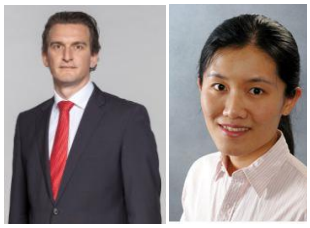
EPRA RESEARCH

European Public Real Estate Association

Real estate securities, real estate or equities?

Content table



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EXECUTIVE SUMMARY

We commissioned the University of Regensburg to update its study on the behaviour of listed real estate companies versus the underlying property market back in 2009. The original research was well received and added to the growing library of research and analysis to bolster the case that a medium to long-term listed estate investment provides direct real estate returns. This strengthens it further.

Background

The updated study builds on the previous analysis and examines whether listed real estate indices in a broader sample of 13 economies are predominantly driven by the underlying property markets or by performance of general stock markets. The economies covered by the research were: Australia, Belgium, Denmark, Finland, France, Hong Kong, Norway, Spain, Sweden, Switzerland, The Netherlands, UK and US.

Using advanced statistical techniques Regensburg generally find a stronger linkage to underlying real estate assets compared against equity stock markets. In the majority of cases, the listed real estate markets are predominantly driven by the performance of the underlying buildings, which can be interpreted as the key driver of listed real estate in the long run.

Investors are faced with a wide range of products and vehicles to gain real estate exposure. In addition to conventional investment in direct commercial and residential real estate, investors have options to invest in a number of alternative real estate vehicles such as closed and open-end funds, listed real estate companies and REITs, or real estate private equity. Given the links listed real estate and the underlying real estate market as well as general stock market, in this project, Regensburg examine the true nature of listed real estate.

Regensburg explore the question whether listed real estate can be classified as an underlying real estate investment, or whether international general stock market trends serve as the predominant driver of performance.

A consequence of a stock exchange listing is the fact that additional drivers – over and above the performance of the underlying property markets – can affect the performance and the risk/return structure of listed real estate to a significant extent. Subsequently, listed real estate performance is also influenced by current economic and market news, analyst expectations and valuations which results in short-term share prices being influenced by general stock market risk.

With this in mind, as share prices are a function of market supply and demand, they may suffer from irrational trading behavior on stock markets; for example, over and under-shooting in phases of boom and bust; or “herding behavior” from investors. As a result, listed real estate companies face the risk that market values are driven by developments on general stock markets in the short-term, despite the fact that the main business of listed real estate companies is the trading and management of income producing real estate.

For this reason, it is valuable to analyse whether listed real estate securities can be characterised as underlying real estate investments and whether their distinctive features, as an alternative investment, remain intact despite stock market ‘noise’. For the purposes of this research, Regensburg used a co-integration framework and the Johansen (1988) procedure. In order to achieve convincing results Regensburg conducted further analyses.

With respect to regulation, disclosure and accounting standards, we still find significant differences across international real estate markets. As these country-specific distinctions can impact results,

reduce comparability and ultimately affect our conclusions, the use of a reliable and consistent data set is of primary importance for the purposes of our examination.

Our dataset includes 13 the important developed economies listed earlier. On average, real estate markets in those regions and countries are relatively more transparent compared against others in the world. Furthermore, they are also more actively traded, are more mature, and offer higher levels of liquidity. As a consequence, those real estate markets offer reliable data and indices that are representative of both direct and indirect real estate investment markets. This is a pre-requisite when using our approach to analyse the characteristics of real estate securities.

Data & General Process

- FTSE EPRA/NAREIT Global Real Estate Index
- Bank of International settlement property price index
- Individual country equity blue chip indices

For the purposes of this examination, Regensburg analysed the real estate markets in the 13 developed economies from the beginning of 1990. At the end of 2011, the market capitalisation for listed real estate in the 13 economies covered 92.5% of that for global real estate investment.

Regensburg first tested the unknown structural break in each market using the unknown break-point test based on a dynamic multi-variate model. The majority structural breaks appear between the end of 2007 and the beginning of 2008.

It combines time series analytical procedures with the concept of economic equilibrium, and facilitates the analysis of long-term equilibrium relationships between non-stationary variables. The cointegration analysis is based on the observation that economic variables often display common trend behaviour. This implies that linear combinations of these variables converge towards a common equilibrium in the long term, even though individual time series fluctuate over time.

In addition to the benefits of liquidity, transparency and management, long-term investments in listed real estate securities offer opportunities to combine the attractions of both direct and listed real estate.

The results

Prior to analysing the features of listed real estate, Regensburg evaluated the implemented model framework with respect to econometric requirements and economic plausibility. Despite the some of the drawbacks of vector error correction models, namely their sensitivity, both implemented models meet the econometric requirements which were defined prior to the estimation. As a result, the VECM framework, including the implemented model specifications, is adopted for examining and evaluating the features of listed real estate.

Based on the cointegration test results Regensburg found that seven markets have one cointegration relationship: Australia, Belgium, Denmark, France, the Netherlands, Switzerland and UK. The cointegation matrix in the other six markets has a rank of two, indicating two cointegration relationships. In each model with co-integration matrix, the first vector is normalised to the listed real estate performance, and the second is normalised to general stock market performance.

Using a vector error correction framework and variance decompositions, we generally find a significantly stronger relationship among real estate assets (underlying and listed real estate) compared against the relationship with general equities. In 11 out of the 13 economies, the real estate securities markets are predominantly driven by the performance of the underlying properties in terms of long-term equilibrium. In the other two markets, the corresponding general stock market and underlying property market play relatively equal roles.

Additionally, we also identify six significant long-run relationships between housing price performance and general stock market performance. The results using variance decomposition substantiate our conclusions. In nine out of the 13 countries, a larger proportion of the performance of the listed real estate securities indices is explained by its underlying property performance. In order to analyse the dynamic relationships amongst the selected macroeco¬nomic variables, the underlying property, and listed real estate indices, the study applies the cointegration concept to vector autoregressive (VAR) models using the vector error correction (VEC) framework according to Johansen (1988).

The long-term synchronicity between listed real estate and underlying direct real estate implies that the primary characteristics of real estate investment persist despite the influences of the general stock market movements in the short term. Ultimately, the development of the underlying real estate markets remained the key driver of the performance of listed real estate for the examined sample. As a result, combined with the benefits of liquidity, dividends payout/yield, quality of assets, transparency and management teams, a medium to long-term investment in listed real estate offer investors the opportunity to combine the attractions of both direct and listed real estate. The ability to blend both direct and listed real estate provides remarkable potential for diversify¬ing the investor´s portfolio whether national, regional or global.

