Russell Investments

The Russell Investments Portfolio Decarbonisation Strategy

Investigating different approaches to reducing the carbon footprint of an equity portfolio without materially impacting performance

Sean Smith, Senior Quantitative Research Analyst
Scott Bennett, Director, Equity Strategy and Research
Pradeep Velvadapu, Senior Quantitative Research Analyst

Introduction

In September 2014, the United Nations supported Principles for Responsible Investment (PRI) launched the Montréal Carbon Pledge. The Montréal Pledge requires signatories to measure and disclose the carbon footprints of part or all of their equity portfolios. The current signatories to the pledge represent over US$10 trillion in assets under management.[1]

In the same year, the Portfolio Decarbonisation Coalition (PDC) was also formed. The coalition requires members not only to measure and disclose the carbon footprints of their equity portfolios, but also to commit to 'decarbonising' their portfolios in the future in line with the PDC guidelines.

A global effort to reduce greenhouse gas emissions may have a significant impact on the activities of governments, companies and individuals around the world. Many asset owners and asset managers are getting actively engaged in the process of carbon reduction. Decarbonisation is increasingly becoming a part of investment policies and is impacting both active and passive investment strategies.

In this paper, we review which areas of the market have the highest carbon footprints; evaluate different approaches to 'decarbonising' equity portfolios; and present the Russell Investments Decarbonisation Strategy as a unique and transparent approach to materially reduce a portfolio's carbon footprint without materially impacting performance.

By adopting the Russell Investments Decarbonisation approach[2], investors may implement a preference for decarbonisation across their listed equity portfolios in a transparent manner, divesting from the most prominent carbon producers while effectively managing active risk at the stock, sector and country level.

[1] See www.montrealpledge.org

[2] Russell Investments Decarbonisation Strategy is a generalised approach. Details on specific implementation can vary based on investor preferences.

Carbon Footprint Definition

The measurement of greenhouse gas (GHG) emissions, by metric tonnes of carbon dioxide equivalent (CO2-e), is defined by multiple 'Scopes'. [3]

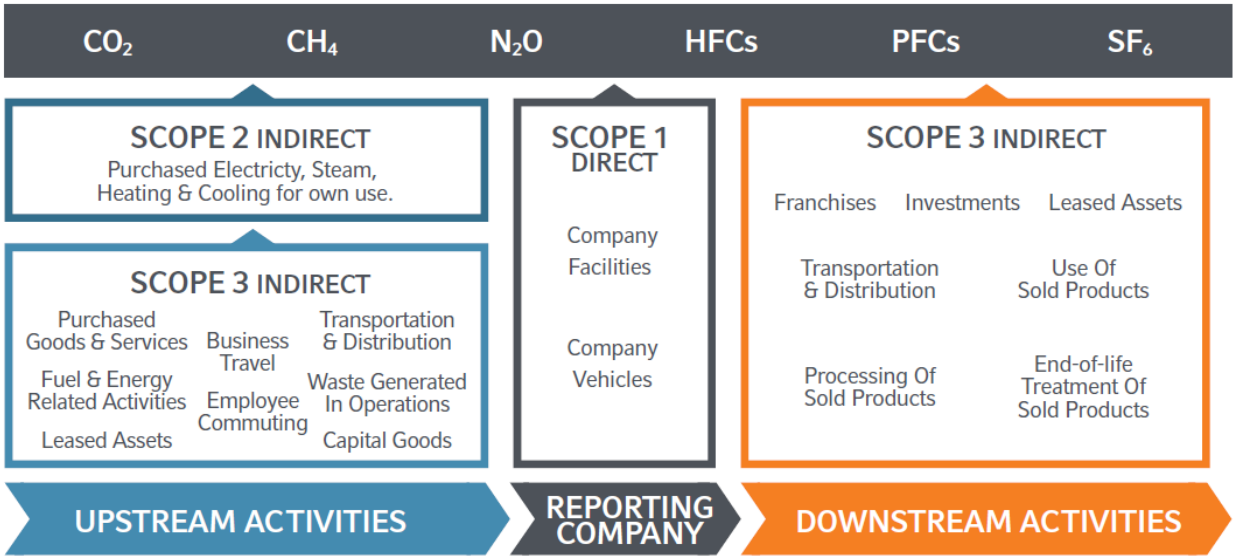
Scope 1 (Direct): Includes emissions that arise directly from sources that are owned or controlled by a company e.g. fuel combustion and industrial processes;

Scope 2 (Upstream): Includes emissions generated by purchased electricity consumed by a company, e.g. generated by heating and cooling systems;

Scope 3 (Downstream): Includes emissions resulting from a company's activities but generated from sources not directly owned or controlled by the company, e.g. business travel, commuting and procurement.

The intention of the Scopes is to minimise double counting, or where double counting is unavoidable, to make it identifiable. The sum of all Scope 1 carbon emissions will represent 100% of global carbon emissions. Scope 2 will have some overlap with Scope 1, where Scope 1 counts the emissions from the electricity generators and Scope 2 includes those same emissions and applies them to the electricity consumer. Scope 3 has significant overlap with Scope 1 and Scope 2.

Exhibit 1: Greenhouse Gas Emission - Scope Summary



Source: Russell Investments and Greenhouse Gas Protocol

At the moment there is no consensus around the definition of 'carbon footprint'. The investment industry seems however to be coalescing behind common principles that scale total Carbon Emissions by some measure of company size or company activity.

For the purposes of this paper we have defined 'carbon footprint' as Scope 1 (direct) carbon emissions plus Scope 2 (electricity consumption) carbon emissions, divided by company revenue (USD). The incorporation of Scope 3 data is something that we will look to incorporate in the future as the data set becomes more robust.

Equation 1: Carbon Footprint Calculation

$$\text{Let Scope 1} = \text{Scope 1 } CO_2\text{-}e \text{ Emissions}$$

$$\text{Let Scope 2} = \text{Scope 2 } CO_2\text{-}e \text{ Emissions}$$

$$\text{Carbon Footprint} = \frac{\text{Scope 1} + \text{Scope 2}}{\text{Total Revenue (USD)}}$$

For this paper we have sourced the Carbon Footprint data from Trucost Plc. The data covers close to 5,000 securities and goes back to 2010.

