Continental Shift? An Analysis Of Convergence Trends In European Real Estate Equities

Colin Lizieri, Patrick McAllister and Charles Ward

School of Business
The University of Reading
Whiteknights, Reading, RG6 6AW
United Kingdom

This paper was originally presented to the Annual Meeting of the American Real Estate Society in Naples, Florida, April 2002
Please check with authors for latest version if intending to cite.

c.m.lizieri@rdg.ac.uk
p.m.mcallister@rdg.ac.uk
c.w.r.ward@rdg.ac.uk

Continental shift? An analysis of convergence trends in European real estate equities

Colin Lizieri, Patrick McAllister and Charles Ward

ABSTRACT

European economic and political integration have been recognised as having implications for patterns of performance in national real estate and capital markets and have generated a wide body of research and commentary. In 1999, progress towards monetary integration within the European Union culminated in the introduction of a common currency and monetary policy. This paper investigates the effects of this 'event' on the behaviour of stock returns in European real estate companies. A range of statistical tests is applied to the performance of European property companies to test for changes in segmentation, co-movement and causality. The results suggest that, relative to the wider equity markets, the dispersion of performance is higher, correlations are lower, a common contemporaneous factor has much lower explanatory power whilst lead-lag relationships are stronger. Consequently, the evidence of transmission of monetary integration to real estate securities is less noticeable than to general securities. Less and slower integration is attributed to the relatively small size of the real estate securities market and the local and national nature of the majority of the companies' portfolios.

KEYWORDS

European Union, Real Estate Securities, Convergence, Return Structure

1.0 Introduction

By 2002, 12 of the European Union's (EU) 15 members had joined a single currency area. Participants in EMU (European Monetary Union) adopted a common currency, monetary policy and also agreed to impose common criteria relating to fiscal policy. The implications for economic performance have been the subject of a great deal of controversy and discussion amongst economists. For investors, whilst the growth of stock market alliances and mergers within the EU signals increased institutional integration in European capital markets, there has also been growing interest in the implications of this process for investment decisions and strategies. Where consequences are identified for the level and pattern of business and investment activity, there will also be significant effects on the level and pattern of commercial real estate performance.

This paper assesses the extent to which the macro-economic shift represented by EMU has influenced the relative performance of publicly traded commercial real estate investment returns. In particular, it seeks to identify the extent to which the monetary integration has reduced the importance of national relative to common factors in determining real estate returns.

The remainder of the paper is organised as follows. The first section examines the background to and evolution of monetary integration within the EU. This is followed by a review of research on patterns of national and regional economic convergence within the EU. The third section examines existing research on the effects of economic integration on capital market and real estate performance. This is followed by a discussion of the data, methodology and results of an empirical investigation of the effects of monetary integration on patterns of performance of European publicly traded commercial real estate markets. The final section concludes and identifies areas for further study.

2.0 EMU and Market Convergence

2.1 The Background to Monetary Union

The culmination of European monetary integration, marked by the introduction of a single currency and single monetary policy for participating members, has been the product of a series of processes and initiatives in the previous three decades. Following a series of reports and proposals, in 1979 the European Monetary System was introduced whereby participating countries joined the Exchange Rate Mechanism[1] (ERM). By 1990, all European Union members except Greece had joined. In the initial years (1979-84), the system for managing exchange rates was quite flexible but in the period 1985-92, the system became more rigid and was increasingly viewed as a fixed rate regime.

[1] This was essentially a 'flexible pegging' arrangement which allowed national exchange rates to vary within pre-specified bands.

This perception changed dramatically in the period 1992-95 when, after severe speculative pressures upon certain currencies, Britain and Italy left the ERM in 1992. In order to dampen further speculation in the currency markets, permitted fluctuation bands for remaining members were widened in 1993 to plus or minus 15%, effectively returning to floating rates.

In 1989 the Delors Report set out the precise timetable and conditions for EMU contained in the Treaty of European Union adopted at Maastricht in 1991. The Treaty stipulated that from 1 January 1999[2] exchange rates between participating countries would be irrevocably fixed and rates at which the Euro will replace existing currencies would be set. The treaty set out specific quantitative convergence criteria concerning levels of; inflation, government fiscal deficits and public debt, exchange rate stability and interest rates which had to be met in the period *prior to* a decision on membership.

Figures 2.1 and 2.2 illustrate how 1997 was the culmination of a notable reduction in variations in inflation and long terms interest rates (with exchange rate variability showing similar patterns) mostly due to the convergence of Spain, Portugal and Italy. From these explicit changes, it might be thought that the Eurozone has implicitly consisted of two regions, North (dominated by Germany and to a lesser extent France with low inflation and interest rates) and South (which had been characterised by higher levels of inflation and interest rates).

[2] Unless an earlier date was agreed.

