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IPF Research Programme

Managing Currency Risk in International Real Estate Investment

APRIL 2018

MAJOR REPORT

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This Programme supports the IPF's wider goals of enhancing the understanding and efficiency of property as an investment. The initiative provides the UK property investment market with the ability to deliver substantial, objective and high-quality analysis on a structured basis. It encourages the whole industry to engage with other financial markets, the wider business community and government on a range of complementary issues.

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Managing Currency Risk in International Real Estate Investment

Report

IPF Research Programme 2015–2018

April 2018

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Disclaimer

Managing Currency Risk in International Real Estate Investment

EXECUTIVE SUMMARY

Exchange rate fluctuations can lead to substantial changes in the domestic currency value of cash flows from and valuations of international real estate investments. Currency movements lead to additional uncertainty about future returns and can dominate underlying property returns. This study analyses market practice in the management of currency risk.

A number of instruments and approaches are available to reduce the impact of currency movement on future returns, including currency forwards, swaps and options. The literature examines these instruments, and combinations of them, and analyses the impact of hedging strategies. This literature in general indicates that hedging improves the risk-adjusted return at a portfolio level. The existing literature on real estate industry practice suggests that currency exposures are either not hedged at all or are typically hedged through forward contracts.

During the final quarter of 2017, some 50 or so respondents with international non-domestic currency exposure from around the world, reflecting a range in size, holding period and type of organisation, answered questions about how they manage currency risk. Two focus groups and follow-up conversations were used to give further insight into the responses. Key findings are:

- The survey suggested that the role of currency management is to minimise risk and the 'noise' from currency movements. Respondents said this was not orientated to currencies that appeared over-valued and they did not take a view that currency management could boost returns. However, on further investigation, it seems that currency management is sometimes used opportunistically to lock in gains from currency movements and, in some cases, hedging is skewed to countries where it is expected to improve returns.
- The vast majority of respondents have a policy and process that they claim does not change with respect to market conditions; however, there does appear to be some flexibility in relation to currencies that are hedged and with respect to what is done in terms of instruments to hedge currency exposure. In some cases, there appears to be a difference between markets where significant depreciation of the currency is priced into currency markets and markets where exchange rates are not expected to move substantially or appreciate.
- The management of currency risk is seen normally either as a client responsibility by more specialist fund managers or as the responsibility of a centralised treasury/finance/currency team by multi-asset managers and clients. In a few cases, the decision was seen as a joint responsibility between the real estate fund manager and this central team but frequently the property team seem not to be actively involved in the decisions on management of currency risks.
- A mixture of instruments are used for currency hedging with forwards the most common and employed by every organisation surveyed that used any currency hedging instrument. Both swaps and options were also used, as well as local leverage.
- Surprisingly, currency hedging policy does not appear to be particularly affected by differing objectives, benchmarks, accounting policy, cash flow or fund structures.
- Investors typically hedge NAV at asset level. As a consequence, if investors borrow locally, this reduces the extent of currency exposure that needs to be hedged. The risk that borrowing decisions are affected by currency was highlighted, i.e. that investors take on more leverage to reduce currency exposure, thereby increasing other risks.
- The cost and availability of hedging instruments does influence whether a currency is hedged and which instruments are used. This was noted with respect to emerging and frontier markets.

EXECUTIVE SUMMARY

A simulation of the effects of currency hedging across different market environments (normal, boom, crash) indicates that hedging using forwards or swaps leads to a substantial reduction in risk but only a limited impact on returns. Consequently, the risk to return ratio – the coefficient of variation – is much lower for hedged portfolios. Hedged portfolios tend to deliver higher risk adjusted returns.

The key conclusions and recommendations of the research are:

- Most managers and/or investors undertake currency risk management or, in the case of managers, report currency exposures to clients so that they can make their own decisions about whether and how to manage currency risk. There is a need to be clear about the circumstances where hedging of currency risk is undertaken and where it is not.
- A range of sophisticated approaches are used to manage currency risk, including a range of hedging instruments (forwards, swaps and options). The extent of hedging and the most appropriate instrument will depend on a range of factors, including cost, objectives, risk tolerance, etc., and so specialist expertise or advice is needed (whether internal or external). In the implementation of hedging, access to live market data and pricing is needed to ensure transaction costs are minimised.
- There appears to be a tendency amongst real estate fund managers to want to leave thinking about currency and currency risk management to others. There is a need for real estate fund managers to understand and integrate the impact of currency risk and the costs of currency risk management into investment decisions.
- Given longer term evidence of how currencies move relative to interest rate differentials and economic growth, there is a logic to leaving currencies of fast growing, higher interest rate countries unhedged, particularly where transaction costs of hedging are high, e.g. emerging markets. However, countries whose currencies are expected to depreciate typically do not do so smoothly and, hence, currency can have a substantial effect on the delivered returns. Emerging markets are more likely to be unhedged. This is particularly the case where FX markets are poorly developed and in these markets investors have limited ability to manage currency risk.
- Information on currency exposures and hedged positions should be gathered to enable risk to be measured and the success of managing currency risk should also be monitored, e.g. whether currency hedging undertaken has removed the impact of currency movements in line with expectations.
- Managers need to make clear what they intend to do with respect to currency hedging and report unhedged and hedged currency exposures in a timely manner to investors. Investors need to integrate explicitly potential currency effects on returns and risk.

1. INTRODUCTION

This report examines contemporary industry practice in managing currency risk for foreign real estate investment. The report focusses on the following questions related to industry practice:

- What are the main approaches to managing currency risk in international real estate portfolios and is this affected by market conditions?
- How is currency risk management policy determined and who is responsible for advice, decisions and execution?
- How do objectives, benchmarking, accounting policy, fund structures, cash flow, leverage and other factors influence approaches to currency risk management?

The report aims to highlight the perceived strengths and weaknesses of different approaches and issues arising.

The research included:

- A review of the literature on currency risk management – both the literature on what fund managers and investors should do, according to theory, and the literature that explores what real estate investors actually do.
- A survey and follow up interviews in Q4 2017 with around 50 responses.
- Discussions/focus groups to discuss the findings in January 2018.

This report sets out relevant concepts and literature in Section 2. Appendix 1 complements Section 2 with more detail on the instruments available to manage currency risk. Section 3 sets out the results of the survey.

In making investment decisions across currencies, investors have to integrate the potential impact of currency movements into their view of prospective returns and risk. Interest rate differentials imply a particular currency movement in forward exchange rate markets; however, currencies do not simply follow the path implied by interest rate differentials and can be volatile leading to substantially increased uncertainty. This is illustrated by the following example:

- Investment A is in country A, where the currency is the Amber. It is expected to deliver a local currency return of 5%, whilst, in country A, expected inflation is 0% and interest rates are 0.5%.
- Investment B is in country B, with currency Beryl. It is expected to deliver a local currency return of 8%, whilst, in country B, expected inflation is 3.0% and interest rates are 3.5%.

If exchange rate movements follow the interest rate differential[1], then A and B appear to offer comparable returns on a common currency basis, i.e. 5% in Amber terms. If currency moves in line with the interest rate differential, then country B's exchange rate will depreciate by 3% relative to country A's. However, if country B's currency depreciates by substantially more than expected, given the interest rate differential, and the investment is unhedged, then Investment B will perform significantly more poorly than expected. Conversely, if, contrary to expectations of a decline in the value of B's currency, this appreciates, then returns will be significantly higher than expected

[1]That is, if interest parity relationships hold.

1. INTRODUCTION

Table 1.1: Hypothetical Example of Impact on Returns of Differential Interest Rates

	Country A (%)	Country B (%)
Expected return local currency	5	8
Expected inflation local currency	0	3
Interest rate (over expected hold period)	0.5	3.5
Expected currency movement	(n/a)	-3
Expected returns in A's currency (Amb rtns)	5	5
If B's currency depreciates by 13% (Amb rtns)	5	-5
If B's currency appreciates by 7% (Amb rtns)	5	15

The uncertainty around the currency movement increases the overall uncertainty of returns. This 'transaction exposure', the sensitivity of the investor's contractual transactions in foreign currencies to exchange rate movements, includes the initial investment and periodic cash flows and the sale at the end of the period.

Additional risks associated with currency relate to the valuation of investments in non-domestic currencies – 'translation exposure' – and how the investments are affected by currency movements – 'economic exposure'. Transaction, translation and economic exposure are defined further in Section 2.

At the simplest level – for an investment being bought and sold at a known date with no intermediate cashflows – a significant element of the currency risk can be reduced by hedging, e.g. entering into a forward contract to sell the amount expected to be received in the foreign currency when the asset is sold into the domestic currency. As outlined in Worzala (1995), the main hedging instruments available are: Currency Forwards – Contracts to buy or sell a currency at a future date. Over-the-counter (OTC) instruments, contractually binding but with no payments until the specified future date.

- Currency Futures – Exchange traded standardised contracts to buy and sell a currency at a future date. As with forwards, there is a clear obligation to make payment.
- Currency Swaps – Contracts exchanging interest (and principal) in one currency for interest (and principal) in another currency.
- Options – Contracts giving the right (but not the obligation) to buy currency at a future date at a given rate.

In addition, using local leverage to reduce currency exposure can help to minimise the impact of currency movements (Baum, 2012). Some investors with global allocations and benchmarks may see currency movements as simply cancelling out or as a natural hedge.

As Figure 1.1 makes clear, there have been substantial movements in currencies over both short-term periods and over the long term. This brings a substantial element of uncertainty – currencies do not simply follow the path suggested by interest rate differentials[2].

[2]Indeed, in the post-GFC period, with strong interventions by central banks, it could be argued that interest rate parity relationships have largely broken down.

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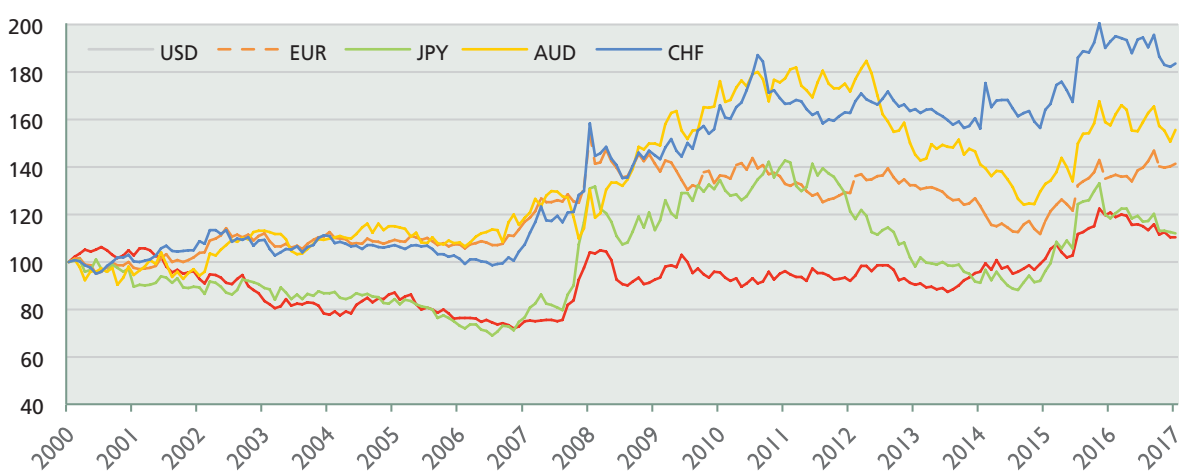
Figure 1.1: Currency Movements GBP to USD, Euro, JPY, AUD and CHF



This impact of currency is evident in a comparison of real estate returns in 2016 in local currency and UK Sterling (GBP) as shown in Table 1.2. Whilst local currency returns only differed by 10% between the strongest and weakest performers, in GBP terms, e.g. for a UK investor, if unhedged, the market return difference would have been over 40%.

Table 1.2: 2016 Returns in Local Currency and in GBP and USD Terms

	Local currency property returns (%)	Currency movement against GBP (%)	Currency movement against USD (%)	GBP property returns (%)	USD property returns (%)
Sweden	13.9	10.7	-7.2	24.6	6.7
Australia	11.8	18.7	-0.5	30.5	11.3
South Africa	11.1	35.2	13.3	46.3	24.4
Netherland	10.3	15.8	-2.9	26.1	7.4
France	7.8	15.8	-2.9	23.6	4.9
USA	7.5	19.3	n/a	26.8	7.5
Japan	6.3	23.0	3.1	29.3	9.4
UK	3.9	n/a	-16.2	3.9	-12.3

Source: MSCI

There has been a growing internationalisation of major real estate markets with associated increased cross-currency flows of capital investing in real estate. London and the UK market are significantly influenced by these flows, with the City of London office market now more than 60% owned by overseas investors (Lizieri & Mekic, 2014). In this context of increased international investment and continuing currency volatility, how do institutional investors ensure that the risks arising from currency movements are appropriately managed?

1. INTRODUCTION

How do they make decisions that are consistent with the objectives of their stakeholders? What instruments are used to manage currency risk and who makes decisions about these? It is these broad issues that are addressed in this report, including the following aspects:

- Do investors and fund managers ('participants') use currency management to minimise risk or to improve returns or both?
- What process does the participant use to determine its currency management policy?
- Do participants typically adopt 'programmatic' currency management (following a policy irrespective of market conditions) or do they tailor their approach, based on market conditions or other considerations?
- Who manages currency risk (for example, property managers or treasury departments); and at what level within an organisation does responsibility lie?
- Do participants benchmark their real estate performance on a hedged or unhedged basis?
- Do participants distinguish between capital hedging and income hedging? If one and not the other, why? Where they do make a distinction, what are the different approaches used?
- Foreign exchange (FX) hedging increases leverage off balance sheet. How do participants view the relationship between currency hedging and overall leverage?
- Are there different strategies for managing emerging market and developed market currencies?
- What is the long-term impact (over a property market cycle, say) of currency volatility on investment performance?
- How critical is the time period over which such performance is measured and how subjective is the nature of any analysis?

The research design consisted of three main elements:

(a) A conceptual and contextual analysis of what is known about currency risk management, as presented in general finance and specific real estate finance literature, covering both the underlying principles and what survey evidence is available about the actual use of FX instruments to manage currency risk;

(b) An analysis of market practice, using a structured survey of a wide range of investors with international (non-domestic currency) exposure, including real estate investment trusts (REITs) and listed property companies, institutional investors, private equity investors, sovereign wealth funds and others. This was followed up via email and phone, to gain an understanding of the issues in deciding whether FX exposure should be hedged and which instruments should be used and why. Survey (and follow-up) interview participants included key market players across a range of investor types, fund types, sizes and domiciles;

(c) A critical appraisal of the survey and follow-up interview findings through focus groups with key market players and discussions with advisers and the project steering group.

This report sets out the findings from the research. First, we present a summary of the key issues and a review of the literature on currency hedging (what research suggests investors should do) and the literature that explores what investors and fund managers ***actually*** do.