The long-term synchronicity between real estate securities and direct real estate implies that the primary characteristics of real estate investment persist despite the influences of the general stock market movements.

Answering this question is of particular importance with respect to issues of asset allocation in a multi-asset portfolio. If listed real estate were found to be predominantly driven by performance of general stock markets, the benefits of listed real estate investment – in terms of portfolio diversification – would be limited. By implication, the intended risk/return structure of an investor´s portfolio would be significantly distorted because the inclusion of listed real estate would involuntarily increase the proportion of investments that are subject to general stock market risk. Consequently, this case would finally result in a portfolio allocation which is more risky than desired. However, these research findings counteract this scenario.

To sum up, our study provides strong evidence that medium to long-term investments in real estate securities fulfill their function as an ‘alternative investment’. For that reason, we assume lower correlations to conventional assets and a more defensive risk/return structure compared to investments in general stock markets. Subsequently, we conclude that medium to long-term investments in listed real estate not only provide opportunities for portfolio diversification, but in addition provide the ability to combine the attractions of both real estate assets – direct and indirect, including benefits in terms of liquidity, transparency, dividend income and management.

Abstract

This study examines whether real estate stock indices in 13 important economies, including: Australia, Belgium, Denmark, Finland, France, Hong Kong, Norway, Spain, Sweden, Switzerland, The Netherlands, UK and, United States, are predominantly driven by the underlying property markets or by progress on general stock markets.

Based on vector error correction models (VECM) and variance decompositions, we generally find a stronger linkage among real estate assets compared against the linkage among the examined equity assets. In most of the cases, the real estate equity markets are predominantly driven by the progress of the underlying properties, which can be interpreted as the key driver of listed real estate in the long run.

1 Introduction

In the recent past, we have observed an ongoing expansion of securitised real estate investments – in particular driven by REIT legislation. Based on EPRA data, by the end of 2006, the market capitalisation for global securitised real estate investments rose to USD 905 billion, three times of that in 2003. Not only UK and US, many other regions in the world also experienced rapid growth in the real estate security market. For example, in 2006 the market capitalisation for French securitised real estate investments was nearly five times of that in 2003, and Hong Kong had a growth of more than 500% during this period.

Subsequently, investors are faced with a wide range of products related to real estate investments. Besides the conventional investment in direct real estate (residential or rental properties) investors have opportunities to invest in several forms of securitised real estate, such as closed and open-end funds, listed real estate companies, REITs or real estate private equity. Given the close link between real estate security and the underlying property market as well as general stock market, in this project, we particularly examine the nature of real estate securities. We explore the question whether listed real estate securities can be characterised as underlying real estate investments or whether the general stock market serves as the predominant driver based on an international analysis.

On one hand, real estate security is an instrument for indirect investments in real estate. Due to the long investment horizon, low correlations and the distinctive risk/return structure, real estate is generally viewed as an 'alternative asset' compared against conventional assets such as stocks or bonds. With respect to issues of asset allocation, investments in real estate provide remarkable potential for diversifying an investor's portfolio (Eichholtz, 1996; Eichholtz et al., 1998; Liu and Mei,1998; Liu et al.,1997).

On the other hand, investments in listed real estate need not suffer the problems in direct real estate investment, such as illiquidity, low information efficiency, inefficient market transparency and reduced profit caused by high transaction costs. A stock exchange listing ensures that transaction prices are quoted in real time and transparency levels are generally higher. In addition, the division into shares reduces the minimum investment requirement or hurdle and, by implication, the market entrance barriers for potential investors. As a result, listed real estate provides an easier route to access underlying real estate exposure for investors – in particular for private investors and smaller institutional investors.

However, a consequence of a stock exchange listing is the fact that additional drivers – over and above the performance of the underlying property markets – can affect the performance and the risk/return structure of listed real estate to a significant extent. Consequently, listed real estate performance is also influenced by current economic news, which means that share price valuation is not spared general stock market risk, including incorrect analyst expectations and valuations – in the shorter term.

With this in mind, As the equity share price is a function of market supply and demand, it may suffer from irrational trading behavior on stock markets, for example, over and under shooting in phases of boom and bust; or "herding behaviour" from investors[1]. As a result, listed real estate companies must face the risk that market values are predominantly driven by developments on general stock markets, although the main business of real estate companies remains focused on trading and management of income producing real estate.

For this reason, it is valuable to analyse whether listed real estate securities can be characterised as underlying real estate investments and whether their distinctive features as an alternative investment remain irrespective of the 'noise' of stock markets[2]. Previous studies, such as Liu and Mei (1992), Li and Wang (1995), Karolyi and Sanders (1998), Pagliari et al. (2005), Hoesli and Serrano (2007), Oikarinen et. al., (2011); Schätz and Sebastian (2011), and among others, examined this question and reached inconsistent results. Their results are largely dependent on the selected method or the sample under consideration.

Nevertheless, most of the previous studies focus on US and UK market. Although US and UK are two most important real estate security markets and cover more than 50% of the market capitalisation for the global securitised real estate investments, it is also interesting for investors to know the situations in other parts of the world. Therefore, we particularly observe 13 important economies, including Australia, Belgium, Denmark, Finland, France, Hong Kong, the Netherlands, Norway, Spain, Sweden, Switzerland, the UK and the US. In 2010, the market capitalisation in the 13 economies consists 92.5% of that for global real estate security investment.

For the purposes of this examination we conduct a co-integration framework and the Johansen (1988) procedure[3]. In order to achieve convincing results we conduct further analyses in order to gain more detailed insights into whether real estate securities are predominantly driven by underlying property markets or equity markets. For this reason, we employ variance decompositions in order to verify our VECM results.

The remainder of this paper proceeds as follows. Section 2 reviews the related literature. Section 3 introduces the selected data during the examination period. Section 4 presents the model framework. Section 5 provides empirical evidence and Section 6 concludes.

[1] In this context, several irrationalities on capital markets were detected by different studies within the research branch of behavioral finance. For example, the findings of Kahneman and Tversky (1979) contradict the basic tenets of utility theory. Accordingly, the authors detected a value func¬tion that is normally concave for gains, but commonly convex and generally steeper for losses. Furthermore, Shiller (1981) discussed the stock market´s efficiency and found that volatility of stock prices is much higher than fundamentally justified. For an overview concerning further possible irrationalities and their distinctions from current economic theory please refer to Andrikopoulos (2007).
[2] Generally, the term "property" is used in British English and "real estate" in American English, respectively. For the purposes of our examination, however, we use the term "property" in order to denote direct real estate investments, while the term "real estate" denotes real estate as an asset class in general including securitized real estate.
[3] As several papers contribute to the development of the Johansen procedure as it is used within the scope of this study, the denoted year refers to the first paper of the VECM series by Johansen and Juselius.