Figure 2.1 Convergence in Bond Yields, 1991-2001

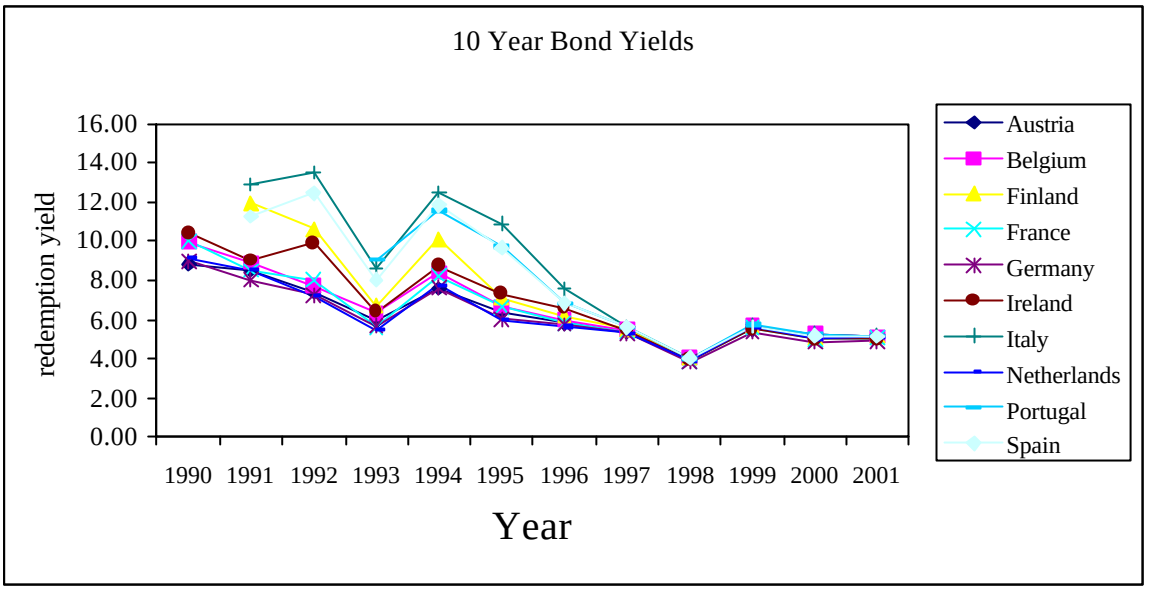
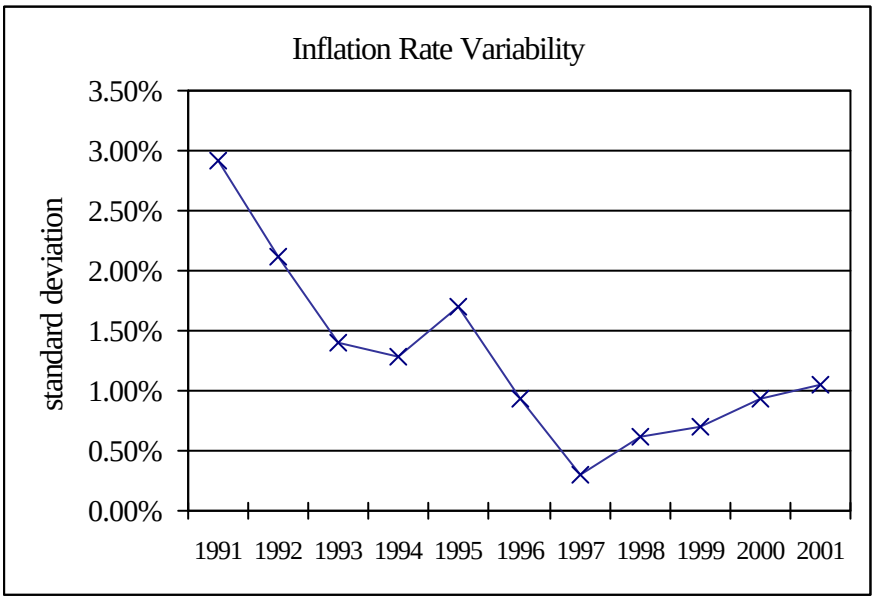


Figure 2.2 Converge in Inflation Rates 1991-2001



2.2 Monetary integration and economic convergence

Before considering the empirical evidence for economic convergence within the EU, it is worth noting that the definition and measurement methodology regarding convergence has generated a whole body of literature by itself. Whilst this methodological debate is outside the scope of this paper, approaches to measuring convergence in the regional economic literature have involved analysis of; differences

in levels and growth rates, patterns of co-movement and correlation, the presence of long term relationships and the relative importance of common explanatory variables. In the financial integration literature, CAPM studies attempt to identify whether separate national markets yield an excess return – a segmentation 'gain'. APT-derived studies of market integration focus on the existence of common factors that explain historic returns.

Underpinning studies of capital market integration are implicit beliefs concerning integration in the underlying economies. However, a lack of convergence in theorising spatial patterns of economic development means that the conflicting predictions of neo-classical and endogenous growth models of economic development produce no settled *a priori* expectations concerning the effects of European economic integration on patterns of national and regional economic growth. For instance, Krugman (1993) from a perspective of endogenous growth theory argues that by reducing the barriers to trade, continued economic integration may produce divergence between European regional economies as production concentrates in the most efficient localities. Alternatively, neo-classical models imply that reductions in the barriers to the mobility of capital and labour will facilitate their movement to low cost regions. This implies convergence as integration increases. On balance, the available evidence suggests that overall there has been a process of erratic and slow convergence.

At the national level, the most recent cohesion report from the EU suggests that there has been convergence in national levels of GDP per head in the period 1988-98 (EC, 2001). Lagging countries (Greece, Spain, Portugal and Ireland) have experienced higher growth rates than the EU average over the period. Recent research by Baele and Vennet (2001) examines evidence of business cycle convergence within the EU. Using monthly data on growth in industrial production for 14 European economies[3], they report bi-annual moving standard deviations[4] and correlations between local industrial production growth and EU-15 industrial production growth between 1990 and 2000.

[3] Austria, Belgium, Finland, France, Germany, Ireland, Italy, Netherlands, Spain, Portugal, Denmark, Norway, Sweden and UK.

With the exceptions of Ireland, Sweden and UK, all countries have experienced substantial increases in correlation from 1990-2 to 1998-2000. Ireland, in particular, has experienced 'divergence' in the second half of the decade with relatively higher growth rates and lower correlations. Baele and Vennet's results suggest unevenness both temporally and cross-sectionally in convergence and that there is no clear link between changes in standard deviation and correlation. In essence, economies can experience divergence from the EU average with simultaneous increasing correlation and vice versa.

There have been numerous studies of aspects of regional economic convergence and cohesion within the European Union. The studies have used an assortment of data sets (unemployment, GDP, productivity), examine different time periods, apply a variety of methodologies and test for various types of convergence. A number of stylised facts emerge from the studies. First, consistent with the above, the rate of convergence is by no means consistent over time. Studies have found periods of convergence followed by divergence. The rate of convergence tended to be fastest in the 1960s and 1970s relative to the 1980s (see Fagerberg and Verspragen, 1996). The lack of sigma[5] convergence in the 1980s is further illustrated by Button and Pentecost (1995) who find remarkable stability in the coefficients of variation in regional GDP between 1977 and 1990.

Second, there is evidence to suggest that both positive and negative economic shocks have contrasting effects on patterns of convergence. Empirical studies have found that economic downturns tend to be associated with regional economic divergence whereas convergence occurs in periods of faster growth (McCarthy, 2000, European Commission, 2001). Empirical studies to date provide little evidence of regional economic convergence in the 1990s. The most recent cohesion report from the European Commission emphasises the long-term nature of the regional convergence process. Whilst finding evidence of convergence at the national level, it finds that the bottom quartile of regions had an income of 68 per cent of the EU average in 1998 compared to 66 per cent in 1988.

