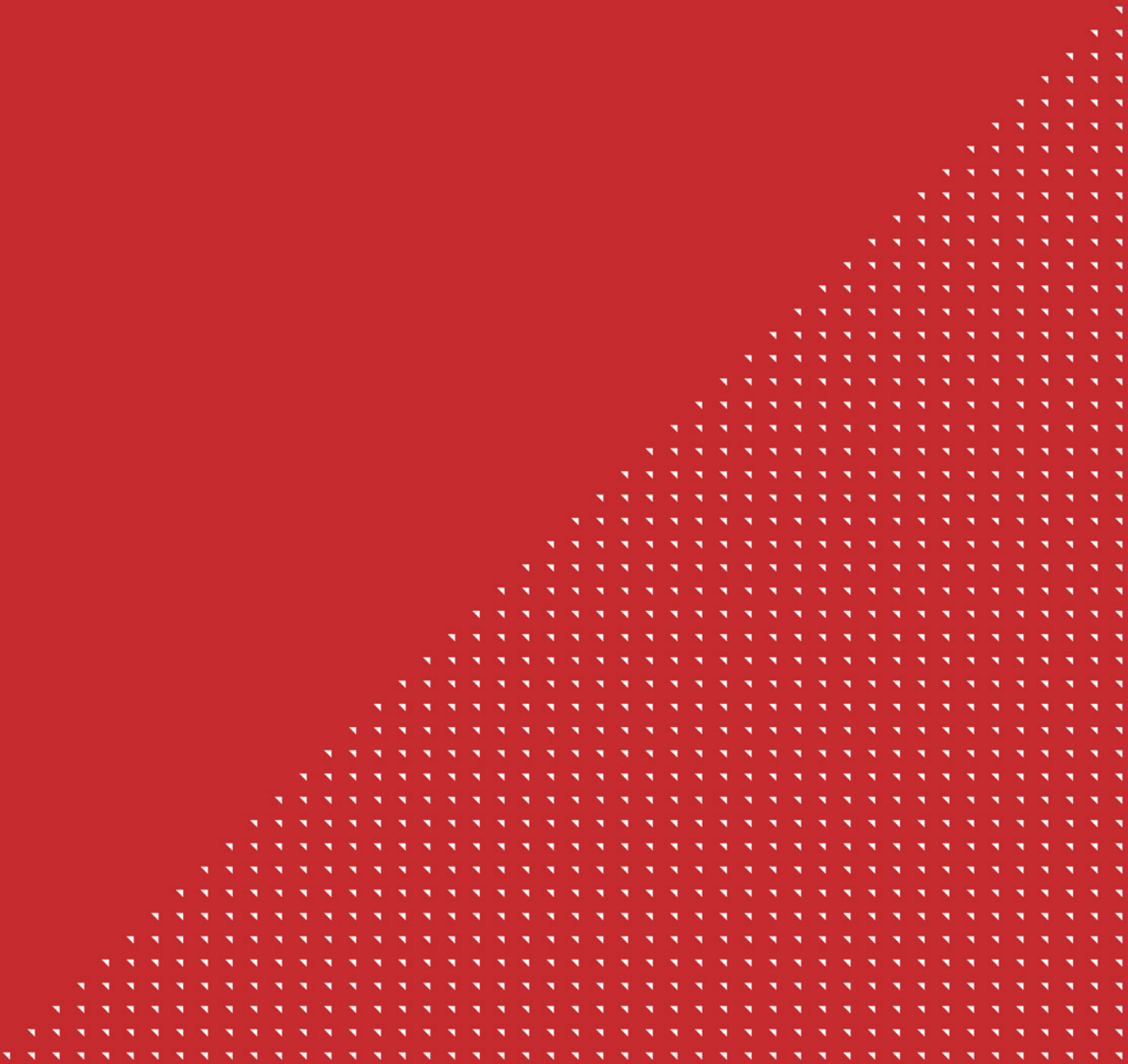


**Red Paper – Portfolio rebalancing**  
**Managing risk in volatile markets**

**February 2009**



## Snapshot

- The current volatile markets can cause a fund's asset allocation to drift from its desired position very quickly.
- These unintended departures from a fund's policy portfolio have negative risk and return impacts that could otherwise be managed through portfolio rebalancing.
- Diversified portfolios will benefit most from rebalancing.
- The most effective way to rebalance is through the use of derivative contracts.
- More frequent (i.e. daily) rebalancing provides better outcomes due to improved liquidity and price discovery, particularly in volatile markets.
- The use of derivative contracts can effectively reduce the transaction and market impact costs of rebalancing.
- Using derivatives does introduce counterparty risk, however, this can be managed through the use of multiple, highly rated counterparties and by using a derivatives trader that acts as agent for the investor.

## Portfolio rebalancing

### Background

Every fund has a set of defined investment objectives it aims to achieve over a set period of time. To achieve these objectives, the fund's investment strategist will typically build a diversified target portfolio based on the outlook for each asset class together with the expected levels of risk and the correlation between asset classes. This portfolio represents the best prospect of meeting the fund's objectives.

All else being equal, unintended departures from the target portfolio increase the risk that the fund's objectives will not be met. One way that fund trustees can control this risk is through portfolio rebalancing. By regularly rebalancing the portfolio to the desired weights, the investment manager can maintain a high level of control over the portfolio outcomes, and keep the portfolio on track to meet the fund's investment objectives.