2 Literature review

The benefits of both direct and listed real estate with respect to diversification in a multi-asset portfolio have been discussed in various studies. Particularly in terms of geographical diversification, several authors certify favorable features of real estate investments.

In this context, real estate provides enhanced benefits compared against international diversification through stocks and bonds. For example, Eichholtz (1996) detects significantly lower correlations between national real estate returns compared against common stocks or bond returns and concludes that international diversification reduces the risk of a real estate portfolio to a greater extent, compared against conventional asset portfolios. Case et al. (1997) find that geographical diversification within different types of commercial real estate, namely industrial, office and retail, is profitable. Furthermore, the study of Eichholtz et al. (1998) examines the impact of continental factors on real estate returns and verifies the existence of attractive international diversification potential for European and US-based investors. These attractive characteristics of international real estate diversification are substantiated by the studies of Newell and Webb (1996) and Goetzmann and Wachter (2001) who focused on industrial real estate.

Regarding the issue of whether real estate securities are fundamentally influenced by underlying prop¬erty markets or general stocks, previous studies reach inconsistent results. These results are largely dependent on the selected method, market or sample. With this in mind, related literature on integration characteristics of listed real estate is primarily focused on US markets using REIT data (see e.g. Liu and Mei, 1992, Karolyi and Sanders, 1998, and Ling et al., 2000). In the process, several studies report high correlations for real estate securities against common stocks. For instance, Li and Wang (1995) conduct a multifactor asset pricing (MAP) model and find that the US REIT market is integrated with the general stock market. Oppenheimer and Grissom (1998) use frequency space correlations and derive a similar conclusion – US REITs exhibit significant co-movement with stock market indices. By Employing regression analysis, Quan and Titman (1999) detect significant relations between stock returns and changes in property values and rents in 17 different countries.

This finding is bolstered by the analysis of Ling and Naranjo (1999), who examined whether commercial real estate markets are integrated with equity markets. Using multi-factor asset pricing (MAP) models, the study finds that the risk premium of the market for real estate securities is integrated with the equity market. The authors also note that the degree of integration increased significantly through the 1990s. In contrast, the integration hypothesis does not apply to real estate portfolios which are valued using appraisal-based methods. Based on the data from 1984Q4 to 2008Q4, Oikarinen et. al., (2011) examine the cointegration relationship among US REITs market (NAREIT), direct (NCREIF) real estate return and stock market by the bivariate vector error correction model(VECM). They demonstrate the long-run relationship between NAREIT and NEREIF, but not with the stock market. Furthermore, by splitting the data into two parts, they find a large and long-lasting deviation from the long-run relation between NAREIT and NCREIF since the beginning of the ‘new REIT era’.

Another cluster of studies find that correlations between underlying real estate markets and real estate securities increased over time (see e.g. Gosh et al. (1996) for the US market). For example, Clayton and MacKinnon (2001) examine a US market sample between 1978 and 1998 using a multi-factor approach. Although underlying real estate does not explain REIT returns over the entire sample, the study exhibits time-varying results which highlight the link between REITs, direct real estate and financial assets. In addition, they also find increasing correlations between direct and indirect real estate. Time-varying correlations are also detected by Hoesli and Serrano (2007), who analysed the relationships between real estate securities, general stocks, bonds and direct real estate in 16 economies.

The international analysis reveals decreasing regression betas over time, which indicates that the influence of the financial assets on real estate securities has become less important in recent years. Nevertheless, the broad stock and bond markets still explain a significant portion of the variance of real

estate securities. As this does not apply to direct or underlying real estate, the results suggest that real estate securities are driven by stocks and bonds rather than by their underlying property markets.

Alternatively, a third cluster of more recent studies, contradicts the results of the earlier studies outlined above and indicates that real estate securities behave more like underlying property markets and less like general stocks in the long run (see e.g. Pagliari et al., 2005, Westerheide, 2006, Tsai et al., 2007, or Morawski et al., 2008). Subsequently, these findings point to opportunities for investors to combine the advantages of listed real estate with those of direct property investments. A blended, or combined, approach to real estate investment would have remarkable implications with respect to asset allocation in a multi-asset portfolio.

Based on the current set of literature, it is clear that the question remains open. In order to add value to the body of research, we contribute by analysing this issue using a alternative approach. Accordingly, we assume that strict observation of econometric requirements in addition to the consideration of the macroeconomic environment ensures reliable results.

3 Real estate and stock market data

With respect to regulation, disclosure and accounting standards, we still find significant differences across international real estate markets. As these country-specific distinctions can impact results, reduce comparability and ultimately affect our conclusions, the use of a reliable and consistent data set is of primary importance for the purposes of our examination.

Our dataset includes 13 important developed economies: Australia, and Hong Kong in the Asia-Pacific area; Belgium, France, Spain, Finland, Norway, Denmark, Netherland, Sweden, Switzerland and U.K. in Europe; and the US in North America.

On average, real estate markets in those regions and countries are relatively more transparent compared against others in the world. Furthermore, they are also more actively traded, are more mature, and experience higher levels of liquidity. As a consequence, those real estate markets offer reliable data and indices that are representative of both direct and indirect real estate investment markets. This is a pre-requisite when using our approach to analyse the characteristics of real estate securities.

Our real estate securities performance data comes from The FTSE EPRA/NAREIT Global Real Estate Total Return Index. Since 2001, EPRA has published reliable index for global real estate investments. It reflects the stock performance of companies engaged real estate ownership in the major markets/regions of the world. The historical data dates back to 1989:Q4.

As for direct real estate investments, we use housing price indices as a proxy for the underlying real estate market. This is an approximation because firstly, the underlying assets consist predominantly of commercial properties, and secondly because instead of the total return, we can only use the appreciation return. Our property price data comes from Bank of International Settlement property price index database. The database includes property prices in around 40 economies in the world. It collects property transaction information from reliable data sources[4] and compiles them as index based on median price method, hedonic model, repeat-sale method or assessment based method. It takes into account of some major issues when constructing property price indices, such as data collection biases and low transaction volumes. In order to estimate the return of property investment, we calculate the log differenced price index as the return index.

