The impact of currency on the performance of European non-listed real estate funds **2017**

Research | Academic Paper

INREV is the European Association for Investors in Non-Listed Real Estate Vehicles. Our aim is to improve the accessibility of non-listed real estate vehicles for institutional investors by promoting greater transparency, accessibility, professionalism and standards of best practice.

As a pan European body, INREV represents an excellent platform for the sharing and dissemination of knowledge on the non-listed real estate industry.

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Executive summary

> **Currency forwards are the most popular hedging instrument**

> **Getting FX right can be the difference between hitting or missing a return target**

> **Getting the hedge ratio right is the most important decision**

This research examined the significance of currency risk and its management for European non-listed real estate funds in a number of ways.

A survey of INREV investor members found a high level of sophistication in currency risk management strategies. This included currency hedging against a range of currencies and at different real estate levels (for example, the entire real estate portfolio or on an asset by asset level). Continual currency hedging was the preferred strategy, with forwards being the preferred hedging instrument. A range of hedging ratios are used, particularly higher (greater than 50%) hedging ratios.

The impact of currency hedging was assessed based on the annual returns in the period 2001 to 2015 of four sample portfolios, with five different hedge ratios (0%, 25%, 50%, 75% and 100%). Risk reduction of between 25% and 36% was observed when the hedged portfolio was compared to the unhedged portfolio. Hedging ratios were seen

to be more important than the choice between different forward hedging terms (such as three months or nine months), and transaction costs had minimal impact on risk and return.

Forward-looking simulations were used to assess the effectiveness of different hedge ratios. Risk reduction of between 13% and 38% was observed when the hedged portfolio was compared to the unhedged portfolio. We identified an optimal hedging ratio under different conditions across four different sample portfolios and this ranged between 50% and 100%, with an average of 81%.

Overall, this research has identified the impact of a wide range of key issues relating to currency risk management strategies in the European non-listed real estate fund space. In doing so, the research has highlighted the importance of using currency hedging when investors from different currency zones invest in European real estate. There is a strong connection between the investor survey results and the empirical analysis regarding hedging strategies, particularly at the higher hedging levels in the long-term analysis.

The key findings highlight the importance of currency risk management for real estate investors seeking international real estate exposure in their overall risk management strategies. Whilst a high level of sophistication is currently evident amongst INREV members, specific results from this research will assist real estate investors in fine-tuning their currency risk management procedures for better real estate portfolio performance.

Unhedged currency exposure has upside potential but downside risk too. Currency movements on their own can make the difference between a target being reached or missed. For managers of non-listed real estate funds, currency movements could spell the difference between a client retained and a client lost.

This study shows that the optimal hedging ratio is likely to be somewhere in the range of 50% to 100%, and therefore blanket hedging is unlikely to be optimal in every case. So it is worth spending time thinking through the investment strategy and its currency implications, and considering how much of the associated currency exposure should be hedged. Setting the hedge ratio correctly will have more impact than any other single decision relating to currency.

The research focuses on real estate investment in isolation, although in practice real estate is often part of a larger multi-asset portfolio in which currency hedging is decided and implemented at the overall portfolio level.

1. Introduction

Non-listed real estate funds are an important investment vehicle in the international real estate investment landscape. Non-listed real estate funds provide local and international investors (whether pension funds, insurance companies, sovereign wealth funds or other institutional investors) exposure to high quality real estate portfolios across various fund mandates, including different real estate fund styles, countries, regions, sectors and structures.

Many institutional investors in the US, Europe and Asia Pacific regions are now seeking global real estate exposure beyond their domestic real estate markets, and non-listed real estate funds are key vehicles to obtain European real estate exposure. Given that fund performance has to be considered in their domestic context, this clearly raises the strategic issue of currency risk, and how to best manage it. This sees currency hedging as a key element in an international real estate risk management strategy. Figure 1 gives a broad profile of the available currency hedging instruments.

This research explores the impact of currency risk on the performance of European non-listed real estate funds with a focus on the following key real estate investment issues:

1. What are the current procedures and practices used by European non-listed real estate funds in managing currency risk in their real estate portfolios?

2. Does currency risk have a significant

Figure 1: Currency hedging instruments, ratios and their impact
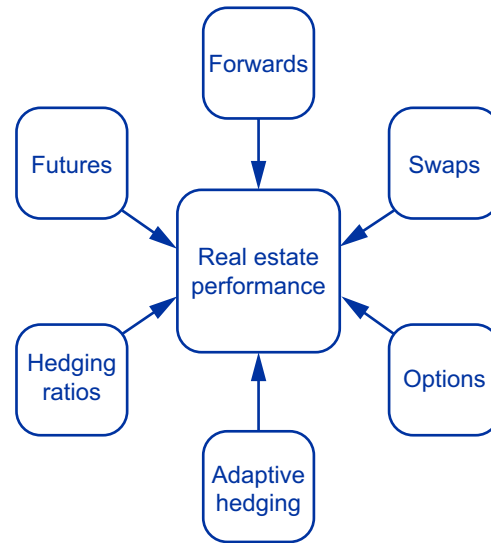
Source: Authors' compilation

impact on European non-listed real estate fund performance?

3. How effective are currency risk management procedures?

4. How can the currency risk of non-listed real estate funds be mitigated?

These issues are assessed via (i) a survey of institutional investors in real estate (ii) historic analysis of performance of four sample portfolios (iii) forward-looking scenario analysis. The historic and forward-looking analyses both focus on return per unit of risk,

and both examine the effects of hedging after all estimated costs.

This report is structured as follows. After a brief review of existing literature in Section 2, details of the non-listed real estate fund data and methodology are provided (Section 3). Then the results of the survey are presented (Section 4). Historic data analysis is the theme of Section 5 and the forward-looking scenario analysis is presented next (in Section 6), before finishing with the practical implications and conclusions (Section 7).

This research report has been commissioned by INREV and is written by Professor Graeme Newell (Western Sydney University) and Associate Professor Chyi Lin Lee (Western Sydney University).

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- Maarten van der Spek (Senior Strategist, Abu Dhabi Investment Authority (ADIA))

- Henri Vuong (Director of Research and Market Information, INREV)

2. Literature review

Numerous studies have found that accounting for currency risk in international real estate investment significantly impacts on the resulting diversification benefits, return and risk profile (eg: Hoesli et al., 2004; Thomas and Lee, 2006; Addae-Dapaah and Hwee, 2009; Kroencke and Schindler, 2012).

Strategies to mitigate currency risk also figure prominently in institutional real estate portfolio management (Newell and McIntosh, 2007). Examples of such studies include Hoesli et al. (2004) and Kroencke and Schindler (2012). They analysed the use of forwards and option contracts in hedging the currency risk of listed and direct real estate investment, whilst Worzala et al. (1997) suggested that the risk of currency fluctuations on the returns of foreign real estate may be reduced with the use of currency swaps.

However, results based on portfolio-based indices may be misleading due to the heterogeneity of private real estate performance, as well as uncertainty or volatility being largely ignored (Worzala and Newell, 1997). Hence Johnson et al. (2006) highlighted the importance of using a forward-looking simulation approach and found that the currency swap strategy resulted in considerable reduction of the downside risk associated with currency fluctuations and produced superior risk-adjusted returns.

A number of studies have also examined the hedging benefits of futures contracts in hedging the risk of listed real estate (Newell, 2010; Lee and Lee, 2012). However, these studies concentrating on the issue of foreign exchange exposure are limited to the listed real estate and direct real estate sectors.

Equivalent research studies on the impact of foreign exchange exposure for non-listed real estate funds are not available in a European context. These previous studies did not assess a range of hedging ratios or optimal hedging ratios; only considering unhedged and fully hedged scenarios.

As such, this report builds on this previous research and provides important insights and contributions on the impact of currency risk on the performance of European non-listed real estate funds in a European and global investor context.

With only limited research available in this area for non-listed real estate vehicles, this report will provide major value-added resources and insights for more informed strategic decision-making by investors and fund managers, whether operating at a European or global level.

3. Data and methodology

This study uses data gathered from a survey of INREV investor members and data extracted from INREV's proprietary dataset of European non-listed real estate funds. In addition, the study uses financial market data drawn from DataStream and capital market assumptions from JPMorgan.

Currency hedging investor survey
A survey among institutional investors was first conducted to assess the currency hedging strategies currently being used with non-listed real estate funds. The aim was to inform the direction of the subsequent empirical analysis used in Sections 5 and 6. Full details of the investor survey are given in Section 4.

Data characteristics
This study used data extracted from INREV's proprietary dataset of European non-listed real estate funds which comprise the INREV Annual Index universe over the period 2001 to 2015. The INREV Annual Index measures net asset value (NAV) based annual performance for non-listed real estate funds. Returns are net of all fees and other costs and represent the aggregate investor return.

The index universe has grown from 29 funds in 2001 to 334 funds in 2015, collectively representing total gross asset value (GAV) of €187.8 billion at the end of 2015. Of the 334 funds, 174 are open end funds and 160 are closed end funds, representing 65.7% and 34.3% of GAV respectively. The index universe is a mix of balanced funds that are diversified across multiple sectors and

multiple countries, and specialist funds that are focused on a single country or single sector investments. Non-listed real estate funds can also vary by style and structure, as well as other fund characteristics.

Historic analysis
To assess the impact of currency risk on non-listed real estate funds, the risk and return profile of four sample portfolios was examined over 2001 to 2015, calculating average annual returns, annual risk (volatility) and risk-adjusted returns (reward-to-risk ratio) for different levels of currency hedging. The sample portfolios are as follows:

1. Sterling invested in Europe ex UK real estate

2. US dollars invested in European real estate

3. Euros invested in UK real estate

4. US dollars invested in UK real estate

For each of the four sample portfolios there is an associated exchange rate, as follows:

1. Basket of euro (80%) and Swiss franc (20%) to sterling

2. Basket of sterling (50%), euro (40%) and Swiss franc (10%) to US dollar

3. Sterling to euro

4. Sterling to US dollar

The hedge ratios were as follows:

1. 0%

2. 25%

3. 50%

4. 75%

5. 100%

Forward-looking analysis (scenario analysis)
The risk, reward and reward-to-risk ratio profile of the sample portfolios at different hedge ratios was analysed on a forward-looking basis, using a Monte Carlo simulation. The simulation makes assumptions about the distribution of future real estate returns, currency returns and cash returns. It also makes assumptions about correlations between different real estate markets and currency movements. The full set of assumptions can be found in Appendix 4.

4. Results of the investor survey on currency hedging strategies in non-listed real estate

This section highlights the results of the INREV investor survey on currency hedging strategies in the non-listed real estate space. This survey was conducted in April 2016 among INREV investor members only. Thirty-nine (39) company responses across 14 different countries were received. The results provide a comprehensive snapshot of currency hedging strategies used and the importance of currency hedging as a real estate risk management strategy. Figure 2 provides a snapshot of the INREV respondents. A copy of the questionnaire is given in Appendix 2.

Respondent profile
A broad profile of investors responded to the survey, comprising pension funds (38%), insurance companies (33%), sovereign wealth funds (8%), multi-managers (8%), fund of funds (5%), family offices (3%) and other (5%). These investors accounted for a minimum of €154.5 billion in their non-listed real estate portfolios (GAV) – this is a minimum figure because 21% of the investors who responded chose not to disclose the value of their non-listed real estate portfolio.