In the second half of 2008, global financial markets experienced extreme volatility, where daily movements in sharemarkets and currencies of 5% to 8% were common. In this environment, a fund's asset allocation can drift from its desired position very quickly, and funds that employ an infrequent rebalancing strategy may need to rebalance at a time when liquidity is thin or unavailable. This may result in the inability to trade or may force trades to be undertaken at poor prices, potentially reducing the fund's long-term returns.

A frequent rebalancing policy (i.e. rebalancing on a daily basis) can help manage these risks.

## Which portfolios benefit most from rebalancing?

Portfolios that comprise a number of asset classes with low or negative correlation benefit the most from rebalancing, as there will be greater divergence in the short-term performance of these asset classes. If the portfolio was made up of assets with a high correlation, market movements would tend to move all asset classes to a similar extent and the portfolio would not deviate significantly from its desired asset allocation. Therefore, the more diversified the fund, the more it will benefit from rebalancing.

Figure 1 shows the benchmark returns from a range of asset classes for the ten financial years to June 2008. It shows the extent that returns can vary between asset classes from year to year. This variability leads to asset allocation drift, and in multi-asset-class portfolios this drift can be significant and can negatively impact the fund's performance.

**Figure 1**

Asset Class	Jun-08	Jun-07	Jun-06	Jun-05	Jun-04	Jun-03	Jun-02	Jun-01	Jun-00	Jun-99
Australian Equities	-13.4%	29.2%	24.2%	24.7%	22.4%	-1.1%	-4.5%	8.8%	16.8%	14.1%
International Equities Hedged	-13.4%	23.8%	17.6%	13.5%	24.6%	-3.7%	-18.0%	-15.2%	13.1%	15.9%
Real Estate	10.8%	18.5%	17.0%	12.7%	11.5%	9.3%	8.8%	10.7%	9.7%	8.0%
Australian Fixed Interest	5.5%	3.5%	2.6%	8.1%	1.9%	9.9%	6.0%	6.9%	6.2%	3.1%
International Fixed Interest	7.9%	5.7%	1.2%	11.6%	4.1%	12.5%	8.7%	10.1%	3.9%	5.2%
Cash	7.3%	6.3%	5.7%	5.5%	5.2%	4.9%	4.6%	6.0%	5.4%	5.0%
Commodities	60.6%	1.3%	41.3%	36.0%	41.8%	27.3%	-0.9%	6.8%	53.9%	-6.9%
International Equities Currency	-9.2%	-13.1%	1.7%	-12.0%	-4.5%	-16.3%	-7.7%	9.6%	9.2%	-8.3%