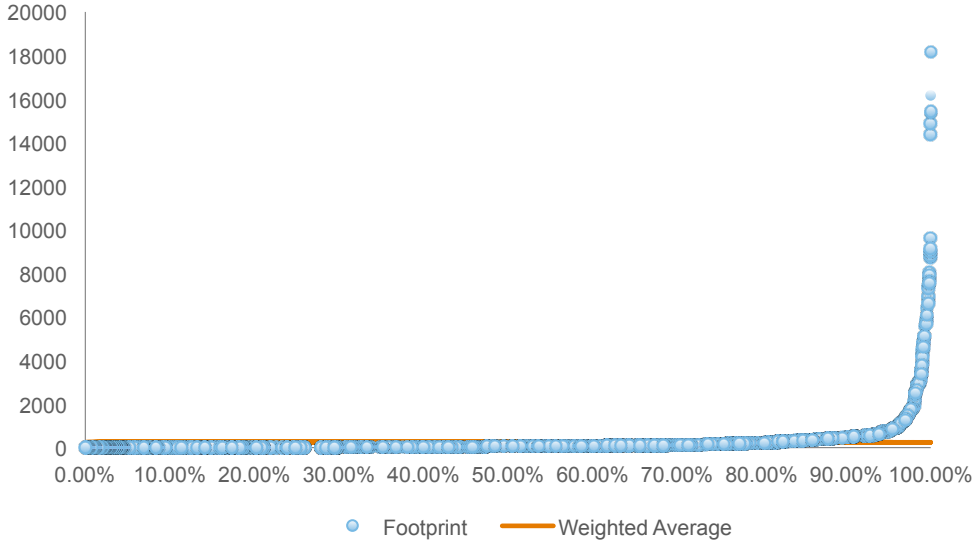
[3] See www.ghgprotocol.org/standards

Carbon Footprint Market Overview

In investigation of the overall carbon footprint of the market, the data shows a small number of companies having exceptionally high carbon footprints. Further, this relatively small number of companies makes up the majority of the carbon footprint of a capitalisation weighted portfolio.

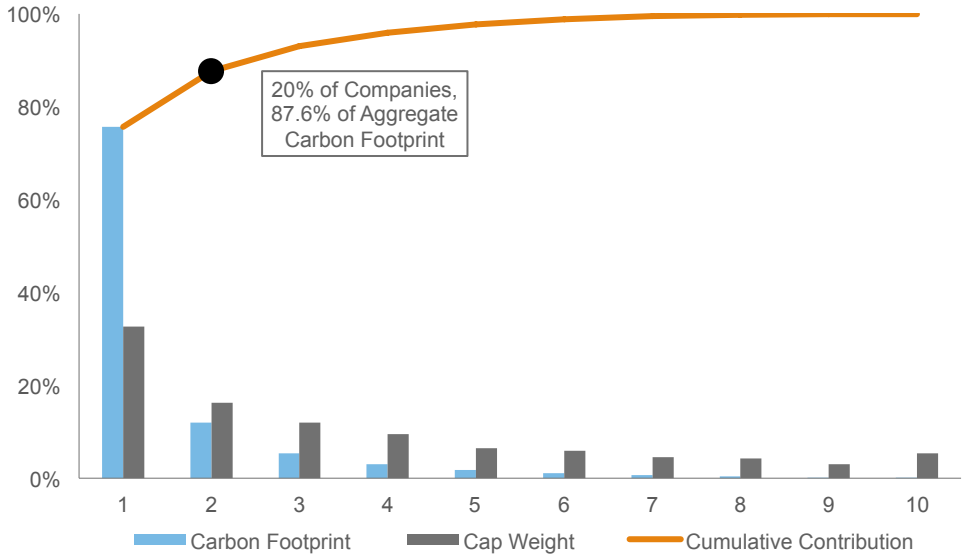
In fact, looking through the MSCI All Country World Index (ACWI), we find that the distribution fits the 80/20 Rule (Pareto's Principle), whereby 20% of companies are responsible for over 80% of the carbon footprint of the MSCI ACWI benchmark.

Chart 1: Carbon Footprint per Security



Source: Russell Investments, MSCI and Trucost as of 30 September 2015.

Chart 2: Pareto's Principle



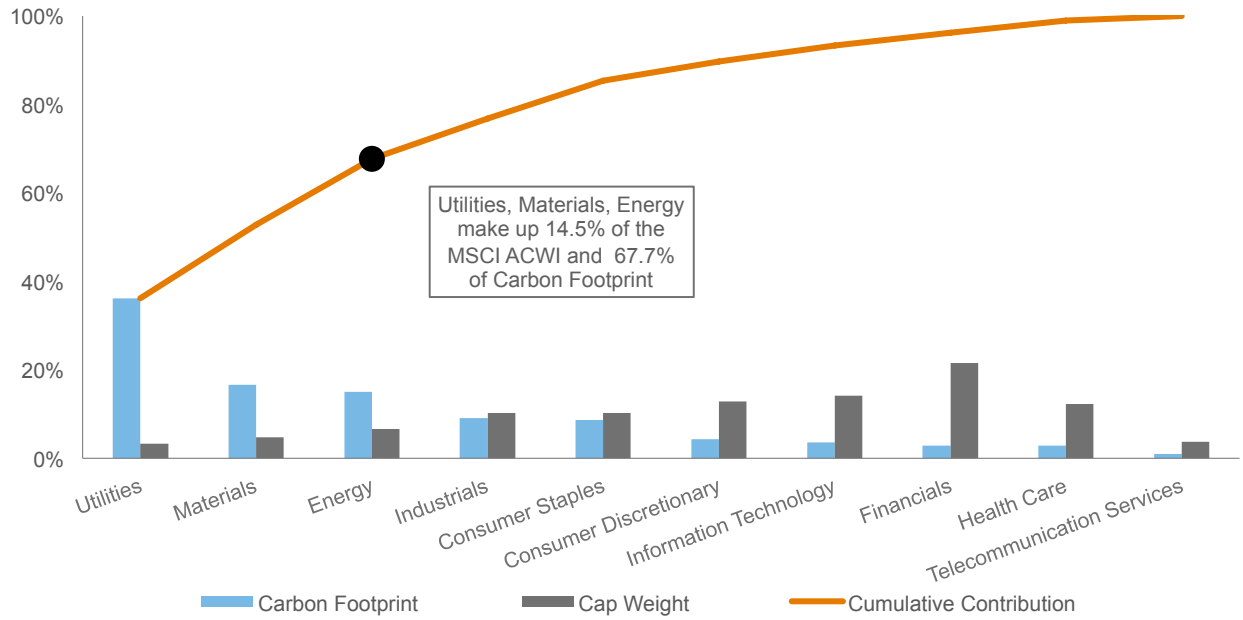
Source: Russell Investments, MSCI and Trucost as of 30 September 2015.