The investors who responded to the survey used a range of geographic diversification strategies, including global (79%), regional (Eurozone / All Europe) (13%) and home country only (8%). The investment styles were dominated by core (73%), followed by value-added (22%) and opportunity (5%). A

diverse range of main organisational locations for these investors were evident, including Europe, UK, US, Canada, Asia and Middle East, reflecting the global nature of non-listed real estate investment activity today.

Currency hedging
The results show that 71% of investors used currency hedging. Of those investors using currency hedging, the main currencies that are hedged were US$ (52%), £ (40%), Japanese Yen (28%), Australian $ (28%) and € (16%). Notably, 32% of investors hedged against all foreign currencies and 68% hedged against at least three currencies; with these hedging strategies being dependent on the real estate portfolio location. Several investors indicated they hedged only against the mature country currencies, but not emerging market currencies. 75% of investors managed the currency hedging themselves.

Currency hedging can be applied at different levels – for example, at the asset level or portfolio level. The level at which currency hedging was applied by the investors in the survey varied considerably: at the entire real estate portfolio (28%); asset by asset (28%); multi-asset portfolio (24%); certain countries only (8%) and other (12%). Overlays were also used by some investors. No investors hedged at the level of certain real estate styles only nor for certain real estate sectors only. Only 24% of investors indicated real estate investment style affected their currency hedging strategy.

Currency hedging strategies
Continual currency hedging was the preferred strategy by 76% of investors, with only 24% of investors choosing specific time periods as their currency hedging strategy. When using hedging, the hedging time period of three months was preferred by more than half (52%), followed by six months (10%) and one year (10%). Other timing strategies included using an internal model or a timing strategy being delegated to specialists.

To implement this currency hedging strategy, the preferred hedging instrument was using forwards (57%), followed to a much lesser degree by using swaps (9%), with several investors using both forwards and swaps. Options were not used.

A range of hedging ratios was targeted, including a 100% hedging ratio, 75% hedging ratio and 50% hedging ratio. This hedging policy was more frequently based on NAV (74%) rather than on GAV (26%).

Concerning the impact of Solvency II on insurance companies, 38% of insurance company respondents stated that it affected their currency hedging policy.

Overall, the investor survey has clearly highlighted the variety of currency hedging strategies used by investors and their high level of sophistication in their currency risk management strategies; further emphasising

the importance of currency hedging as part of an investors' real estate risk management framework. This sophistication included extensive use of currency hedging against a range of currencies and at different real estate levels (e.g. entire real estate portfolio, asset by asset). Continual currency hedging was the pref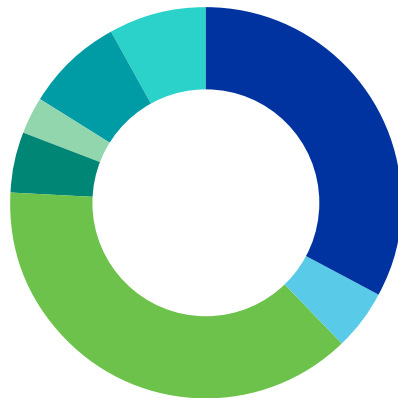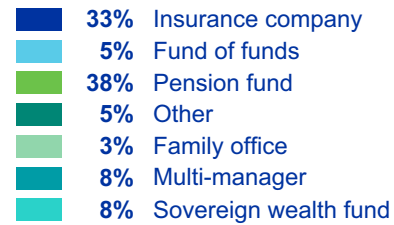erred strategy, with forwards being the preferred hedging instrument. Hedging ratios in the 50% to 100% range dominate.

These investor survey results provide a useful context to the empirical analysis in subsequent sections of this report, which assess the effectiveness of various currency hedging strategies on the performance of European non-listed real estate funds over 2001 to 2015, as well as the scenario analysis for currency hedging strategies going forward.

Figure 2: Profile of respondents and strategies in the INREV survey

A: Investor type

33%	Insurance company
5%	Fund of funds
38%	Pension fund
5%	Other
3%	Family office
8%	Multi-manager
8%	Sovereign wealth fund

B: Geographic strategy

79%	Global
8%	Regional - Eurozone
8%	Home country only
5%	Regional - All Europe
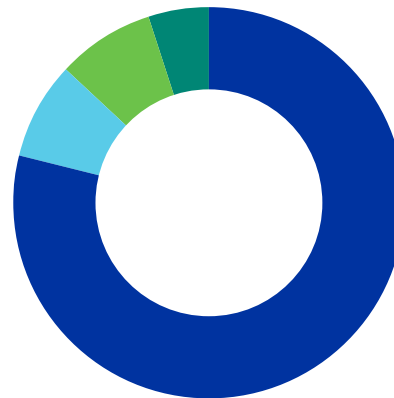
C: Real estate hedging strategy

28%	Asset by asset
8%	Certain countries only
28%	Entire real estate portfolio
24%	Multi asset portfolio
12%	Other
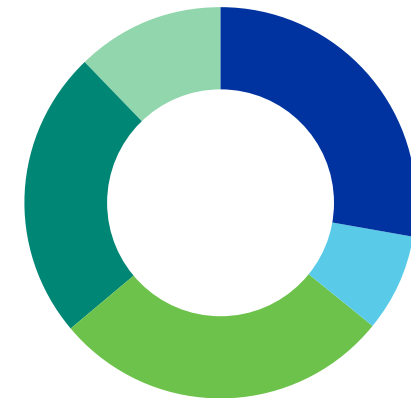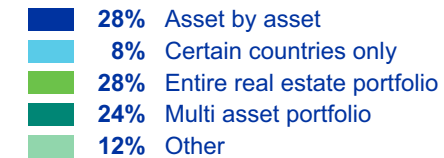
5. Analysis of the effects of currency hedging strategies on risk and return

This section analyses historic real estate returns and currency returns from 2001 to 2015. It examines the effect of currency hedging strategies on returns and risk by applying a range of hedging ratios to four sample portfolios, namely:

1. Sterling invested in Europe ex UK real estate

2. US dollars invested in European real estate

3. Euros invested in UK real estate

4. US dollars invested in UK real estate

The sample portfolios were extracted from the INREV Annual Index, consisting of 334 funds at the end of 2015 split by structure between open end (55%) and closed end (45%). In terms of style, the split is 74% core and 26% value added.

Sample portfolio 2 (US dollars invested in European real estate) reflects the entire universe of 334 funds. Sample portfolios 3 and 4 (Euros invested in UK real estate and US dollars invested in UK real estate) reflect a sub-set comprising 53 funds, split 50%:50% between open end and closed end, and 72%:26% between core and value added. Sample portfolio 1 (sterling invested in Europe ex UK real estate) reflects a sub-set of 281 funds split between open end (55%) and

closed end (45%), and between core (74%) and value added (26%).

The asset allocation of the two multi-country sample portfolios (portfolios 1 and 2) can be found in Appendix 5.

In terms of currency hedging instruments, the survey results have demonstrated that the preferred hedging instrument was forwards, therefore currency forwards were considered in the historical analysis. The forward data was obtained from DataStream.

> A currency forward is an essential currency hedging tool that allows investors to lock in the exchange rate for the purchase or sale of a currency on a future date. Unlike currency futures, currency forwards are over-the-counter instruments and offer flexibility that can be tailored to a particular amount and delivery period.

To estimate the net-of-hedging cost returns for the non-listed real estate portfolio, we calculated interest rate differentials for relevant pairs of currencies. In addition, administrative costs and cash drag were also considered. We assumed that hedge ratios were static rather than dynamic and that they were maintained throughout each calendar year by means of four consecutive three-month forwards.

The four sample portfolios involve three real estate markets (the UK appears in two portfolios) and four exchange rates, which are as follows:

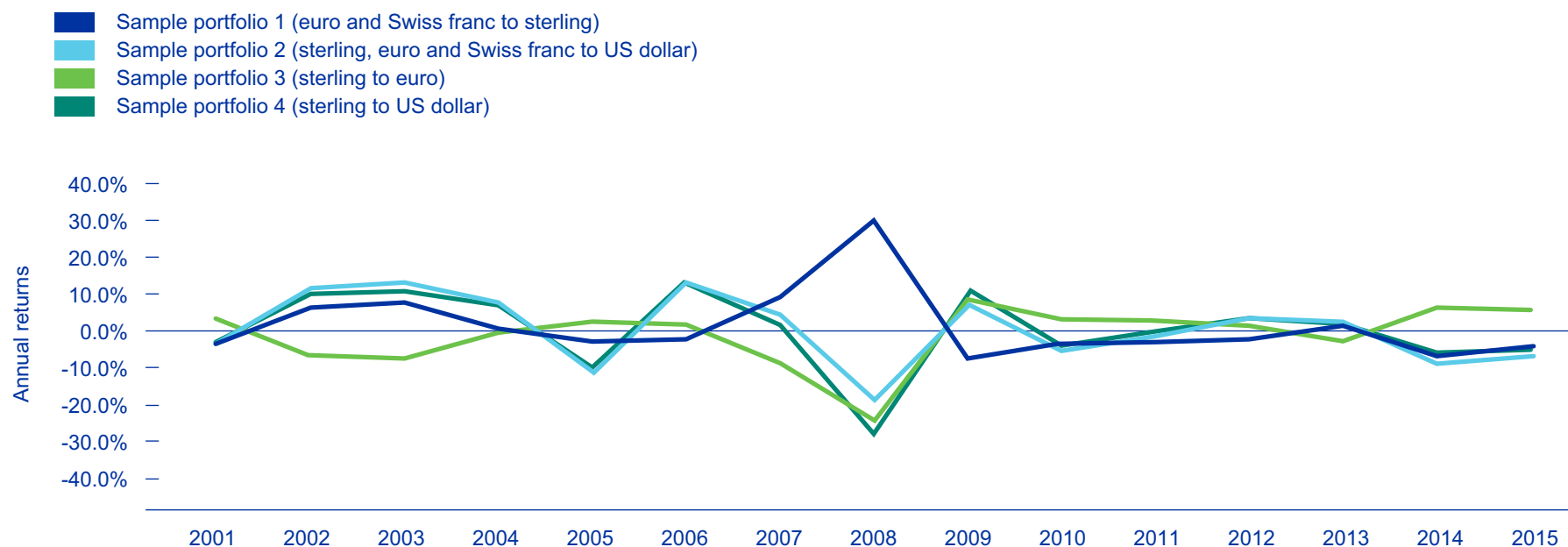1. Basket of euro (80%) and Swiss franc (20%) to sterling

2. Basket of sterling (50%), euro (40%) and Swiss franc (10%) to US dollar

3. Sterling to euro

4. Sterling to US dollar

Figure 3: Real estate fund returns 2001 to 2015

Over the period 2001 to 2015, UK real estate had an average annual return of 7.2%, Europe had 5.9% and Europe ex UK experienced an annual average return of 4.8%, all in local currency.

Figure 4: Currency returns 2001 to 2015

■ Sample portfolio 1 (euro and Swiss franc to sterling)
■ Sample portfolio 2 (sterling, euro and Swiss franc to US dollar)
■ Sample portfolio 3 (sterling to euro)
■ Sample portfolio 4 (sterling to US dollar)

The average returns for the four key pairs of currencies over the period 2001 to 2015 fall into the range of -0.7% (for euros invested into UK real estate) to 1.6% (sterling invested in Europe ex UK). However, there was considerable volatility in individual years such as 2008, when the euro and the Swiss franc strengthened significantly against sterling. The returns in individual years can be seen in Table 1 below.