## Rebalancing through derivatives

There are three broad approaches to implementing portfolio rebalancing:

1. Rebalancing physical asset holdings
2. Rebalancing by cashflow
3. Rebalancing through derivative contracts.

Rebalancing physical asset holdings involves buying and selling securities such as shares, property and bonds at the prevailing market price. This can be very expensive and has significant tax implications. Assets may need to be bought or sold at a time when the best price cannot be achieved or where there is no market for that asset. Buying and selling physical assets can also take a considerable amount of time. While this is occurring, the portfolio remains exposed to risk.

Rebalancing by cashflow involves the use of net cash inflows, distributions, coupon payments, rental receipts and dividends etc. to purchase assets in the asset classes with the largest underweight holdings. This is a moderately effective means of rebalancing as it shifts the portfolio closer to its target positioning. However, it can take considerable time to generate and then invest the excess cash. It is also not an effective strategy for funds with net cash outflows.

The most effective way to rebalance is through the use of derivative contracts. These typically involve the purchase and sale of index futures contracts, but can also include over-the-counter swaps and forwards, as well as options. Derivative markets are significantly more liquid than physical markets, and as such the transaction costs are significantly lower. In addition, derivative positions that generate a positive exposure (long) or a negative exposure (short) to an asset class can be held. This gives the strategist more flexibility in managing the fund's total effective exposures. With a derivatives-based rebalancing program in place, the portfolio asset allocation consists of the physical assets held within each asset class plus a derivative position in each asset class. The size (and sign) of the derivative exposures can then be modified in line with market movements to maintain the desired effective exposures.

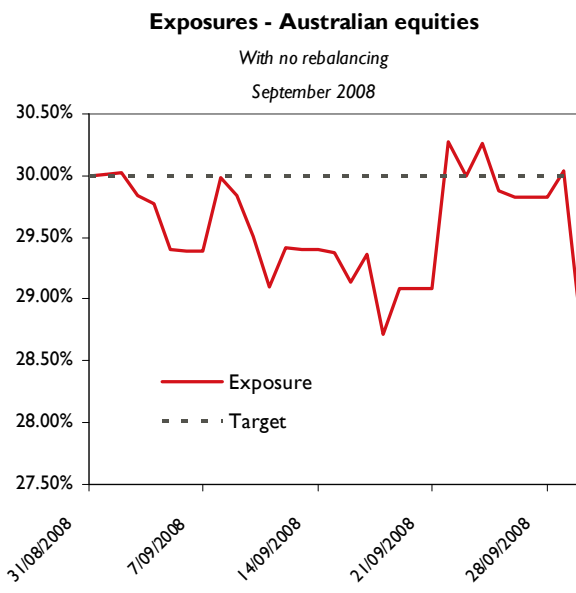
## Rebalancing in volatile markets

In practical terms, risk can be described as 'being in the wrong place at the wrong time'. Because it is impossible to accurately determine when the 'wrong time' will be, an investment manager can only manage the risk of being in the wrong place. Therefore, risk should be measured as the size of the deviation from the target portfolio and the potential impacts of such a position.