[4] They calculate a 12 month moving average of the difference between local industrial production andEU-15 industrial production growth.

The lack of regional convergence in this period is further reinforced by the fact that the standard deviation between regions has remained relatively stable. The EC report argues that, at current rates, it will take a number of decades before disparities are eliminated and without intervention this convergence will be even weaker.

2.3 Monetary integration and the capital markets

Studies of capital market integration have customarily used data sets that precede the introduction of the single currency. Empirical results display some inconsistency. In terms of basic correlation between markets, studies report large increases since the 1980s. Freimann (1998, p.40) finds that from "from the mid-1970s until the end of 1996, the correlation between European stock markets has, on average, tripled – from 20 per cent to more than 60 percent". This is consistent with Rouwenhorst (1999) who finds similar increases in correlation. More recently, in unpublished preliminary research, Baele and Vennet (2001) find significantly positive contemporaneous correlations between local excess returns and EU-15 returns ranging from 0.57 in Belgium to 0.88 in the UK. Moreover, these increases have been significantly higher than changes in correlation between non-European markets.

However, in order to overcome the limitations of basic correlation measures (that increasing country correlation may be due to increased correlation between sectors across countries), country and industry effects have been separated using econometric methodology. Rouwenhorst (1999) reports that country effect dominated sector effects in explaining return variability. However, similar studies[6] using more up to date data report that, since 1997, industry effects have overtaken country effects (see Baca *et al*, 2000 and Cavaglia *et al*, 2000). In related research, Chelley-Steeley and Steeley (1999) use a vector autoregressive (VAR) framework to examine the effects of the removal of exchange controls on European stock market integration. They find that domestic factors explain less of the variation in an equity market return after the removal of exchange controls.

[5] Sigma convergence focuses on dispersion of growth rates and levels. It is often tested by analysing trends in standard deviations and coefficients of variation.

It is clear that the period prior to the introduction of a single currency has seen increases in correlation. The literature suggests a number of direct effects of the introduction of EMU. The relative significance of the 'event' of EMU for national markets should be related to the degree to which it varied from European yardsticks in the past. A number of effects have been proposed.

- With the exceptions of the Netherlands, UK and Ireland, EU countries place quantitative restrictions on asset allocation. Often they require currency matching of assets and liabilities and place limits on investment in equities and foreign investments. A consequence of the introduction of a single currency is that the currency matching rules no longer restrict investors to their national markets[7].

- The elimination of exchange rate uncertainty within the Euro zone removes the costs of hedging. This will only have been a barrier where there is relative instability in exchange rates.

- The convergence of risk free rates produces increased homogeneity in the valuation of equities. This increased homogeneity will be further enhanced if the convergence hypothesis holds and results in a reduction in country effects on corporate dividend payments. Again, it is apparent that the significance of this effect will be a function of the degree of divergence prior to introduction.

- This convergence of risk free rates also results in a cancellation of assets as government issued bonds become increasingly similar.

A further point is that the effects of monetary integration have proved uneven. Beltratti (1999) argues that effects on variance on the business cycle may not be uniform. There seems a relatively clear, if somewhat simplistic, divide between 'southern' economies such as Spain, Portugal and Italy which have in the past two

[6] These studies do not isolate European markets. They include non-EMU European markets, USA, Japan and Australia

[7] The restrictions on equity investments are still in place and, outside the countries referred to, a 'bond bias' is still generally apparent in EU investing institutions. An objective of the European Commission is to achieve a 'prudent man' model of regulation for EU investing institutions and an associated increase in allocation to equities.

decades experienced higher than (EU) average volatility in bond yields, inflation, exchange rates and GDP growth and 'northern' economies which have essentially 'tracked' the German economy. *Ceteris paribus*, it seems reasonable to postulate that economies which have reduced volatility of macro-economic fundamentals will experience reduced capital market volatility. Indeed, applying Markowitz optimisation to stock and bond investment, Beltratti (1999) concludes that the effects of increased co-variances produced by monetary integration are likely to be outweighed by reduced volatilities and that, consequently, the impacts on diversification potential of monetary integration will be minimal.

3.0 Is Real Estate Different?

The extent to which the financial characteristics of the public real estate sector differ from other mainstream sectors is a pertinent issue. Although commentators emphasise the lack of portability of property as an asset dass, it is clearly rooted also in global economic factors both through occupational demand and by capital market effects. Nevertheless, there are a number of potential sources of segmentation. Issues such as limited free float, substantial non-real estate holdings, low liquidity and poor accounting transparency are commonly cited problems associated with public real estate markets in the EU. Further sources of segmentation may be relative differences in internationalisation. Most major economic sectors within the EU have experienced a significant degree of global and/or pan-European consolidation in the last decade. Dermeier and Solnik (2001) find evidence that the influence of international factors on returns is positively linked to level of international business that the company performs.

In the case of the public real estate sector, a lack of internationalisation manifests in a number of ways. First, there have been relatively few cross-border takeovers or mergers involving public real estate companies with the emphasis being on share swaps and strategic alliances. Second, although there are a number of public real estate investment companies with pan-European portfolios, most public real estate companies are heavily weighted in their investment activities to their domestic

markets. For instance, Land Securities Trillium Plc one of the largest public real estate investor in Europe has no non-domestic real estate assets. This home country bias is a feature of both private and publicly traded markets. In addition, the relatively small size of the publicly traded real estate markets may make it 'slip under the radar' for many international portfolio investors.

To confirm the domestic nature of European property companies, we examined the portfolios of 155 real estate companies in thirteen countries based on information in the *GPR Handbook of European Property Companies* (GPR, 1998). 27% of those companies had portfolios that were *local* in nature (that is were based in a single city or region); a further 49% had 100% domestic portfolios. 9% had some international holdings as a minor part of their portfolio. Only 15% were truly international in nature. Over a third of those international firms were German open ended funds. Excluding these, just over 10% of the European real estate companies were diversified across countries and 80% had no non-domestic holdings.