Table 1: Historic currency returns 2001 - 2015

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Sample portfolio 1 (euro and Swiss franc to sterling)	-2.9%	6.5%	8.0%	0.4%	-2.7%	-2.2%	9.6%	30.3%	-7.4%	-3.0%	-2.6%	-1.8%	1.7%	-6.5%	-3.7%
Sample portfolio 2 (sterling, euro and Swiss franc to US dollar)	-3.1%	11.8%	13.5%	7.5%	-10.7%	13.1%	4.7%	-18.4%	7.2%	-5.1%	-1.0%	3.1%	2.9%	-8.5%	-6.6%
Sample portfolio 3 (sterling to euro)	3.0%	-6.1%	-7.4%	-0.4%	2.9%	2.0%	-8.5%	-24.0%	8.7%	3.5%	3.3%	2.1%	-2.3%	7.0%	5.8%
Sample portfolio 4 (sterling to US dollar)	-2.5%	10.6%	10.9%	7.4%	-10.2%	13.7%	1.9%	-27.4%	11.2%	-3.9%	0.3%	4.1%	2.1%	-5.7%	-5.0%

Figure 5: Comparison of real estate and currency risk 2001 to 2015

■ Volatility of real estate returns
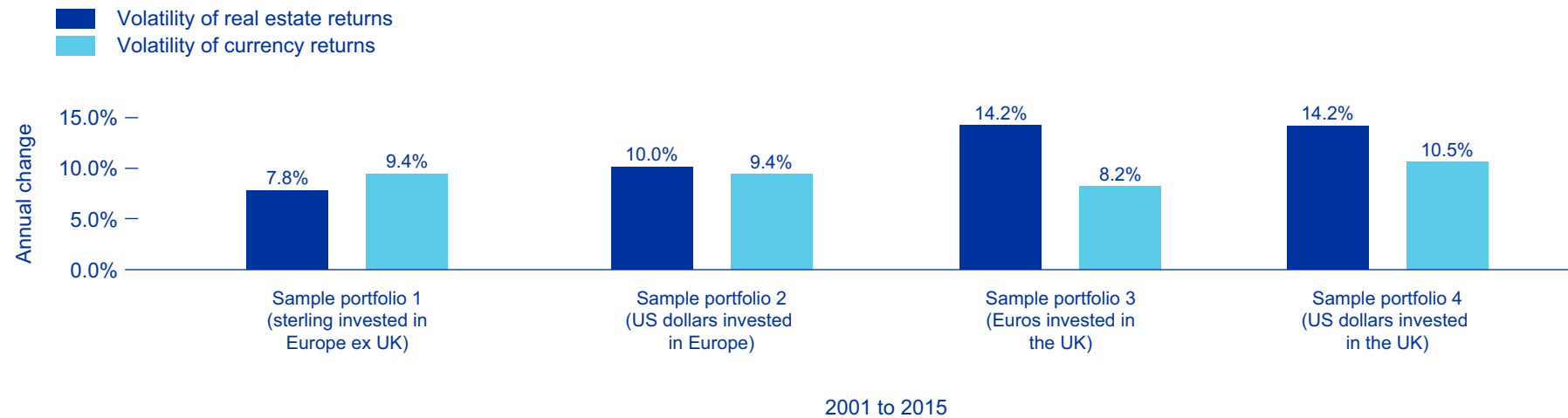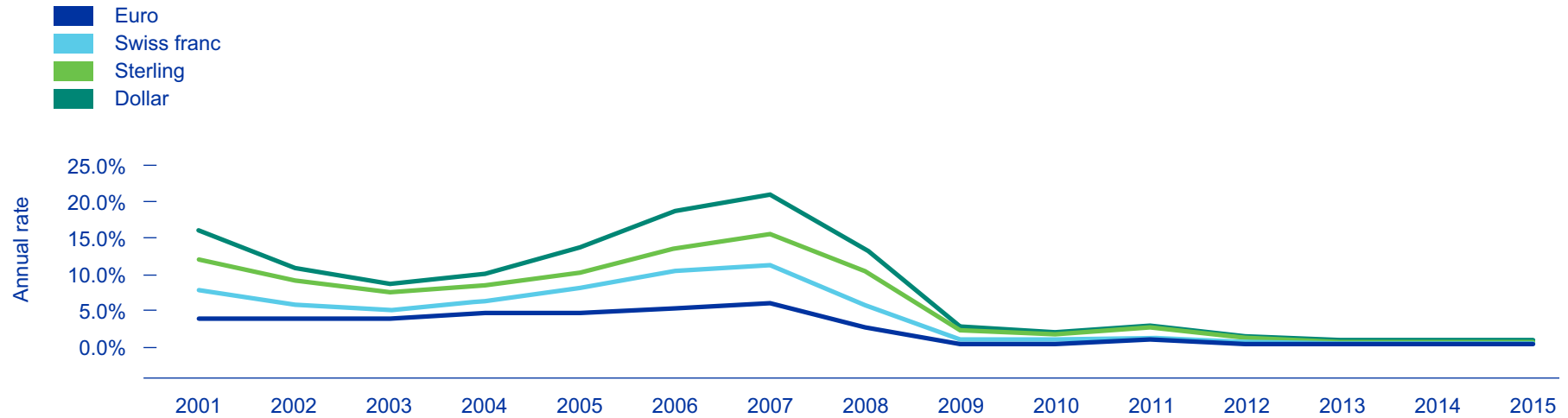■ Volatility of currency returns

Figure 5 shows the volatility (standard deviation) of annual real estate and currency returns. It is worth noting that real estate volatility is significantly higher than currency volatility for those portfolios that invest in the UK.

Figure 6: Cash returns 2001 to 2015

■ Euro
■ Swiss franc
■ Sterling
■ Dollar

Cash returns are relevant because the interest differential between cash returns in the domestic currency and in the foreign currency (or currencies) is the main driver of hedging costs. Interest differentials are low at present, but Figure 6 shows how they have varied substantially in the past. For example, in 2007, sterling interest rates were at 6%, while Swiss franc interest rates were at 2.8%.

Figure 7: Interest rate differentials 2001 to 2015

- Europe ex UK/sterling
- Europe/US dollar
- Sterling/euro
- Sterling/US dollar
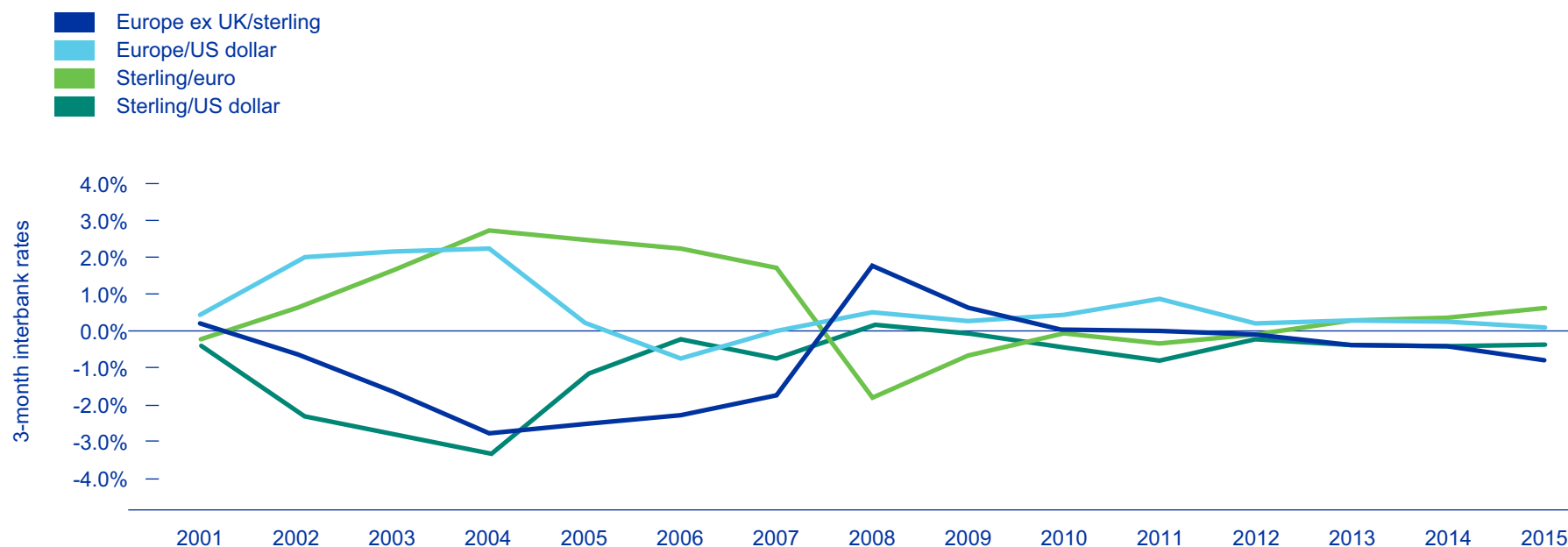
The interest rate differential arises when the cost of borrowing foreign currency is greater than the interest that can be earned by placing the borrowed funds in a local currency deposit account. On occasions, the reverse happens - it costs less to borrow foreign currency than the interest earned on domestic currency. In such cases the interest differential is a negative cost – in other words, a gain.

The other costs are administration (assumed to be 16 basis points, or 0.0016%) and cash drag (which varies, but was of the order of 15bps to 25bps).

Figure 8: Summary historic data for sample portfolio 1 (sterling invested in Europe ex UK)
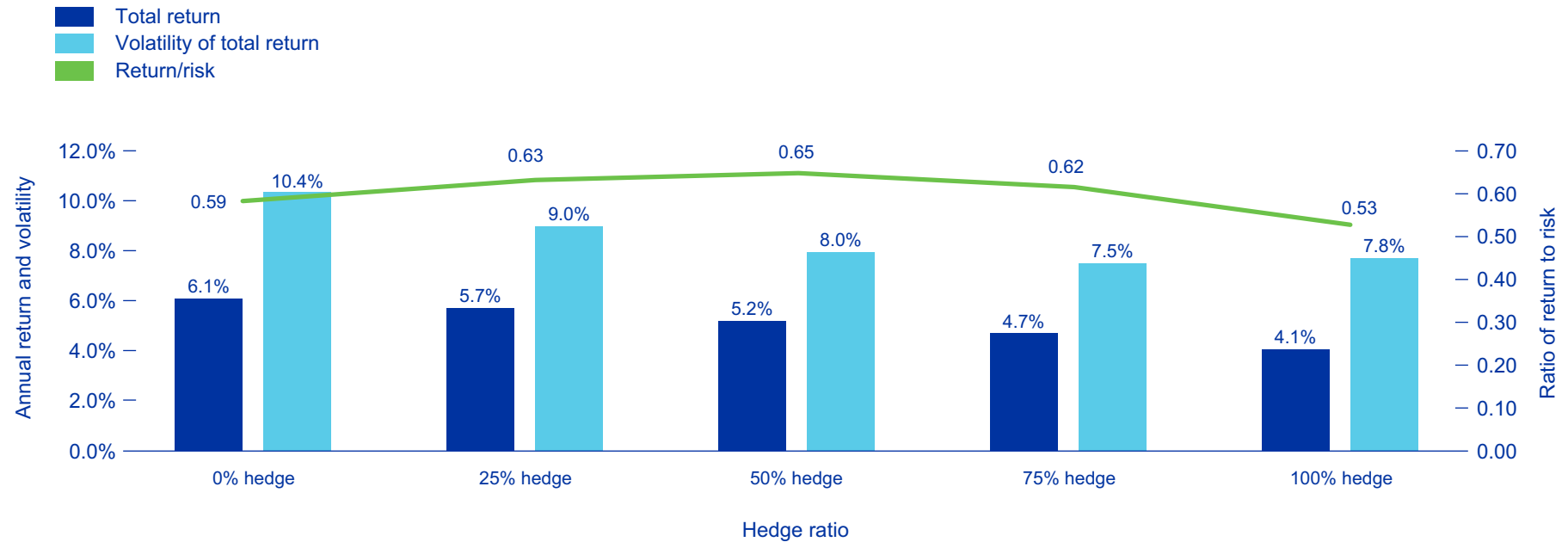

Figure 8 shows three aspects of this sample portfolio: annual return; annual risk; annual return divided by annual risk. It does this for five different hedging ratios: 0%, 25%, 50%, 75% and 100%. The idea is to locate the hedging ratio that gives the highest and therefore most efficient ratio of return to risk.

