.5%	\$465B	0.5%
New Zealand	\$73B	0.3%	\$113B	0.2%	\$206B	0.2%
Philippines	\$48B	0.2%	\$134B	0.3%	\$300B	0.3%
Vietnam	\$21B	0.1%	\$65B	0.1%	\$171B	0.2%
Asia-Pacific	\$7,169B	27.0%	\$19,085B	39.2%	\$44,937B	48.8%
Global	\$26,559B	100%	\$48,723B	100.0%	\$92,065B	100.0%

Source: Author's compilation from Pramerica Real Estate Investors (2012)

Looking at these 2021 real estate growth projections more fully, Table 11 presents the forecast size of the major global real estate markets in 2021.

Table 11: Size of the Major Global Real Estate Markets: 2021

Country	Real estate (US\$)	Global market share
United States	\$10,290B	21.1%
China	\$9,741B	20.0%
Japan	\$3,073B	6.3%
Germany	\$1,977B	4.1%
UK	\$1,953B	4.0%
Brazil	\$1,938B	4.0%
Russia	\$1,698B	3.5%
India	\$1,630B	3.3%
France	\$1,528B	3.1%
Canada	\$1,216B	2.5%
South Korea	\$933B	1.9%
Australia	\$892B	1.8%
Total	\$48,723B	100%

Source: Author's compilation from Pramerica Real Estate Investors (2012)

This sees the Asia-Pacific region having 5 of the top 12 global real estate markets in 2021, compared to only 3 of the top 12 global real estate markets in 2011. This reflects significant real estate market growth over this period from China (#1 market growth; based on US\$ growth), India (#3), Indonesia (#7), South Korea (#8) and Japan (#10). This sees five of the top 10 major real estate growth markets globally over 2011-2021 being in the Asia-Pacific region and over 50% of the global real estate market growth coming from the Asia-Pacific region over this period.

Overall, these projections over 2011-2031 present a major increase in the Asia-Pacific real estate market share, as well as a significantly increased role by the developing real estate markets in the Asia-Pacific region over the next twenty years. This presents a very positive context for the Asia-Pacific real estate markets going forward over the next 20 years.

5.0 THE LIQUIDITY OF THE ASIA-PACIFIC REAL ESTATE MARKETS

While the size of the various real estate markets is an important investment consideration, the liquidity of these real estate markets is also an important factor for investors, as it provides insights concerning how readily traded or tightly held commercial properties are in these various real estate markets. Using the commercial real estate transaction activity from Real Capital Analytics and the real estate market size estimates from Pramerica Real Estate Investors, liquidity is assessed as the percentage of the real estate market transacted each year. Table 12 presents the liquidity factors for the major Asia-Pacific commercial real estate markets for each of 2010, 2011 and 2012 and averaged over 2010-2012; these Asia-Pacific liquidity levels are benchmarked against the liquidity of the major international real estate markets in Europe and North America.

Table 12: Liquidity Factors of the Major Asia-Pacific Real Estate Markets

Country	2012		2011		2010		2010-2012	
	Liquidity	Rank	Liquidity	Rank	Liquidity	Rank	Liquidity	Rank
Asia-Pacific	1.54		1.34		1.04		1.31	
Japan	1.06	7	0.93	7	0.80	7	0.93	7
China	1.09	6	0.92	8	0.55	8	0.85	8
Australia	3.23	2	2.16	4	1.80	4	2.40	3
Sth Korea	1.48	5	1.63	6	0.94	6	1.35	6
Singapore	2.99	3	4.32	2	3.03	3	3.45	2
Hong Kong	7.87	1	5.40	1	5.69	1	6.32	1
Taiwan	1.82	4	2.73	3	1.52	5	2.02	4
Malaysia	0.83	8	1.79	5	3.45	2	2.02	5
US	3.43		2.48		1.62		2.51	
Germany	2.58		2.21		1.54		2.11	
UK	3.82		3.57		3.39		3.59	
France	1.81		1.81		1.74		1.79	
Canada	2.70		1.98		1.85		2.18	
Netherlands	1.47		1.21		1.45		1.38	
Sweden	5.20		5.00		4.32		4.84	
Global	2.04		1.70		1.32		1.69	

Source: Author's calculation

Amongst the Asia-Pacific real estate markets, increased levels of liquidity were generally evident over this three-year period. The most liquid Asia-Pacific real estate markets were seen to be Hong Kong (#1), Singapore (#2) and Australia (#3). While Japan had the highest level of real estate transactions in the Asia-Pacific region, the significant size of the Japan real estate market saw it only ranked #7 for liquidity amongst the Asia-Pacific real estate markets; only China had less liquidity than Japan.

At a global level, the major real estate markets have also seen increased levels of liquidity, with the overall Asia-Pacific region seeing less liquidity in its real estate markets (1.31) than the global real estate markets (1.69).

At an individual market level, the most liquid real estate markets globally were Hong Kong (#1), Sweden (#2), UK (#3), Singapore (#4), US (#5) and Australia (#6). This sees several of the Asia-Pacific real estate markets well-represented amongst the most liquid real estate markets globally. This further reinforces the investor attractiveness for the Asia-Pacific real estate markets.

6.0 FUTURE OPPORTUNITIES FOR THE ASIA-PACIFIC REAL ESTATE MARKETS

This report has clearly identified the significance of the Asia-Pacific real estate markets, both at a regional and global level. This significance is expected to be further enhanced over the next twenty years; particularly with the growth in the developing real estate markets in the Asia-Pacific region.

The resulting growth, maturity and sophistication in the Asia-Pacific real estate markets will see a major transformation in the Asia-Pacific real estate markets over the next twenty years, including:

- i. increased levels of Asia-Pacific real estate in institutional investor portfolios
- ii. enhanced quality of real estate assets available to investors
- iii. increased stature for Asia-Pacific real estate assets in global portfolios
- iv. further development of important REIT markets in the developing real estate markets in Asia
- v. further development of unlisted real estate products, including country-specific and pan-Asia real estate portfolios
- vi. increased opportunities for skilled real estate professionals in all sectors of the real estate industry in the Asia-Pacific region, including real estate funds management, real estate asset management, valuation and real estate professional services
- vii. increased levels of real estate market information and value-added real estate services in these unique and dynamic Asia-Pacific real estate markets to enhance real estate investor decision-making.

As such, the Asia-Pacific real estate markets will become increasingly important; both as a destination for global capital for real estate investment and as a source of this real estate capital. This will take on an increasingly important role with the increased significance of the Asia-Pacific real estate markets in the future.

Overall, this presents exciting prospects and opportunities at all levels for the Asia-Pacific real estate markets as they increase their global significance, investment stature and market share over the next twenty years.

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