In order to cover the influences of the general stock market, we use the respective main benchmark indices for each market. As common in previous studies, the general stock total return index is represented by the S&P/ASX 200 for Australia market, Hang Sang Index for Hong Kong market, BEL 20 for Belgium, CAC 40 for France, IBEX 35 for Spain, OMX Helsinki 25 for Finland, OBX index for Norway, OMX Copenhagen 20 for Denmark, AEX index for Netherland, OMX Stockholm 30 for Sweden, Swiss Market Index for Switzerland, FISE 100 index for UK and S&P 500 for US.

[4] The sources for BIC property price database include: Australian Bureau of Statistics (Australia), Federal Public Service, Directorate General Statistics and Economic Information and Study and Advice in Real Estate (Belgium), Wüest und Partner (Switzerland), Statistics Denmark (Denmark), Bank of Spain (Spain), Statistics Finland (Finland), National Institute of Statistics and Economic Studies (France), Fédération Nationale de l'Immobilier(France), Halifax (UK), Census and Statistics Department (Hong Kong), The Dutch Land Registry Office (Netherland), Statistics Norway (Norway), US Census Bureau (US) and Federal Housing Finance Agency (US).

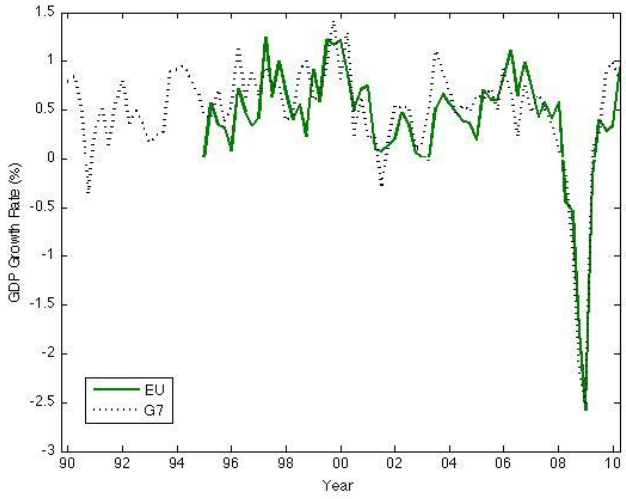
4 Data description

4.1 Testing for structural breaks

In order to avoid misinterpretation and incorrect economic implications due to 'noise' or instability in the determinant trend, we examine the dataset for structural breaks. Accounting for structural breaks is particularly important when applying co-integration techniques. Omission to account for structural breaks leads to unreliable unit root test decisions and consequently to the risk of misleading estimation models (Perron, 1989).

As illustrated in Figure 1, the available data start at the beginning of the 1990s, and end in the middle of 2010. Since 2007, the world economy has experienced serious financial crisis that had its originations in the collapse of US housing market and subprime mortgage market. The crisis quickly spread to the rest of the world, such as UK, Spain, Germany, Iceland, and Ireland. Ultimately, the global economy was affected.. The global real gross domestic product declined by 2.2% in 2009, and by more than 2.5% in Europe and the G7 countries. Therefore, the period post-2007 is particularly worth testing, as the recession and its consequences for global credit markets ought to be closely linked to our real estate-related macroeconomic model.

Figure 1: World GDP Growth Rate



Notes: OECD database. 17 EU zone Countries consists of Austria, Belgium, Cyprus, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Malta, the Netherlands, Portugal, Slovakia, Slovenia, and Spain. G7 countries include Canda, France, Germany, Italy, Japan, United Kingdom and United States

In this analysis, we prefer to apply stability tests on the basis of dynamic multi-variate models before employing co-integration techniques. In so doing, we abandon the approach of the related studies, which primarily use CUSUM and CUSUMQ tests, or Chow tests, on the basis of OLS regressions. In addition, as there are only 10 quarters from 2007 to the end of our data in 2010, the time period is not long enough to perform split data tests. Subsequently, instead of the split data approach, we choose the break-point test (see Candelon and Lütkepohl, 2001). Furthermore, we test for structural breaks under the framework of unknown break points. Using this method, we examined the data from 1990:Q1 to 2010:Q2 for in the 13 markets for structural breaks. The unknown break point tests are applied on the basis of VEC models[5]. To avoid instability, we end our estimation period before the structural break.

[5] The date for the structural break is verified using different VECM orders in order to minimise the impact of individual model specifications. However, we find VECM orders do not substantially affect our results.

4.2 Descriptive statistics

Table 1 outlines all time series used and presents the corresponding descriptive statistics for their first differences. With the exception of Hong Kong and the Netherlands, which provide monthly data, the time series in the other economies are quarterly-based.

The available data ends in 2010:Q2, when many countries/regions of the world were still in the throes of the financial crisis. In most of the economies examined, the break point appears between the end of 2007 and the beginning of 2008. The last structural break occurs in Hong Kong in 2009:Q3. We do not identify only significant structural breaks in Finland and Sweden. The available data for Denmark and Spain end at 2008:Q1 and 2009:Q1, respectively, which means that they are not suitable for a break test. Therefore, with the exception of Finland, Sweden, Denmark and Spain, the observation period in the other economies begins at the beginning of 1990 and ends before the estimated structural break (mainly between end 2007 – beginning 2008). The time series in the above four economies include all the available periods.

A comparison between the above economies reveals some similarities. Most of the time series, including FTSE EPRA/NAREIT, most stock indices and some housing price indices have a stable increase since 1990s, and obvious decrease in 2007, revealing some common trends among different regions and across different sectors. In general, the broader stock and real estate securities market are exhibit more volatility than housing market, while real estate securities are even more volatile compared against the general stock market.

When comparing across different economies, we find that Norway has the most volatile real estate equity market. The highest real estate securities return among the 13 economies appears in Norway in 1993:Q1, while the lowest occurs also in Norway in 2008:Q3.[6] Finland has the most unstable housing and stock market. Largest house price increase in the 13 markets occurs in Finland in 1990:Q4, and largest decrease in Finland in 1993:Q4. Finland also has the greatest stock price increase in 1999:Q4 and Norway has the greatest stock price decrease in 2008:Q3.

[6] It should be noted that Norway has historically few constituents in the FTSE EPRA/NAREIT Index series which results in a small number of real estate securities driving the performance and volatility of the country index.