Much of the research on international real estate investment has focused on the question of whether the theoretical portfolio gains from investing across national boundaries apply to property markets, particularly when currency risk is considered. Analysis of direct (private) real estate markets is badly hampered by poor quality data, short time series and definitional problems. Since this paper is concerned with real estate securities, we note just three papers. Worzala and Bernasek (1996) considered the potential impact of European integration, concluding that the European project would reduce differences in performance across national markets. Goetzmann and Wachter (2000) used factor analysis on property returns in a number of global cities and detected a "global" property factor implying a source of common variation. Lee & D'Arcy (1998) examined sector, local and national property market effects in Europe using an approach similar to that employed by Heston & Rouwenhorst (1994) and Beckers *et al*. (1996). They suggest that there are strong country factors that dominate sector and city effects. They argue that European integration may have less impact on real estate because of structural and institutional differences.

A substantial body of work on securitised real estate has been produced by Eichholtz and co-workers using the GPR property indices employed in this study. Eichholtz (1996) produced evidence that suggested that international real estate stocks were better diversifiers than equities or bonds, suggesting that the correlation between national property markets are lower than for the other major asset classes. Eichholtz *et al.* (1998) test for the existence of "continental" factors in real estate securities. They find evidence of a strong European effect with a significant continental factor which appears to increase in strength from the early 1990s (that is, with the completion of the Single European Market and move toward Monetary Union). By contrast, they find little evidence of a significant Asian continental factor.

Brouen & Eichholtz (2001) note that the price reactions to property company equity and debt offerings vary markedly across European countries and attribute differences to real estate tax regimes. Eichholtz *et al.* (2001) contrast property companies with a domestic focus with those that follow global investment strategies. Their results suggest that local oriented firms significantly outperform global firms once corrected for portfolio composition. The implication drawn is that real estate markets are intrinsically local in nature and that information asymmetry and information costs are major constraints to adopting a global strategy. Gordon & Canter (1999) also use GPR data to examine the correlation between national property and equity markets in relation to type of investment vehicle and the international nature of property companies. In some markets they find convergence in returns; in others, divergence.

4.0 Methods and Data

Given the foregoing, the objectives of this phase of the research are, first, to examine whether there is evidence of growing integration between Eurozone property companies in the period leading to the full adoption of the single European currency; and, second, to examine whether real estate is "different" – that is, whether it exhibits less signs of convergence than European equities in general. Accordingly, we set out to examine indices of public-traded property companies in the Eurozone countries and to compare their performance to overall stock market behaviour in those countries. Our data analysis consists of four different approaches; correlations between returns, principal component analysis, Granger causality tests and VARs.

We begin by examining the correlation between the country indices. Two analyses are performed. First, we examine the cross-sectional average correlation between countries in the period before and after lock-in of currencies, that is, pre-1997 and post-1997. Our prior expectations, in general, are that the average correlation between countries will increase in the latter period and that cross-sectional standard deviations will fall. We also expect the correlation between the real estate series to be much lower than between the equity market series. Second, we examine the average of rolling five year correlations for both equity and property series. The expectation here is that, for both series, the correlations will increase as adoption of the Euro approaches.

Convergence and integration implies a single pan-European market factor. We test this by applying principal components analysis to the returns from the series, again for both pre-1997 and post-1997 periods. Evidence of integration would be provided by the existence of a single factor explaining a high proportion of the variation in the dataset, with the majority of countries showing high loadings on this factor. Prior expectations are that the influence of a pan-European factor will be greater in the post-1997 period and that it will be more evident in equity markets than in real estate markets. We should note that this common movement *could* be a *global* rather than a European equity or property market factor: this will be investigated in the second phase of the research project.

In a fully integrated market, there should be no leading and lagging relationships with business cycles harmonised and arbitration preventing price discovery anomalies. We test this proposition for the equity and real estate series using Granger causality testing. For each pair of countries, we test for one-way and two-way causality for the pre-1997 and post-1997 periods. The prior expectation is that evidence of causality – particularly one-way causality - will decline as European convergence associated with monetary union increases. We expect that the equity series will be more fully integrated and, hence, exhibit fewer lead-lag relationships. On the other hand, the apparent segmentation of real estate markets may reduce the incidence of Granger causality.

For analysis, we have used monthly return data: using higher frequency data, while increasing the number of observations, is likely to introduce excess noise into the analysis. Since we examine the effect of monetary union, we cannot assume fully hedged indices so we convert all series to provide US dollar returns. This presents a number of problems, since many series are now reported in Euros, requiring the use of spliced currency series. This affected both the availability and length of data series.

Equity market data were obtained from DataStream; however, there are known problems with the DataStream property market series. Two sources were available for property company data: Global Property Research (GPR) and the European Public Real Estate Association (EPRA), both of whom collect and analyse the stock market performance of public listed real estate firms. Both kindly agreed to provide data. EPRA data ran from January 1990, while many of the GPR series ran from January 1984. In this paper, we have used the GPR series, not least to provide comparability with other studies using this data source. In later research we will compare the two series. Initial analysis reveals that many EPRA and GPR series have high correlations. However, there are some anomalies which require further analysis[8]. We have used series for Germany, the Netherlands and Austria which exclude Open Ended Funds. We acknowledge that there may be a survivorship bias in the data series.

In total, we have common stock and property company series for eight Eurozone countries: Austria, Belgium, France, Germany, Ireland, Italy, the Netherlands and Spain. Basic descriptive statistics for the series are shown in Appendix 1. Many of the series fail conventional tests of normality, largely as a result of high kurtosis – fat tails being characteristic of stock market series. While this does not affect the exploratory analysis conducted here, it needs to be borne in mind in conducting any subsequent capital market pricing analysis or modelling work. Note that, with the exception of Ireland, the real estate series have produced lower average returns than the corresponding equity market series, with no compensating reduction in risk. This reflects the long bull market run in global stock markets. In the post-1997 period, property company performance was superior to the overall stock market in all countries bar the Netherlands and Spain.

[8] for example, there is virtually zero correlation between EPRA and GPR US$ return series for Germany: the average correlation between series is around 0.50.