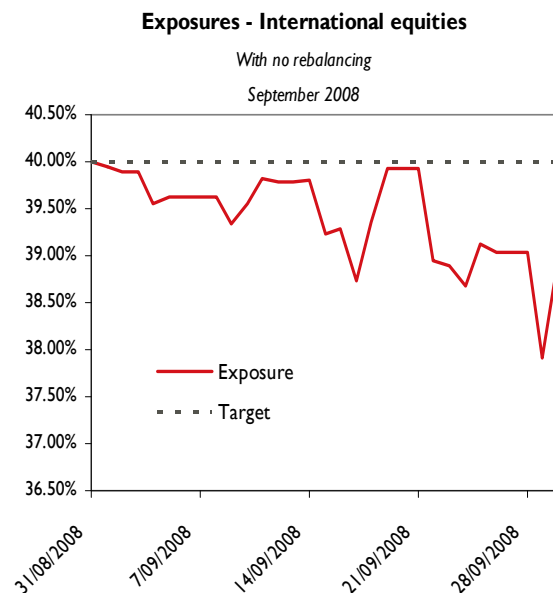
In times of significant market volatility, large market movements can occur over short timeframes. This can result in a portfolio's asset exposures drifting significantly from the desired position very quickly and increases the short-term risk for fund performance.

The figures below show the exposure drift that a non-rebalanced portfolio comprising 30% Australian equity, 40% international equity and 30% cash would have experienced in September 2008, when markets fell sharply but also rebounded strongly on some days:

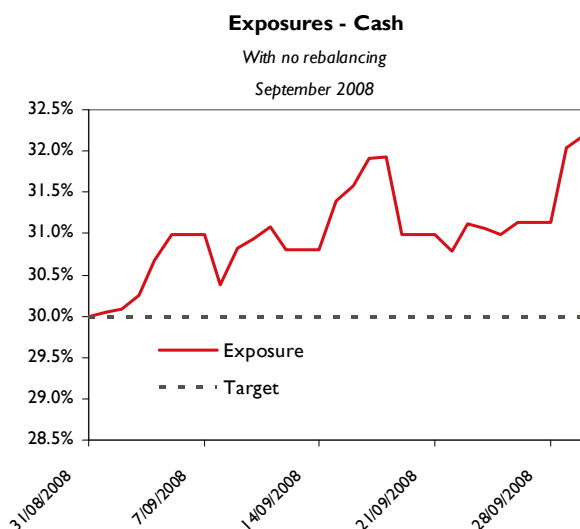
**Figure 2**



**Figure 3**



**Figure 4**



In these examples, the fund's asset allocation drifted by more than 2% from its target exposure within a one month period. In times of market illiquidity or dislocation, as we saw in September and October 2008, trading or rebalancing may not be possible. If the investment manager had employed an infrequent (e.g. monthly) rebalancing program, it may have been forced to rebalance a significant proportion of the portfolio at a time when liquidity was unavailable, which could have resulted in either the inability to rebalance the portfolio (thus leaving the continued risk associated with the unbalanced positions held), or the need to rebalance at prices that were significantly worse than could have been achieved at other times.

In such conditions, a more frequent rebalancing strategy (i.e. rebalancing on a daily basis) offers a number of benefits:

- A frequent rebalancing strategy offers greater risk control than an infrequent rebalancing strategy. This is due to two main factors: (1) The portfolio will deviate only slightly from the target asset allocation at any point in time (one day's movement) as opposed to wider movements with less frequent rebalancing; and (2) smaller volumes will be traded at any time, which means that trading is less reliant on the availability of market liquidity. In addition, if trading cannot be undertaken, the risk associated with the unbalanced positions held is smaller (because position sizes tend to be much smaller when frequent rebalancing is undertaken).
- In steeply falling markets, a frequent rebalancing strategy will result in gradual buying as markets fall. This means that purchases are undertaken at lower prices, improving the fund's potential future performance. It also mitigates the risk of having a large underweight position in a volatile asset class just before markets bounce back.
- A frequent rebalancing strategy is also a more efficient way to use the information at hand. If investment decision-makers strongly believe that markets are heading much higher or lower, they should change the policy weights in the fund to reflect this belief and take full advantage of the anticipated move (i.e. dynamic asset allocation). In this scenario, a higher or lower policy weight that is frequently rebalanced will outperform a lower or higher weight that is allowed to drift.