The large skew in the carbon footprint data presents the key opportunity and also some challenges when looking to meaningfully reduce the overall carbon footprint. The opportunity is that we can reduce the aggregate carbon footprint of a portfolio by adjusting the weight of a relatively small number of companies. The challenge is that this small number of companies is concentrated in a narrow set of sectors, and altering sector allocations may impact portfolio returns. If we reduce carbon footprint, we may induce active negative exposures to one or more of these sectors and/or industries, and consequently subsequent active positive exposures to other sectors and/or industries to make up the difference.

In Chart 3, below, we show that over two thirds of the carbon footprint of the MSCI ACWI comes from just three sectors: Energy, Materials and Utilities (EMUs). Further the market capitalisation weight of the EMUs is less than 15% of the MSCI ACWI.

When looking at decarbonisation strategies we are cognisant of the embedded sector exposures that are inherent. Even a simple strategy of removing the top 120 carbon footprint contributors can result in very large underweights to EMU sectors.

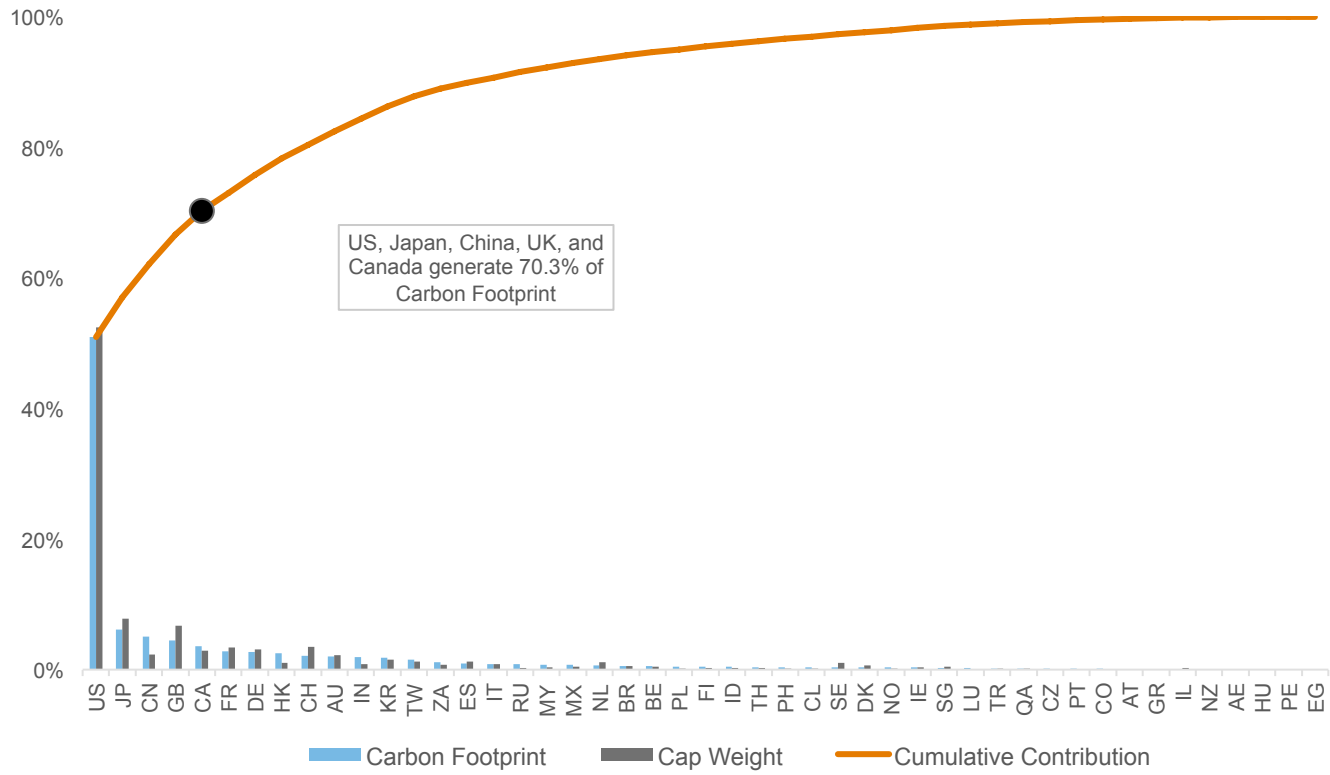
Chart 3: Carbon Footprint by Sector



Source: Russell Investments and MSCI as of 30 September 2015.

When we evaluate carbon footprint by country contribution, we find that the contributions are for the most part typically in line with the countries' respective market capitalisation weights in the MSCI ACWI. We don't see a similar large discrepancy between aggregate carbon footprint and market capitalisation when we look across countries and regions.

Chart 4: Carbon Footprint by Country[4]



Source: Russell Investments, MSCI and Trucost as of 30 September 2015.

Portfolio Decarbonisation

An Introduction

Understanding the carbon footprint of an equity portfolio is a relatively straightforward exercise. It requires measures of the carbon footprints of the underlying individual securities and the corresponding weights of those securities in the portfolio. The aggregate carbon footprint is simply the weighted average of the underlying carbon footprints of the securities (see Equation 2).

Equation 2: Portfolio Carbon Footprint

$$\text{Carbon Footprint}_i = \text{Carbon Footprint for security i}$$

$$\omega_i = \text{weight of security i in portfolio}$$

$$\text{Aggregate Carbon Footprint} = \sum_{\text{securities}} \omega_i \cdot \text{Carbon Footprint}_i$$

Once we know the aggregate carbon footprint of the portfolio, we can easily determine each security's contribution to the total carbon footprint. This is done by multiplying the weight of the security by its carbon footprint and dividing the result by the total carbon footprint of the portfolio (see Equation 3).

Equation 3: Contribution to Portfolio Carbon Footprint

$$\text{contribution}_i = \frac{\omega_i \cdot \text{Carbon Footprint}_i}{\text{Aggregate Carbon Footprint}}$$

The contribution to Portfolio Carbon Footprint can provide guidance on which securities have the largest impact on the aggregate carbon footprint.

[4] Country Code definitions are provided in Appendix 4

Given the mathematics involved in measuring a portfolio's carbon footprint, decarbonising a portfolio is relatively straightforward. The challenge arises with the introduction of other objectives, such as matching the return of a benchmark while reducing the portfolio's carbon footprint. This additional objective induces a trade-off between effective decarbonisation and efficient portfolio return replication. The concentration of high-carbon-footprint securities across a small number of sectors makes the return-replication objective particularly challenging.