5.0 Preliminary Results

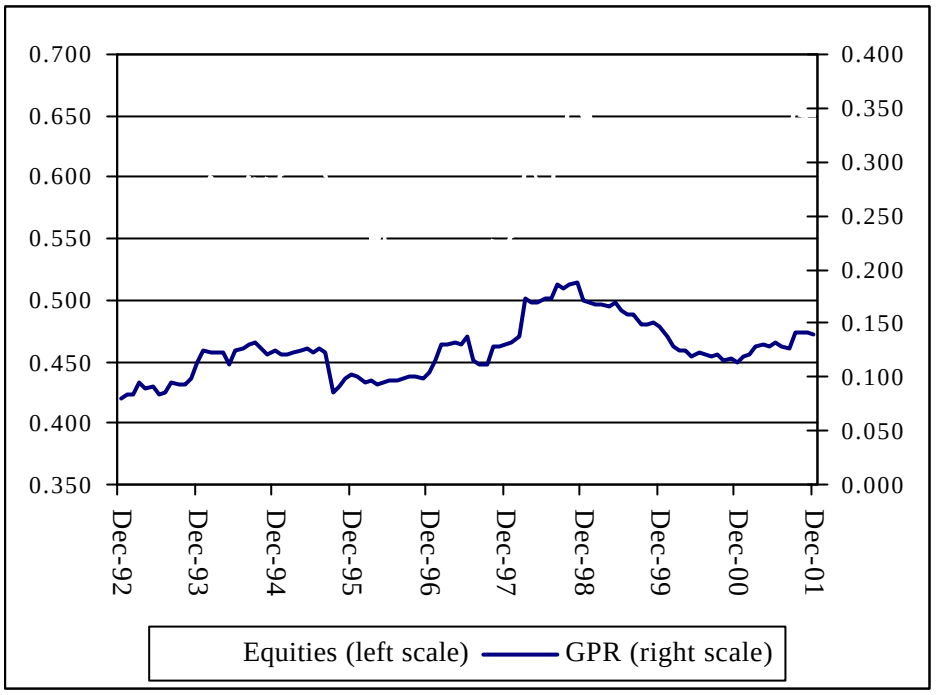
Figure 5.1 shows the average correlation of returns between the eight Eurozone countries analysed for the equity and the GPR property indices. As can be seen, the average correlation for the equity indices is considerably higher than for the property indices, with the latter also exhibiting greater variance. This supports the idea that real estate markets are less integrated than the wider equity markets in Europe. The equity market correlation increases markedly in the post-1997 period, with the difference significant at the 0.01 level, and there is a slight reduction in volatility. The average correlation also increases for the property series, although the result is not statistically significant.

Figure 5.1: Return Correlation, Eight Eurozone Countries

	Equities		**GPR**	
	Mean	**St Dev**	**Mean**	**St Dev**
Full Period	0.590	0.117	0.125	0.224
Pre 1997	0.557	0.137	0.100	0.253
Post 1997	0.652	0.120	0.140	0.247

Figure 5.2 shows rolling five year average correlations for both equity and property series. For the equities, the average correlation declines in the first half of the 1990s then climbs sharply following the decision to implement the single currency and the locking in of convergence criteria in 1997. Average correlations in the property indices actually decline from their peak in 1994-1998: this may reflect the differing exposure of national stock markets to the TMT boom-bust cycle and, hence, attitudes to value sectors such as real estate. The differences in the cycle limit, allied to an overall reduction in returns, mask any convergence in return levels across markets in the post-1997 period. The cross-sectional coefficient of variation increases for the equity indices in the later period as mean returns fall from 1.6% to 0.6%; for the property indices, an increase in returns is offset by an increase in cross-sectional volatility.

Figure 5.2: Five Year Rolling Correlation, Eurozone Mean



To see if it were possible to detect a common single factor affecting performance a series of factor analyses was performed. For both equity and property series, principal components analysis was used to decompose the variance; components with eigenvalues greater than one were retained and then rotated using the varimax procedure in an attempt to improve the interpretability of the factors. Separate analyses were run for the pre-1997 and post-1997 periods and for the full sample. The presence of a single large factor explaining much of the variation in the data would be evidence of common patterns of movement. Full results are shown in Appendix 2.

In all three analyses of the equity indices, a single factor explained a high proportion of the variance in the data. For the pre-1997 period, the first component had an eigenvalue of nearly five and explained some 62% of variance. All eight countries had loadings in excess of 0.6 (the lowest being Austria and Italy). In the post-1997 period, the explanatory power of the principal component had increased further, with an eigenvalue of 5.6, explaining 70% of the data variance. All countries had loadings of 0.7 or higher on this single factor. Thus, there is strong evidence of a common European stock factor, which strengthens in the post-Euro period.

The analyses of the GPR real estate series produce a much less clear picture. In the pre-1997 period, three components have eigenvalues greater than one. The largest explains less than a third of the variation in the data; the second explains around 21% of the variation and the third accounts for a further 14%. The factors are not easy to interpret. The first factor has strong positive loadings for France, Germany and Ireland, a weaker loading for Spain and a negative loading on Austria. The second has higher positive loadings on Italy, Netherlands and Spain, the third has higher loadings on Austria and Belgium[9].

The post-1997 analysis produces near identical results: two factors have eigenvalues greater than unity, with the third, at 0.97, falling just below the extraction cut-off. The three factors explain 31%, 25% and 12% of the variation, respectively. The factor loadings for the first two factors are very similar to those of the pre-1997 analysis; the only major changes being that Belgium has a high loading on the second factor and Spain has a low loading on the first factor. The full period analysis is very similar to the post-1997 analysis. It is thus not possible to conclude that there is a strong common factor operating in the Eurozone public real estate markets.

Figure 5.3 summarises the results of the Granger causality tests for lead and lag relationships. The tests were carried out using a 12 period lag window. We show the results including and excluding relationships significant to the 0.10 significance level (given the relatively small observation period, it may be worthwhile to consider weakly significant results). For both equity and real estate series, the number of causal relationships falls in the post-1997 period: the change is more pronounced for the property company data. As is often the case with Granger causality tests, the results are unstable and dependent on the lags included in analysis. However, the decline in lead-lag relationships does seem consistent, providing weak evidence of convergence in these markets in the Euro period.

[9] The factor analytic literature suggests that the final component extracted tends to act as a "clean up" factor, making interpretation of loadings problematic.

Figure 5.3: Granger Causality: Evidence of Lead and Lag Relationships

Pre 1997	**-- including 0.10 sig. --**		**-- excluding 0.10 sig. --**	
	Equity	**Property**	**Equity**	**Property**
None	64.3%	71.4%	89.3%	78.6%
One Way	32.1%	25.0%	10.7%	21.4%
Two Way	3.6%	3.6%	0.0%	0.0%
Post 1997	**-- including 0.10 sig. --**		**-- excluding 0.10 sig. --**	
	Equity	**Property**	**Equity**	**Property**
None	67.9%	78.6%	92.9%	96.4%
One Way	32.1%	21.4%	7.1%	3.6%
Two Way	0.0%	0.0%	0.0%	0.0%

Another method of revealing inter-country relationships of returns is by the VAR approach. VARs were estimated over the sub-periods 1984-1996 and 1997-2002; we select the optimal lag length using the Hannan-Quinn, Final Prediction Error and Schwarz criteria. For the equities the appropriate lag was one, while for the GPR series, it was taken as six. In the latter case, the shortage of the time period post-1997 restrained the lag length which might, otherwise, have been longer than six months.