1. INTRODUCTION

Next, we present evidence from the survey, which was distributed in October 2017 with follow-up requests and interviews over subsequent months. Respondents were from firms active in the commercial real estate market across a broad range of scale, types and activities, ranging from large sovereign wealth funds and global fund managers to niche private equity investors and private offices. The findings from this review of current practice, along with the literature review and simulation findings, were presented to two focus groups (one in Cambridge, one in London) and discussed with the IPF's research project steering group to gauge reaction, to explore more deeply key findings from the research and to ensure market relevance.

Section 4 summarises our simulation analysis to explore how a variety of characteristics affect whether an investor should hedge currency risk and to what extent. The conclusions and implications from the study are set out in the final section of the report.

2. CURRENCY RISK ISSUES AND LITERATURE ON ITS MANAGEMENT

Section 2 sets out some of the key concepts about how currencies are related to each other, with implications for why currency risk needs to be managed and why the extent to which it needs to be managed may vary, depending on the risk tolerance and holding period of an investor. This section also reviews the literature on currency risk management, highlighting key insights for real estate investors.

2.1 Currency (foreign exchange) movements and risk

Currency (foreign exchange) risk primarily relates to unexpected changes in foreign exchange (FX) rates. In order to understand some of the issues around currency risk management it is necessary to understand some of the key concepts around how exchange rates are determined.

A range of influences affect exchange rates including economic growth, the economic structure of economies, trading relationships, inflation, interest rates and capital markets and sentiment (expectations) about these drivers. There are a number of key theories that underpin expectations about currency and the pricing of instruments that can be used to manage currency risk (or speculate about currency movements), including:

- Purchasing Power Parity (PPP) states that exchange rates should reflect the purchasing power across countries, i.e. that the price of goods will not diverge across countries creating large opportunities for arbitrage over the long (or very long!) run – the law of one price. Given the evidence from observing the real world, this has been adjusted to take account of income growth effects – real exchange rates of relatively fast growing economies tend to increase over time. It is recognised that PPP gives an indication of likely movements over the long term but that divergence from PPP can be substantial and persistent (on average taking three to five years to reduce the deviation of the exchange rate from PPP by a half). Some versions of PPP separate out goods and assets that could be arbitraged from those, such as retail domestic services (hairdressing being an oft-cited example), that could not, a distinction echoed in the economics of trade literature.
- Uncovered interest rate parity is the idea that investors are indifferent to the interest rates offered on riskless deposits across two countries – this is because the exchange rate movement is expected to offset any interest rate differential. Under the Fisher effect[3], for every country, then nominal interest rate equals the real interest rate plus the expected rate of inflation and, under the international Fisher effect, with the strong assumption that real interest rates are the same across countries, then differences in nominal interest rates should reflect the expected inflation differential between countries. The higher nominal return in a high inflation country would be expected to be the same when converted into a common currency as the return from a low inflation country. There is evidence to suggest that real interest rates do tend to be similar across countries but there are substantial and persistent deviations in currencies from the movements anticipated by interest rate differentials and convergence is characterised by jump processes (see below).
- Covered interest rate parity links forward exchange rates, the interest rate differential across two countries and the expected spot exchange rate. A forward contract is used to eliminate exchange rate risk and the difference between the spot (today's) exchange rate and the forward exchange rate reflects the nominal interest rate differential between the two currencies. In general, provided the deposits are riskless in the two countries and there are no other distortions, e.g. tax, then the evidence suggests covered interest parity generally holds. In freely traded markets, if this condition was not satisfied there would be a clear arbitrage opportunity.
- The Forward Rate as an unbiased estimator is the concept that the forward rate reflects unbiased expectations of the spot rate in the future. It should be noted that an unbiased expectation is not the same as an accurate expectation or forecast.

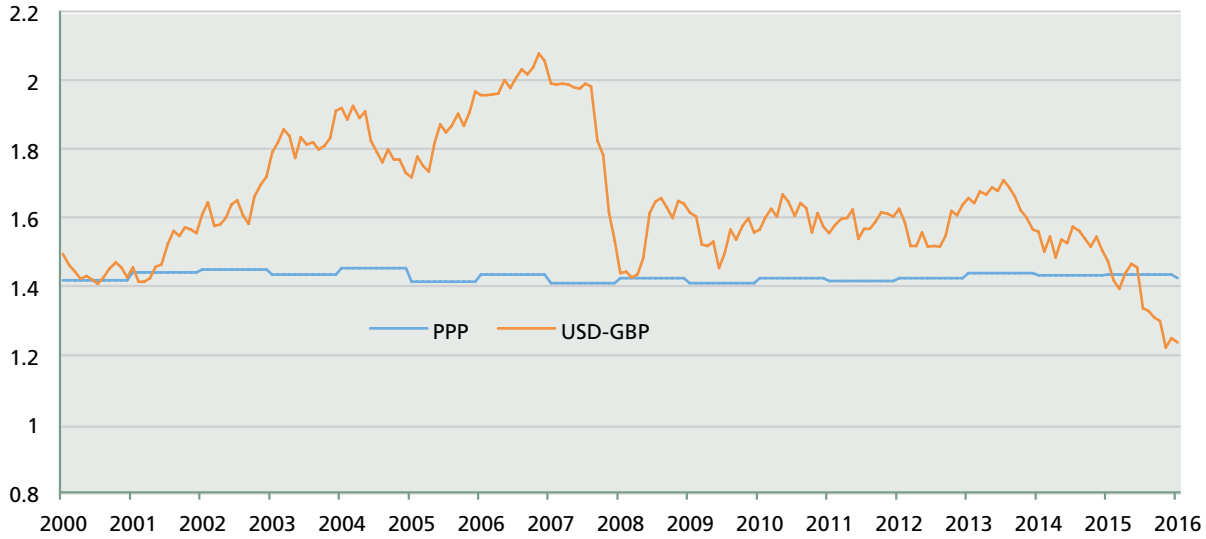
[3]The theory proposed by economist Irving Fisher, describing the relationship between inflation and both real and nominal interest rates.

2. CURRENCY RISK ISSUES AND LITERATURE ON ITS MANAGEMENT

The technical literature has explored at depth the extent to which these parity relationships hold (with the consensus being that, at best, they hold in the long run) and the nature of the adjustment process (with current consensus pointing to a jump convergence, whereby rates or currencies can diverge until a threshold point is reached, at which point the components adjust to their equilibrium positions (this would be consistent with a model where arbitrage gains must exceed the costs and risks of trading). By implication, small deviations from parity relationships can persist for long periods. As a consequence, long-term currency convergence is unreliable.

As outlined above, whilst the above theories and parity conditions give important insights into currency movements, it is clear that exchange rates in the short to medium term can diverge substantially from both purchasing power parity and from the expected movement given interest rate differentials. This is illustrated in Figure 2.1. The GBP-USD exchange rate has been at the rate implied by PPP a few times over the last 16 years but has deviated by a substantial amount and for substantial periods of time. Whilst it may have looked as if sterling might fall back to the PPP implied rate in 2004/2005, the pound strengthened further until the financial crisis led to a sharp adjustment.

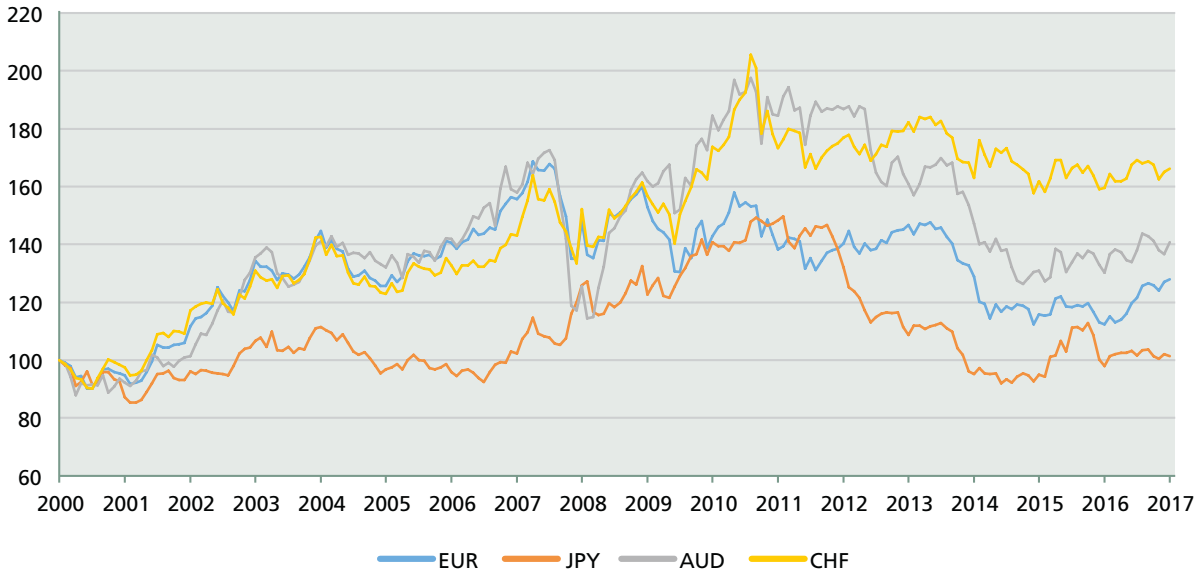
Figure 2.1: USD-GBP Exchange Rate and Rate Implied by Purchasing Power Parity



Similarly, as illustrated in Figure 2.2, currencies have moved around substantially relative to each other and not followed the path suggested by the modest interest rate differentials over recent years – with the USD strengthening even though interest rate differentials might suggest it should weaken.

2. CURRENCY RISK ISSUES AND LITERATURE ON CURRENCY RISK MANAGEMENT

Figure 2.2: Currency Movements USD to Euro, JPY, AUD and CHF (2000 = 100)



It is clear that currencies are volatile and unpredictable and thus foreign exchange rate risk brings additional uncertainty to international investment returns. A successful foreign investment in the local currency could be a poor performing investment in domestic currency terms as a result of unexpected currency movements.

Exchange rate risk exposure can be broken down into a number of elements:

1. Transaction exposure

Transaction exposure relates to the sensitivity of the contractual transactions in foreign currencies to exchange rate movements. In the case of foreign direct real estate investment, transaction exposure relates to the purchase of the initial investment, the periodic cash flows and the sale at the end of the holding period – the impact of unexpected exchange rate movements on the conversion of the actual cash flows.

2. Translation exposure

This relates to financial statements, e.g. consolidation of valuations and accounts into local currency. Whilst the actual payments are reflected in transaction exposure, translation exposure relates to the impact on valuations from exchange rate fluctuations.

3. Economic exposure

Economic exposure is sensitivity of cash flows to exchange rate movement. Whilst transaction exposure captures an element of this economic exposure, economic exposure also includes the second round effects of currency movements on economic growth and capital flows and, hence, on the performance of the property, which may often help to compensate unexpected exchange rate movements over time.

2. CURRENCY RISK ISSUES AND LITERATURE ON CURRENCY RISK MANAGEMENT

Whilst we know that hedging can reduce exchange rate exposure, there are still many questions that require investigation. Does hedging improve the risk and return profile of foreign investments? Do managers know their currency risk profile? What determines the hedging decision? Which instruments are used to hedge? Are there differences in risk management practice by size and type of organisation? Is there any relationship between the size of the firm and risk management practice? The literature has looked at a range of these issues in a general corporate finance context, in the context of multi-asset, equity and bond investment management and, to a more limited extent, in the context of international real estate investment. Appendix 2 sets out some of this key literature in more detail whilst the principal findings are set out below.

2.2 General industry practice for hedging and currency risk management

The main insights from the literature on what companies do with respect to currency risk management relevant to real estate investors are:

- Local financing (local leverage) is used to reduce currency exposure. Companies borrow locally to reduce the impact of currency movements on earnings, etc.
- Financial derivatives are used more extensively by those with tighter financial constraints and by those with more expertise in using derivatives. If companies are in a position to withstand short-term volatility, they do less to manage currency risk, avoiding direct costs.
- Truly global businesses, with internationally diversified revenue in many currencies, may see their international diversification as providing a natural hedge against currency fluctuations.
- The rationale for hedging in many companies is to smooth fluctuations in earnings, to reduce uncertainty for example.
- Currencies that are more expensive or difficult to hedge might be left unhedged rather than incurring the additional costs in these markets.

2.3 Investment management – equities and bonds, etc.

From a review of the literature on the theory, practice and recommendations with respect to multi-asset investment portfolios, the main findings are:

- A lack of correlation in currencies means that global diversification reduces currency risk compared to a narrow range of international markets in portfolios.
- A perfect hedge is not possible unless the foreign currency rate of return is known. In effect, investors should recognise that currency risk is inevitable for 'growth' assets. Uncertainty of cash flows makes achieving a perfect hedge practically impossible.
- The optimal hedging ratio may be less than one, e.g. for a UK investor with AUD 500m of exposure to Australian assets, it may be better to hedge 300 or 400m of AUD exposure than 500m or nothing.
- Long-term 'natural' hedging, through currencies reverting to mean real exchange rates, is unreliable and structural shifts do occur.
- There is an argument that optimal hedging may depend on how underlying markets interact with currency movements. Currencies that perform strongly when underlying markets perform strongly may require a different approach from those where the correlation between the local market and its currency is weak or negative.
- Industry practice and advice with respect to currency risk management vary widely, from full hedging, through currency overlay strategies and partial hedging to naked exposure (no hedging), with the suggestion that it depends on the investor's objectives, location, risk tolerance and other factors, including their understanding of currency risk.

2. CURRENCY RISK ISSUES AND LITERATURE ON CURRENCY RISK MANAGEMENT

2.4 Real estate industry

In the literature on currency risk management in a real estate context key insights include:

- Currency and currency risk management play an important role in determining the overall contribution of international real estate portfolios to risk and return at a wider portfolio level.
- There may be issues in the consistency with which countries and their associated currency risks are integrated into investment processes.
- In general, hedging appears to improve risk adjusted returns for international real estate portfolios.
- The instruments used and the approach need to reflect the longer term uncertain nature of real estate values and cash flows.
- Many standard financial hedging tools and techniques are inappropriate for real estate investments with long holding periods and intermediate cash flows.

3. CURRENCY RISK MANAGEMENT PRACTICE: SURVEY AND FOCUS GROUPS

Section 3 sets out the key findings on the review of the currency risk management processes, policies and issues of international real estate investors.