As the hedging ratio increases, three effects can be seen:

1. Returns decrease, due to the cost of hedging

2. Risk decreases, as exposure to currency risk gets hedged

3. The risk reduction from hedging occurs in a non-linear way

For these reasons, it is not necessarily the case that being 100% hedged is most efficient. There may be a sweet spot below 100% where the ratio of return to risk is at its highest. For example, for sterling invested in Europe ex UK real estate that sweet spot occurs when the hedge ratio is about 50%. With this degree of hedging, the ratio of return to risk reaches its peak of 0.65.

'There may be a sweet spot below 100% where the ratio of return to risk is at its highest'

Figure 9: Summary historic data for sample portfolio 2 (US dollars invested in Europe)

Legend:
- ■ Total return
- ■ Volatility of total return
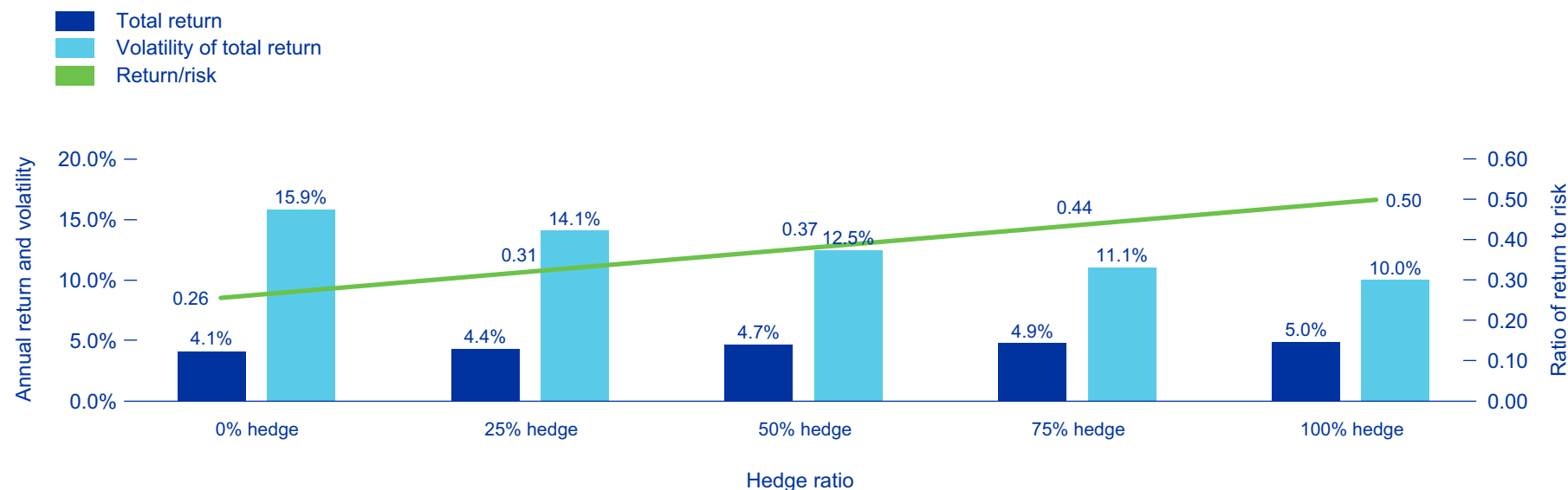- ■ Return/risk

Figure 9 shows the corresponding data but for the second sample portfolio, but this time for US dollars invested into European real estate. The most efficient hedge ratio for this portfolio is 100%, because this is where the return/risk ratio is highest, at 0.50. Note that European real estate is more volatile than Europe ex UK real estate, due to the UK's higher volatility.

Figure 10: Summary historic data for sample portfolio 3 (Euros invested in the UK)
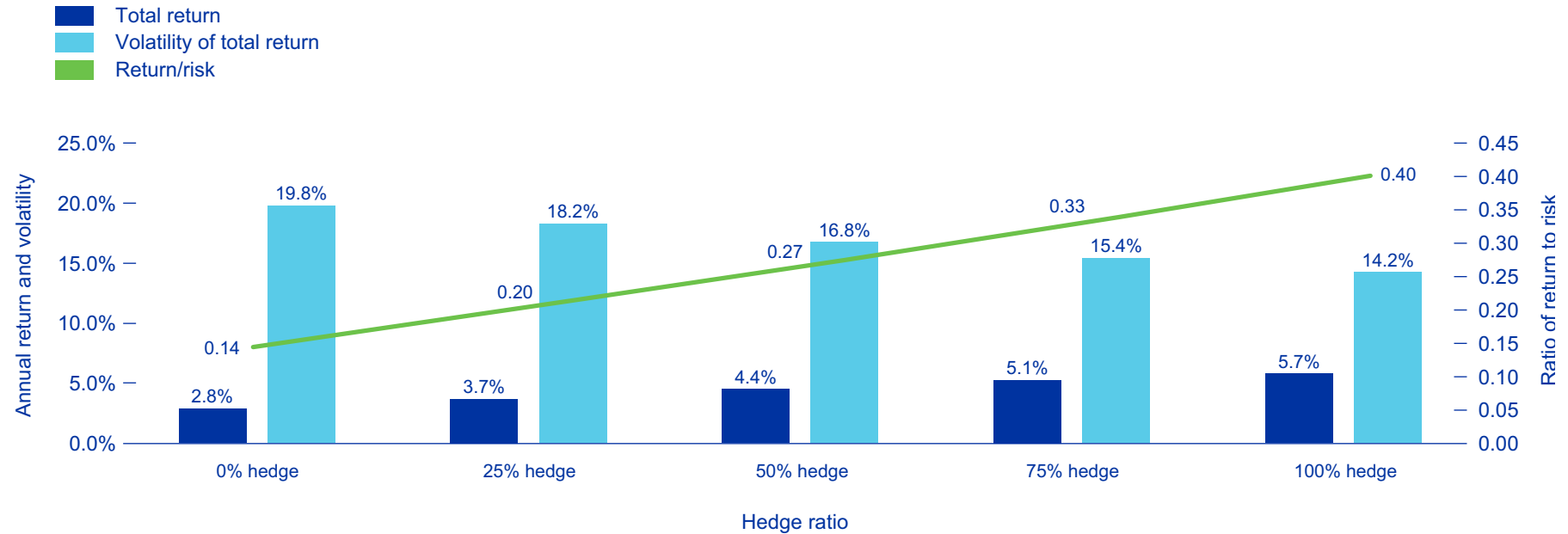
For the third sample portfolio, the optimal hedge ratio over the period is 100%. This reflects the fact that sterling weakened against the euro for the period 2001 to 2015. Over that period, the sterling/euro exchange rate went from approximately 1.6 in 2001 to around 1.3 in 2015, experiencing a dramatic fall to around 1.0 during the global financial crisis (GFC). The benefit of being 100% hedged in 2008 is twice as large as any annual gain that an unhedged position would have delivered.

Figure 11: Summary historic data for sample portfolio 4 (US dollars invested in the UK)

Legend:
- Total return
- Volatility of total return
- Return/risk
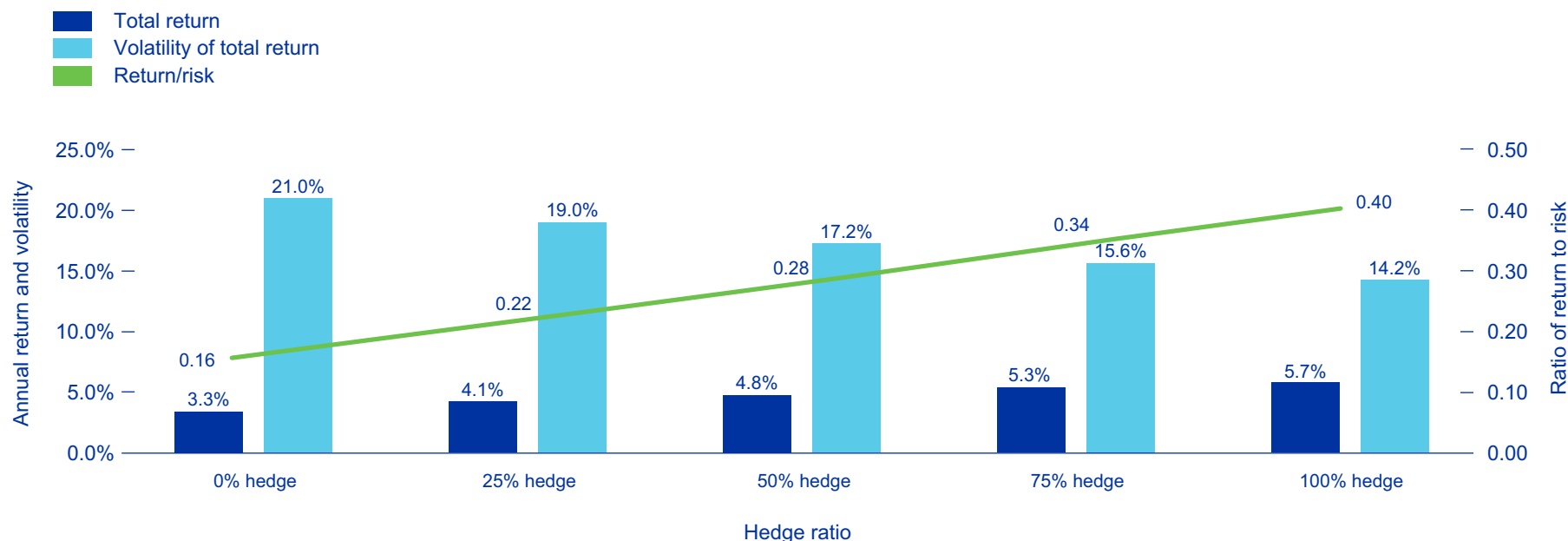
The results show that in the period 2001 to 2015, higher levels of hedging generally led to increasing returns and a decreasing level of volatility. Over that period, the sterling/ dollar exchange rate went from approximately 1.5 in 2001 to a peak of 2.1 in 2007 before a dramatic fall to 1.4 in 2008 which has not been recovered. The benefit of being 100% hedged in 2008 is twice as large as any annual gain that an unhedged position would have delivered.

Comment on all four sample portfolios
For the annual real estate fund performance over 2001 to 2015 at both the single-country and multi-country levels, currency risk effects were a significant contributor to risk and return and risk-adjusted returns. Managing those currency effects using currency forwards would have altered the risk and return experience for fund managers and for investors over that period. The results from the historic data analysis show that hedging ratios of 50% to 100% worked best in all cases.