Given the VAR, the relationship between the returns from each country can be explored by means of the impulse functions. With eight series, the patterns of influence are not at all clear, as can be seen from one example of the impulse function which is the impact of property markets on one another for the sub-period 1984:1 to 1996:12. (see Appendix 3, Figure 3.1). An alternative and preferred insight can be gained by examining the variance decompositions. Of course, one recognised problem with VAR analysis is that the results of variance decomposition are influenced by the order of the decomposition.

In this paper we follow Chelley-Steeley and Steeley (1999) by ordering the series after analysing the first order cross correlation over the whole period. The VAR has then been ordered according to which equity market leads another. Chelley-Steeley and Steeley found in their examination of European equity markets that this ordering

accorded closely with the market capitalisations of the equity markets. In our case, this is not found to be the case. Nevertheless, as pointed out by Chelley-Steeley and Steeley, the ordering issue is less of an issue in this application because we are not concerned with the absolute ordering of the variance decomposition but the change from one sub-period to another.

Figures 5.4 and 5.5 compare the percentage of the variation in each national equity and property markets attributable to changes in its own and other markets. The figures show the proportionate effects after 3 months of innovations in one market explaining the variation in each market whereas the cut-off period in the property market was chosen to be six months in the light of the stronger serial correlation in property returns. In Figure 5.4, for example, in the case of the Dutch equity market, before 1997, 96% of the variance was self-induced whilst in the later period the proportion of variation explained by the domestic market fell to 64%.

Convergence after the 1984-1996 period would be reflected in an increased contribution from other markets and a reduced contribution from the domestic market. The figures in the cells in Tables 5.4 and 5.5 that are printed in bold italic type are consistent with the hypothesis. As can be seen, the effect is more clearly revealed in the equities market than in the property market. Of the 64 numbers in each table, 44 of the entries (69%) in the equities case are consistent with greater integration whereas, in the case of the property markets, only 30 entries (47%) would be consistent with the hypothesis of greater integration. This lack of change exhibited in the VAR analysis is consistent with the results of the other methods used in the paper.

Figure 5.4 Variance Decomposition Analysis: Equities

Equities:
Variance Decomposition
----- Innovation in -----

Explaining	Netherlands	Germany	Italy	France	Belgium	Spain	Ireland	Austria
	95.9	2.8	0.0	0.7	0.0	0.1	0.3	0.2
Netherlands	***64.4***	0.8	***2.8***	***1.0***	***7.1***	***17.6***	***0.8***	***5.4***
	68.1	25.0	0.5	0.9	0.4	0.5	3.0	1.6
Germany	46.8	***21.3***	***1.9***	***2.0***	***5.8***	***17.4***	0.0	***4.6***
	22.8	3.9	68.7	1.0	0.3	0.1	3.1	0.1
Italy	***35.4***	***8.5***	***30.7***	0.1	***3.3***	***13.5***	2.0	***6.5***
	51.3	5.1	0.2	39.1	0.7	0.6	1.6	1.4
France	39.8	***9.7***	***7.0***	***16.9***	***5.3***	***14.7***	1.0	***5.7***
	66.8	2.7	1.0	3.0	24.6	0.0	1.3	0.7
Belgium	39.0	1.6	***4.5***	2.0	40.1	***5.5***	***4.6***	***2.8***
	55.7	3.1	4.3	0.1	4.4	31.5	0.1	0.8
Spain	36.8	***10.2***	***6.1***	0.4	1.4	37.2	***2.7***	***5.2***
	68.4	0.8	1.1	0.2	3.3	1.3	24.8	0.1
Ireland	18.9	0.2	***11.0***	***8.0***	2.0	***16.0***	39.2	***4.6***
	27.7	15.1	0.3	0.6	2.0	0.6	6.6	47.2
Austria	***31.0***	0.2	***1.7***	***13.6***	***5.2***	***13.6***	***7.3***	***27.5***

For each country, the first row is pre-1997, the second is post-1997
Figures in bold italic are consistent with the hypothesis of increasing integration.

Figure 5.5 Variance Decomposition Analysis - Property Companies

Property
Variance Decomposition
----- Innovation in -----

Explaining	Germany	Ireland	Austria	Italy	Belgium	Netherlands	Spain	France
	45.5	4.5	6.5	5.9	26.8	4.4	3.1	3.2
Germany	***29.6***	***8.5***	***17.0***	***9.2***	3.8	***18.0***	***4.7***	***9.2***
	10.0	4.6	14.7	7.2	11.9	48.9	2.1	0.6
Ireland	4.9	77.9	3.4	3.3	4.2	4.3	0.9	***1.0***
	4.7	3.8	41.9	1.0	10.5	31.5	3.7	2.8
Austria	2.9	***14.1***	62.0	***5.6***	1.4	0.7	***4.7***	***8.6***
	40.8	2.7	9.1	20.4	8.2	14.6	2.9	1.2
Italy	28.5	***44.2***	1.4	***19.5***	2.3	1.9	1.6	0.6
	5.8	4.1	3.9	7.7	34.5	37.4	3.8	2.7
Belgium	***20.2***	***4.8***	***18.4***	6.1	39.8	1.3	2.9	***6.5***
	7.6	2.5	23.9	6.0	2.6	56.4	0.7	0.2
Netherlands	3.1	***52.8***	15.7	1.2	***9.3***	***10.3***	***1.6***	***5.9***
	12.1	5.3	12.4	4.5	6.9	52.0	4.5	2.3
Spain	8.9	***33.9***	***24.0***	***7.6***	3.0	8.3	7.1	***7.1***
	12.1	4.3	20.8	9.0	6.2	45.1	1.4	1.2
France	10.6	***58.5***	3.8	***13.2***	3.1	2.0	***3.8***	5.0

For each country, the first row is pre-1997, the second is post-1997
Figures in bold italic are consistent with the hypothesis of increasing integration.