3.1 Management of Currency Risk and Level within Organisation

In this phase of the project, an electronic survey with follow-up discussions was conducted. Of the 49 responses received, 45 reported having an international real estate investment exposure and identified currency risk issues within their portfolios. Of these 45, 31 (69%) had an explicit hedging policy or strategy. Organisations that participated were a mix of UK-based businesses investing internationally and organisations based outside the UK investing internationally. The respondents spanned a broad spectrum, from large sovereign wealth funds and large fund managers to more niche organisations, and from specialist real estate managers to multi-asset class investors, with a 57%:43% split between multi-asset and real estate specialists. Typically, respondents held substantial portfolios and, therefore, may be more sophisticated and well-resourced than the wider population of international investors in real estate. The respondents included a mixture of more narrowly focussed international and fully global mandates, which included emerging market exposure with a very broad range of international exposures overall.

Further details of the characteristics of the respondents are included in Appendix 3.

3.2 Policy and responsibilities for currency hedging

Do investors hedge and do they have a particular policy for hedging?

In general, most respondents hedge foreign currency exposure, with 78% indicating hedging of currency risk is undertaken. 31 respondents (69%) have a specific policy or strategy for hedging currency risk. Of the 14 who do not, reasons varied – sometimes because it is dealt with at a multi-asset level or left to their clients; in some instances, hedging is occasional and without a consistent policy or they believe they have self-hedging, given the multiple currencies in their portfolio.

From the survey, it appeared that the majority of respondents adopt 'programmatic' currency management (following a policy irrespective of market conditions). Those taking a more opportunistic approach were more limited, although subsequent answers suggested there was a degree of flexibility among a number of respondents about how policy is applied and this more selective approach was also more evident in the follow up interviews and focus groups.

Who manages currency risk (property managers or treasury departments) and at what level within an organisation does responsibility lie?

	Real estate specialist	Multi-asset organisation
Fund manager/Client	4	3
Treasury/Finance/Central function	8	10
Interaction between Fund manager and Treasury	1	2

Note: Only responses where both questions were answered are included

3. CURRENCY RISK MANAGEMENT PRACTICE: SURVEY AND FOCUS GROUPS

Where there is a wider mandate and the organisation manages equities and bonds, etc., it appears that currency hedging or international real estate portfolios is typically done by the treasury/central finance team rather than the real estate team. For real estate specialists, the management of currency risk is normally done centrally by a finance person. There was less interaction than expected between real estate teams and those managing the currency risk.

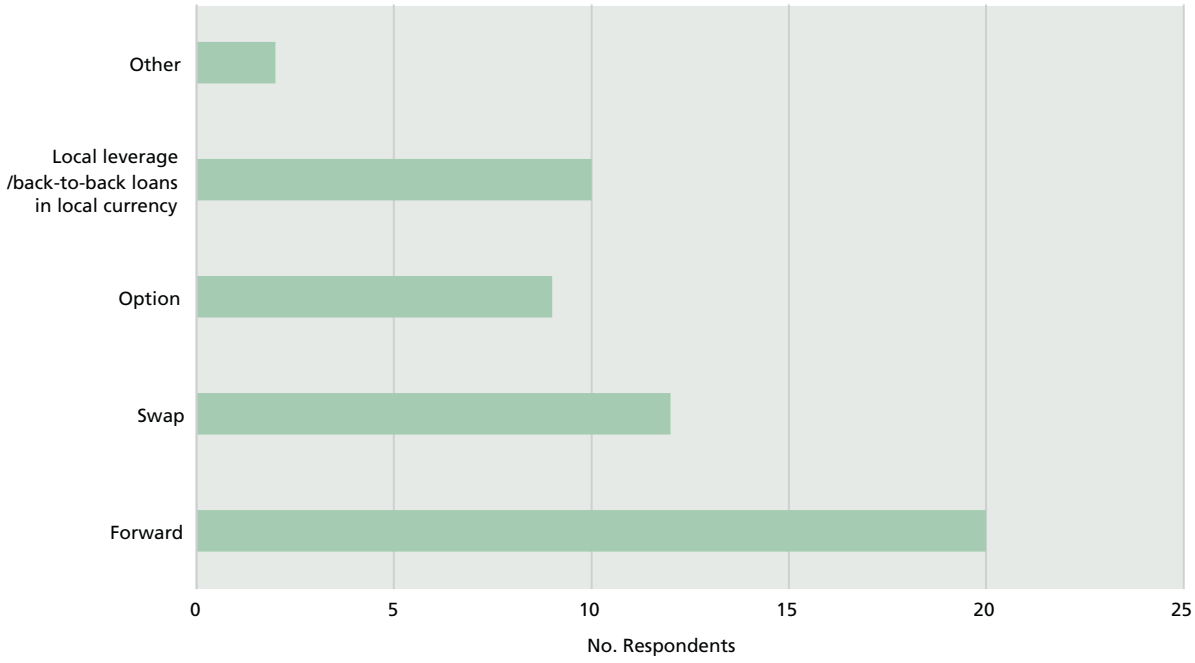
In terms of the choice of instruments used for hedging, this is typically a finance/treasury decision with cases where they have no involvement – left to the client or done by the real estate fund manager – relatively rare (only seven responses).

3.3 Instruments used and approaches to currency risk management

What is the process for determining currency management policy and which instruments and approaches are used for managing currency risk and why?

In terms of the motivations for hedging and why respondents choose specific instruments, the answers indicated a range of issues affecting these choices, as well as a range in the level of understanding about different instruments. Reasons given for using particular instruments in the survey and follow-up interviews ranged from "this is what we have always done", to "we want to avoid complexity"/a desire to use instruments they understand and that are relatively simple, to taking a pragmatic view as to what is the most cost effective mechanism in line with the goals of the client or the fund.

Figure 3.1: Choice of Hedging Instrument



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Whether a currency appears to be over- or under-valued (from the position of a currency relative to PPP and historic trends) appears to have a fairly limited impact on currency hedging, with just four respondents stating this forms part of their decision-making process and two others indicating it might do in some circumstances. However, as discussed further below, there does seem to be a resistance to hedging currencies where a significant depreciation is priced into currency hedging instruments.

The cost and availability of hedging instruments does have an influence on whether currency is hedged and which instruments are used – over half of the respondents to this question said it had an impact. Those that did not see this as significant were, typically, invested in developed markets where costs are relatively low and the instruments are readily available. Follow up discussions indicated a number of countries where hedging was felt to be difficult to do at scale, including Brazil, Mexico, Malaysia and India; although, in some cases, this appears to be as much about the differential in interest rates as true hedging costs (e.g. the transaction cost as reflected in bid-offer spreads).

Frequency of valuation generally was not seen as an important factor in influencing hedging, with only five respondents indicating it affected the instruments used. This is perhaps surprising, given that the suitability and cost-effectiveness of particular hedging vehicles depends critically on time horizon and frequency of payments. However, it may be that periodic payments in the non-domestic currency may not be repatriated but retained and rolled up, resulting in an accounting, not an economic, payment. If that is the case, however, it highlights the interaction between interest rate differentials and currency movements.

The majority of respondents (30 of the 44 responses to this question) incorporate currency risk explicitly in their investment decision-making process. In some cases this was reflected in the hurdle rate, in others the costs were expressly included to convert all cash flows into investment appraisals. However, further discussions indicated that, for some investors, there are certain markets where an adjustment for the priced in currency movement would suggest assets might not achieve the desired rates of return, leading to currencies being left unhedged.

Does expected holding period affect hedging decisions and is hedging affected by the time period over which performance is measured?

There was little evidence that holding period affects hedging policy or the instruments used, although two respondents indicated that for shorter term investments it is more desirable to hedge. Similarly, there was little evidence that the frequency of performance reporting and the time period over which it is measured has a significant influence on investor and fund manager hedging decisions. As noted above, this is somewhat surprising.

3.4 What is hedged?

Do investors hedge capital only or capital and income or income only?

Most investors hedge net asset value (NAV) in the foreign currency. In a few instances, invested equity was hedged but not the profit (or loss); generally, however, capital appreciation, as reflected in the NAV, is hedged. Only two respondents stated that they hedge income.

3.5 Other considerations on currency hedging

How do participants view the relationship between currency hedging and overall leverage?

Local leverage is seen as a natural hedge and is generally perceived to reduce the hedging requirement. There was no mention of currency hedging impacting on overall balance sheet leverage.

3. CURRENCY RISK MANAGEMENT PRACTICE: SURVEY AND FOCUS GROUPS

Are there different strategies for managing emerging market and developed market currencies?

As noted, the cost and availability of hedging instruments is a factor in deciding on currency hedging strategies. A number of respondents noted the difficulties in hedging emerging market currencies, e.g. Indian Rupee and Brazilian Real. The implied depreciation in some emerging markets was seen as a barrier to hedging.

Respondents were invited to comment on what other matters they thought needed to be addressed in respect of currency risk management in real estate investment. Issues mentioned included the need to consider whether a client is hedging currency elsewhere in their portfolio and the necessity of thinking about borrowing. Whether real estate captures unanticipated inflation and, hence, is an inflation hedge was also raised (although it was noted that high inflation countries might see a complete collapse).

The ANREV survey of investor currency risk management practice, undertaken concurrently with this study and with a substantially smaller sample size, was consistent with most of these findings but indicated more of a mix in instruments used, across swaps, options and forwards.

3.6 Focus Group Feedback

To gain further insights on these findings and to discuss issues arising with respect to currency risk management, focus groups were held in January 2018. These groups typically focused on larger organisations but included both real estate specialists and multi-asset managers.

Findings from the survey were shared with those attending and they were asked to comment on them as well as to explore whether there were other key issues that needed to be addressed. Focus group views generally were consistent with the findings from the survey but gave some more detail of current practice. In particular, the focus groups confirmed:

Widespread use of a central team and/or an external advisor.

The rationale for this was a combination of wanting to focus on the real estate aspects of transactions and of ensuring this specialist area was dealt with by experts, together with, importantly, a recognition that there are potentially significant costs involved and, thus, access to the appropriate market data feeds and insights are essential. This did raise the issue that those making real estate decisions may, in some cases, underestimate or not appreciate how currency affects real estate underwriting assumptions.

Forwards are the most widely used instrument

There is a desire to avoid complexity and forwards are seen as the easiest instrument to understand – both in terms of how they operate and in terms of pricing. They were also seen to offer the benefit of being easy to revisit regularly, e.g. every quarter, to check the desired hedging ratio (against theory, typically 100%) is in place. However, others believed swaps provide more effective hedging.

Hedging is normally done on NAV with income rarely hedged

The NAV is normally used for hedging (obviously where no leverage is used this is also GAV). Income is relatively rarely hedged. The NAV is seen as being the effective currency exposure.

3. CURRENCY RISK MANAGEMENT PRACTICE: SURVEY AND FOCUS GROUPS

The policies for currency hedging are subject to some flexibility

It appears that, whilst many respondents had highlighted how, even where there was a general philosophy about hedging, this is not applied in all cases – there is some flexibility. It emerged from the discussions that, even in developed markets, if there is a significant interest rate differential, reflected in FX instrument pricing, then there is a greater likelihood that currencies will be left unhedged. However, others had firmer policies where the obligation to hedge meant that developed markets, with significant depreciation priced in, may well become impossible to invest in in order to meet hurdle rates of return.

Differences in practice between emerging markets and developed markets

Emerging market currencies are less widely hedged than developed markets; this is despite the higher volatility and risk of emerging market currencies. The high cost mentioned in survey responses appeared to be particularly focused on the interest rate differential (which should, potentially, be reflected in yields and growth expectations for the higher interest rate emerging market). This therefore raised an issue that emerging market risk in global portfolios is potentially not fully understood and this is considered further in Section 5.

Other issues raised in the focus groups included:

Multi-currency funds, e.g. funds investing across several currencies

The discussions highlighted the need either to segment funds into distinct currency 'sleeves' or to make it unambiguous that currency is ***not*** being managed within the fund and it is up to clients to hedge their own exposure arising from investment in the fund, or that currency risk is hedged within the fund (making it clear to clients that this is happening).

Foreign currency leases

Markets where leases are denominated in another currency, e.g. Euro leases in Poland or USD leases in Mexico, raise the issue of whether these need to be hedged. For a Euro-denominated fund investing in a Polish property with a Euro lease the income (and that proportion of its value) does not need to be hedged. The extent to which the rest of the value needs to be hedged should reflect the extent to which the market is a Euro or a Zloty market. Leases denominated in another currency increase cash flow risk so this does not represent a full hedge from the local currency (for example, for a lease with dollar denominated rents in another non-USD location, if there is a substantial currency deterioration relative to USD, the tenant is likely to be more prone to delinquency and default).

4. SIMULATION EXERCISE

This section summarises the findings from a simulation exercise to explore how different instruments impact on returns and risk at an international real estate portfolio level and the effectiveness of currency hedging – further details on the method and assumptions are included in Appendix 4.

A forward-looking Monte Carlo simulation was used to explore how hedging affects risk and return. This used assumptions about expected return and volatility for key variables, then simulated the possible paths for all the key variables. This method is superior to historical analysis in two ways. Firstly, the investment decision is made in an ex-ante, expectation context; hedging decisions should not be based on ex-post historic data. Secondly, use of historical data for a defined time period treats a single, unique historical span as being representative of all possible futures; thus, there is no uncertainty.

The survey indicated most investors prefer to use either three-month rolling forwards and/or swaps to hedge their currency risk. Therefore, the effectiveness of hedging is compared by using those two financial instruments in the Monte Carlo simulation. The simulation is set up to explore the impact on international investment into the UK, but the same principles apply to international investment by UK-based investors. The assumption is of two types of investor who invest in the UK: US investors and European investors. Central bank interest rates are listed in Table A1.1 in Appendix 1. The US interest rate is higher than the UK's, whilst the European interest rate is lower than the UK's. As outlined in Appendix 1, a US investor who uses a forward to hedge would have a gain from carry and a European investor who uses a forward to hedge would have a cost of carry. The simulation results have a general implication for an investor who invests and hedges in a relatively higher or relatively low interest rate country. The assumed investment horizon is five years and there are three scenarios for the real estate return in the UK: 1) Normal; 2) Crash or Downside; 3) Boom or Upside. The use of these scenarios allows testing of the effectiveness of currency hedging during different stages of the real estate cycle, when values are broadly stable, falling or rising strongly.

The use of three hedging strategies was explored:

1) No hedging;
2) Hedging, using three-month rolling forwards; the principal of the forward contract is updated every three months according to the new appraisal (valuation) of the real estate portfolio. Transaction and settlement costs are included, as explained in Appendix 4.
3) Hedging, using a long-term swap to match the investment holding horizon. It is assumed the investor uses a swap to hedge the initial investment, not the exit value, since this is unknown at the time of investment. The transaction cost of the swap is considered, as explained in Appendix 4.

The simulation was run with 10,000 iterations, to obtain the distributions for the internal rate of return (IRR) as illustrated in Figure 4.1, the aim being to explore how the risk-adjusted returns differ between unhedged, rolling forward hedging and swap hedging. This can be tested by examining the coefficient of variation. Expected mean and standard deviation of the IRR distribution from the simulation are calculated and the coefficient of variation is simply the ratio of the standard deviation to the mean. The coefficient of variation therefore measures risk per unit of return – the lower the coefficient of variation, the less the portfolio risk per unit of return.