To gain further insights into the ex-ante hedging results, a forward-looking simulation approach to currency hedging risk management was also undertaken, and this can be read in the next Section.

6. Scenario analysis of the effects of currency hedging strategies on risk and returns

This section looks at possible future scenarios for real estate and currency returns. It estimates the effect of different currency hedging strategies on risk and returns by forecasting a realistic range of estate returns, currency returns and hedging costs over annual holding periods. The estimates are produced using stochastic (probabilistic) modelling of the same four sample portfolios that were described in the previous section, namely:

1. Sterling invested in Europe ex UK real estate

2. US dollars invested in European real estate

3. Euros invested in UK real estate

4. US dollars invested in UK real estate

Appendix 4 contains the full set of risk, return and correlation assumptions which are used in the probabilistic modelling. The model works by generating random correlated returns for real estate and currency, and then adjusting these by subtracting randomly generated costs. The costs are a combination of interest rate differentials, cash drag and fixed administration costs, as follows:

Interest rate differential: Foreign 3-month interest rate minus domestic 3-month rate

Cash drag: Foreign real estate return minus domestic 3-month interest rate

Administration: 16 basis points, calculated as the mid-point of:

- Direct transaction costs
  (buy/sell spreads on
  FX forwards):   3 - 7 bps

- Indirect costs (dealing with
  cash flows from rollovers):   2 - 5 bps

- Management fees for
  passive hedging: 5 - 10 bps

- Overall administration costs: 10 – 22 bps

The modelling assumes that hedge ratios were static rather than dynamic and that they were maintained throughout each calendar year by means of four consecutive three-month forwards.

Figure 12: Summary forecast data for sample portfolio 1 (sterling invested in Europe ex UK)
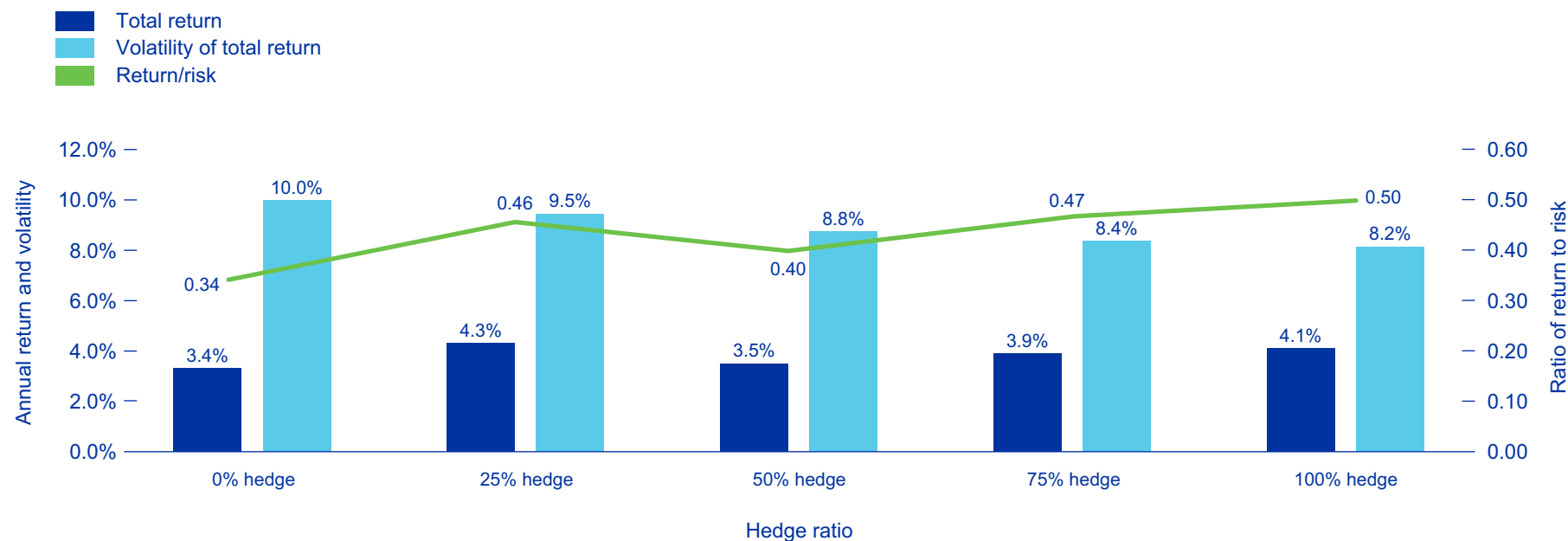
As seen in Figure 12, the modelling exercise indicates that the optimal hedging ratio is 100%, though the difference in efficiency between 100% and 75% is modest. There is considerable unpredictability in the currency and interest rate markets, and as a result the evolution of the return to risk ratio is not always a straight line or a smooth arc. This is the case in Figure 12.

Figure 13: Range of outcomes for sample portfolio 1 (sterling invested in Europe ex UK)
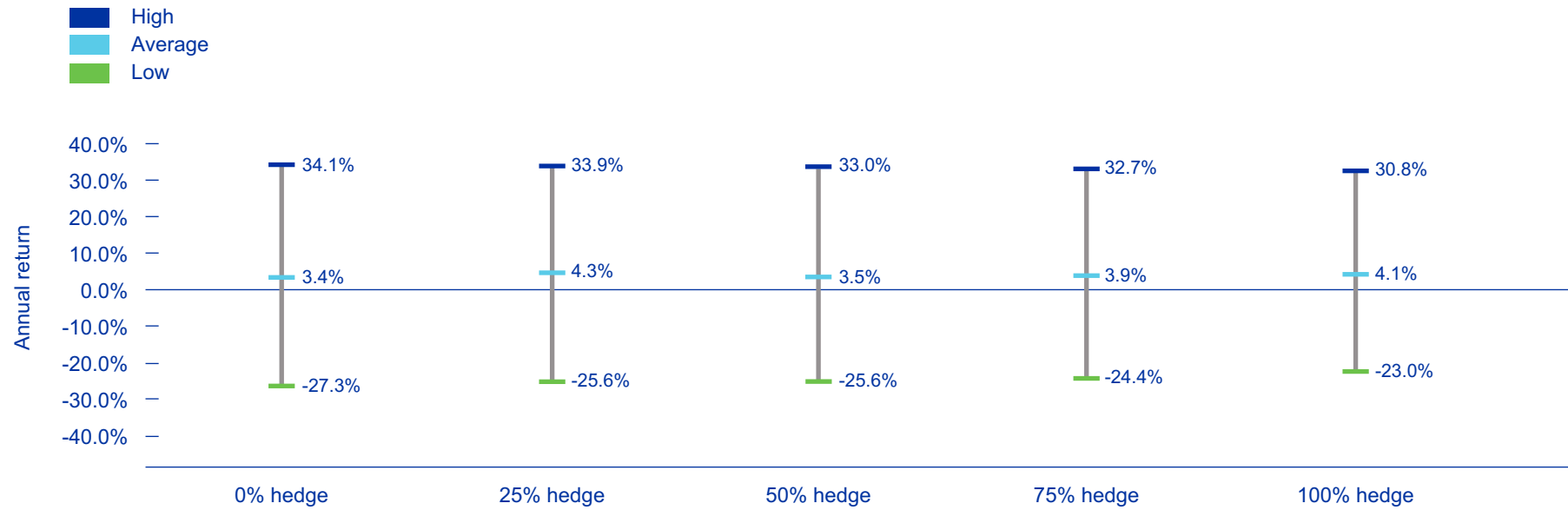
As the hedge ratio increases, the range of outcomes gets narrower

Figure 14: Summary forecast data for sample portfolio 2 (US dollars invested in Europe)
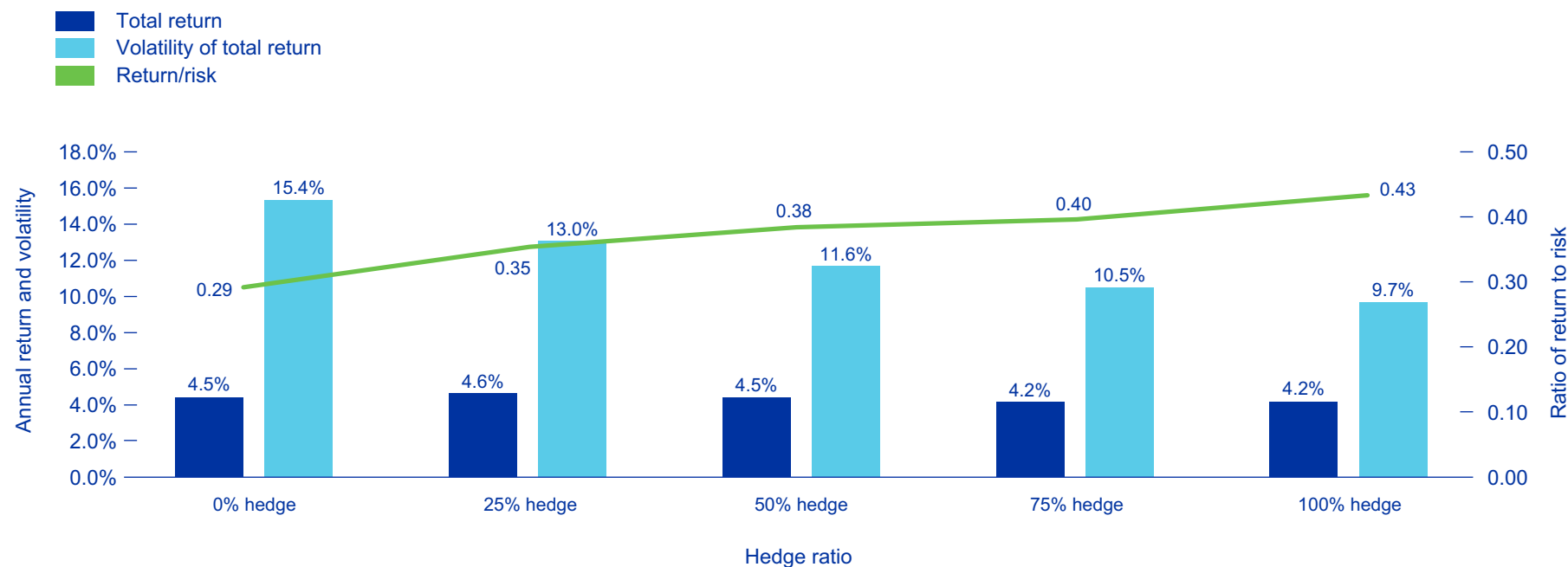
Figure 14 shows that the optimal hedge ratio for this sample portfolio, based on the assumptions set out in Appendix 4, is 100%. As the hedge ratio increases, the reduction in risk tapers off and as a result the improvement in efficiency also tapers off. Put another way, the main improvement in efficiency occurs when the hedge ratio goes from 0% to 50%, and the improvements thereafter are less marked.