We now look at three common approaches to achieving these (potentially) conflicting objectives, and we detail Russell Investments' unique approach to doing so while remaining consistent with the values outlined in the Montréal Pledge and by the Portfolio Decarbonisation Coalition.

Carbon Objectives and Success Criteria

To evaluate different approaches we have centered on a common investment objective for many asset owners in this space*; generate a benchmark-like return while keeping the carbon footprint of the portfolio below a specified level relative to the benchmark*.

For consistency and transparency we have defined the benchmark for all the strategies as being the MSCI All Country World Index and the required carbon footprint level as being 50% of this index.[5]

In addition to the high level objective above, in Table 1 we have identified some additional criteria which we will use to evaluate the investment and philosophical efficacy of these strategies.

Table 1: Success Evaluation

CRITERION	MEASUREMENT	DESIRED EXPOSURE	DESCRIPTION
Active Return	Absolute value of Portfolio Return minus benchmark return; R-Squared	Low	We want to ensure that the performance of the decarbonised portfolio is able to match the benchmark
Active Risk	Standard deviation of active returns; Maximum Active Drawdown	Low	We want to avoid return patterns that display high levels of active risk and have significant deviations from the benchmark
Active Share	Sum of absolute security weight deviations divided by two.	Low	We want the portfolio to allocate capital in an effective way and have a high commonality in holdings with the benchmark
Carbon Footprint Exposure	Weighted average Carbon Footprint.	< 50%	We are targeting a minimum 50% reduction in the carbon footprint of the strategy relative to the benchmark.
Transfer Co-Efficient	Negative Correlation of active weights with carbon footprint.	High	Ideally we would like to see a strong negative relationship between the active positions in the decarbonisation strategy and the carbon footprint of the individual securities.
Turnover	Minimum of buys and sells per quarter.	Low	Ideally we would like the decarbonisation strategy to display relatively modest levels of turnover so that we can preserve the returns after transaction costs.

Source: Russell Investments, MSCI and Trucost as of 31 December 2015.

We are using Trucost data from February 2010 to December 2015. Trucost provides several metrics that measure carbon emissions, but we focus on its calculated Carbon Footprint metric as defined previously in Equation 1.

All portfolios are rebalanced semi-annually, and our analysis is based on monthly observations.

[5] The Montréal Pledge and PDC do not specify a level in terms of carbon reduction percentage. In our engagement with asset owners around the world, the feedback has been that a 50% reduction is considered a material reduction, and we have settled on that metric for the purposes of this paper.

Portfolio Construction Strategies

Below we detail three common approaches to portfolio decarbonisation and also detail the unique Russell Investments Decarbonisation strategy (we provide a more detailed description of the Russell Investments Decarbonisation Strategy in Appendix 1). For all of the strategies below, portfolios are rebalanced on a semi-annual basis using the Trucost carbon footprint.

Divestment

Description: To aggregate the carbon footprint, this strategy removes the 120 highest contributors and re-weights the portfolio on a pro-rata basis.[6]

Expectations: Divestment is a blunt approach to reducing the aggregate carbon footprint of a portfolio. It may result in relatively large expected sector and industry exposures along with a relatively high tracking error. However, this strategy should incur only a modest level of active share, because it takes advantage of the high level of skew in the carbon footprint data.

Sector Neutral Reallocation

Description: This strategy is similar to Divestment, but without the sector deviations. In this strategy, the investor removes the highest-carbon-footprint securities in a sector and then, to maintain sector weight, re-weights the securities within the sector on a pro-rata basis. In this methodology, we remove all stocks with a carbon footprint greater than the 60th percentile within the sector.

Expectations: Sector Neutral Reallocation should overcome the sector and industry biases that we see in the standard Divestment approach. However, the process of keeping active sector exposures neutral should result in larger individual active stock positions and also in a relatively weak relationship between carbon footprint and subsequent active exposure. We expect that these strategies will also tend to have higher levels of active share.

Risk Model Optimisation

Description: This strategy uses a risk model–based optimisation that seeks to minimise the carbon footprint while keeping ex-ante tracking error at less than 30 basis points. [7] It also incorporates active weight constraints at the security, sector and country level. The security-level constraint is that the absolute weight of a security has to be less than 20 times the benchmark weight. Active sector and country positions are limited to +/- 2%. These constraints are consistent with publicly available indices.[8,9]

Expectations: Risk Model Optimisation should be very effective in reducing the aggregate carbon footprint of a portfolio and also in managing ex-ante tracking error. However, relative to the Divestment strategy, the resulting portfolio may lack 'intuition'. For example, you may have two securities with the same carbon footprint, but with active positions that are diametrically opposed. This is a result of the introduction of the covariance matrix in the risk model and the additional objective of keeping ex-ante tracking error below 30bps. This strategy, despite being low-risk, has a relatively high level of active share and may also induce a relatively weak relationship between the carbon footprint and subsequent active positions.

[6] '120 Names' was chosen such that the Divestment strategy would have a comparable reduction in aggregate carbon footprint.

[7] We use Axiom's WW 2.1 risk model.

[8] The objectives and constraints applied to the Risk Model Optimisation approach are based on the MSCI ACWI Low Carbon Target Index. Although the objectives and constraints are similar, there are differences in terms of the underlying data sources and also the risk model utilised. The data presented in this paper is for illustrative purposes only. Specific returns and portfolio characteristics may vary from official numbers from MSCI.

[9] 'MSCI Global Low Carbon Target Indexes Methodology' (September 2014): https://www.msci.com/eqb/methodology/meth_docs/MSCI_Low_Carbon_Target_Indexes_Methodology.pdf

The Russell Investments Decarbonisation Strategy

Description: The Russell Investments Decarbonisation Strategy is a hybrid of the three approaches described above. It aims to preserve the strengths of all the approaches and minimise the biases. We believe decarbonisation is a unique problem that requires a unique solution. While investors are looking to encourage decarbonisation, they still have a fiduciary commitment to deliver on return expectations. This strategy emphasises a divestment approach while also incorporating security, sector and country constraints to effectively manage active risk and ensure that fiduciary obligations are met. The approach aims to achieve a 50% reduction in the carbon footprint while minimising the active share of the portfolio relative to the benchmark, as opposed to minimising forecasted active risk. The sector constraints applied are also asymmetric, to better reflect the underlying skew in the carbon footprint data and to avoid a heavy re-weighting to certain sectors, such as the Financials sector. The constraints applied in the portfolio are:

- **Security:** Active weights are limited +0.2%/-0.5%
- **Country:** Active weights are limited +0.2%/-0.2%
- **Sector/Industry:** Active weights are limited +0.3%/-0.5%

The Russell Investments Decarbonisation Strategy preserves the direct relationship associated with a divestment approach and is also able to keep active risk levels and sector exposures low without the introduction of a risk model.