4. SIMULATION EXERCISE

Figure 4.1: Distribution of IRR

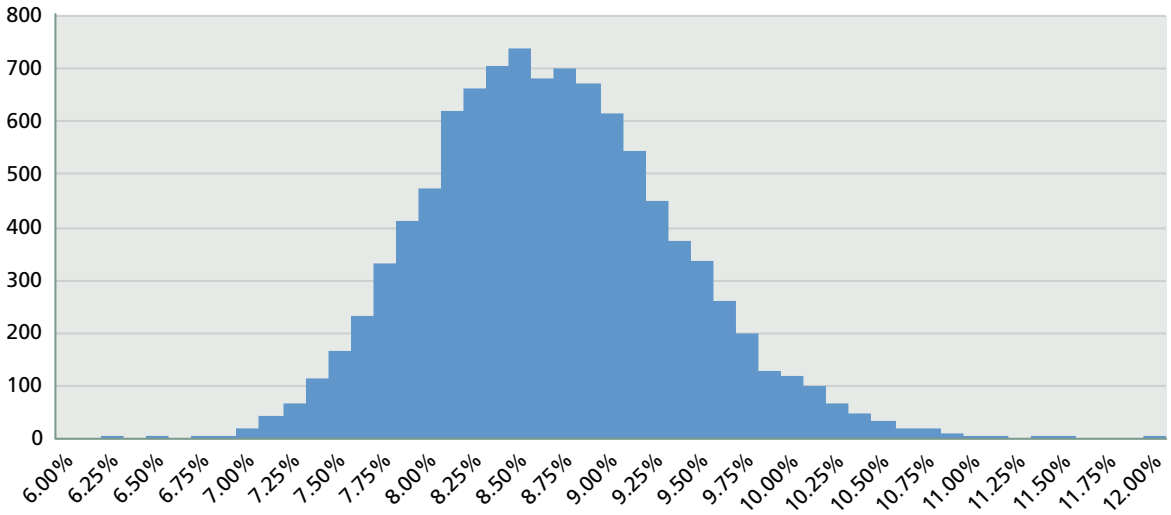


Table 4.1 summarises the simulation results for a US investor. Panel A presents the results of the normal real estate return case: the coefficient of variation is 0.039 using a swap to hedge, compared to 0.080 for the portfolio hedged using forwards, whilst the unhedged portfolio has a coefficient of variation of 0.451. Hence, the results indicate that both hedging methods markedly improve the return-risk profile of the investment and swap hedging outperforms rolling forward hedging. Since the rolling forward contract constantly changes the principal of the contract every three months and settlement is involved at the expiration of the contract, it brings some uncertainty to the cash flows. On the other hand, as the principal of the swap contract is fixed, the cash flow of the contract is certain at the expiration date. Furthermore, income is hedged as well by using the swap contract (although this does assume regular repatriation of intermediate cash flows).

Panel B presents the results of the boom/upside real estate return case; the results indicate that both hedging methods would improve the return-risk profile of the investment. In contrast to the normal case, rolling forward hedging outperforms swap hedging. Under the upside case, the value of the real estate portfolio increases substantially and the principal of the swap contract is based on the initial amount of investment; this leaves the investor with a significant amount of foreign currency cashflow unhedged (i.e. the difference between exit value and investment). Conversely, rolling forward contracts provide flexibility to adjust the principal and leave a minor amount of foreign currency cashflow unhedged. Some of the respondents from the survey indicated that the reason they prefer a rolling forward is its flexibility in such circumstances.

4. SIMULATION EXERCISE

Table 4.1: Monte Carlo Simulation Results for US Investor

Panel A: Normal Case			
	No Hedging	**Rolling Forward Hedging**	**Swap Hedging**
Mean	8.46%	8.61%	8.19%
Standard deviation	3.81%	0.69%	0.32%
Coefficient of variation	0.451	0.080	0.039
Panel B: Boom/Upside Case			
	No Hedging	**Rolling Forward Hedging**	**Swap Hedging**
Mean	13.48%	13.68%	13.66%
Standard deviation	3.98%	1.00%	1.31%
Coefficient of variation	0.295	0.073	0.098
Panel C: Crash/Downside Case			
	No Hedging	**Rolling Forward Hedging**	**Swap Hedging**
Mean	3.88%	4.05%	3.41%
Standard deviation	3.62%	0.43%	0.89%
Coefficient of variation	0.934	0.105	0.262

Panel C presents the results of the crash/downside case. The results are similar to the boom/upside case; both hedging methods would improve the return-risk profile of the investment and rolling forward hedging outperforms swap hedging. Under the downside case, the value of the real estate portfolio decreased substantially and the principal of the swap contract is based on the amount of investment, the exit value is not enough to honour the principal amount of the swap contract at the expiration date – the investor is left with a significant gap to settle the contract and has to buy British pounds from the spot market at this point in order to settle the contract. On the other hand, the flexibility of the rolling forward contract leaves a minor principal gap to settle the contract at the time of the exit.

In general, hedging by using currency derivatives improves the risk-return profile of the investment, but the choice of the hedging instrument depends on the pattern of real estate returns. During the normal period where the capital value of the real estate is relatively less volatile, hedging by swap contract is preferable. On the other hand, during the crash or boom period where the capital value of the real estate is relatively more volatile, hedging by rolling forward contract is preferable.

4. SIMULATION EXERCISE

Table 4.2 presents the simulation results for a European investor across the different market environments. The conclusions are similar to the US investor case, with both hedging methods improving the risk-return of the investment and with hedging using swaps out-performing rolling forward hedging during the normal real estate return case, whereas rolling forward hedging outperforms swap hedging in the upside and downside scenarios for the same reasons as in the US case. Returns in Euros are lower than returns in USD, reflecting the interest rate differential (cost of carry). Consequently, risk per unit of return, as captured by the coefficient of variation, is higher for European investors than US investors.

Table 4.2: Monte Carlo Simulation Results for European Investor

Panel A: Normal Case			
	No Hedging	**Rolling Forward Hedging**	**Swap Hedging**
Mean	6.83%	6.48%	6.56%
Standard deviation	3.65%	0.68%	0.30%
Coefficient of variation	0.534	0.106	0.045
Panel B: Boom/Upside Case			
	No Hedging	**Rolling Forward Hedging**	**Swap Hedging**
Mean	11.78%	11.46%	11.47%
Standard deviation	3.84%	0.99%	1.24%
Coefficient of variation	0.326	0.087	0.108
Panel B: Crash/Downside Case			
	No Hedging	**Rolling Forward Hedging**	**Swap Hedging**
Mean	2.39%	1.99%	2.08%
Standard deviation	3.54%	0.42%	0.84%
Coefficient of variation	1.480	0.211	0.403

5. INTERPRETATION OF RESULTS AND CONCLUSIONS

5.1 Issues arising

The analysis of currency movements highlights that currency volatility (risk) is normally substantial and that, whilst real exchange rates tend to mean revert, this is a slow process. This means that unmanaged currency risk will lead to significant short-term volatility in multi-currency real estate portfolios and that, over the medium term, currency may make the difference between achieving investor objectives or not. Consequently, there is a strong case for potential currency movements to be carefully integrated into investment decisions.

A number of approaches are possible to integrate currency into investment decisions. We would argue that if foreign currency cash flows are being modelled then the hurdle rate for investments should be adjusted to reflect that currency exposure (as suggested in prior research for the IPF). At the least, the hurdle rate employed should reflect the differential in risk free rates if the foreign exchange exposure is to be unhedged. If the core interest rate in the domestic currency is substantially higher (or lower) than that in the target market, it would be inappropriate to use the domestic proxy for the risk free rate, for example, since this neither reflects inflation differentials, nor the currency movements that interest rate parity relationships might imply.

Further, exchange rate movements (generally) add volatility over and above that experienced in the underlying real estate market and that needs to be reflected in risk premia, over and above anticipated currency appreciation and depreciation signalled by interest rate differentials. Historic data on currency movement between domestic and target countries (and the relationship between currency movements, inflation interest rates and the underlying market) will provide key information in deciding appropriate adjustments to targets, although cash flow-based modelling needs to be forward-looking and the past is an imperfect guide to future economic relationships.

Both of these considerations will have an impact on risk-adjusted return metrics, such as the Sharpe ratio. Thus, investors need to ensure that inputs fully reflect the returns, risks and interest rate structures in a consistent way, avoiding double-counting but ensuring that the foreign exposure is properly accounted for in reporting.

The decision to leave currency exposure unhedged will be driven by a number of factors. One might be the nature of the investment vehicle: for example, a fund that has international investors from a range of different countries and currencies would be unable to specify the optimal hedging ratio and strategy to meet the needs of all capital providers. Another might be obstacles to hedging in the form of high costs, unavailability of appropriate vehicles or illiquidity in hedging markets, rendering hedging impractical – an issue that is likely to be most prevalent in emerging markets or those lacking transparency. Allied to these is investment horizon: there are significant differences between the exchange rate risks of a short-run investor having a near-horizon exit planned, with repatriation of income and capital, and those of a long-term investor with no short-run pressures. In the latter case, the costs and liquidity of long-run currency management tools (and the additional risks of rolling over short-term instruments) may preclude hedging, even if there is no confidence that mean reversion in currency markets operates.

If, however, the currency risk is going to be fully (or close to fully) hedged, then the anticipated cash flows from the international investment can be converted into domestic currency. However, the direct hedging costs (and interest differentials) need to be integrated fully into the analysis to ensure that decisions and any comparisons across countries and between competing projects are appropriate.

5. INTERPRETATION OF RESULTS AND CONCLUSIONS

The decision whether hedging takes place at the real estate portfolio level or at the discretion of a multi-asset team or client has to be discussed and agreed with the client and it is obvious that responsibilities must be defined clearly. The desire by the real estate team, in many cases, for others to take responsibility for managing currency risk is understandable but should be balanced with an understanding of how currency might impact on the underlying performance of real estate investments and the relative costs of managing currency risk across different countries. Underwriting and analysis need to reflect this.

The survey and subsequent discussions identified that a number of organisations have sophisticated approaches to managing currency risk and a strategy that shows a clear understanding of how to manage it. However, even in those organisations when there is a policy in place to avoid currency risk, there are exceptions (such as markets where transaction costs are unacceptably high or where leases are denominated in a different currency, etc.). This pragmatism is appropriate provided the currency risk that remains is recognised and integrated into decision making. The flexibility to reflect a likely fall in values to ensure a currency is over-hedged, or to avoid hedging markets where the transaction costs are particularly high, makes sense at this practical level. However, not hedging currency risk simply because the interest differential means that currency hedging would lock in a lower return than if the currency stays at current levels is inconsistent with a policy that claims to not take currency risk. This raises issues about how currency is integrated into investment decision-making process and reflected in cash flow modelling.

In terms of understanding the costs of currency risk management, there does seem to be some confusion amongst some managers and investors. The transaction costs of currency hedging in developed markets are low but interest rate differentials can be large. This interest rate differential – the cost of carry – is not a real cost in that, if exchange rates move in line with those implied by the interest rate differential, then the currency gain on the underlying exposure will fully offset this cost of carry. For example, if Australian one-year interest rates are 4% above those in the UK, then this interest rate differential will be reflected in the one-year currency forward. The actual cost of the transaction to manage currency risk is likely to be c. 0.1-0.2% p.a. The actual movement in the currency will lead to a loss or gain from the forward, but should not be seen as a cost in the same way.

As noted, currencies are volatile and deviations from the expected path from purchasing power parity suggest that, without hedging, currency can have a significant impact on the performance and risk of international real estate portfolios. Although international open-ended and international closed-ended funds would have exposure to the impact from currency volatility, the former would be typically more sensitive to annual performance and risk. This, and the potential variability of cash flow, means that international open-ended funds are more likely to need to hedge currencies; and that forwards with their greater flexibility are more likely to be the appropriate instrument. For closed-ended funds there is likely to be more flexibility about the hedging instruments that are appropriate. As with other investors, there is a need for the objectives and risk tolerance to be clearly established.

5. INTERPRETATION OF RESULTS AND CONCLUSIONS

Emerging markets – typically higher growth, higher inflation markets with higher interest rates – present particular issues in terms of management of currency risk. Over the long term, these currencies might be expected to appreciate in real terms, which would suggest that, typically, there would be a long-term loss from currency hedging. From a return perspective, therefore, there is a stronger justification for not hedging currency. This is exacerbated by the higher transaction costs of hedging in currencies of emerging market countries. However, the volatility of these currencies means that, from a risk perspective, there is a stronger requirement to hedge. Consequently, this does suggest that these markets are more appropriate for longer term investors (and longer term closed-ended funds) with less sensitivity to short term issues and, hence, a greater tolerance for risk.

There is no guarantee that an emerging market will converge on a developed market's interest rate and inflation environments, hence careful consideration of institutional structure, transparency and governance issues is needed in these circumstances. To some extent, these factors will be reflected in the risk premia applied to emerging property markets, so care is needed to avoid double counting in adjusting for currency volatility. The issue of how different types of emerging markets should be treated, what is and what is not reflected in local risk premia and whether inflation and interest rate convergence affects appropriate currency hedging strategies, is an area that would merit further study.