Of course, it should be noted that market participants rarely identify market trends in advance, and therefore it is important that a fund's rebalancing strategy does not rely on the portfolio manager's ability to undertake superior forecasting of market conditions compared to the average investor. Instead, policy development must be robust across a wide range of market conditions, and allow the process to successfully operate under a 'veil of ignorance' about future market conditions.

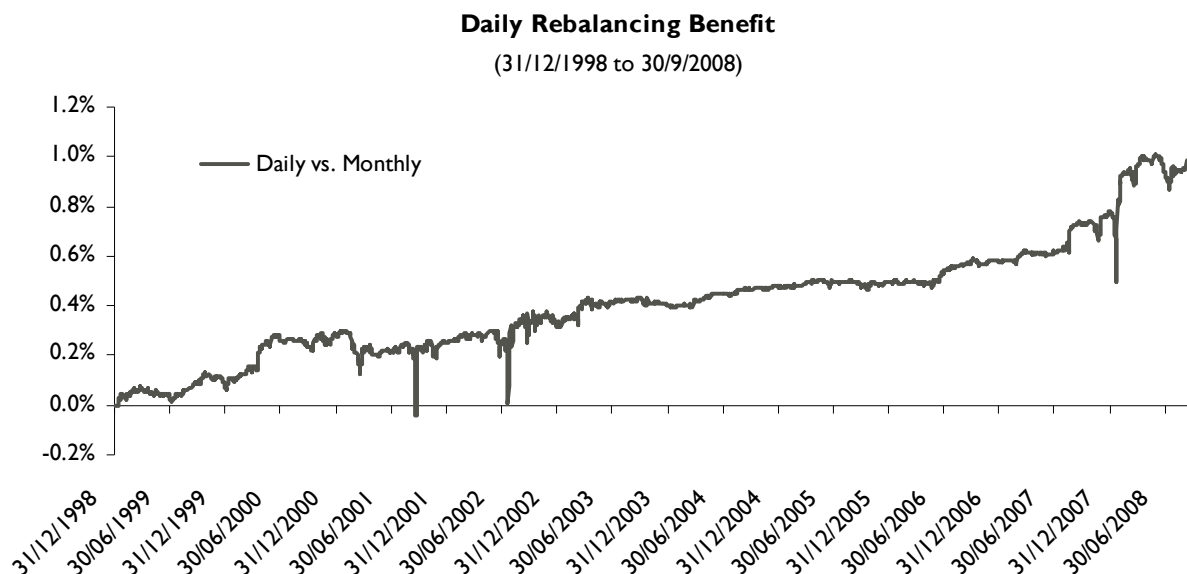
## Daily versus monthly rebalancing

Rebalancing on a monthly basis is the strategy most commonly employed. However, this approach ignores the fact that member cashflows take place on a daily basis, that markets trade on a daily basis, and that the risks associated with asset allocation drift exist on a daily basis. This is especially true during highly volatile market conditions.

Monthly rebalancing strategies often result in drift positions in equity and currency markets that can be several percentage points away from the target portfolio position. If a market reversal occurs while this drift position is in place, the portfolio returns may be negatively impacted.

Figure 5 compares the performance of a portfolio comprising 30% Australian equity, 40% international equity and 30% cash using different rebalancing frequencies:

**Figure 5**



The chart above shows the cumulative value added from a daily rebalancing strategy compared to a monthly rebalancing strategy. The results show that since 31 December 1998, daily rebalancing resulted in higher risk-adjusted returns when compared to the returns achieved through monthly rebalancing.

The published calculations for multi-sector funds often incorrectly use the monthly benchmark returns for each asset class to calculate the monthly benchmark return for the fund, rather than compounding the daily benchmark returns of each asset class weighted by the target asset allocation each day.

The latter calculation reflects the interaction of markets during the month, while the former calculation, known as the monthly rebalanced benchmark return, ignores these interactions. Our research suggests that neglecting these interactions can lead to a difference in returns of up to several basis points per annum.