Expectations: We expect the Russell Investments Decarbonisation Strategy to exhibit low active risk, low active share, low exposure to sectors, industries and countries, and at least a 50% reduction in the aggregate carbon footprint of the benchmark. By avoiding the use of a covariance matrix and retaining the carbon footprint as the primary driver of exposure we should maintain a relatively strong relationship between a securities carbon footprint and subsequent active position.

Portfolio Decarbonisation Analysis

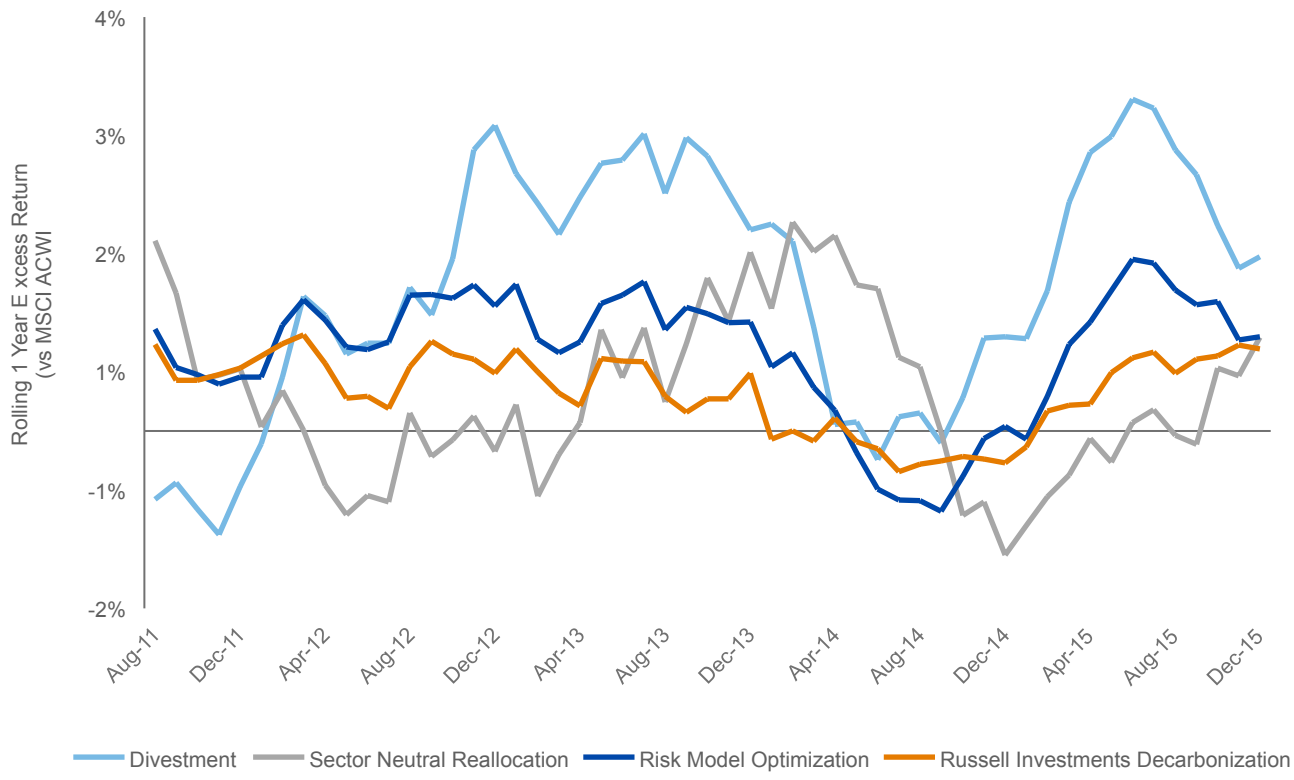
In this section we will review the different portfolio construction approaches and test them against the criteria detailed in Table 2. The intention is to provide perspective for the different approaches across multiple contexts, to enable investors to get a more complete understanding of different decarbonisation strategies.

Table 2: Return Statistics Summary

METRIC	ACWI	DIVESTMENT	SECTOR NEUTRAL REALLOCATION	RISK MODEL OPTIMISATION	RUSSELL INVESTMENTS DECARBONISATION
Start Date	Jul 30, 2010	Jul 30, 2010	Jul 30, 2010	Jul 30, 2010	Jul 30, 2010
End Date	Dec 31, 2015	Dec 31, 2015	Dec 31, 2015	Dec 31, 2015	Dec 31, 2015
Years	5.42	5.42	5.42	5.42	5.42
Frequency	Semi-Annual	Semi-Annual	Semi-Annual	Semi-Annual	Semi-Annual
Observations	65 Months	65 Months	65 Months	65 Months	65 Months
Annualised Return	8.96%	9.92%	9.38%	9.65%	9.35%
Annualised Volatility	13.63%	13.59%	13.92%	13.74%	13.74%
Sharpe Ratio	0.6575	0.7303	0.6734	0.7024	0.6809
Sortino Ratio	0.6499	0.7060	0.6692	0.6847	0.6619
Maximum Drawdown	-20.17%	-19.78%	-19.75%	-19.83%	-20.01%
Historical Beta	-	0.9952	1.0197	1.0074	1.0079
Annualised Excess Return	-	0.96%	0.42%	0.69%	0.39%
Annualised Tracking Error	-	0.83%	0.91%	0.44%	0.37%
T-Stat	-	2.4740	1.0860	3.4094	2.3826
Jensen's Alpha	-	0.93%	0.23%	0.58%	0.30%
Jensen's T-Stat	-	2.5369	0.6146	3.0330	1.9420
Information Ratio	-	1.1613	0.4588	1.5554	1.0652
Active Semi-Deviation	-	0.69%	0.75%	0.29%	0.31%
Active Sortino Ratio	-	1.4035	0.5532	2.4067	1.2704
Maximum Active Drawdown	-	-1.19%	-1.37%	-0.82%	-0.49%
P(Excess Return < 0)	-	44.62%	49.23%	40.00%	38.46%
R-Squared	-	0.9963	0.9961	0.9990	0.9993
Annualised 1-Way Turnover	9%	10%	16%	25%	11%
Name Count	2444	2318	1389	1632	1637
Active Share		17%	41%	25%	12%
Aggregate Carbon Footprint as a Percentage of ACWI		46%	45%	29%	47%

Source: Russell Investments, MSCI and Trucost as of 31 December 2015.

Chart 5: Rolling 12-Month Excess Returns



Source: Russell Investments and MSCI as of 31 December 2015.