5.2 Conclusions and recommendations

This research has focused on what real estate investment managers do in terms of current practice. The key conclusions and recommendations are:

i. **Most managers and/or investors undertake currency risk management or, in the case of managers, report currency exposures to clients so that they can make their own decisions about whether and how to manage currency risk.**

ii. **A range of sophisticated approaches are used to manage currency risk, including a range of hedging instruments (forwards, swaps and options).**

iii. There is a range of approaches to managing currency risk, from those that take full responsibility to those that see this risk as the responsibility of others (clients or a central team). **It is not surprising that there is a range of approaches to currency risk management but it is clearly important that the extent to which currency risk is managed or not is fully understood by clients and managers alike.**

iv. The research has highlighted that, whilst most managers indicate that foreign exchange instruments are used to manage currency risk, there is variation in how these are used, with a significant bias away from managing currency risk where there is a 'cost' of doing so, e.g. where the foreign currency is expected to depreciate relative to the domestic currency. In effect, this means that currency management is being used selectively to boost returns, as well as managing risk. Given longer term evidence on how currencies move relative to interest rate differentials and economic growth, there is a logic to leaving currencies of faster growing, higher interest rate countries unhedged, particularly where transaction costs of hedging are high, but again there is a need for this risk to be clearly understood and recognised. Currencies that are expected to depreciate typically do not do so smoothly and, hence, currency can have a substantial effect on the delivered returns. Complete hedging of currency risk is rare and managers should recognise that there normally remains an element of currency risk in portfolios. **It is essential to establish the circumstances when hedging of currency risk is undertaken and when it is not.**

5. INTERPRETATION OF RESULTS AND CONCLUSIONS

v. There were some concerns expressed that real estate fund managers do not understand the full costs of hedging or the impact of currency risk on portfolios. **There is a need to understand the costs of currency risk management.** A clear distinction between the transaction costs (the spread) for currency hedging instruments, the impact of the interest rate differential (embedded in forward pricing) and other costs might be helpful in integrating currency risk management into investment decisions. This also raises the issue of the need for more understanding of the wider portfolio implications of additional currency risk. Real estate fund managers should ensure they work sufficiently closely with those making currency decisions and clients so that investment decisions reflect the wider portfolio impact.

vi. In the implementation of hedging – e.g. the purchase of forwards, swaps or options – access to live market data and pricing is required to minimise transaction costs. Which is the most appropriate instrument will depend on a broad range of factors and **specialist expertise or advice is needed** (whether internal or external).

vii. There was a suggestion that leverage is sometimes higher than it would have otherwise been in order to reduce foreign exchange risk. This appears, simply, to be amplifying one set of risks (property market and property specific risks) to reduce another (currency risk).

viii. Emerging markets bring particular currency issues because, over the long term, hedging currency risk in high interest rate and fast growing economies is normally likely to have a significant negative impact on returns whilst these currencies are more volatile and currency movements can have a particularly large impact on the delivered returns. In addition to the cost from the interest rate differential, with less developed foreign exchange markets, instruments to manage currency risk are more expensive and, in some cases, not available. Consequently, for emerging markets where foreign exchange markets are poorly developed, real estate investors have limited ability to manage currency risk. For emerging markets where hedging of currency risk is feasible, the hedging decision will need to reflect similar issues to those in developed markets.

ix. There are no simple answers to what a real estate investor or manager should do with respect to currency risk management, given it depends upon the investor's objectives, their tolerance to different risks, their domicile, the outlook for specific markets, the costs involved in hedging risk and other factors. Best practice is, therefore, to have **a clear and transparent policy that sets out what is hedged and what is not, and why, and in what circumstances variation is allowed.** In addition, **information on currency exposures and hedged positions should be gathered to enable risk to be measured and the success of managing currency risk should also be monitored,** e.g. whether currency hedging undertaken has removed the impact of currency movements in line with expectations.

x. For **managers**, they need to make clear to clients (i.e. investors) what they intend to do with respect to currency hedging and report in a timely manner both unhedged and hedged currency exposures.

xi. For **investors,** potential currency effects on returns and risk need to be integrated explicitly in the investment decision making process. Investors need to understand what managers will do with respect to currency and make sure it is aligned with their policy and that they will receive the necessary information to hedge currency exposures.

APPENDIX 1: FOREIGN EXCHANGE HEDGING INSTRUMENTS – EXPLANATION AND KEY TERMS

Exchange rate quotation

An exchange rate can be quoted directly or indirectly. A direct quote is a foreign exchange rate quoted as the domestic currency per unit of the foreign currency. An indirect quote is a foreign exchange rate quoted as the foreign currency per unit of the domestic currency. For example, from the US investor's perspective, the direct exchange rate of the US dollar against the British pound is 1.39$/£, the indirect exchange rate of the US dollar against the British pound is 0.7194£/$. The exchange rates used in the formula of this study are all direct quotations.

Spot exchange rate

The current exchange rate at which a currency pair (e.g. USD/BP) can be bought or sold for immediate delivery, i.e. the rate at which USD would convert to GBP today.

Forward contract

A forward contract is a customised contract between two parties to buy or sell an asset at a specified price on a future date. Forward contracts are negotiated contracts available over-the-counter and usually drawn between two financial institutions or between a financial institution and one of its clients. In case of the currency forward, the forward contract is an agreement between two parties to exchange a specified amount of a currency at a specified exchange rate (called the forward rate) on a specified date (called the delivery date) in the future. Forward contracts are typically for an amount of $1 million or more and are therefore typically used by larger companies and investors and are not normally used by consumers or small firms. In cases where a bank does not know the investment organisation well (or does not fully trust it), the bank may request it to make an initial deposit as assurance of intending to fulfil its obligations. Such a deposit is called a compensating balance and typically does not pay interest. The most common forward contracts are for 30, 60, 90, 180 and 360 days, although other periods are available.

Like the spot rates, forward rates have a bid-ask spread, it is around 0.04% for developed market currencies. For the same currency pair, the spread tends to be wider for forward contracts that have an obligation further into future – so the bid-ask spread on a 180-day forward contract is normally higher than on a 30-day forward contract. The market for shorter-term forward contracts tends to be more liquid, which means that banks can more easily create offsetting positions for a given forward contract.

Equation A1.1: Relationship between Spot Rate and Forward Rate

$$F_0 = S_0\left(\frac{1+r^*}{1+r^F}\right)^t$$

Where S_0 is the spot price at time 0, F_0 is the forward price at time 0. r^F is the annual foreign currency interest rate, r^* is the domestic currency interest rate and t is the number of years.In case of continuous compounding interest, the relationship between spot rate and forward rate is:

Equation A1.2:

$$F_0 = S_0 e^{(r^*-r^F)t}$$

APPENDIX 1: FOREIGN EXCHANGE HEDGING INSTRUMENTS – EXPLANATION AND KEY TERMS

The 'cost of carry' reflects interest rate differentials. By holding a low interest rate currency, there is a 'positive cost of carry' relative to a higher interest rate currency, which should normally be offset by the gain from underlying currency movements. For example, if Japanese interest rates are zero and US interest rates are 2%, holding Japanese cash has a cost of carry of 2%. The forward will price in an appreciation of 2% of JPY/USD, reflecting the differential in interest rates. So, if the current rate is 110 JPY/USD, a one-year forward would be priced at 107.8, reflecting this interest rate differential. It should be noted that the cost of carry is not a real cost, in that, if exchange rates move in line with those implied by the interest rate differential, then the currency gain will fully offset this cost of carry.

Exchange rates typically do not exactly follow the path implied by interest rate differentials. This can create a loss or gain on the forward. Taking the example above for a Japanese investor with a USD to JPY expected movement of 2%, if the exchange rate is unchanged (110) at settlement date then a Japanese investor would have agreed to exchange dollars for yen at a rate of 107.8 and so would have a loss on the currency forward (and a currency gain on their underlying US assets). If the dollar has weakened to 90, a Japanese investor would make a substantial gain on the currency forward offsetting the fall in value in JPY terms of underlying US assets.

Table A1.1 summarises details of the one-year interest rate for six developed market currencies as at 31 December 2017, showing the current central bank rate for each currency and its spread to UK currency. From the non-UK investor's perspective, where the domestic currency interest rate is lower than the UK's, there will be a cost to hedge, in the sense that the forward prices in this interest rate differential – the cost of carry.

Table A1.1: Interest Rates and Differentials as at 31 December 2017

Currency	EUR	JPY	CHF	AUD	HKD	USD
Current central bank interest rate	0.00%	-0.10%	-0.75%	1.5%	1.5%	1.5%
Spread to GBP	-0.5%	-0.6%	-1.25%	1.0%	1.0%	1.0%
Pay or receive carry from non-UK investor's perspective	Pay	Pay	Pay	Receive	Receive	Receive

Forward contracts are typically for standardised value dates, e.g. one month, three months or a year. By using a forward contract that covers all the foreign currency exposure, an investor can eliminate currency risk in the short-term. However, to apply this hedging strategy in the long-term, the investor needs to roll over the forward contract at maturity. When a forward hedge is rolled over, the investor who wants to continue to hedge the investment must close out the position held by the forward contract by using the spot exchange rate market immediately prior to expiry of the forward contract. That is, the old contract is settled with the present spot rate and a new forward position is created for the next period. In the process of rolling over, therefore, the investor either gains or lose from settling the forward contract; this is called settlement cost. Furthermore, every time the investor completes the roll over, a transaction cost is again incurred.

APPENDIX 1: FOREIGN EXCHANGE HEDGING INSTRUMENTS – EXPLANATION AND KEY TERMS

Options

Currency options provide the right to purchase or sell currencies at specified prices within a specific period of time. Currency options are usually traded on an exchange, but there is also an over-the-counter market whereby currency options are offered by commercial banks and brokerage firms. The buyer of a currency option pays a premium, which reflects the price to acquire the option. Currency options are classified as either calls or puts. A currency call option grants the right to buy a specific currency at a specified price within a specific period of time. The price at which the owner is allowed to buy that currency is known as the exercise price or strike price. A currency put option grants the right to sell a specific currency at a specified price within a specific period of time.

Currency options that give the rights to buy or sell with flexibility as to when exercised during the option term are called American options. European currency options are similar to American options, other than that that they can only be exercised on the expiration date – at the end of the option term – and cannot be exercised before the expiration date. The pricing formulae of European currency options are:

Equation A1.3:

$$c = S_0 e^{-r^* T} N(d_1) - K e^{-r^F T} N(d_2)$$

$$p = K e^{-r^F T} N(d_2) - S_0 e^{-r^* T} N(d_1)$$

Equation A1.4:

$$d_1 = \frac{\ln\left(\frac{S_0}{K}\right) + (r^* - r^F + \sigma^2/2)T}{\sigma\sqrt{T}}$$

$$d_1 = \frac{\ln\left(\frac{S_0}{K}\right) + (r^* - r^F - \sigma^2/2)T}{\sigma\sqrt{T}} = d_1 - \sigma\sqrt{T}$$

c is the premium for call option, p is the premium for put option, S_0 is the direct spot exchange rate for US investor, r^F is the annual foreign currency interest rate, r^* is the domestic currency interest rate, K is the strike price, T is time to maturity in number of years, σ is the volatility of the spot rate (annualised).

Option prices depend on currency volatility, term, the strike price relative to today's exchange rate and interest rates. More volatile currencies are more expensive to buy options for.

APPENDIX 1: FOREIGN EXCHANGE HEDGING INSTRUMENTS – EXPLANATION AND KEY TERMS

Currency Swap

A currency swap is an agreement between two parties to exchange a series of cash flows denominated in one currency for those denominated in another for predetermined period of time. In its simplest form, a currency swap involves exchanging principal and interest payments in one currency for principal and interest payments in another. A currency swap agreement requires the principal to be specified in each of the two currencies. The principal amounts in each currency are usually exchanged at the beginning and at the end of the life of the swap. There are three main types of currency swaps:

1. Fixed-for-fixed: the interest rate in both currencies is fixed;
2. Fixed-for-floating: one party pays fixed interest in one currency and the other party pays floating interest in another currency; and
3. Floating-for-floating: the interest rate in both currencies is floating.

To illustrate how a currency swap works, consider the following example:

Firm A, a UK company, needs to borrow $65 million for five years to purchase an office building in the US. Firm B, a US company, needs to borrow £50 million for five years to invest in UK. Suppose Firm A can borrow GBP at 7% and Firm B can borrow USD at 4%. By entering into a swap agreement, the US company can borrow US dollars for the UK company and the UK company can borrow British pounds for the US company. The US company services the interest payments on the loan in British pounds and the UK company service the interest payments on the loan in US dollars.

There are three key stages in the process:

1. Initial change of principal

   Firm A raises £50 million in the UK and Firm B raises $65 million in the US. Both companies exchange loans at an agreed exchange rate. In this example, the exchange rate is £1=$1.3. Firm A receives $65 million and Firm B receives £50 million. The exchange rate will usually be determined from the spot rate between the two currencies.

2. Periodic interest payments

   As part of the agreement, the company needs to pay the counterparty regular interest payment in the counterparty's currency. In this example, we assume it is a fixed-for-fixed swap contract and Firm A pays 4% interest on $65 million each year and Firm B pays 7% on £50 million each year.

3. Maturity and re-exchange of principal

   On maturity, both parties will re-exchange the original principal amounts. In this example, after five years, Firm A repays £65 million to Firm B and receives £50 million in return.

It is important to note that the amounts of principal that are re-exchanged at the maturity of the currency swap agreement are the same as those exchanged initially. There is no adjustment for movements in the exchange rate over the course of the agreements. As a result, the company has to recognise the five-year foreign exchange liability and the possibility that it could make a loss on the transaction.

APPENDIX 1: FOREIGN EXCHANGE HEDGING INSTRUMENTS – EXPLANATION AND KEY TERMS

Since two parties pay different interest rate, it seems that the party paying the higher interest rate is worse off. In fact, currency swaps can be motivated by comparative advantage. To illustrate this, we further assume that Firm A can borrow US dollars at 9% and Firm B can borrow British pounds at 6%, as shown in Table A1.2. Firm A has a comparative advantage in borrowing British pounds (7/9 < 6/4), while Firm B has comparative advantage in borrowing US dollars (4/6<9/7). It does not matter that Firm B could borrow British pounds at a less rate than Firm A, this only means it has an absolute advantage in borrowing in both currencies.

Table A1.2: Illustration of Borrowing Rates

	USD	GBP
Firm A	9%	7%
Firm B	4%	6%

Finding two companies that need the same amount of money for the same time period can be very difficult. Therefore, financial intermediaries play a major role in facilitating currency swaps. A corporation usually enters into a currency swap with a bank as its counterparty, then the bank will find another corporation to offset the contracts. The bank gains the bid-ask spread on the swap for both currencies. Furthermore, the bank charges 2% on the initial loans in up-front fees.

APPENDIX 2: LITERATURE REVIEW

This appendix reviews the literature around currency with respect to risk management, firstly with respect to companies in general, secondly in the investment literature and, finally, specifically in the context of international real estate investment.

General industry practice for hedging and currency risk management

Multi-national corporations (MNCs) are defined as firms that engage in some form of international business, for example, a firm incorporated in one country that has production and sales operations in several other countries. The manager of an MNC will conduct international financial management to maximise the value of the firm. Since business activities in a foreign country could affect the cash flow in domestic currency terms, i.e. the cost of capital and value of the firm, one important task of international financial management is managing currency risk. According to the literature, there are three main currency risk hedging method for MNCs: 1) operational hedging, which involves the relocation of production faculties to achieve a better alignment of costs to revenues; 2) natural hedging, which involves financing an operation in local currency; and 3) financial derivative hedging, which involves purchasing currency derivatives. Previous empirical studies have examined whether MNCs hedge currency risk, how different hedging methods are incorporated and the effectiveness of currency hedging.