Figure 15: Range of outcomes for sample portfolio 2 (US dollars invested in Europe)

As the hedge ratio increases, the range of outcomes gets narrower
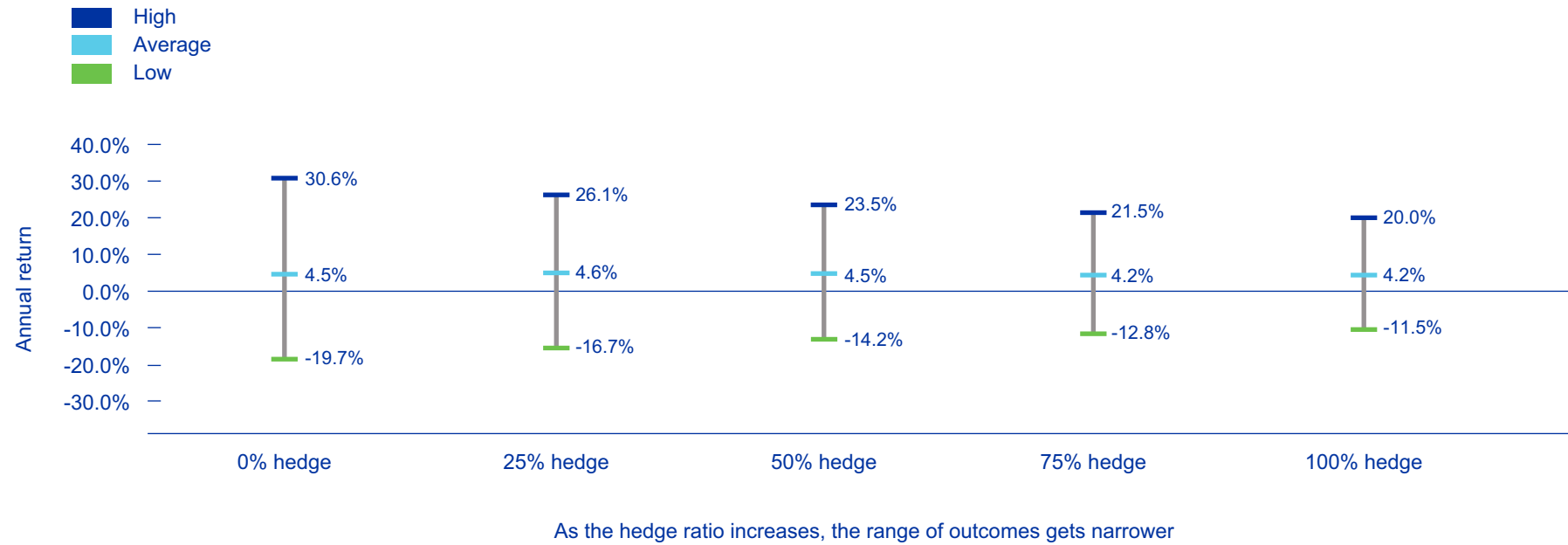
Figure 15 is based on the same modelling results, but it shows something slightly different: the gap between the best, worst and median outcomes for each hedge ratio. It shows that the spread of outcomes (best minus worst) narrows as more currency risk is hedged.

Figure 16: Summary forecast data for sample portfolio 3 (Euros invested in the UK)
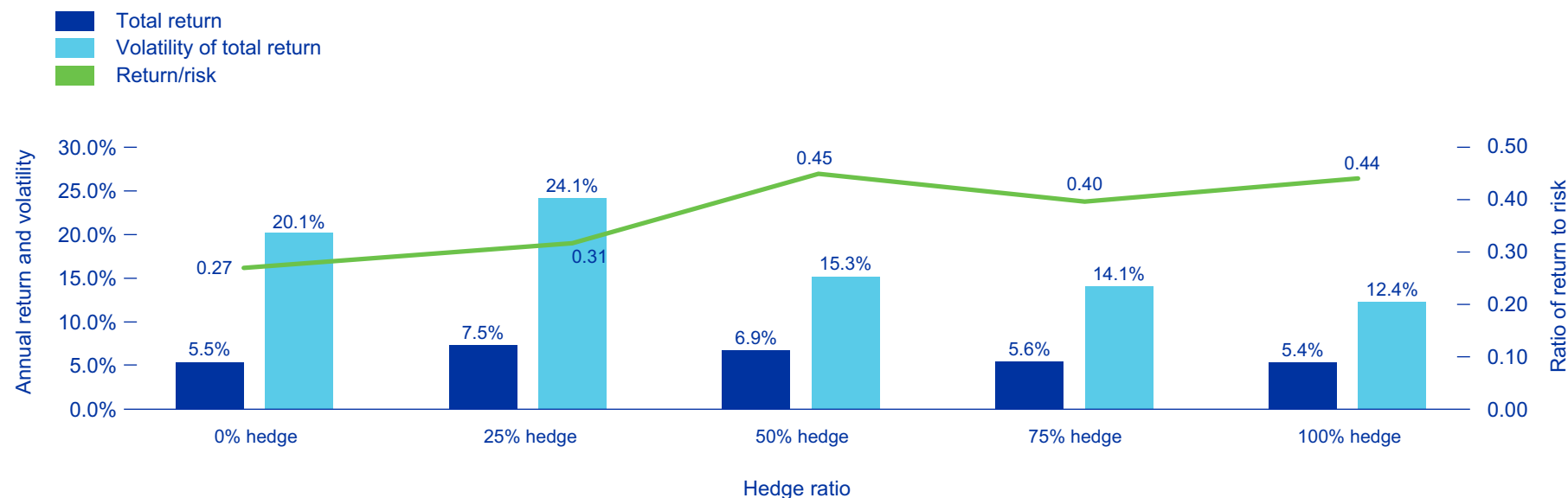
As seen in Figure 16, the modelling exercise indicates that the optimal hedge is 50%, but it is only slightly better than the 100% hedge. Again, the key pattern to note is that risk reduction is greatest as the hedge ratio moves from 0% to 50%, while the risk reduction effect at ratios of greater than 50% is more modest.

All the simulations in this section of the report deal with static hedging strategies: that is, a fixed hedge ratio is applied in every period.

Figure 17: Range of outcomes for sample portfolio 3 (Euros invested in UK real estate)

Legend:
- High (dark blue)
- Average (light blue)
- Low (green)

Annual return (y-axis):
- 60.0%
- 50.0%
- 40.0%
- 30.0%
- 20.0%
- 10.0%
- 0.0%
- -10.0%
- -20.0%
- -30.0%
- -40.0%

	0% hedge	25% hedge	50% hedge	75% hedge	100% hedge
High	40.1%	49.0%	33.0%	28.7%	26.0%
Average	5.5%	7.5%	6.9%	5.6%	5.4%
Low	-25.1%	-30.1%	-17.1%	-17.0%	-14.8%

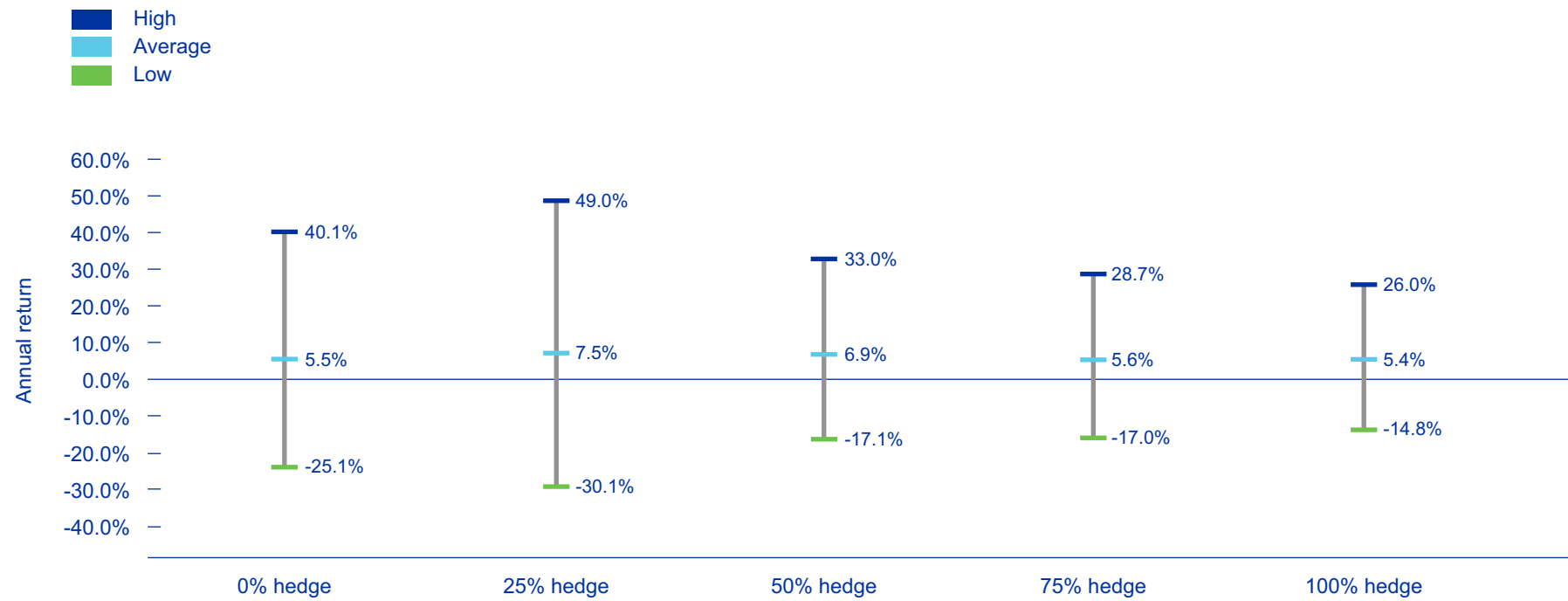As the hedge ratio increases, the range of outcomes generally gets narrower

Figure 18: Summary forecast data for sample portfolio 4 (US dollars invested in the UK)
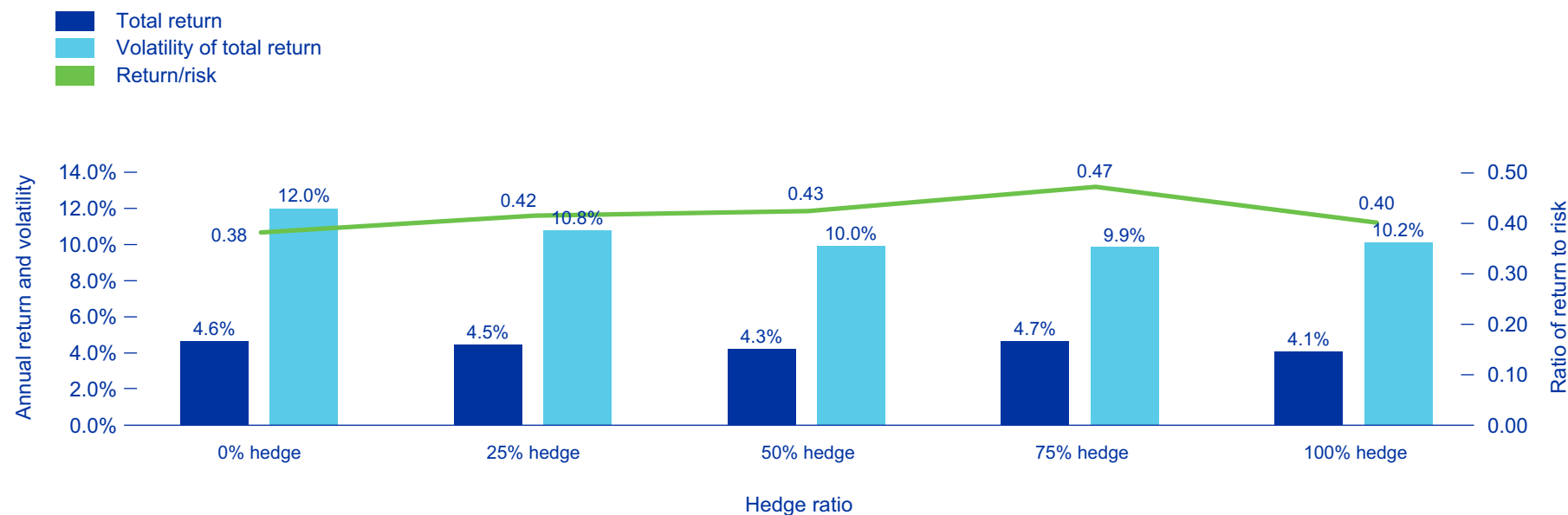
As seen in Figure 18, the modelling exercises indicates that the optimal hedge ratio is 75% for US dollars invested in UK real estate. It delivers a return to risk ratio of 0.47, materially better than the return to risk ratios of the other hedging ratios.