6.0 Summary and Conclusions

Monetary integration within the EU has been characterised by periodic advance and retreats. For a core group of countries, the long-term stability of their exchange rate and monetary policy relative to Germany meant that the transition to and introduction of a single currency in 1999 produced limited changes to their macro-economic environment. For another 'southern' group, the transition to and participation in a common currency constituted a major macro-economic regime shift. For investing institutions, the elimination of exchange rate risk and convergence of risk free rates would seem *prima facie* to reduce market segmentation. However, it is apparent that the economic effects of monetary integration are often inconsistent and that the markets have not clearly revealed any strong change in line with expectations.

Nominal convergence can be associated with real divergence. Where economies within single currency areas are experiencing contrasting economic performances, the inability to use the exchange rate, monetary policy and, to a lesser extent, fiscal policy as adjustment mechanisms can serve to intensify differences in the level of economic activity. For instance, Finland, Ireland and Italy all experienced notable increases in the variation (from the EU average) of industrial production growth in the period 1999-2000. In Italy, this was associated with a major increase in business cycle synchronicity (as measured by moving correlation co-efficients), whilst in Finland and Ireland the outcome has been decreasing business synchronicity. Paradoxically, this increase in dissimilarity in rates of economic growth is a pre-condition for convergence to similar levels of wealth. This is borne out by the fact that national variations in GDP per head have reduced in the 1990s. However, it is notable that there has been little change in regional differences in GDP per head.

Previous research on European stock market integration suggests that the last two decades have seen reductions in segmentation. There have been significant increases in market correlations and more recent research suggests that sector effects have begun to overtake country effects in explaining company returns. Increasing integration is further confirmed as stock markets are shown to respond to shocks in other European stock markets. However, integration has been less notable in indirect real estate markets.

The main conclusion of this paper is that commercial real estate equity markets are much less integrated than wider equity markets. Relative to the wider equity markets, the dispersion of performance is higher, correlations are lower, a common contemporaneous factor has much lower explanatory power whilst lead-lag relationships are stronger. As a result the evidence of transmission of monetary integration to real estate securities is less noticeable than to general securities. We attribute less and slower integration mainly to the size of the real estate securities market and the local and national nature of the majority of the companies' portfolios.

In terms of further research, a limitation of this paper is the focus on European data *per se*. In order to assess whether the changes identified have been caused by, rather than simply being associated with European monetary integration, it is necessary to incorporate the effects of global integration. In particular, it would be useful to assess whether the US or non-EMU markets display similar changes in correlation, causality and impulse response. In addition, dealing with aggregate data may be disguising interesting national variations in the effects of monetary integration. Evidence at the macro-economic level would imply that these exist. This research has also alluded to the diversity in portfolio composition of individual real estate companies. Analysis of variations in performance between domestic investors and non-domestic investors would provide further insights into the influence of European integration.

Bibliography

- Baca, S. Garb, B. and Weiss, R. (2000) The Rise of Sector Effects in Major Equity Markets, *Financial Analysts Journal*, September-October, 34-40
- Baele, L. and Vennet, R (2001) European Stock Market Integration and EMU, Paper in progress, Department of Financial Economics, Ghent University
- Beckers, S., Connor, G. and Curds, R. (National versus Global Influences on Equity Returns *Financial Analysts Journal* 52:2, 31-39.
- Beltratti, A. (1999) Has the Euro Eliminated the Benefits of Country Diversification within Europe?, Paper presented to Prudential Portfolio Managers, February, 1999.
- Brouen, D. and Eichholtz, P. (2001) Capital Structure Theory: Evidence from European Property Companies' Capital Offerings *Real Estate Economics* 29(4) 615-622
- Button, K. and Pentecost, E. (1995) Testing for Convergence of the EU Regional Economies, *Economic Inquiry*, 33, 664-671.
- Chelley-Steeley, P. and Steeley, J. (1999) Changes in the Comovement of European Equity Markets, *Economic Inquiry*, 37, 3, 473-488.
- Cavaglia, S. Brightman, C and Akev, C. (2000) The Increasing Importance of Industry fFactors, *Financial Analysts Journal*, September-October, 41-53.
- Diermeier, J. and Solnik, B. (2001) Global Pricing of Equity *Financial Analysts Journal* 57(3) 37-47
- Eichholtz, P. (1996) Does International Diversification Work Better for Real Estate than for Stocks and Bonds *Financial Analysts Journal* Jan-Feb, 56-62.
- Eichholtz, P., Koedick, K. and Schweitzer. M. (2001) Global Property Investment and the Costs of International Investment *Journal of International Money and Finance* 20(3) 349-366.
- Eichholtz, P., Huisman, R., Koedick, K. and Schuin, L. (1998) Continental Factors in International Real Estate Returns *Real Estate Economics* 26(3) 493-509.
- European Commission (2001) *Second Report on Economic and Social Cohesion* Brussels: European Commission.
- Fagerberg, J. and Verspragen, B. (1996) Heading for Divergence? Regional Growth in Europe Reconsidered, *Journal of Common Market Studies*, 34(3) 431-448.
- Freimann, E. (1998) European Integration and Country Allocation in Europe *Financial Analysts Journal*, September-October, 32-41
- Goetzmann, W. and Wachter, S. (2000) The Global Real Estate Crash: Evidence From An International Database in S. Brown and C. Liu (eds) *A Global Perspective on Real Estate Cycles* Dordrecht: Kluwer.
- Gordon, J. and Canter, T. (1999) International Real Estate Securities: A Test of Capital Market Integration *Journal of Real Estate Portfolio Management* 5(2) 161-181.