Geczy, Minton and Schrand (1997) examined the determinants of corporate use of currency derivatives of US firms. They found that firms with greater growth opportunities and tighter financial constraints are more likely to use currency derivatives. Firms with extensive foreign exchange rate exposure and economies of scale in hedging activities are also more likely to use currency derivatives. Allayannis and Ofek (2001) examined whether US non-financial firms use currency derivatives for hedging or for speculative purpose. Their results suggest that US non-financial firms use currency derivatives for hedging to reduce their exchange rate exposure and that likelihood of using currency derivatives increases with firm size, research and development (R&D) expenditures, and exposure to foreign sales or foreign trade. Hagelin and Pramborg (2004) investigated the risk-reducing effect of foreign exchange hedging for a sample of Swedish firms. They found a significant reduction in foreign exchange exposure from the use of financial hedges. The evidence suggests that the usage of foreign-denominated debt, as well as currency derivatives, reduce a firm's foreign exchange exposure. Zhou and Wang (2013) examined the effect of the use of currency derivatives for UK firms. They found that UK firms use derivatives to hedge against the risk of unfavourable exchange rate movements and the hedge is effective in reducing a firm's risk exposure.

The above studies show evidence of using financial derivative hedging and the effectiveness of reducing currency risk. Other studies have been conducted comparing operational hedging or natural hedging with financial derivative hedging. Elliott, Huffman and Makar (2003) examined the relationship between the use of foreign-denominated debt (FDD) and foreign currency derivatives (FCD) in hedging for US firms. They showed that FDD is negatively related to the use of FCD. Essentially, if more debt is used in the foreign country then foreign currency derivative use is reduced. Hutson and Laing (2014) examined the relationship between operational hedging and financial hedging for US firms. Operational hedging was measured by the corporation's multi-national operations and risk reduction arose from currency diversification across its international revenue streams. They concluded that many highly operationally hedged firms do not use foreign currency derivatives as risk management tools, seeing their international sources of revenue as providing a natural hedge.

APPENDIX 2: LITERATURE REVIEW

Previous empirical studies showed that MNCs use a range of different hedging methods to mitigate currency risk but, in order to understand the hedging decisions in detail, several survey-based studies have been conducted. The main purpose of these surveys was to attempt to identify whether the mangers comprehended their currency risk profiles, the decision and purpose of currency hedging, how hedging was implemented and, specifically, what instruments firms used.

Loderer and Pichler (2000) examined the risk management policies of industrial firms in Switzerland. Based on a questionnaire, their results showed firms were unable to quantify their currency risk profile and, somewhat surprisingly, they appeared to think they did not need to know this. This puzzling conclusion might be explained by the use of on-balance sheet instruments (local loans, operating adjustments) or contractual clauses that reflected currency movements.

Batten, Mellor and Wan (1993) investigated the foreign exchange product and risk management preferences of Australian firms. They found that Australian firms used derivative products extensively for risk management, in particular options and swaps, in addition to spot and forward transactions.

Marshall (2000) surveyed the foreign exchange risk practices of large UK, USA and Asia Pacific MNCs. The results showed statistically significant differences in the importance and objectives of foreign exchange risk management. For UK and US MNCs, the main objective of managing foreign exchange risk was to seek certainty of cash flow while, for a higher proportion of Asia Pacific MNCs, their main objective was the minimisation of fluctuations in earnings. The majority of Asia Pacific MNCs ranked foreign exchange risk management as equally or significantly more important than business risk management, whereas most of the UK and US MNCs ranked foreign exchange risk management as equally important as business risk management and one-third of US MNCs rated foreign exchange risk management as marginally more important than business risk management. This greater emphasis on FX risk management may be explained by the fact that Asia Pacific and UK MNCs rely on a higher degree of overseas business. In terms of which hedging instruments were used, US and UK MNCs were seen to prefer forward contracts and currency swaps compared to currency options or exchanged-traded instruments, e.g. currency futures. Asia Pacific MNCs were more likely to use exchange-traded instruments. Furthermore, the size and the industry sector were important determinants of the use of financial hedging instruments.

Brown (2001) focused in detail on foreign exchange risk management at a single, large, multi-national corporation. The study was based on an investigation of HDG Inc, a US-based manufacturer of durable equipment. The results suggest that the main motivation factors for managing foreign exchange risk were smoothing earnings, facilitating internal contracting and obtaining competitive pricing advantages in the product market. HDG had a strong preference for using options to hedge currency positions. This was seen to be primarily because of accounting treatment and competitive pricing concerns. Moreover, for some illiquid currencies for which options are less viable, HDG would rather not hedge at all than use forwards.

Bartram (2007) also focused on in-depth analysis of the foreign exchange exposure of a large non-financial firm. The study was based on the German multi-national company VEBA AG, a conglomerate with a high degree of industrial diversification. By analysing data, including cash flows, derivatives, and foreign currency debt, the results showed that the operating cash flows of the firm were significantly exposed to exchange rates but that corporate hedging mitigated this exposure – that is, the international diversification of the firm made foreign exchange rate risk exposure at the aggregate holding company level insignificant.

APPENDIX 2: LITERATURE REVIEW

This literature highlights a number of issues relevant to currency hedging by real estate investors:

- Local financing (local leverage) is used to reduce currency exposure.
- Financial derivatives are used more extensively by those with tighter financial constraints and by those with more expertise in using derivatives.
- Truly global businesses with internationally diversified revenue in many currencies may see their international diversification as providing a natural hedge against currency fluctuations.
- The rationale for hedging in many companies is to smooth fluctuations in earnings, e.g. reduce uncertainty.
- Currencies that are more expensive or difficult to hedge may be left unhedged rather than bear the additional costs in these markets.

Investment management – equities and bonds, etc.

Industry practice and advice with respect to currency risk management varies widely from full hedging, through currency overlay strategies and partial hedging to naked exposure (no hedging) with the suggestion that it depends on the investor's objectives, location, risk tolerance and other factors including their understanding of currency risk. Standard investment management textbooks such as Bodie, Kane and Marcus[4] note that exchange rates are not highly correlated and, hence, exchange rate risk will, to a large extent, be diversified away in globally diversified portfolios. They also note that a perfect hedge is not possible unless the foreign currency rate of return is known. This is part of the rationale for some in the industry to argue in favour of hedging bonds but leaving equities unhedged.

Perold and Schulman (1988) analyse the effect of currency hedging on the risk of multi-country equity and bond portfolios from a US investor's perspective. Their study considers the stock and bond markets of Japan, the UK and Germany using equity indices and Salomon Brothers non-US bond indices. Assuming currency returns are zero in the long-run and correlation of currencies with other asset classes are close to zero on average, by analysing the risk of various hedged and unhedged portfolios, they show that full hedging of currency risk could reduce risk without affecting returns. They proclaim currency hedging as a 'free lunch' for investors. Froot (1993) re-examines the logic and evidence behind the Perold and Schulman (1988) study. He argues that the free lunch for hedging is a short-horizon argument and it generally applies only if real exchange rates follow random walks. In the long-run, the mean reversion in real exchange rates implies that purchasing power tends toward parity and real exchange rates over time remain roughly constant. On the other hand, hedged returns over the long-run are dominated by fluctuations in cross-country differences in unexpected inflation and real interest differentials. He concludes that the hedging ratio depends on the investment horizon; full hedging is not optimal over the long-run.

Schmittman (2010) examined the benefits from hedging the currency exposure of international investments in single- and multi-country equity and bond portfolios from the perspectives of German, Japanese, British and American investors. Over the period 1975 to 2009, hedging of currency risk substantially reduced the volatility of foreign investments on a quarterly basis. Contrary to the Froot (1993) study, he found that the investment horizon has limited effect on the decision about currency hedging. Whilst Froot argued that mean reversion in real exchange rates would provide a 'natural hedge' over long return intervals, he examined investment horizons ranging from one quarter to five years and did not find evidence suggesting that hedging ratios should be significantly lower for longer term investment.

[4]Essential of Investments.

APPENDIX 2: LITERATURE REVIEW

Whilst hedging can reduce risk, there are several problems around implementing the hedging strategies. Eun and Resnick (1988) highlighted the problem with estimation risk, that is, the return on foreign equity investment is uncertain at the time of investment and, thus, investors can only hedge the expected return not the actual return. They proposed two methods simultaneously to reduce currency risk: multi-currency diversification and hedging via forward exchange contracts. They showed that hedging strategies that aim to control both estimation and exchange rate risks almost consistently outperformed the US domestic portfolio in out-of-sample periods. Lioui and Poncet (2002) pointed out that hedging currency risk using forwards incurred additional interest rate risk, thus the optimal hedging ratio is significantly smaller than one.

Campbell et al. (2010) proposed an optimised method to hedge currency risk in portfolios of international equities. Based on the data over the period 1975 to 2005, they found that Australian dollar, Canadian dollar, Japanese yen, and British pound were positively correlated with world stock markets. The euro, Swiss franc and US dollar were negatively correlated with the world equity market. They suggested, therefore, that international equity investor could minimise their equity risk by taking short positions in the Australian and Canadian dollar, Japanese yen and British pound, and long positions in the US dollar, euro and Swiss franc. Barroso, Menichetti and Reichenecker (2017) re-examined the hedging approach of Campbell et al. (2010) in a realistic setting, which incorporated transaction and rebalancing costs, margin requirements and estimation uncertainty. They confirmed that the method proposed by Campbell et al. (2010) was still robust in reducing risk, but the Sharpe ratio was lower than a purely domestic portfolio investment for US investors, which suggested that the benefits of international diversification are not necessarily viable for investors.

The key insights arising from this literature on currency risk management of equities and bond portfolios for this study include:

- The lack of correlation in currencies means that global diversification reduces currency risk compared to a narrow range of international markets in portfolios.
- A perfect hedge is not possible unless the foreign currency rate of return is known. In effect, investors should recognise currency risk is inevitable for 'growth' assets. Uncertainty of cash flows makes achieving a perfect hedge practically impossible.
- The optimal hedging ratio may be less than one, e.g. for a UK investor with 500m AUD of exposure to Australian assets it may be better to hedge 300 or 400m of AUD exposure than 500m or nothing.
- Long term 'natural' hedging through currencies reverting to mean real exchange rates is unreliable.
- There is an argument that optimal hedging may depend on how underlying markets interact with currency movements. Currencies that perform strongly when underlying markets perform strongly may require a different approach from those where the correlation between the local market and its currency is weak or negative.
- Industry practice and advice with respect to currency risk management vary widely from full hedging, through currency overlay strategies and partial hedging, to naked exposure (no hedging) with the suggestion that it depends on the investor's objectives, location, risk tolerance and other factors, including their understanding of currency risk.

APPENDIX 2: LITERATURE REVIEW

Real estate industry

Modern portfolio theory (MPT) suggests that mean-variance portfolio efficiency, e.g. reducing risk for a given level of return or increasing returns for a given level of risk, will typically be enhanced by investments with low correlations with existing assets. Empirical findings from research in the early 1990s indicated that US real estate offered foreign investors no benefits in terms of mean-variance portfolio efficiency (see Ziobrowski and Curio, 1991; Ziobrowski and Boyd, 1991; and Ziobrowski and Ziobrowski, 1993, 1995).

Ziobrowski and Curio (1991) compared different efficient frontiers for British and Japanese investors. The benchmark efficient frontier only included domestic financial assets and domestic real estate, they then added US financial assets and US real estate to construct the second and third efficient frontiers. The results indicated that US real estate does not improve foreign portfolio performance. The volatile exchange rate fluctuations induced a level of risk in assets that offset potential diversification benefits to foreign investors. Ziobrowski and Boyd (1991) followed a similar approach, but added US-dominated debt to hedge exchange rate risk. Leveraged US real estate provided no significant diversification benefits to either British or Japanese investors. Although leverage reduced the foreign exchange risk, it simultaneously induced higher levels of ordinary financial risk. Ziobrowski and Ziobrowski (1993) and Ziobrowski and Ziobrowski (1995) used a similar approach, but hedged foreign exchange risk with currency options and currency forwards. The results showed that hedging using currency options or currency forwards hedging in the long-term investment horizon did not provide benefit to the investors. When options were used over long-term holding periods, the periodic cost of the option premiums offset the gain. When forwards were used over long-term holding periods, the inclusion of foreign assets did not provide a diversification benefit. Options and forwards are usually short-term contracts; swaps, on the other hand, tend to be longer-term contracts. Ziobrowski, Ziobrowski and Rosenberg (1997) adopted a similar approach by using a currency swap to hedge foreign exchange risk; again, the results showed no diversification gains for the foreign investor

The above studies did not consider roll-over costs and assumed that the financial contracts closed out at the end of each year without incurring settlement or transaction costs. Worzala (1995) examined the use of forward contracts for a US investor purchasing UK real estate. She showed that forward contracts appeared to improve the risk-adjusted return (measured by the coefficient of variation) for the US investor. However, when the transaction and roll-over costs of the three-month forward contracts were included, the returns were lower and the volatility increased sharply; the volatile settlement cost substantially increased the risk level. This research suggested that hedging with rolling forwards would be inappropriate for trying to hedge against adverse exchange rate fluctuation for a long-term investment.

Previous research was typically based on portfolio-based indices. This may be misleading since most investors would be exposed to tracking error and specific risk, given the heterogeneity of private real estate performance and the small number of foreign properties held. Worzala, Johnson and Lizieri (1997) examined a single UK real estate investment made by a US investor, held for a five-year period. They used Monte Carlo simulation to test the impact of exchange rate fluctuations on the anticipated cash flow and whether investors benefited from using currency swaps. The results indicated that hedging using currency swaps can improve risk-adjusted returns. Johnson et al. (2006) built on an approach adopted by Worzala, Johnson and Lizieri (1997); in addition to allowing exchange rates to vary across time, this study also allowed the rental growth rate and the capitalisation rate to vary. The results indicated that hedging the initial investment improved the risk-adjusted return.

APPENDIX 2: LITERATURE REVIEW

Hoesli et al. (2004) analysed the impact of including direct real estate in portfolios of financial assets in each of seven countries (the US, UK, France, Netherlands, Sweden, Switzerland and Australia). The results are interesting: not all nationalities needed to hedge their currency risk. The US and UK investors had better performance from unhedged mixed-asset portfolios, while investors in some of the smaller countries gained additional benefits by taking on a forward contract hedging strategy.

Newell and Macintosh (2007) conducted a survey-based study to understand the hedging strategies of Australian listed property trusts (LPT). The results showed that LPTs employed a wide range of hedging strategies, including natural hedging, use of currency forwards to hedge the income component and use of cross-currency swaps to hedge capital components.

Newell and Lee (2017) examined the significance of currency risk and its management for European non-listed real estate funds. A survey of INREV investor members showed that investors applied a range of currency risk management strategies. This highlighted that hedging was done at different levels, e.g. real estate portfolio level (28%[5]), asset by asset (28%), multi-asset portfolio (24%). Three-month continual currency hedging was the preferable strategy and the preferred hedging instrument was currency forwards. A range of hedging ratios were targeted, typically varying from 50% to 100% of NAV. Historical analysis and Monte Carlo simulations were adopted to examine the effective of different hedging ratios. The optimal hedging ratio varied under different conditions across different portfolios, demonstrating a 100% hedging ratio was not always optimal.