Figure 19: Range of outcomes for sample portfolio 3 (Euros invested in UK real estate)

Legend:
- High
- Average
- Low

	0% hedge	25% hedge	50% hedge	75% hedge	100% hedge
High	25.6%	22.6%	20.7%	21.1%	20.8%
Average	4.6%	4.5%	4.3%	4.7%	4.1%
Low	-15.1%	-12.9%	-11.9%	-11.4%	-10.9%

Annual return

As the hedge ratio increases, the range of outcomes tends to get narrower

Comment on all four portfolios

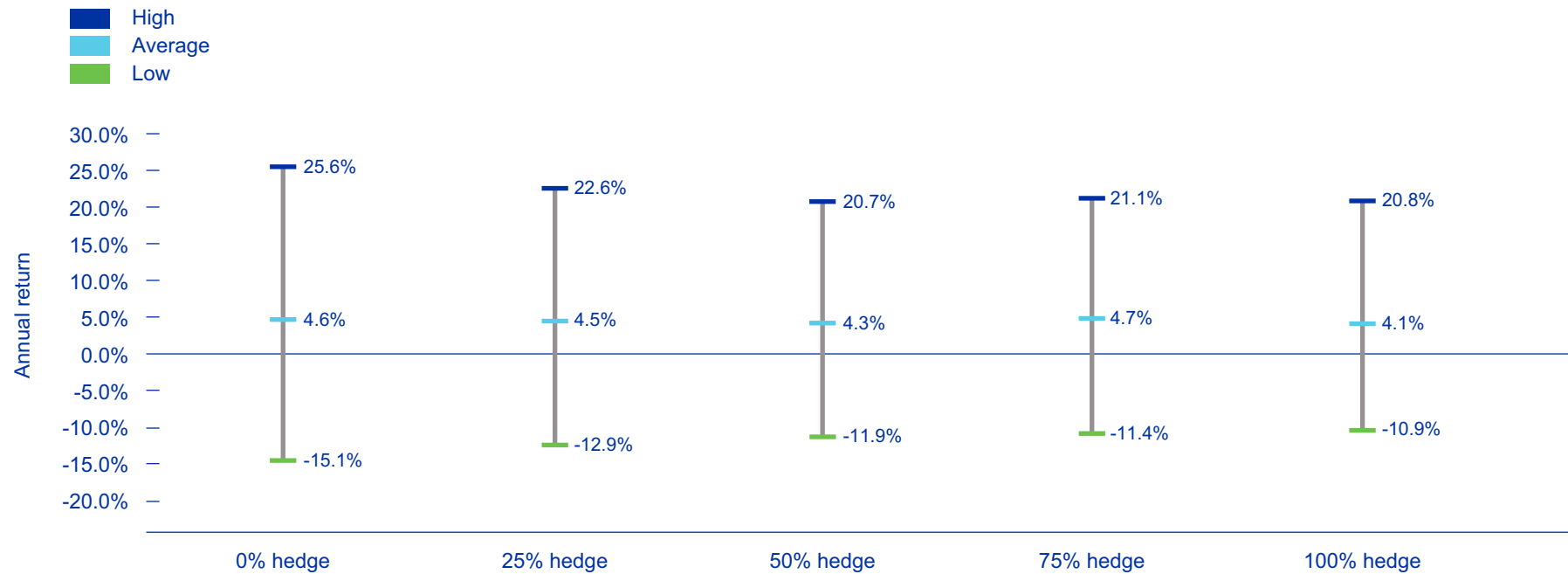The impact of transaction costs is marginal and does not alter the overall conclusions regarding the use of currency forwards. The relatively minor impact of transaction costs and of the forward term (3-months, 6-months, 9-months) suggests that decision-making should focus more on the selection of the hedging ratio rather than the detailed mechanics of implementing those decisions.

A key takeaway from these modelling exercises is that there are two factors influencing the impact that currency will have on the portfolio: the volatility of currency relative to that of the underlying asset (the volatility ratio) and the interaction between currency and the underlying asset. The larger the volatility ratio the greater the impact of the foreign-currency exposure on the portfolio's volatility.

7. Practical implications and conclusions

Currency risk management is a key dimension of an investor's overall risk management strategy when incorporating international real estate into their portfolio.

Unhedged currency exposure has upside potential but downside risk too. Currency movements on their own can make the difference between a target being reached or missed. For managers of non-listed real estate funds, currency movements could spell the difference between a client retained and a client lost.

So it is important to get currency management right, and the key component of currency management is the hedge ratio. Setting the hedge ratio correctly will have more impact than any other single decision relating to currency.

This study shows that the optimal hedging ratio is likely to be somewhere in the range of 50% to 100%, and therefore blanket hedging is unlikely to be optimal in every case. So it is worth spending time thinking through the investment strategy and its currency implications, and then considering how much of the associated currency exposure should be hedged.

> 'The key component of currency management is the hedge ratio'

Within the discussion of the hedge ratio, consider whether certain currencies should be excluded from the hedging programme (for example, for euro-oriented funds, it may be decided to exclude currencies that are pegged to the euro).

In addition to the hedge ratio, attention needs to be paid to the level at which currency risk is managed (for example, asset by asset or at portfolio level). When the hedge ratio decision is made, turn to implementation. Currency risk can be managed using different instruments and those instruments can be set over different time horizons such as three months, six months and so on. Forwards are a popular choice among investors, and in terms of cost and effectiveness, there is little to choose between the various terms that are available.

The five main messages from this research are:

- Currency effects can dominate real estate returns, turning good real estate returns into disappointments and vice versa

- Getting FX right can be the difference between hitting or missing a return target

- Investors currently apply a high level of sophistication in their currency risk management strategies. This includes currency hedging against a range of currencies and at different real estate levels, including the entire real estate portfolio and at an asset by asset level.

- The effective use of currency forwards to mitigate currency risk, leading to risk reduction evident across the various hedging ratios compared to the unhedged strategy.

- The importance of setting specific levels of hedging to achieve the optimal risk-adjusted returns. The scenario analysis has taken a forward-looking approach to currency risk management, and it suggests an average optimal hedging ratio of 81%, though the specific number itself is less significant than its location in the broad 50% to 100% range.

These investor survey and empirical results provide a useful context for currency risk management decisions that specific real estate investors need to take. This will be influenced by specific real estate investment considerations such as the balance of their domestic versus international real estate portfolio, which international real estate markets they seek to prioritise, market weightings and exposure, developed versus emerging markets, currency volatility expectations, style of real estate fund to be used, as well as their broader real estate risk management procedures.

Further research could assess the effectiveness of other currency hedging instruments (e.g. swaps, options), as well as a fuller assessment of practical real estate fund implementation issues. More research concerning optimal hedging ratios under certain market conditions would also be useful for investors as they seek effective currency

risk management strategies in the non-listed real estate space for their international real estate exposure and delivery.

Currency risk management should continue as an important strategic issue for real estate investors seeking international real estate exposure in their overall strategies. Specific results from this research will assist real estate investors to fine-tune their currency risk management procedures for more effective real estate portfolio performance management.

Appendices

Appendix 1: Bibliography

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Appendix 2: Survey of INREV investor members

Q1: Do you use currency hedging? Yes ☐ No ☐

If No, please answer questions 16-17.

Q2: Which currencies do you hedge (you may select more than one currency)?

€ ☐ £ ☐ US ☐ Japanese yen ☐ Australian $ ☐

Other ☐ (specify currencies _____)

Q3: Do you manage the currency hedging yourself? Yes ☐ No ☐

Q4: Do you allow or request your managers to use currency hedging?

Yes ☐ No ☐ Not applicable ☐

Q5: Do you explicitly prefer your managers not to hedge?

Yes ☐ No ☐ Not applicable ☐

Q6: If you prefer the manager to hedge, is there anything you want done by the manager

(specify) _____

Q7: If you prefer the manager to hedge, is there anything you do not want done by the manager

(specify) _____

Q8: At what level is currency hedging carried out?

Asset by asset: **Yes** ☐ **No** ☐

Elements of real estate portfolio:

Style: **Yes** ☐   **No** ☐

Certain countries only: **Yes** ☐   **No** ☐

Entire real estate portfolio: **Yes** ☐   **No** ☐

Multi-asset portfolio: **Yes** ☐   **No** ☐

Q9: Does investment style affect your currency hedging strategy? Yes ☐   No ☐

Q10: Does currency hedging affect your investment style? Yes ☐   No ☐

Q11: When is currency hedging done?

Continually: **Yes** ☐   **No** ☐

Specific times only: **Yes** ☐   **No** ☐

(If Yes, please specify the times _____)

Q12: When you hedge, for what time period do you hedge?

3M ☐   **6M** ☐   **1Y** ☐   **3Y** ☐   **Other** ☐

Q13: What hedging ratio(s) do you use?

100% ☐   **50%** ☐   **Other** ☐

(specify the ratios _____)

Q14: How is currency hedging implemented?

Swaps: **Yes** ☐   **No** ☐

Forwards: **Yes** ☐ **No** ☐

Options: **Yes** ☐ **No** ☐

Other (please specify): _____

Q15: Do you treat real estate currency hedging differently to other asset classes?

Yes ☐ **No** ☐

If Yes, specify how it is different and why ?_____

Q16: What is your overall currency hedging policy?