Table 1: Statistics descriptions, observation periods and structural breaks

		Mean	Std	Max	Min	SP	BP	Ob. No.
AU	Δ ln *HP*	0.0159	0.0182	0.0588	-0.0265	1993:Q1	2008:Q3	62
	Δ ln *Stock*	0.0152	0.0699	0.1934	-0.2532			
	Δ ln *REE*	0.0214	0.1161	0.3406	-0.5466			
BE	Δ ln *HP*	0.0145	0.0184	0.0484	-0.0531	1990:Q4	2008:Q1	70
	Δ ln *Stock*	0.0158	0.1058	0.2150	-0.3161			
	Δ ln *REE*	0.0092	0.0853	0.1669	-0.2025			
DK	Δ ln *HP*	0.0201	0.0192	0.0604	-0.0181	1992:Q4	- *	62
	Δ ln *Stock*	0.0207	0.1039	0.2463	-0.3393			
	Δ ln *Stock*	-0.0181	0.2313	0.5178	-0.9102			
FI	Δ ln *HP*	0.0078	0.0719	0.1586	-0.1822	1993:Q3	-	79
	Δ ln *Stock*	0.0176	0.1655	0.5361	-0.3680			
	Δ ln *REE*	0.0235	0.1863	0.4241	-0.3788			
FR	Δ ln *HP*	0.0101	0.0245	0.0521	-0.0593	1992:Q4	2008:Q4	61
	Δ ln *Stock*	0.0144	0.1154	0.2626	-0.3368			
	Δ ln *REE*	0.0253	0.1143	0.3799	-0.3021			
HK	Δ ln *HP*	0.0041	0.0408	0.1081	-0.1553	1993:01	2009:03	193
	Δ ln *Stock*	0.0087	0.0799	0.2667	-0.3466			
	Δ ln *REE*	0.0078	0.1065	0.4506	-0.4399			
NL	Δ ln *HP*	0.0065	0.0059	0.0245	-0.0066	1995:02	2008:10	164
	Δ ln *Stock*	0.0067	0.0618	0.1472	-0.2261			
	Δ ln *REE*	0.0072	0.0513	0.1466	-0.2831			
NO	Δ ln *HP*	-0.0001	0.0067	0.0206	-0.0198	1992:Q4	2008:Q1	62
	Δ ln *Stock*	0.0089	0.1312	0.2173	-0.3882			
	Δ ln *REE*	-0.0265	0.2422	0.7331	-1.0120			
ES	Δ ln *HP*	0.0195	0.0234	0.0630	-0.0322	1995:Q4	- **	54
	Δ ln *Stock*	0.0272	0.1235	0.3440	-0.2784			
	Δ ln *REE*	-0.0039	0.2089	0.3105	-0.7969			
SE	Δ ln *HP*	0.0122	0.0230	0.0663	-0.0686	1991:Q2	-	77
	Δ ln *Stock*	0.0268	0.1389	0.3288	-0.3814			
	Δ ln *REE*	-0.0013	0.1627	0.3911	-0.4864			
CH	Δ ln *HP*	-0.0014	0.0128	0.0232	-0.0388	1990:Q1	2007:Q3	69
	Δ ln *Stock*	0.0163	0.1022	0.2176	-0.3136			
	Δ ln *REE*	0.0172	0.0979	0.2817	-0.2027			
GB	Δ ln *HP*	0.0156	0.0235	0.0788	-0.0391	1990:Q1	2008:Q3	74
	Δ ln *Stock*	0.0188	0.0799	0.1980	-0.2145			
	Δ ln *REE*	0.0067	0.1421	0.3132	-0.6350			
US	Δ ln *HP*	0.0110	0.0092	0.0361	-0.0201	1990:Q1	2008:Q3	74
	Δ ln *Stock*	0.0190	0.0833	0.1931	-0.2477			
	Δ ln *REE*	0.0296	0.1152	0.3004	-0.5053			

Notes: Au stands for Australia, BE stands for Belgium, DK for Denmark, Fi for Finland, FR for France, HK for Hong Kong, NL for Netherland, NO for Norway, ES for Spain, SE for Sweden, CH for Switzerland, GB for United Kingdom, and US for United States. Denotes the log differenced property price index, denotes log differenced stock index, and denotes the log differenced EPRA/NAREITs real estate equity index. SP stands for the starting period, and BP for the estimated break point. Ob. No. for the number of observation in each time series. * data ends at 2008:Q1.** data ends at 2009:Q1.

5 Methodology

In order to analyse the dynamic relationships amongst the selected macroeco¬nomic variables, the underlying property, and real estate securities indices in the US and the UK, this study applies the cointegration concept to vector autoregressive (VAR) models using the vector error correction (VEC) framework according to Johansen (1988).

The concept of cointegration is traced back to Granger (1981, 1986) and Engle and Granger (1987). It combines time series analytical procedures with the concept of economic equilibrium, and facilitates the analysis of long-term equilibrium relationships between non-stationary variables. The cointegration analysis is based on the observation that economic variables often display common trend behaviour. This implies that linear combinations of these variables converge towards a common equilibrium in the long term, even though individual time series fluctuate over time.

According to Engle and Granger (1987), time series are cointegrated if they display the same degree of integration, and a linear combination of these variables is stationary. Furthermore, the use of the time series in their levels guarantees that information loss due to the conventional use of first differences is avoided. According to the Granger representation theorem, the dynamic adjustment process of co-integrated variables towards the long-term equilibrium path can be represented by an error correction model (ECM). Subsequently, long-term equilibrium relationships are combined with short-term dynamics.

Co-integration analysis

In order to detect the existence of cointegrating relationships, we employ the trace test and the maximum eigenvalue test. Determination of rank and estimation of the coefficients are performed as a maximum likelihood estimation. The corresponding likelihood-ratio test statistics are:

$$\lambda_{Trace} = -T\sum_{r+1}^{k}\ln(1-\lambda_i) \qquad \textbf{(4.1)}$$

$$\lambda_{\max} = -T\ln(1-\lambda_i) \qquad \textbf{(4.2)}$$

λ represents the estimated eigenvalues of the reduced rank of the matrix π. In the process, the sequential test strategy begins with $r=0$ and is continued until the null hypothesis for the 5% significance level cannot be rejected for the first time. The related value of r ultimately corresponds to the cointegration rank. In this way there are (n-r) stochastic trends in the system. [7]

$$\Delta Y_t = \mu + \pi Y_{t-1} + \sum_{i=1}^{k-1}\Gamma_i \Delta Y_{t-i} + \varepsilon_t \qquad \textbf{(4.3)}$$

ΔY_t is a (n × 1) vector of the first differences of stochastic variables Y_t, and μ is a (n×1) vector of the constants. The lagged variables are contained in vector Y_{t-1}. The (n×n) matrices Γ_i represent the short-term dynamic. The coefficients of the co-integrating relationships (co-integration vectors) and of the error correction term are contained in the matrix π, with

$$\pi = \alpha\beta' \qquad \textbf{(4.4)}$$

β represents a (n×r) matrix of the r cointegrating vectors. The (n×r) matrix á contains the so-called loading parameter, i.e. those coefficients that describe the contribution of the r long-term relationships in