## Frequent versus range-based rebalancing

Rebalancing does not need to be based on a fixed time period – it can be triggered when the asset exposures move outside of a predefined range or past a particular trigger point. While this can be a useful means of preventing the portfolio asset allocation from drifting significantly, it raises questions regarding how much rebalancing should be undertaken at that point, and how wide the range should be.

Figure 6 shows the effect of a range-based rebalancing strategy on a simple three asset class portfolio, and the impact of this approach in times of extreme market volatility.

**Figure 6**

**Performance impact if overweight prior to market corrections**

Month	Monthly Benchmark Returns			Performance Impact *			
	Australian Equities	International Equities	Cash	Australian Equities	International Equities	Cash	Portfolio Impact
Oct-87	-41.28%	-19.22%	1.12%	-1.03%	-0.48%	-0.06%	-1.57%
Sep-01	-6.67%	-8.99%	0.40%	-0.17%	-0.22%	-0.02%	-0.41%
Jun-02	-4.40%	-7.62%	0.40%	-0.11%	-0.19%	-0.02%	-0.32%
Jul-02	-4.11%	-8.29%	0.40%	-0.10%	-0.21%	-0.02%	-0.33%
Sep-02	-4.09%	-11.07%	0.40%	-0.10%	-0.28%	-0.02%	-0.40%
Jan-08	-10.76%	-8.27%	0.60%	-0.27%	-0.21%	-0.03%	-0.51%
Jun-08	-7.35%	-7.84%	0.63%	-0.18%	-0.20%	-0.03%	-0.41%
Sep-08	-9.85%	-10.86%	0.59%	-0.25%	-0.27%	-0.03%	-0.55%

\* Assuming the following start of month exposures: Australian equities - 2.5% overweight; International equities - 2.5% overweight; Cash - 5% underweight

In this example, the portfolio has an overweight position of 2.5% in both Australian equities and international equities and a 5% underweight position in cash at the start of the month, which are the maximum positions allowed before rebalancing is triggered.

The results show that the slightly overweight position in Australian and international equities significantly impacted the performance of the portfolio when equity markets performed poorly. The total portfolio performance experienced a portfolio impact of -1.57% in October 1987 and -0.55% in September 2008. This example highlights that even with a rebalancing range as tight as 2.5%, significant risk still exists for the investor.

In addition, if rebalancing is only undertaken at a particular trigger point, then at that point the portfolio has already reached what the strategist considers to be a risky position and the portfolio will need to be rebalanced quickly. If the market is suffering from a lack of liquidity or some form of dislocation at the time the portfolio is rebalanced, rebalancing will be detrimental to the fund's performance. However, not rebalancing may result in the portfolio maintaining a higher than desired level of risk. A frequent rebalancing program will help avoid this situation.

## What about the costs?

Although it is natural and appropriate for investment managers to be concerned about the transaction costs associated with the day-to-day management of the fund, minimising these costs is not and should not be the primary consideration when designing a risk management policy. Instead, the focus for such a policy needs to be on the fund's risk-adjusted returns, after fees, transaction costs and taxes, and the extent to which it meets client objectives over time.

For example, it would be possible to minimise any trading costs associated with rebalancing by simply never trading. However, this would leave the fund exposed to the unwanted and unmanaged risks associated with asset allocation drift. A trade-off is required.

That said, the costs associated with trading derivative contracts are significantly lower than trading physical assets. Trading derivative contracts incurs brokerage fees, spread costs and management fees. Assuming your manager does not charge you spread costs and the management fee is known in advance, that only leaves brokerage costs that are charged as a dollar amount per transaction. A frequent rebalancing strategy involves a higher level of activity, and this means higher brokerage costs. However, it is naive to consider these costs in isolation. The real cost of transacting is related to the market impact of the trading activities, and this is dependant on market liquidity and the size of the trades to be implemented.