_____

Q17: Respondent profile

Type of investor:

Pension fund ☐   Property fund manager ☐   Insurance company ☐   Family office ☐

Sovereign wealth fund ☐   Fund of fund ☐   Multi-manager ☐   Other ☐

Portfolio size (specify): _____

Geographic diversification:

Global ☐   Europe (ex-UK) ☐   Europe (including UK) ☐   UK only ☐   US ☐   Asia Pacific ☐
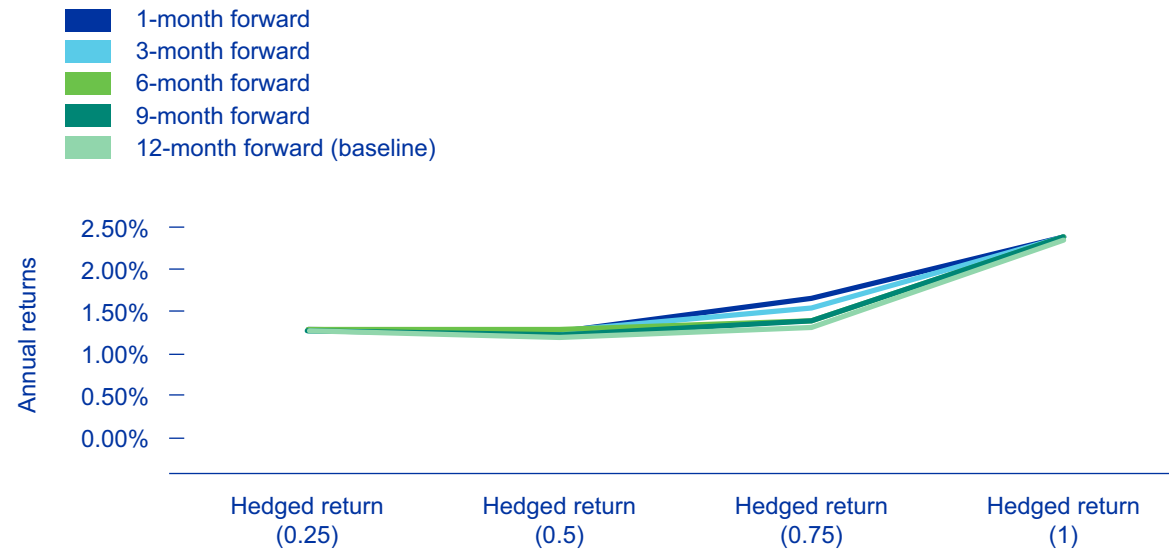
Other ☐   (please specify _____)

Investment styles used:

Core ☐   Value-added ☐   Opportunistic ☐   Debt ☐

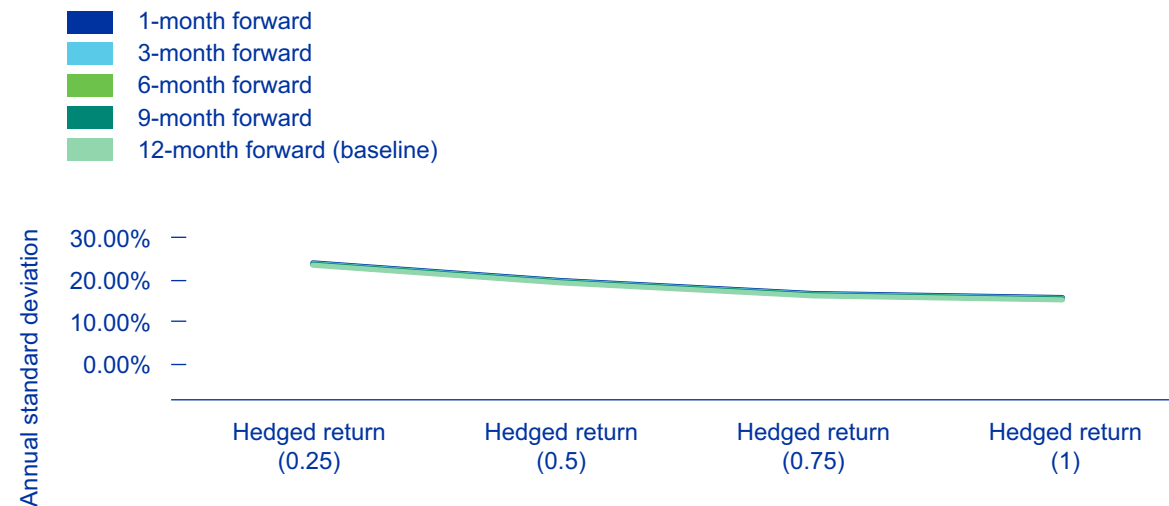Main location of your organization (specify): _____

Appendix 3: Different forward exchange terms

Figure 1: Impact of forward exchange terms and hedging ratios on median historic returns

In the charts in this Appendix the numbers in brackets on the horizontal axis indicate the hedge ratio. For example, hedged return (0.25) means the return when a hedging ratio of 25% was applied.

Legend:
- 1-month forward
- 3-month forward
- 6-month forward
- 9-month forward
- 12-month forward (baseline)

Figure 2: Impact of forward exchange terms and hedging ratios on historic risk

Legend:
- 1-month forward
- 3-month forward
- 6-month forward
- 9-month forward
- 12-month forward (baseline)

* numbers in brackets in each graph represent the hedging ratio

Figure 3: Impact of forward exchange terms and hedging ratios on historic risk-adjusted returns

- 1-month forward
- 3-month forward
- 6-month forward
- 9-month forward
- 12-month forward (baseline)
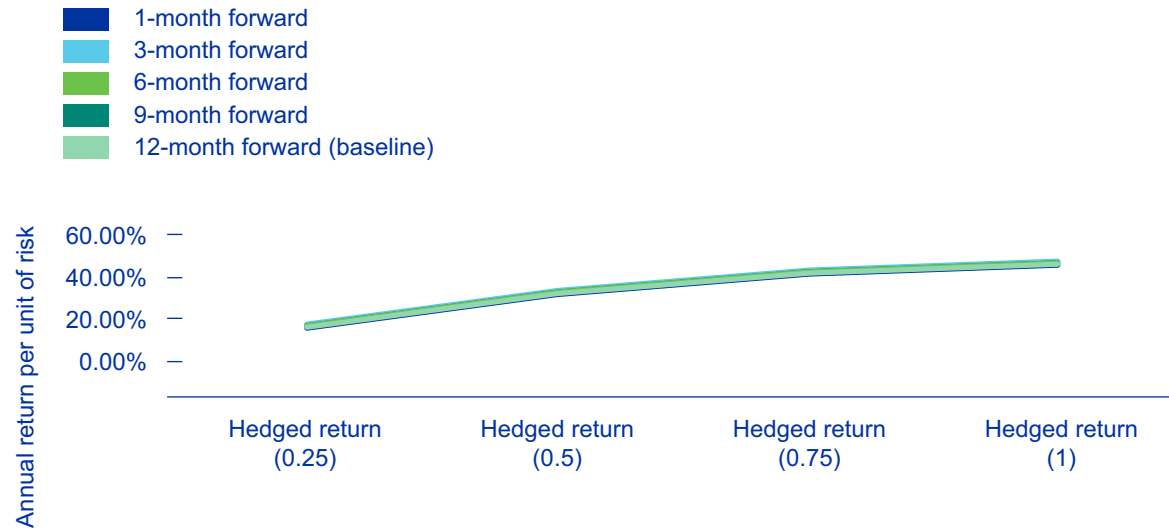
Figure 4: Level of historic risk reduction across forward exchange term and hedging ratios

- 1-month forward
- 3-month forward
- 6-month forward
- 9-month forward
- 12-month forward (baseline)
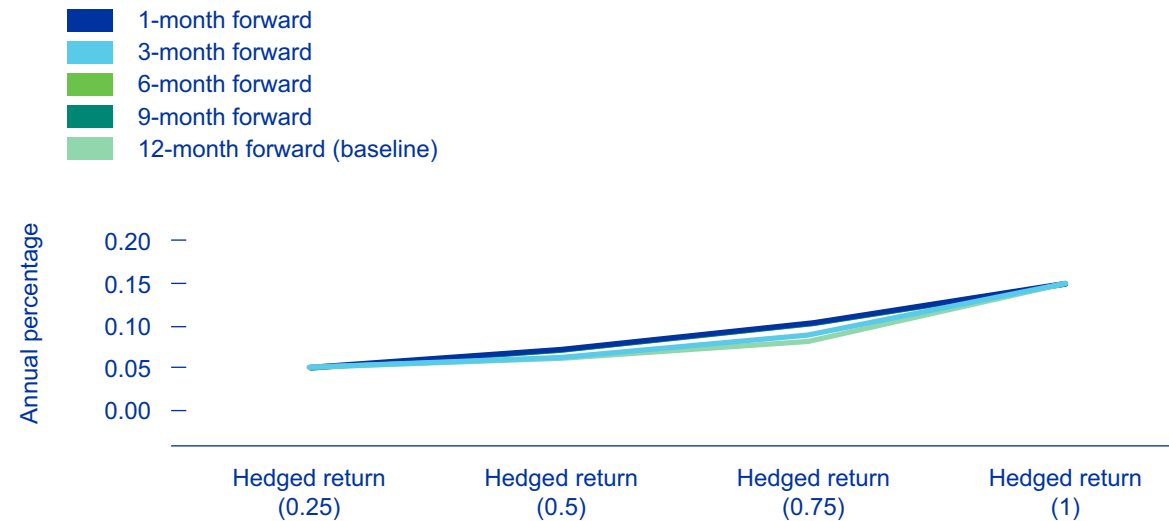
Appendix 4: Assumptions used in the Monte Carlo simulations

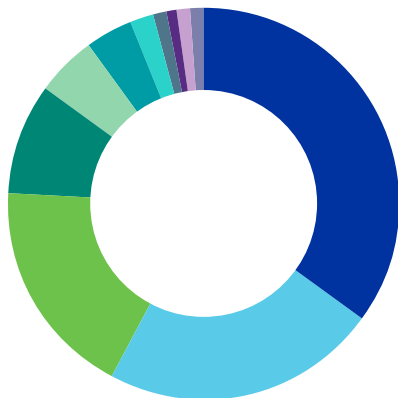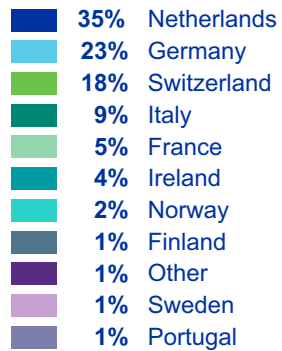| Real estate	Return	Risk
Europe ex UK prime property	0.040	0.080
European prime property	0.045	0.110
UK prime property	0.050	0.140
Currency		
Europe ex UK (euro + CHF)/sterling	0.000	0.110
Europe (sterling + euro + CHF)/US dollar	0.000	0.110
Sterling/euro	0.000	0.110
Sterling/US dollar	0.000	0.110
Cash		
Sterling cash	0.025	0.008
Dollar cash	0.023	0.005
Euro cash	0.013	0.005
Europe cash (sterling + euro+ CHF)	0.018	0.006
Europe ex UK cash (euro + CHF)	0.010	0.005

	Real Estate w (Europe ex UK)	Real Estate Returns (Europe)	Real Estate Returns (UK)	FX returns (Europe ex UK per GBP)	FX returns (Europe per US dollar)	FX returns (Euro & CHF per GBP)	FX returns (GB per dollar)	FX returns (US into GB)
Real Estate Returns (Europe ex UK)	1.0							
Real Estate Returns (Europe)	0.9	1.0						
Real Estate Returns (UK)	0.8	1.0	1.0					
FX returns (Europe ex UK per GBP)	0.3	0.3	0.2	1.0				
FX returns (Europe per US dollar)	0.2	0.2	0.1	0.6	1.0			
FX returns (Euro & CHF per GBP)	0.4	0.5	0.4	-0.1	-0.4	1.0		
FX returns (GB per dollar)	0.1	0.1	0.0	-0.2	-0.3	-0.2	1.0	
FX returns (US into GB)	0.4	0.5	0.5	0.5	-0.5	0.4	0.4	1.0

Source: JP Morgan Long-Term Capital Market Assumptions 2017; INREV Annual Index

The risk assumptions for real estate and the correlations are based on historic patterns.

Appendix 5: Asset allocation of sample portfolios 1 and 2

Asset allocation of sample portfolio 1

	35%	Netherlands
	23%	Germany
	18%	Switzerland
	9%	Italy
	5%	France
	4%	Ireland
	2%	Norway
	1%	Finland
	1%	Other
	1%	Sweden
	1%	Portugal

Asset allocation of sample portfolio 2

	54%	UK
	16%	Netherlands
	10%	Germany
	8%	Switzerland
	4%	Italy
	2%	France
	2%	Ireland
	1%	Norway
	1%	Finland
	2%	Other