The IPF hurdle rate study, 2017, touched on how foreign investment was integrated into the investment decisions. This noted that, in appraising projects "***25% of participants discounted the foreign currency cash flows using a hurdle rate specific to that country or specific investment, 21% translated the foreign currency cash flows of the project into home currency by using forward rates and used the domestic hurdle rate. The other participants responded that this was either not applicable as they did not have foreign investments, or they:***

- *used a basket of currencies as part of a global balanced portfolio;*
- *implemented a strategy of underwriting in local currency but looked at foreign exchange risk separately;*
- *made a decision on currency hedging based on a fund's risk appetite; used benchmark rates at the start of each year;*
- *raised funds in foreign currency and appraised opportunities in the foreign market, to avoid currency fluctuation."*

The study noted that larger managers may use a currency overlay strategy at a multi-asset level whilst smaller funds and real estate specialists might need to approach hedging and currency risk more directly at project level. The study also noted that there may be some confusion around currency impact and the relationship with inflation and, by implication, these risks are managed.

The key insights arising from this literature for this study include:

- Currency plays an important role in determining the overall contribution of international real estate portfolios to risk and return at a wider portfolio level.
- In general, hedging appears to improve risk adjusted returns for international real estate portfolios.
- The instruments used and the approach need to reflect the longer term uncertain nature of real estate values and cash flows.
- There may be issues in the consistency with which countries and their associated currency risks are integrated into investment processes.

[5] 28% of the respondents hedging their currency risk at the real estate portfolio level.

APPENDIX 2: LITERATURE REVIEW

Respondent Profile

As illustrated in Figure A3.1, the respondent organisations covered a range of domiciles with over 60% with HQs outside the UK.

Figure A3.1: Contributor Organisation Domicile

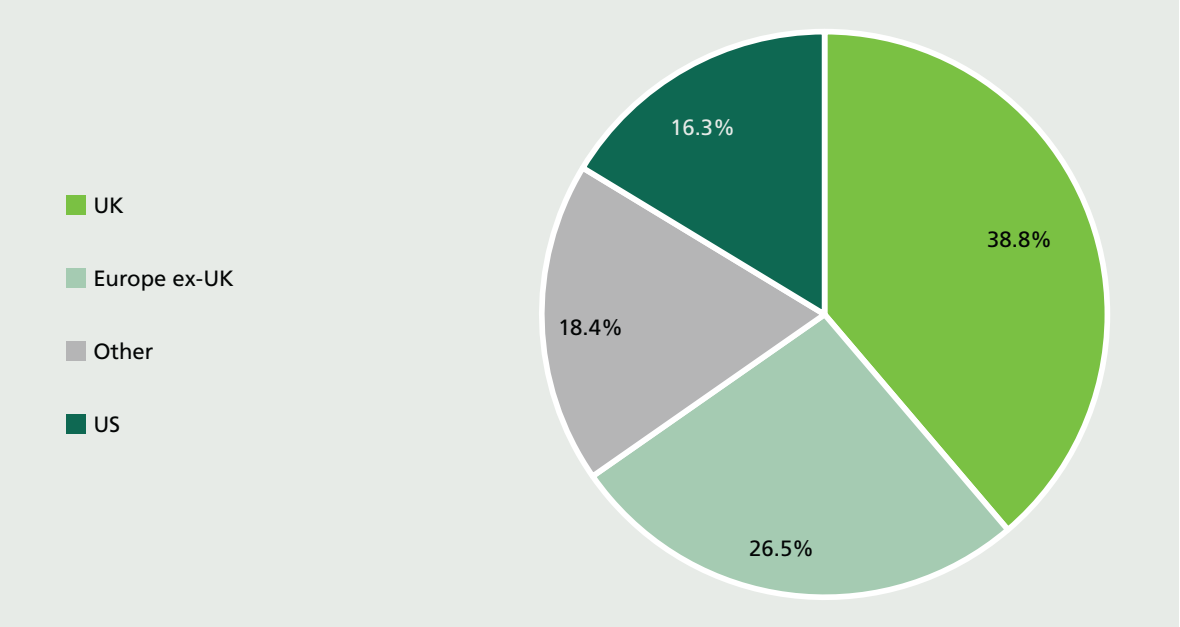
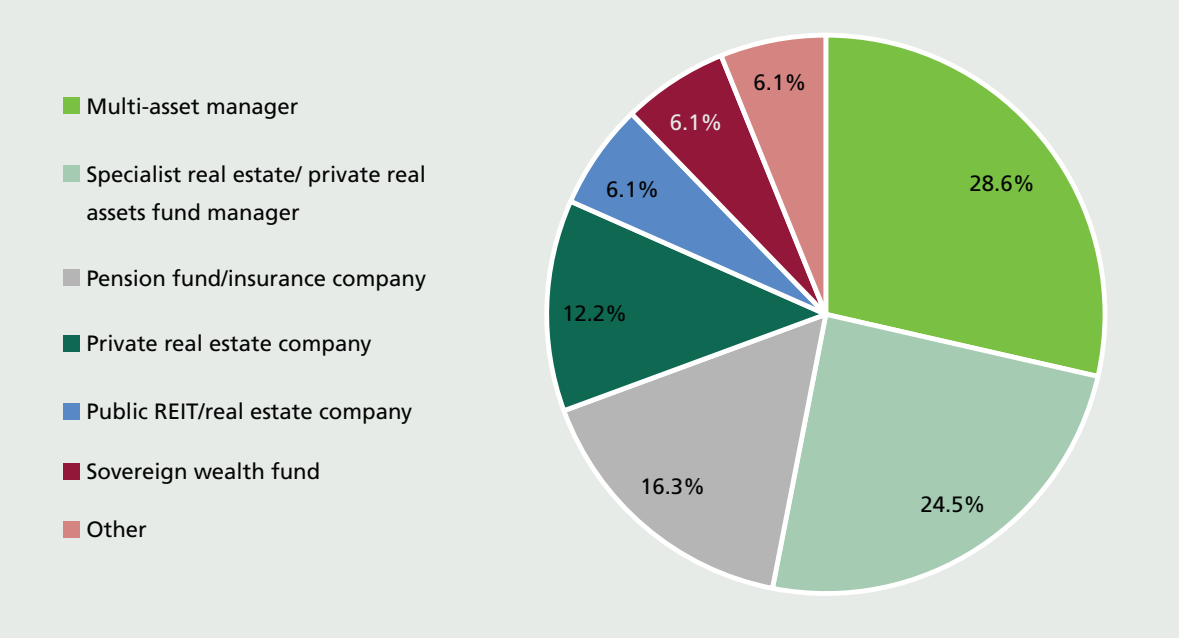


Figure A3.2 indicates the range of organisation types across the respondents. Multi-asset managers and multi-asset investors (pension funds, insurance companies and sovereign wealth fund and other investors) represented for 57% of the sample and real estate organisations accounted for 43% of the sample.

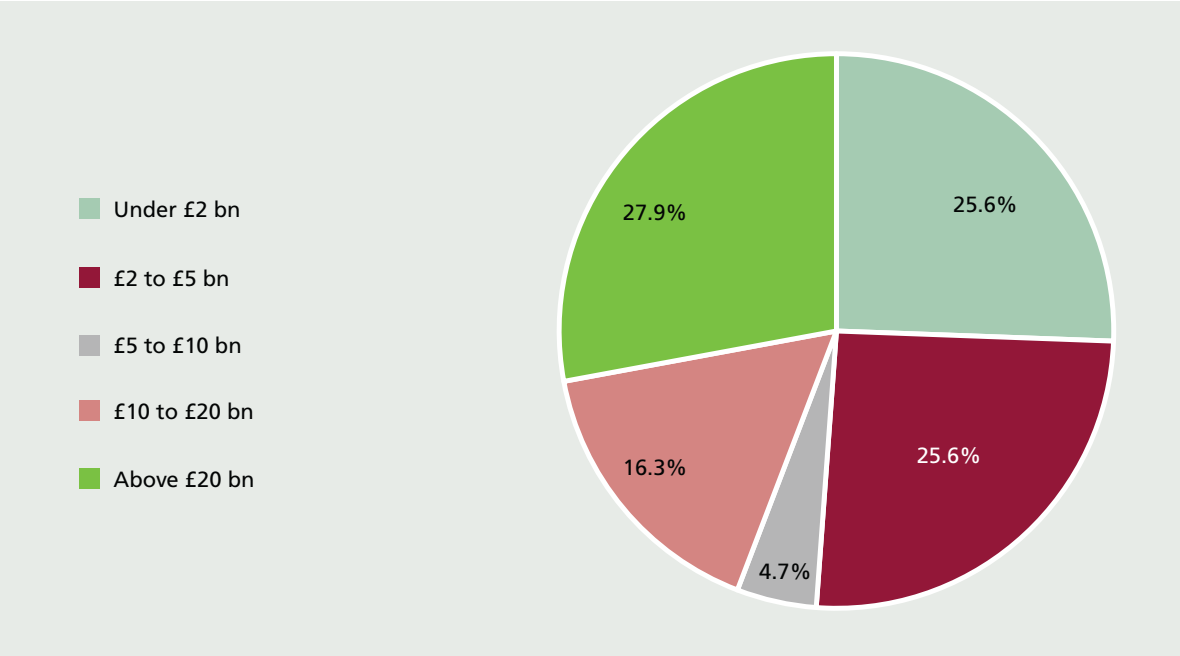
Figure A3.2: Organisation Type



APPENDIX 3: CURRENCY RISK MANAGEMENT PRACTICE – SURVEY AND FOCUS GROUPS

Figure A3.3 shows the range of size of organisation real estate exposure and highlights that, typically, respondents had substantial portfolios and, therefore, may be more sophisticated and better-resourced than the population of international investors in real estate as a whole.

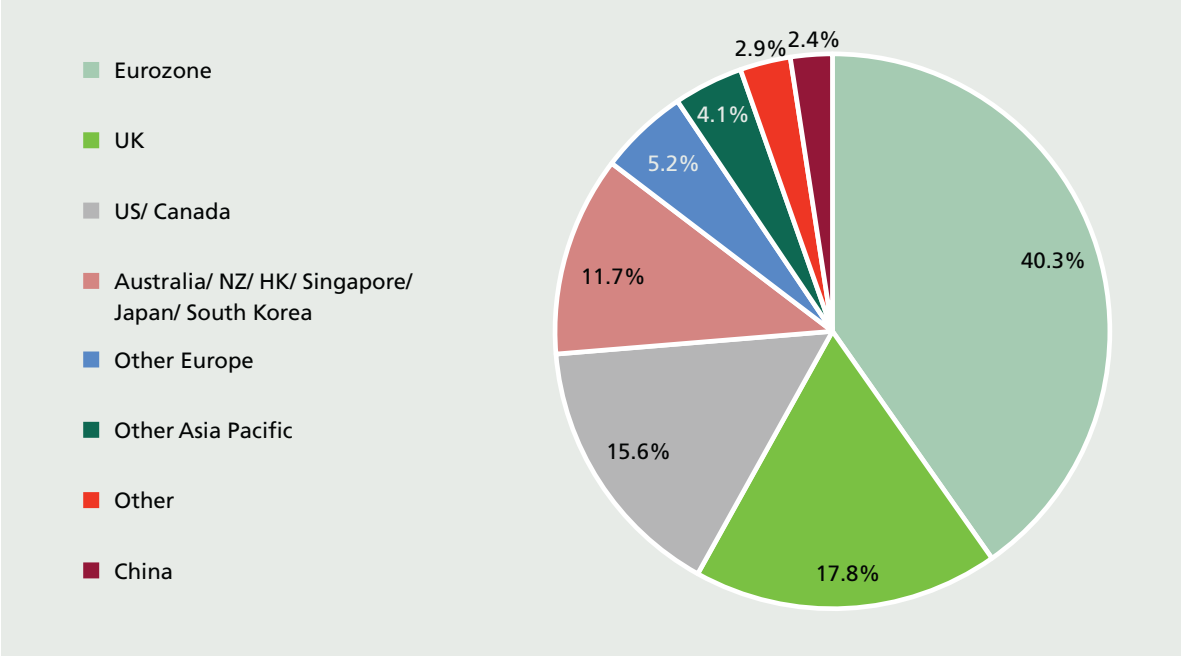
Figure A3.3: Size of Real Estate Portfolio



APPENDIX 3: CURRENCY RISK MANAGEMENT PRACTICE – SURVEY AND FOCUS GROUPS

Figure A3.4 illustrates the average (unweighted) allocation by geography (including their home currency) of mandates and funds that respondents gave their answers for. This shows the tilt towards the UK and continental Europe that might be expected given the respondent domicile pattern. The respondents included a mixture of more narrowly focussed international mandates and fully global mandates, which included emerging market exposure.

Figure A3.4: Mandate/Fund Allocation by Country/Geography



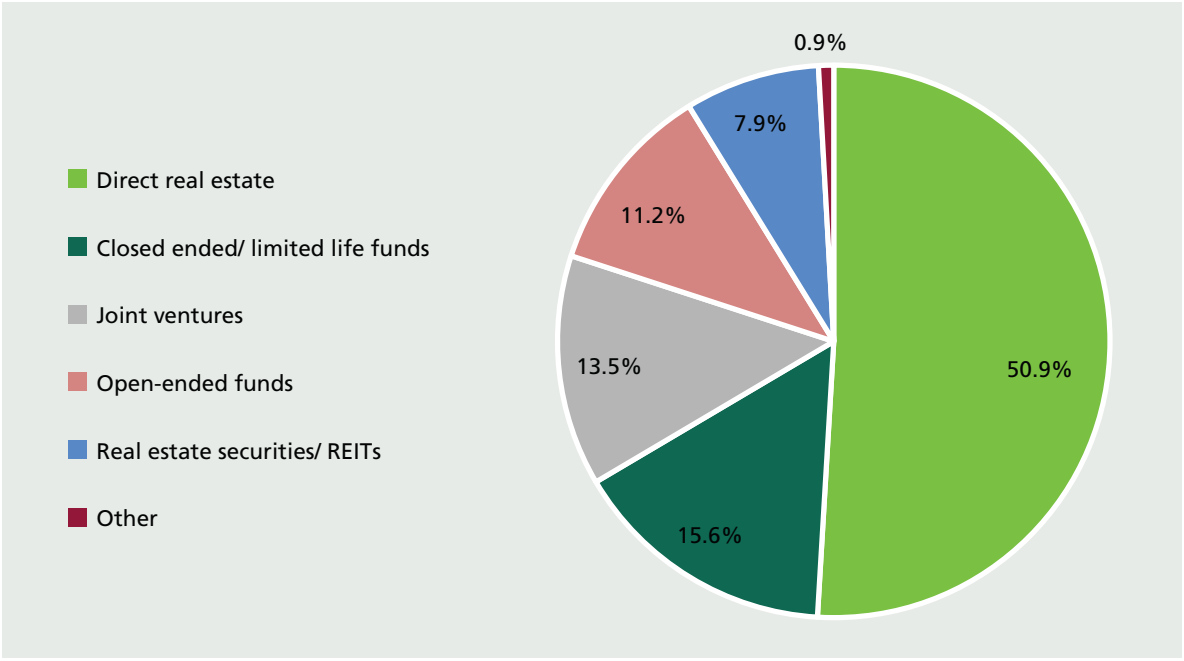
APPENDIX 3: CURRENCY RISK MANAGEMENT PRACTICE – SURVEY AND FOCUS GROUPS

There was a broad range of investment mandates and type of investment made. Respondents ranged from those investing 100% in REITs and listed real estate securities, to 100% private fund exposure to 100% direct exposure. Figure A3.5 shows the average allocation by type of investment.