A frequent rebalancing framework will generate trades that run against the prevailing market conditions in the long run – that is, sales tend to be made on ‘up’ days and buys tend to occur on ‘down’ days. This is particularly true for domestic and international equity markets. This effect, known as ‘trading against the noise’, can be thought of as a form of liquidity provision by the fund to the market that attracts a return premium, and this offsets the costs associated with conducting the rebalancing program.

Daily rebalancing also results in smaller volumes being traded on any day. This means that it is easier to trade at the ‘market price’, as larger volumes can move the market price and result in trades being undertaken at less advantageous prices.

## Managing the risks of using derivatives

Rebalancing listed assets can be undertaken using exchange-traded futures contracts. However, rebalancing in foreign exchange and other markets requires the use of over-the-counter (OTC) derivative contracts. Trading in OTC derivative markets requires a counterparty to execute the other side of the trade. These counterparties are typically investment banks that are buying and/or selling derivative securities as part of the bank’s operations.

The value of a derivative contract is marked-to-market each day, and changes in the market value of this contract generate a profit or a loss for the investor and the counterparty. At the expiration of the contract the investor pays any loss to the counterparty, or the counterparty pays any profit owed to the investor. Counterparty risk relates to the inability of the counterparty to make the payment required to the investor. This could result if the counterparty becomes bankrupt, as was the case with Lehman Brothers in 2008.

Counterparty risk can be managed through the use of a range of highly-rated counterparties, which limits exposure to any one counterparty. In addition, the use of multiple counterparties means that trading can be undertaken at competitive prices through the use of competitive pricing tension.

The management of counterparty risk can be further enhanced by using a derivatives trader that acts as agent for the investor. Funds often use investment banks to trade derivative securities, but these banks are often acting as principal on the other side of the transaction. This creates an obvious conflict of interest that leaves the potential for trading to be undertaken at pricing which may not be in the best interest of the fund. This issue can be avoided by using a derivatives trader that acts as agent for the fund who can scour the market for the best deal.

Counterparty risk can be managed further through the use of International Swaps and Derivative Association (ISDA) Master Agreements and Credit Support Annexure (CSA) Agreements. ISDAs are used to ensure trades are subject to uniform terms and conditions, while CSAs allow counterparties to request collateral in the form of cash and other securities on a daily basis to reduce the credit exposure held on any day.

## Choosing the optimal strategy

The most appropriate rebalancing strategy will ultimately depend on the investor’s investment objectives and, in particular, their attitude to risk.

QIC believes that the risk associated with a drifting asset allocation is a risk that is unintended, unmanaged, and most likely unrewarded. In addition, the use of derivative securities allows trading costs to be greatly reduced compared to physical trading, and trading can take place with much shorter delays in the decision-making framework. Finally, if markets suffer from a trendless volatility over short-term periods, then trading against that volatility should generate returns that further reduce the cost of the rebalancing activities.

As a result, we believe that the rebalancing strategy that provides the greatest level of risk and return benefits to funds would typically involve:

- rebalancing through the use of derivative contracts
- rebalancing frequently (i.e. daily, providing data is available)
- retaining discretion over the timing of trading to allow trading when markets are more liquid
- trading as agent for clients rather than as principal so there is no conflict of interest
- using a range of banks and brokers to appropriately manage counterparty risk.

### The QIC difference

QIC offers portfolio rebalancing and risk management services that are designed to prevent unintended risks eroding your ability to meet your investment objectives. QIC is not an investment bank and we act as agent on behalf of our clients. This means that we do not face a conflict of interest related to also acting as principal in a transaction. This gives us the freedom to use a range of different counterparties to ensure our clients always receive competitive market pricing.

For further information about portfolio rebalancing or the many ways that QIC can efficiently manage the risks faced by your portfolio, please call Clayton Sills, Business Relationship Manager on 02 9347 3344 or Troy Rieck, Managing Director on 07 3360 3848.

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