- GPR (1998) *GPR Handbook of European Property Companies* Maastricht: Global Property Research.
- Heston, S. and Rouwenhorst, K. (1994) Does Industrial Structure Explain the Benefits of International Diversification *Journal of Financial Economics* 36, 5-25.
- Krugman, P. (1993) Lessons of Massachusetts for EMU in *Adjustment and Growth in the European Monetary Union*, Torres, F and Giavazzi, F. (eds), Cambridge University Press, New York.
- Lee, S. and D'Arcy, P.E. (1998) A Real Estate Portfolio Strategy for Europe *Journal of Real Estate Portfolio Management* 4(2) 113-123.
- McCarthy, L. (2000) European Economic Integration and Urban Inequalities in Western Europe, *Environment and Planning A*, 32, 391-410.
- Rouwenhorst, K. (1999) European Equity Markets and the EMU, *Financial Analysts Journal*, May/June, 57-64.
- Van Daalhuizen, J., Eichholtz, P., Lie, R. and de Wit, I. (2000) Modelling European Office Returns, Paper delivered at RICS Cutting Edge Research Conference, London.
- Worzala, E. and Bernasek, A. (1996) European Economic Integration and Commercial Real Estate Markets *Journal of Real Estate Research* 11(2) 159-181

APPENDIX ONE: DESCRIPTIVE STATISTICS

(a) GPR Property Series

	Austria	Belgium	France	Germany	Ireland	Italy	Netherlands	Spain
Mean	0.41%	0.58%	0.74%	0.53%	1.79%	0.98%	0.45%	0.91%
Maximum	21.13%	27.65%	16.09%	39.56%	56.42%	35.31%	11.93%	36.18%
Minimum	-14.65%	-14.73%	-14.71%	-20.43%	-31.84%	-16.14%	-15.69%	-23.18%
Std. Dev.	5.47%	5.54%	4.89%	6.68%	11.84%	7.71%	3.95%	9.24%
Skewness	0.615	0.653	-0.019	1.307	0.577	0.962	-0.346	0.967
Kurtosis	6.051	5.850	3.499	9.583	5.675	5.535	4.180	5.695
Jarque-Bera	0.518	73.32	2.25	399.25	67.57	91.16	14.87	81.16
Probability	0.372	0.000	0.324	0.000	0.000	0.000	0.001	0.000
Observations	125	179	216	191	191	216	191	177

(b) DataStream Equity Series

	Austria	Belgium	France	Germany	Ireland	Italy	Netherlands	Spain
Mean	1.32%	1.30%	1.51%	1.08%	1.74%	1.42%	1.33%	1.01%
Maximum	42.41%	24.11%	19.38%	17.81%	27.00%	27.76%	13.60%	22.49%
Minimum	-19.48%	-18.96%	-15.50%	-17.74%	-25.32%	-15.47%	-17.95%	-18.32%
Std. Dev.	7.86%	5.23%	6.09%	5.71%	6.77%	7.17%	4.63%	6.17%
Skewness	0.903	0.093	0.008	-0.240	-0.071	0.612	-0.459	-0.080
Kurtosis	6.832	5.453	3.204	3.753	5.048	3.636	4.304	3.825
Jarque-Bera	161.504	54.46	0.38	7.18	37.93	17.10	22.89	5.23
Probability	0.000	0.000	0.827	0.028	0.000	0.000	0.000	0.073
Observations	216	216	216	216	216	216	216	178

(c) Mean Monthly Returns By Time Period

		Austria	Belgium	France	Germany	Ireland	Italy	N'lands	Spain
GPR	**Pre 97**	0.49%	0.18%	0.40%	1.39%	1.51%	0.73%	0.64%	1.14%
	Post 97	0.33%	1.35%	1.60%	2.37%	2.41%	1.63%	0.03%	0.47%
	Full	0.41%	0.58%	0.74%	1.70%	1.79%	0.98%	0.45%	0.91%
Equity	**Pre 97**	1.91%	1.61%	1.72%	1.31%	2.02%	1.57%	1.60%	1.14%
	Post 97	-0.20%	0.47%	0.97%	0.49%	1.01%	1.06%	0.60%	0.74%
	Full	1.32%	1.30%	1.51%	1.08%	1.74%	1.42%	1.33%	1.01%

APPENDIX TWO: FACTOR ANALYSES

2.1 ***Equity Indices***

(a) Variance Explained:

	Pre 1997		**Post 1997**		**Full Period**	
Component	**Eigenvalue**	**% Variation**	**Eigenvalue**	**% Variation**	**Eigenvalue**	**% Variation**
1	4.968	62.1	5.588	69.9	5.173	64.7
2	0.793	9.9	0.772	9.7	0.694	8.7
3	0.691	8.6	0.543	6.8	0.641	8.0
4	0.534	6.7	0.345	4.3	0.475	5.9
5	0.409	5.1	0.320	4.0	0.377	4.7

(b) Factor Loadings (single factor):

	Pre 1997	Post 1997	Full Period
Austria	.611	.746	.653
Belgium	.868	.791	.834
France	.821	.906	.855
Germany	.902	.895	.901
Ireland	.770	.709	.742
Italy	.633	.811	.706
Netherlands	.883	.935	.901
Spain	.762	.866	.805

2.2 ***GPR Property Indices***

(a) Variation Explained:

	Pre 1997		**Post 1997**		**Full Period**	
Component	**Eigenvalue**	**% Variation**	**Eigenvalue**	**% Variation**	**Eigenvalue**	**% Variation**
1	2.537	31.7	2.497	31.2	2.417	30.2
2	1.688	21.1	1.982	24.8	1.797	22.5
3	1.134	14.2	0.970	12.1	0.927	11.6
4	0.833	10.4	0.802	10.0	0.817	10.2
5	0.619	7.7	0.561	7.0	0.633	7.9

(b) Factor Loadings, Pre 1997

	Factor 1	Factor 2	Factor 3
Austria	-0.602	0.341	0.516
Belgium	0.197	-0.004	0.858
France	0.828	-0.005	0.280
Germany	0.767	-0.004	0.108
Ireland	0.691	-0.207	-0.005
Italy	0.001	0.699	-0.318
Netherlands	-0.331	0.698	0.195
Spain	0.463	0.659	0.263

(c) Factor Loadings, Post-1997

	Factor 1	Factor 2
Austria	-0.625	0.341
Belgium	-0.001	0.690
France	0.842	0.009
Germany	0.794	0.001
Ireland	0.778	0.198
Italy	0.314	0.607
Netherlands	-0.168	0.703
Spain	0.005	0.716

(d) Factor Loadings, Full Sample

	Factor 1	Factor 2
Austria	-0.644	0.403
Belgium	0.009	0.572
France	0.804	0.243
Germany	0.785	0.002
Ireland	0.713	0.189
Italy	0.119	0.555
Netherlands	-0.367	0.638
Spain	0.188	0.729

APPENDIX THREE: VAR IMPULSE RESPONSE FUNCTIONS

Figure A3.1 Impulse Functions for Property Markets 1984:1 1996:12