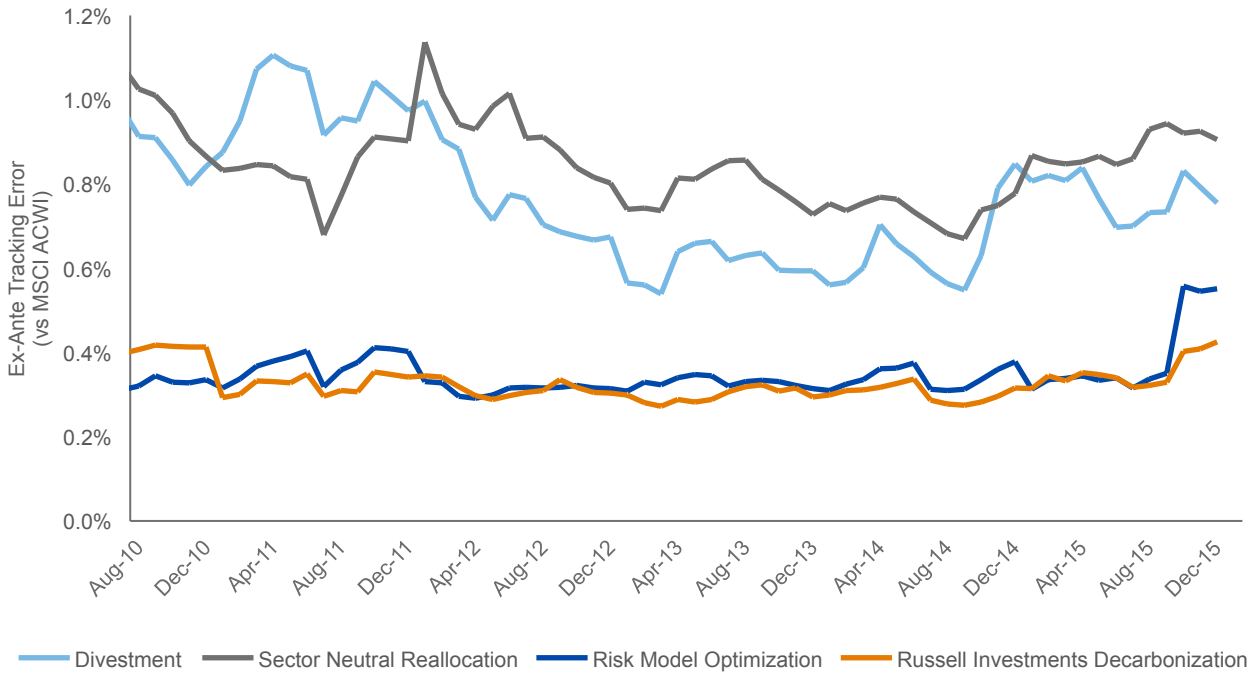
Table 3 shows rankings based on metrics identified in Table 1 focused on measuring similarity to benchmark returns. Russell Investments Decarbonisation has the excess return closest to zero, lowest tracking error, smallest maximum active drawdown, and highest R-squared in terms of returns explained by benchmark returns. Charts 5 and 6 further validate that the Russell Investments Decarbonisation Strategy is highly effective at delivering a benchmark-like return. We see that the Risk Model Optimisation strategy has a fairly low tracking error, low drawdown and high R-squared. However, its excess return is substantial and is reflective of benchmark-relative risks. These risks are also present in the Divestment and Sector Neutral Reallocation strategies, as indicated by their higher tracking errors and drawdowns. Our expectation is that these risks are due to sector exposures and asset-level positions. We will examine this in more detail below.

Table 3: Distance Metric Ranks

METRIC	DIVESTMENT	SECTOR NEUTRAL REALLOCATION	RISK MODEL OPTIMISATION	RUSSELL INVESTMENTS DECARBONISATION
Excess Return	4	2	3	1
Tracking Error	3	4	2	1
Maximum Active Drawdown	3	4	2	1
R-Squared	3	4	2	1

Source: Russell Investments and MSCI as of 31 December 2015.

Chart 6: Active Risk



Source: Russell Investments, MSCI and Axioma as of 31 December 2015.

To put a finer point on the issue of tracking error, Chart 6 shows the time series of predicted tracking error. Despite the fact that the Risk Model Optimisation strategy has tracking error embedded into its construction methodology, the Russell Investments Decarbonisation Strategy exhibits as good a predicted tracking error and an even better realised tracking error. This also confirms our expectations that the Divestment and Sector Neutral Reallocation strategies are consistently introducing risk. Keep in mind, this is risk that can be measured by a risk model. We still contend that there is risk introduced by the Risk Model Optimisation strategy which is not effectively captured by the risk model, but which does explain the difference in realised tracking error. Table 4 highlights these differences. In all strategies, with the exception of the Risk Model Optimisation strategy, realised tracking error is very close to predicted tracking error. However, the Risk Model Optimisation strategy explicitly maximises carbon footprint reduction under the constraint of predicted tracking error. This inherently emphasises dimensions of risk that aren't captured by the risk model. [10,11] As this strategy explicitly chases a low carbon footprint, to the degree that this factor is uncorrelated with other risk model factors, the risk model treats the reduction in aggregate carbon footprint as risk-free. This is referred to as the alignment problem in Ceria, Saxena and Stubbs (2012). It results in the under-prediction of tracking error as evidenced by the 10 bps difference in realised tracking error compared to the expected 35 bps. In addition, as shown by Hunstad (2015), errors in tracking error estimates increase polynomially with active share. [12] This leads us to conclude that we shouldn't carry a significant amount of active share when targeting such low levels of tracking error.

[10] Ceria, Saxena and Stubbs (2012). 'Factor Alignment Problems and Quantitative Portfolio Management', *Journal of Portfolio Management*, Vol. 28, No. 2 (Winter 2012).

[11] Michaud, R.O. 'The Markowitz Optimisation Enigma: Is 'Optimised' Optimal?', Financial Analysts Journal, Vol. 45, No.1 (January– February 1989), pp. 31–42.