[7] The choice of the underlying lag structure of the VAR models is based in the first stage on the information criteria of Akaike (AIC), Schwarz (SC) and Hannan-Quinn (HQ). We furthermore test the models for heteroscedasticity and autocorrelation. Should both or either occur in the consequen¬tial VEC models we choose the next highest order. In all models examined the use of this approach enables misinterpretation of the test results to be avoided at the tolerable expense of losing a few degrees of freedom. Prior to this decision, it was necessary to conduct further analyses in order to preclude the possibility, that other reasons, such as, for instance, high values of correlation among the selected variables, are responsible for the significant deviations from the null hypothesis of the White (1980) test.

the individual equations. Here α and β have full rank. It should be noted that the analysis is not definite. If in Equation (4-3) π is replaced by the Equation (4-4), then the error correction representation follows (vector error correction model, VECM):

$$\Delta Y_t = \mu + \alpha\beta' Y_{t-1} + \sum_{i=1}^{k-1} \Gamma_i \Delta Y_{t-i} + \varepsilon_t \qquad \textbf{(4.5)}$$

Evaluation principles

Within the scope of this examination we choose equal evaluation principles in order to allow for comparisons between both countries. The approach of evaluating the VEC models in their entirety allows us to gain deep insights into the intensity of linkages among variables in addition to the relevant channels which are responsible for the adjustment process after deviations from the long-term equilibrium.

In the process, the case of multi-dimensional cointegrating relationships is explicitly taken into account. For this purpose, we apply hypotheses tests in order to verify whether individual coefficients can be restricted to zero without accepting significant losses of information. In so doing, a single regressor is eliminated in each step. The identification of those individual factors which significantly contribute to explaining the country-specific equilibrium is based on the results of the tests for linear restrictions (LR tests). If individual vari¬ables do not significantly contribute to the detected equilibrium, these factors are restricted to zero within the corresponding vector. In this case information is only provided via the coefficients related to the adjustment process.

Variance decomposition

Employing variance decompositions provide further information on the relative significance of the individual variables in explaining index development. To do this, the variance of the errors discovered ex post is allocated proportionately to the examined variables. As this method is also conducted on the basis of vector error correction models, we once more take into account the dynamic character of the interrelations among the considered variables.

By determining the Cholesky order, a causal structure is implicitly assumed among the variables of the system. This is expressed in the distribution of the common components of the interference terms in favour of the variables preceded in the Cholesky order. This fact could have a major influence on the results especially in the case of a strong correlation between the original error values. As a consequence of this, we verify the results of the variance decompositions by choosing alternative Cholesky orders.

6 Empirical results

Prior to analysing the features of real estate securities, we evaluate the implemented model framework with respect to econometric requirements and economic plausibility. Despite the well-known disadvantage of vector error correction models, namely their sensitivity, both implemented models meet the econometric requirements which have been defined prior to the estimation. As a result, this VECM framework, including the implemented model specifications, is adapted for examining and evaluating the features of real estate securities.

VECM results – technical evaluation

The VECM results for the 13 economies are summarised in Tables 2 and 3. Based on the cointegration test results we find seven markets have one cointegration relationship. They are Australia, Belgium, Denmark, France, the Netherlands, Switzerland and UK. The cointegation matrix in the other six markets has a rank of two, indicating two cointegeration relationships. In each model with co-integration matrix, the first -vector is normalised to the real estate securities performance, and the second is normalised to general stock market performance.

The implemented restrictions are accepted by the LR tests. Furthermore, the p-values of the White tests consistently indicate that the risk of heteroscedasticity is eliminated at 10% significance level.[8] The choice of lag structural VAR estimation is based on maximum likelihood ratio test, Akaike (AIC), Schwarz (SC) and Hannan-Quinn (HQ) criteria. Most of the significant adjustment coefficients for the error correction terms display negative signs, indicating a return to the long-term equilibrium path. Due to the decomposition of the matrix, the use of the error correction approach allows the evaluation of long-run relationships as well as the adjustment mechanism separately (see Equation 4.4). Accordingly, the vectors for the long-term relationships are outlined in Table 2 and the vectors with reference to the adjustment processes are displayed in Table 3.

[8] The estimated models are free from possible hazards caused by occurring autocorrelation within the residuals, too, although not explicitly mentioned in Table 2.

Table 2: Long-run equilibrium relationships (β-vectors)

	Rank	REE	Stock	HP	P White test
AU	1	1.0000	23.543 (4.422)	35.234 (3.170)	6.588
BE	1	1.0000	0.9415 (0.6228)	168.35 (3.337)	7.706
DK	1	1.0000	-0.0045 (-1.190)	444.55 (4.875)	0.042
FI	2	1.0000	0	88.884 (8.227)	4.182
		0	1.0000	0.4297 (5.601)	
FR	1	1.0000	-1.7208 (-2.662)	48.872 (4.651)	11.043*
HK	2	1.0000	0	10.105 (2.987)	16.839
		0	1.0000	16.263 (3.482)	
NL	1	1.0000	-0.0999 (0.354)	73.842 (2.551)	14.058
NO	1	1.0000	16.432 (4.753)	55.709 (2.683)	5.053
ES	2	1.0000	0	405.63 (5.979)	2.256
		0	1.0000	408.83 (5.747)	
SE	2	1.0000	0	44.222 (2.391)	2.289
		0	1.0000	-61.594 (-4.242)	
CH	2	1.0000	0	66.438 (4.233)	1.161
		0	1.0000	14.922 (5.863)	8.807*
GB	1	1.0000	-0.0881 (-0.434)	7.0673 (3.495)	4.221
US	2	1.0000	0	161.96 (6.450)	
		0	1.0000	1.1788 (9.752)	5.216

Notes: Notes: AU stands for Australia, BE stands for Belgium, DK for Denmark, FI for Finland, FR for France, HK for Hong Kong, NL for Netherland, NO for Norway, ES for Spain, SE for Sweden, CH for Switzerland, GB for United Kingdom, and US for United States. HP denotes the property return index, Stock denotes logged stock total return index, and REE denotes the logged EPRA/NAREITs real estate stock total return index. Rank denotes the rank of matrix. Coefficients are converted so that relationships between the normalised variable and the risk factors can be directly identified as positive or negative. For reasons of clarity we do not report the corresponding constant c and the as a proxy for the error term. T-statistics are included in parentheses. P White test denotes the p values of the White test for heteroscedasticity. We report the maximum p value of the standardized residuals in three equations. * denotes the 10% significance level with the null hypothesis that no heteroscedasticity in the standardized residuals.