The respondent base included those answering on behalf of specific funds they were managing, as well as those that were involved in running a multi-asset global portfolio. For the former, exposure is typically direct, whilst, for major pension funds and sovereign wealth funds, they, more typically, have a range of investment types. Of the total, 27 respondents answered on behalf of real estate-specific mandates or organisations whilst, for the remainder, real estate is part of a wider multi-asset allocation.

In terms of motivation for investing in real estate markets with different currencies, a broad range of reasons was given. The most common was diversification but other reasons included accessing markets with more attractive risk and return profiles or taking advantage of a broader opportunity set.

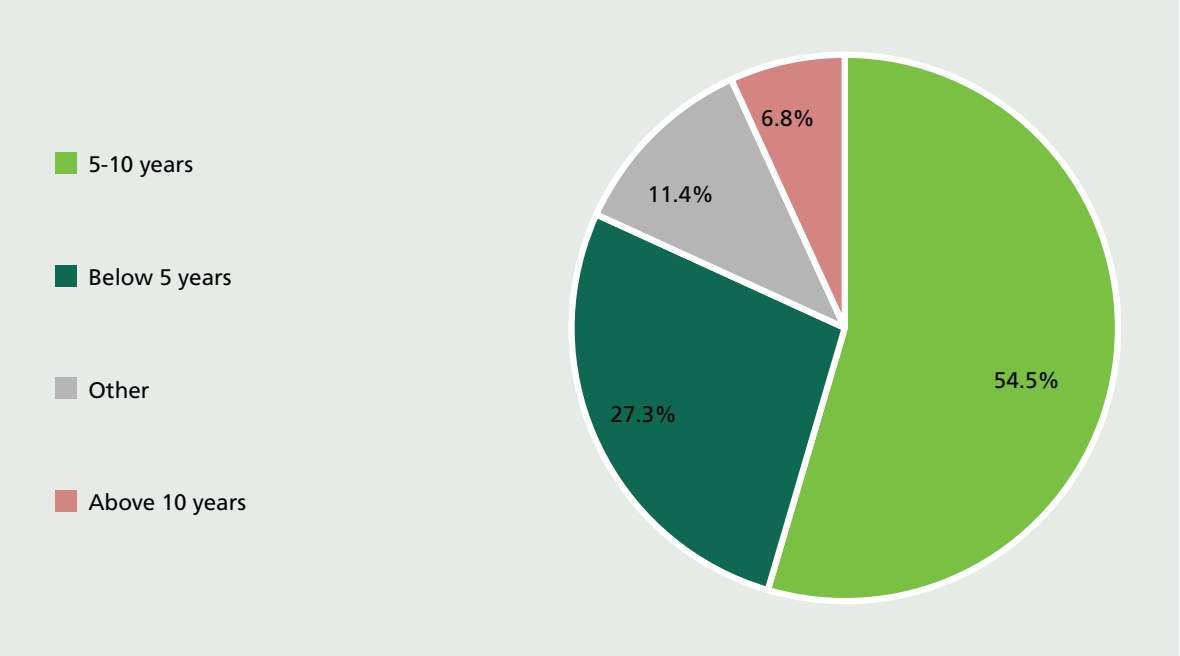
Figure A3.5: Mandate/Find Allocation by Type of Investment



APPENDIX 4: MONTE CARLO SIMULATION ASSUMPTIONS

The typical holding period for investments ranged from relatively short term to those expecting to generally hold investments for the long term but, as illustrated in Figure A3.6, was focussed on the five to 10-year period with more prevalence of shorter term investment horizons than long term (over 10 years).

Figure A3.6: Typical Holding Periods



APPENDIX 4: MONTE CARLO SIMULATION ASSUMPTIONS

UK real estate return assumptions

Based on the data from IPD and our adjustment, we assume the real estate return during the normal, upside and downside case as listed in Table A4.1.

Table A4.1: Real Estate Return Assumptions

	Normal	Boom/Upside	Crash/Downside
Capital Index	100.00	100.00	100.00
Year 1	102.00	114.00	90.00
Year 3	106.12	135.83	81.09
Year 5	110.41	154.47	77.03
Year 1-5 income (per annum)	5.64	3.98	7.30

Spot rate path assumptions

We assume exchange rate returns follows a geometric Brownian motion; the drift term is based on the central bank interest rate differential and the volatility is based on the historical data. We assume the USD/GBP differential drifts upward at a speed of 1% per year with volatility of 7.815%; the EUR/GBP drifts downward at a speed of 0.5% per year with volatility of 7.625%.

Forward rate path assumptions

Forward point is the difference between the forward rate and spot rate. Based on the historical data of spot rates and forward rates obtained from DataStream, we calculate the mean of the forward point and the standard deviation. We assume the forward point follows a Brownian motion. Furthermore, we used vine copula to capture the correlation between the spot and forward point by using the historical data. Every three months, the three-month forward price is simulated based on the simulated spot price and above assumptions.

Forward hedging strategy and costs assumptions

We assume the investor uses a three-month rolling forward contract, the principal of the forward contract is updated every three months according to the new appraisal (valuation) of the real estate portfolio.

Transaction cost: the transaction cost is based on the historical bid-ask spread of the three-month forward contract. The transaction cost is incurred every time the investor buy the forward contract. The transaction costs for USD/GBP forward and EUR/GBP forward are 0.14% per annum and 0.2% per annum, respectively.

Settlement cost: at the expiration of the forward contract, the contract needs to be settled before it is rolled over to the new contract; the settlement amount is the difference between the forward price purchased in the last period and the current spot price. We assume that the settlement amount is not directly paid at the expiration of the contract; the broker holds a settlement balance account for the hedger, the settlement balance either pays or earns 1% per annum, depending on whether the balance is negative or positive. The final settlement balance is paid at the end of the investment period.

APPENDIX 4: MONTE CARLO SIMULATION ASSUMPTIONS

Swap hedging strategy and cost assumptions

We assume the principal of the swap contract is based on the amount of the investment. The interest rate for the periodic foreign currency payment is the initial capitalisation rate and the contractual interest rate for periodic domestic currency receivable is the initial capitalisation rate plus the difference in the central bank interest rate. The inclusion of the difference in central bank interest rates reflects the difference in the risk-free rate. For example, if a US investor invests in the UK and purchases a swap contract, if the interest rate for the GBP payment is 5%, the interest rate for the USD receivable is 6%, since the risk-free rate for the US is 1% higher than in the UK.

We assume that purchasing a swap contract incurs an origination fee, which is 2% of the principal and paid up front. A periodic transaction fee (0.25%) of the periodic payment amount is also assumed.

APPENDIX 5: BIBLIOGRAPHY

Allayannis, G. & Ofek, E. (2001). Exchange rate exposure, hedging, and the use of foreign currency derivatives. **Journal of international money and finance**, 20(2), 273-296.

Batten, J., Mellor, R. & Wan, V. (1993). Foreign exchange risk management practices and products used by Australian firms. **Journal of International Business Studies**, 24(3), 557-573.

Baum, A. & Hartzell, D. (2012). **Global Property Investment: Strategies, Structures, Decisions,** Wiley-Blackwell, Chichester.

Barroso, P., Menichetti, M. & Reichenecker, J. A. (2017). Hedging with an edge: parametric currency overlay. **30th Australasian Finance and Banking Conference 2017**. Available at SSRN: https://ssrn.com/abstract=3020981

Bartram, S. M. (2007). What lies beneath: Foreign exchange rate exposure, hedging and cash flows. **Journal of Banking & Finance,** 32(8), 1508-1521.

Brealey, R.A., Myers, S.C. & Allen F. (2006). **Corporate Finance,** 7th Edition, McGraw-Hill, New York.

Brown, G. W. (2001). Managing foreign exchange risk with derivatives. **Journal of Financial Economics**, **60**(2), 401-448.

Campbell, J. Y., Serfaty-De Medeiros, K. & Viceira, L. M. (2010). Global currency hedging. **The Journal of Finance, 65**(1), 87-121.

De Roon, F. A., Nijman, T. E. & Werker, B. J. (2003). Currency hedging for international stock portfolios: The usefulness of mean–variance analysis. **Journal of Banking & Finance, 27**(2), 327-349.

Elliott, W. B., Huffman, S. P. & Makar, S. D. (2003). Foreign-denominated debt and foreign currency derivatives: complements or substitutes in hedging foreign currency risk?. **Journal of Multinational Financial Management, 13**(2), 123-139.

Eun, C. S. & Resnick, B. G. (1988). Exchange rate uncertainty, forward contracts, and international portfolio selection. **The Journal of Finance, 43**(1), 197-215.

Froot, K. A. (1993). **Currency hedging over long horizons** (No. w4355). National Bureau of Economic Research.

Géczy, C., Minton, B. A. & Schrand, C. (1997). Why firms use currency derivatives. **the Journal of Finance, 52**(4), 1323-1354.

Geltner, D. M., Miller, N. G., Clayton, J. & Eichholtz, P. (2007). **Commercial Real Estate: Analysis & Investments**, Mason, Thomson South-Western.

Hagelin, N. & Pramborg, B. (2004). Hedging foreign exchange exposure: risk reduction from transaction and translation hedging. **Journal of International Financial Management & Accounting, 15**(1), 1-20.

Hoesli, M. Lekander, J. & Witkiewicz, W. (2004). International evidence on real estate as a portfolio diversifier. **Journal of Real Estate Research, 26**(2), 161-206.

Hutchison, N.E., Lizieri, C.M., MacGregor, B.D., Mansley, N. et al. (2017). An Investigation of Hurdle Rates in the Real Estate Investment Process. **Investment Property Forum.**

Hutson, E. & Laing, E. (2014). Foreign exchange exposure and multinationality. **Journal of Banking & Finance, 43**, 97-113.

Johnson, R., Lizieri, C. M., Soenen, L. & Worzala, E. (2006). Simulating currency risk on private investments in real estate. **Journal of Real Estate Portfolio Management,** 12(9), 91-102.

APPENDIX 5: BIBLIOGRAPHY

Lioui, A. & Poncet, P. (2002). Optimal currency risk hedging. **Journal of International Money and Finance, 21**(2), 241-264.

Loderer, C. & Pichler, K. (2000). Firms, do you know your currency risk exposure? Survey results. **Journal of Empirical Finance, 7**(3), 317-344.

Mansley, N. & Wang, Z. (2018). Currency Risk Management for Investors in Asia Pacific Non-Listed Real Estate Funds. **ANREV.**

Marshall, A. P. (2000). Foreign exchange risk management in UK, USA and Asia Pacific multinational companies. **Journal of Multinational Financial Management, 10**(2), 185-211.

Newell, G. & Lee, C. L. (2017). The Impact of Currency on Performance of European Non-listed Real Estate Funds 2017. **INREV**

Newell, G. & MacIntosh, I. A. N. (2007). Currency risk management practices by Australian listed property trusts. **Pacific Rim Property Research Journal, 13**(2), 213-233.

Perold, A. F. & Schulman, E. C. (1988). The free lunch in currency hedging: Implications for investment policy and performance standards. **Financial Analysts Journal, 44**(3), 45-50.

Schmittmann, J. M. (2010). **Currency hedging for international portfolios** (No. 10-151). International Monetary Fund.

Worzala, E. (1995). Currency risk and international property investments. **Journal of Property valuation and Investment, 13**(5), 23-38.

Worzala, E. M., Johnson, R. D. & Lizieri, C. M. (1997). Currency swaps as a hedging technique for an international real estate investment. **Journal of Property Finance, 8**(2), 134-151.

Zhou, V. Y. & Wang, P. (2013). Managing foreign exchange risk with derivatives in UK non-financial firms. **International Review of Financial Analysis**, 29, 294-302.

Ziobrowski, A. J. & Curcio, R. (1991). Diversification benefits of US real estate to foreign investors. **Journal of Real Estate Research, 6**(2), 119-142.

Ziobrowski, A. J. & Boyd, J. (1991). Leverage and foreign investment in US real estate. **Journal of Real Estate Research,** 7(1), 33-57.

Ziobrowski, A. J. & Ziobrowski, B. J. (1993). Hedging foreign investments in US real estate with currency options. **Journal of Real Estate Research, 8**(1), 27-54.

Ziobrowski, A. J. & Ziobrowski, B. J. (1995). Hedging foreign investments in US real estate with forward contracts. **Journal of Property Valuation and Investment, 13**(1), 22-43.

Ziobrowski, A. J., Ziobrowski, B. J. & Rosenberg, S. (1997). Currency swaps and international real estate investment. **Real Estate Economics, 25**(2), 223-251.

APPENDIX 6: RESPONDENTS AND PARTICIPANTS IN

Focus Groups

Note: the authors are very grateful for the participation of the following firms but emphasise that the findings are the work of the research team alone and should not be taken as representing the views or position of any of the organisations listed here. We also thank those who supported the research whilst wishing to remain anonymous.

ADIA
AEW
Allianz Real Estate
APG Asset Management
Aviva Investors
Barings
Benson Elliot
Blue Sky Group
Cambridge Investment Management Ltd
CBRE GI
Centrica
CNP Assurances SA
Cording Real Estate Group
Europa Capital LLP
Fidelity International
Franklin Templeton
Gaw Capital Partners
GIC
Global Student Accommodation
Goldman Sachs
Grosvenor
GTIS Partners
Heitman
HSBC Global Asset Management
InfraRed Capital Partners
JPMorgan Asset Management
Kames Capital
LaSalle Europe
Lendlease Asia
M&G Real Estate
M7 Real Estate Ltd
Mitsubishi Estate Co., Ltd.
Morgan Stanley
Nan Fung
Niam
Norges Bank Real Estate Management
Old Park Lane Management Limited
Orion Capital Managers
Partners Group
PATRIZIA Immobilien AG
Pembroke Real Estate
PFA Pension
PGIM
PGGM
Prime Management & Co. KG
Schroders
Swiss Life Asset Management
TH Real Estate
UBS
Union Investment Real Estate

Some organisations provided multiple responses on behalf of different mandates.