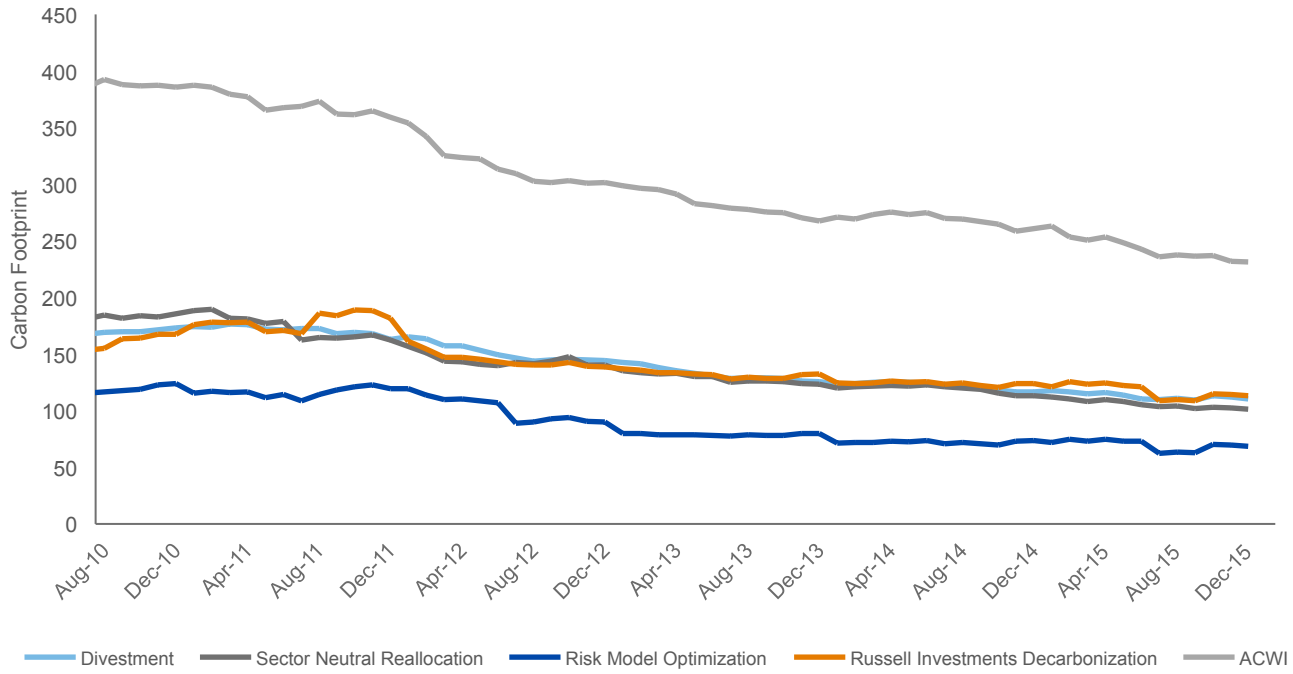
[12] Hunstad (2015). 'Reducing Your Reliance on Risk Models: Another Look at Active Share' in 'News and Views', *Alternative Investment Analyst Review*, Spring edition.

Table 4: Ex-Post versus Ex-Ante Tracking Errors

TRACKING ERROR	DIVESTMENT	SECTOR NEUTRAL REALLOCATION	RISK MODEL OPTIMISATION	RUSSELL INVESTMENTS DECARBONISATION
Ex-Post	0.83%	0.91%	0.44%	0.37%
Ex-Ante	0.77%	0.85%	0.35%	0.33%
Realised Gap (Ex-Post – Ex-Ante)	0.06%	0.06%	0.10%	0.04%

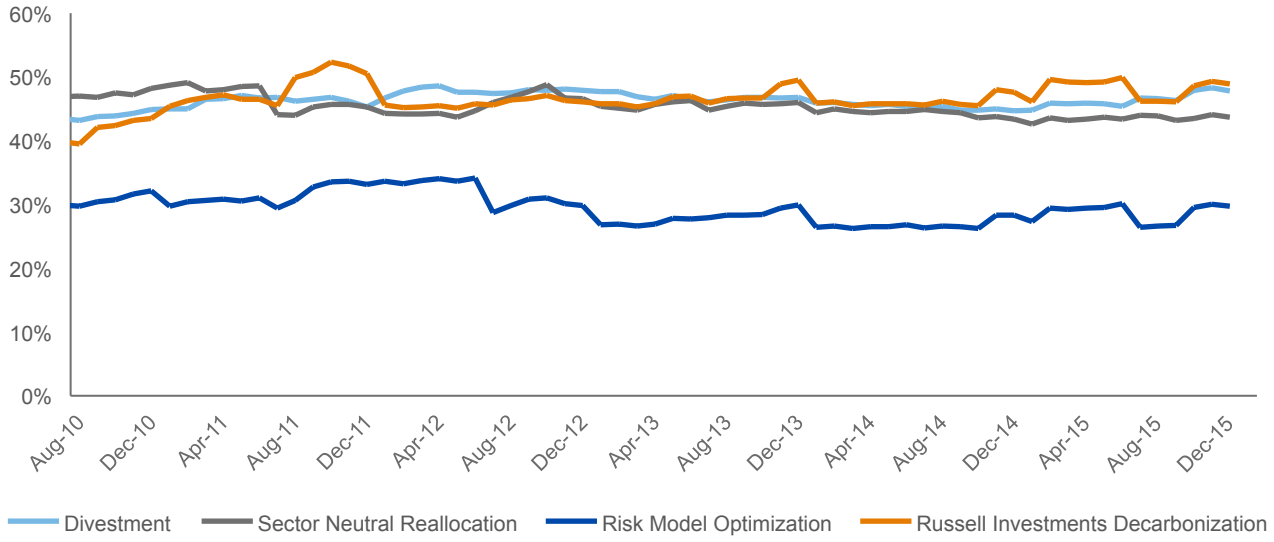
Source: Russell Investments as of 31 December 2015

Chart 7: Carbon Footprint Exposure



Source: Russell Investments, MSCI and Trucost as of 31 December 2015.