Table 3: Adjustment process (α-vectors)

	D(REE)	D(Stock)	D(HP)
AU	-0.0437 (-2.242)	-0.0043 (-1.247)	-0.0515 (-4.395)
BE	-0.0034 (-0.452)	-0.0036 (-0.392)	-0.0024 (-3.910)
DK	0.0071 (2.215)	0.0010 (0.758)	-0.0007 (-3.183)
FI	0.0027 (1.051)	0.0083 (9.861)	-0.0118 (-5.046)
	-0.2891 (-0.803)	-1.4342 (-12.44)	0.2644 (0.825)
FR	0.0171 (0.673)	0.0157 (0.651)	-0.0112 (-4.573)
HK	-1.3513 (-2.402)	-0.652 (-1.476)	0.8894 (4.129)
	0.7749 (2.101)	0.3498 (1.207)	-0.5887 (-4.168)
NL	-0.0378 (-2.778)	0.0599 (2.800)	0.0002 (0.145)
NO	-0.0148 (-0.813)	0.0501 (2.342)	-0.0077 (-2.211)
ES	0.1509 (1.638)	0.1361 (4.291)	-0.0087 (1.570)
	-0.1319 (-2.324)	-0.1373 (-4.362)	0.0073 (1.326)
SE	-0.1264 (-3.207)	-0.0319 (-0.807)	0.0087 (1.900)
	-0.0999 (-2.046)	-0.0080 (-0.163)	0.0184 (3.250)
CH	-0.0978 (-2.344)	-0.1587 (-3.708)	-0.0078 (1.221)
	0.2316 (1.100)	-1.1175 (-5.171)	-0.0314 (-0.984)
GB	-0.2209 (-3.671)	0.0699 (1.886)	-0.0224 (-2.340)
US	-0.0198 (-4.069)	0.0007 (1.563)	-0.0089 (-2.041)
	2.7671 (4.241)	-0.0756 (-1.361)	0.4356 (0.738)

Notes: AU stands for Australia, BE stands for Belgium, DK for Denmark, FI for Finland, FR for France, HK for Hong Kong, NL for Netherland, NO for Norway, ES for Spain, SE for Sweden, CH for Switzerland, GB for United Kingdom, and US for United States. HP denotes the property return index, Stock denotes logged stock total return index, and REE denotes the logged EPRA/NAREITs real estate stock total return index. Coefficients are converted so that relationships between the normalized variable and the risk factors can be directly identified as positive or negative. For reasons of clarity we do not report the corresponding constant c and the as a proxy for the error term. T-statistics are included in parentheses.

We find consistent signs of the macroeconomic variables in the 13 examined economies with economic theory. In all of the VECM models, we find significant positive long-term relationships (vectors) between the performance of real estate securities market and indirect housing investment market, indicating that the real estate assets affect each other positively in the long run. This strong linkage is recognisable by their unalterable contribution to the long-term equilibrium with comparably high t-values.

Additionally, we also identify significant positive relationships between real estate securities and broader stock indices in Australia and Norway, indicating that the real estate stock markets can also be influenced by the general stock market. Based on the estimation results for Australia and Norway markets, we can see that housing market and general stock performances both significantly contribute to the long-term equilibrium in real estate securities, implying that both the underlying property market and the general stock index significantly determine the progress of the real estate securities index. In contrast, in the other markets, including Belgium, Denmark, Finland, Hong Kong, Netherland, Spain, Sweden, Switzerland, UK and US, the underlying property market plays the predominant role in the performance of the real estate securities market in the long run.

Moreover, based on the six models or markets with two cointegration relationships, we can see a positive long-run relationship between the general stock and housing market. Based on wealth effect theory, when the general stock or property price rises, people tend to perceive themselves to be richer and hence are encouraged to make further investments. In this scenario, we could expect a positive relationship between the performances of underlying real estate market and general stock market. Our empirical results are consistent with the wealth effect theory in a general sense. However, we also find one exception. The result for Sweden suggests a significant negative long-run relationship between general stock performance and underlying property prices.

In order to analyse whether real estate securities primarily reflect underlying real estate or general equities, some studies take the comparison of the corresponding coefficients as a basis for their decision. The fact that the underlying real estate assets significantly contribute to the long-term equilibrium in all of the 13 regions, while the general stock market is only found in three of the economies, offers a further widely-used but not 100% robust criterion – in this context. With respect to the outlined VECM results, the majority of model estimation results would suggest a closer linkage the underlying real estate assets compared to the equity markets indicating that the distinctive features and characteristics of underlying real estate persist, despite the listing on stock exchanges. Nevertheless, we prefer to employ further analyses and conduct additional variance decompositions in order to verify the VECM results, with a view to gain further insights into this issue.

Variance decomposition

As indicated in Table 4, in most of the cases, a comparatively substantial contribution to the performance of the real estate securities indices is explained by their respective underlying property market. For example, in US, around 35% of the variance of real estate securities indices is explained by housing price indices, while only 1% relates to the S&P500. In Switzerland, Spain and UK, the performance of property investment can explain more than 20% of the performance of the corresponding real estate securities indices. Finland, Belgium, Denmark and France have a qualitatively same but less pronounced result. Moreover, in those markets, we find that the percent of variance explained by property indices experience remarkable growth in many of the economies when considering longer periods, while the growth of general stock indices is quite modest in the long term.

In Hong Kong and Sweden, the long-term impact of the two aspects are equal, indicating both markets play equivalent roles in explaining the performance of real estate securities assets. We find two exceptions: the Netherlands and Norway. With a proportion of around 3.5%, the general stock indices in the two economies can explains the performance of real estate securities to a higher degree compared against the underlying property indices (approximately 1.5%).

Table 4: Variance decomposition

AUSTRALIA

Quarter	REE	Stock	HP
1	100	0	0
2	97.680	1.308	1.012
3	93.218	4.600	2.182
4	83.418	8.389	8.193
5	75.808	12.216	11.977
6	72.256	13.268	14.475
7	71.162	13.844	14.994
8	71.455	13.805	14.740

FINLAND

Quarter	REE	Stock	HP
1	100.000	0.000	0.000
2	99.013	0.008	0.979
3	99.036	0.070	0.894
4	98.930	0.075	0.995
5	98.919	0.088	0.993
6	98.890	0.092	1.018
7	98.879	0.097	1.024
8	98.867	0.100	1.034

BELGIUM

Quarter	REE	Stock	HP
1	100.000	0.000	0.000
2	99.739	0.065	0.196
3	98.809	0.370	0.821
4	98.859	0.318	0.824
5	98.900	0.335	0.765
6	98.806	0.371	0.822
7	98.636	0.424	0.940
8	98.561	0.512	0.927

FRANCE

Quarter	REE	Stock	HP
1	100.000	0.000	0.000
2	99.996	0.000	0.004
3	99.749	0.077	0.174
4	99.582	0.070	0.349
5	99.353	0.059	0.588
6	99.184	0.053	0.763
7	99.045	0.047	0.908
8	98.957	0.043	0.999

DENMARK

Quarter	REE	Stock	HP
1	100.000	0.000	0.000
2	98.272	0.048	1.681
3	95.914	0.113	3.973
4	93.665	0.176	6.159
5	91.727	0.229	8.044
6	90.117	0.274	9.609
7	88.795	0.310	10.894
8	87.712	0.340	11.948

HONG KONG

Month	REE	Stock	HP
1	100.000	0.000	0.000
2	99.199	0.298	0.503
3	91.708	4.827	3.465
4	90.390	5.058	4.552
5	88.250	6.179	5.571
6	86.698	7.309	5.992
7	83.959	8.906	7.135
8	82.289	9.165	8.546

NETHERLAND

Month	REE	Stock	HP
1	100.000	0.000	0.000
2	99.355	0.561	0.084
3	99.535	0.376	0.089
4	99.612	0.302	0.086
5	99.419	0.487	0.094
6	98.353	1.561	0.086
7	97.485	2.362	0.154
8	95.566	3.939	0.496

SWEDEN

Quarter	REE	Stock	HP
1	100.000	0.000	0.000
2	96.694	0.364	2.942
3	95.523	0.790	3.687
4	96.139	0.681	3.180
5	96.430	0.648	2.922
6	96.379	0.866	2.756
7	95.775	1.567	2.658
8	94.561	2.857	2.583

Table 4: Variance decomposition

NORWAY

Quarter	REE	Stock	HP
1	100.000	0.000	0.000
2	98.497	1.310	0.193
3	94.973	2.656	2.372
4	94.265	3.415	2.321
5	94.501	3.439	2.061
6	94.849	3.413	1.738
7	95.192	3.152	1.656
8	95.430	3.011	1.559

SWITZERLAND

Quarter	REE	Stock	HP
1	100.000	0.000	0.000
2	97.216	0.170	2.615
3	87.429	2.685	9.886
4	82.908	4.460	12.632
5	79.980	5.149	14.871
6	76.599	6.116	17.285
7	73.907	6.900	19.193
8	72.017	7.433	20.550

SPAIN

Quarter	REE	Stock	HP
1	100.000	0.000	0.000
2	96.893	0.122	2.985
3	88.251	0.054	11.695
4	84.110	0.047	15.843
5	80.598	0.037	19.365
6	77.922	0.039	22.039
7	75.938	0.039	24.022
8	74.340	0.039	25.622

UK

Quarter	REE	Stock	HP
1	100.000	0.000	0.000
2	93.338	3.420	3.242
3	89.121	5.659	5.220
4	82.557	6.039	11.404
5	79.508	5.870	14.622
6	76.297	5.483	18.221
7	73.866	5.214	20.920
8	71.271	4.950	23.779

US

Quarter	REE	Stock	HP
1	100.000	0.000	0.000
2	97.380	0.052	2.569
3	92.471	0.174	7.355
4	86.516	0.333	13.151
5	80.365	0.504	19.131
6	74.498	0.671	24.832
7	69.138	0.825	30.037
8	64.354	0.965	34.682

For this reason, the results of the implemented variance decompositions consistently indicate a closer linkage between the real estate assets (underlying and real estate securities) compared against the general equity markets in the majority of the 13 economies. The long-term synchronicity between real estate securities and direct real estate implies that the primary characteristics of real estate investment persist despite the influences of the general stock market movements. Ultimately, despite the daily supply and demand variance of real estate securities prices, the development of the underlying real estate markets remained the key driver of the performance of listed real estate securities during the examined sample. As a result, in addition to the benefits of liquidity, transparency and management, long-term investments in listed real estate securities offer opportunities to combine the attractions of both direct and listed real estate. The ability to combine or blend both direct and listed real estate securities provides remarkable potential for diversifying the investor´s portfolio.

7 Conclusion

The underlying property markets do not solely represent the only driver for the performance and risk/ return structure of listed real estate securities. Listed real estate securities must contend with the fact that short-term market values are partly influenced by developments on general stock markets, irrespective of the fact that the main business of the real estate securities index constituents is focused on trading and management of real estate assets. For precisely that reason, it is critical to analyse to what extent the general stock markets influence the performance of listed real estate securities.

Answering this question is of particular importance with respect to issues of asset allocation in a multi-asset portfolio. If listed real estate securities were found to be predominantly driven by performance of general stock markets, the benefits of listed real estate investment – in terms of portfolio diversification – would be limited. By implication, the intended risk/return structure of an investor´s portfolio would be significantly distorted because the inclusion of listed real estate would involuntarily increase the proportion of investments that are subject to general stock market risk. Consequently, this case would finally result in a portfolio allocation which is more risky than desired. However, these research findings counteract this scenario.

For the purposes of this examination, we analyse the real estate markets in the 13 developed economies since the beginning of 1990. In 2010, the market capitalisation for securitised real estate in the 13 economies covered 92.5% of that for global real estate security investment.

We first test the unknown structural break in each market using the unknown break point test based on a dynamic multi-variate model. The majority structural breaks appear between the end of 2007 and the beginning of 2008.

Using a vector error correction framework and variance decompositions, we generally find a significantly stronger relationship among real estate assets (underlying and listed real estate) compared against the relationship with general equities. In 11 out of the 13 economies, the real estate securities markets are predominantly driven by the performance of the underlying properties in terms of long-term equilibrium. In the other two markets, the corresponding general stock market and underlying property market play relatively equal roles.

Additionally, we also identify six significant long-run relationships between housing price performance and general stock market performance. The results using variance decomposition substantiate our conclusions. In nine out of the 13 countries, a larger proportion of the performance of the listed real estate securities indices is explained by its underlying property performance.

To sum up, our study provides strong evidence that long-term investments in real estate securities fulfil their function as an ‘alternative investment’. For that reason, we assume lower correlations to conventional assets and a more defensive risk/return structure compared to investments in general stock markets. Subsequently, we conclude that long-term investments in listed real estate securities not only provide opportunities for portfolio diversification, but in addition provide the ability to combine the attractions of both real estate assets – direct and indirect, including benefits in terms of liquidity, transparency, income and management.

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