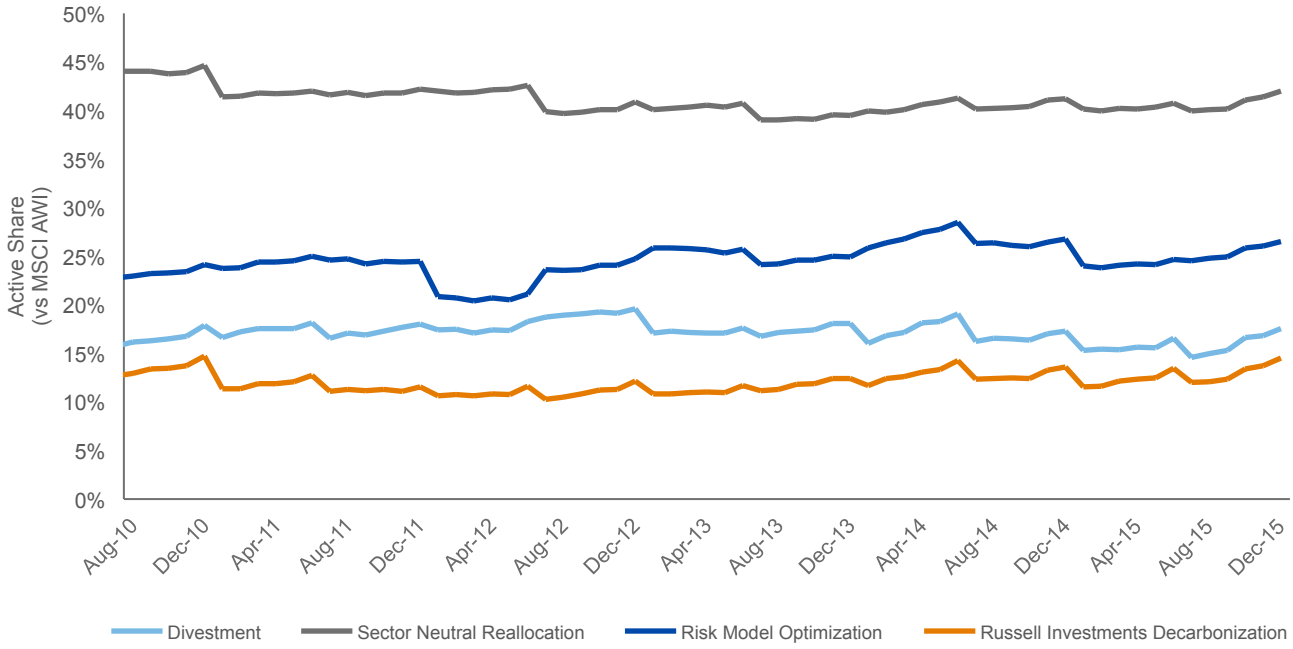
Chart 8: Relative Carbon Footprint Exposure



Source: Russell Investments, MSCI and Axioma as of 31 December 2015.

Charts 7 and 8, above, demonstrate each strategy's capability of achieving better than 50% reduction in carbon footprint. The noticeable outlier is the Risk Model Optimisation strategy, with an average reduction closer to 70%. However, this comes at the expense of risk. One of the caveats to using a covariance matrix within an optimisation is that it is possible to emphasise dimensions of risk that aren't captured by the risk model. We see this when we compare realised risk to predicted risk for all strategies, as shown above. This is the primary reason we've chosen not to optimise relative to a covariance matrix.

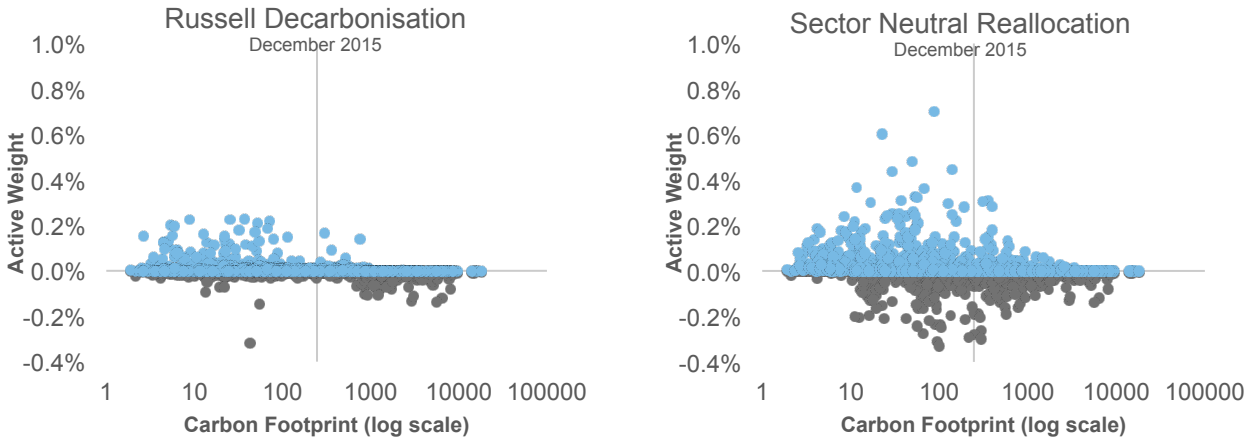
Chart 9: Active Share

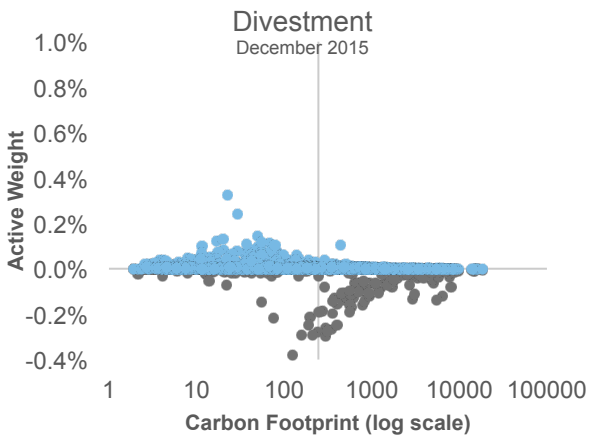


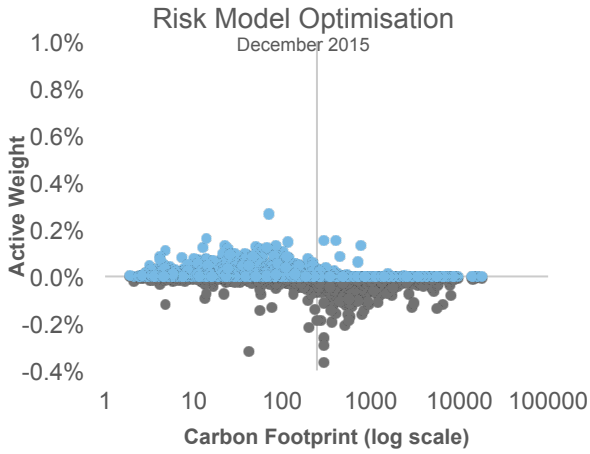
Source: Russell Investments and MSCI as of 31 December 2015.

Instead, we've chosen to keep as close to the benchmark as we can, using the intuitive Active Share metric. Chart 9 demonstrates how effective the Russell Investments Decarbonisation Strategy is at minimising active share while achieving our carbon footprint reduction objective.

Chart 10: Transfer Coefficient Visualisation







Source: Russell Investments and MSCI as of 31 December 2015.

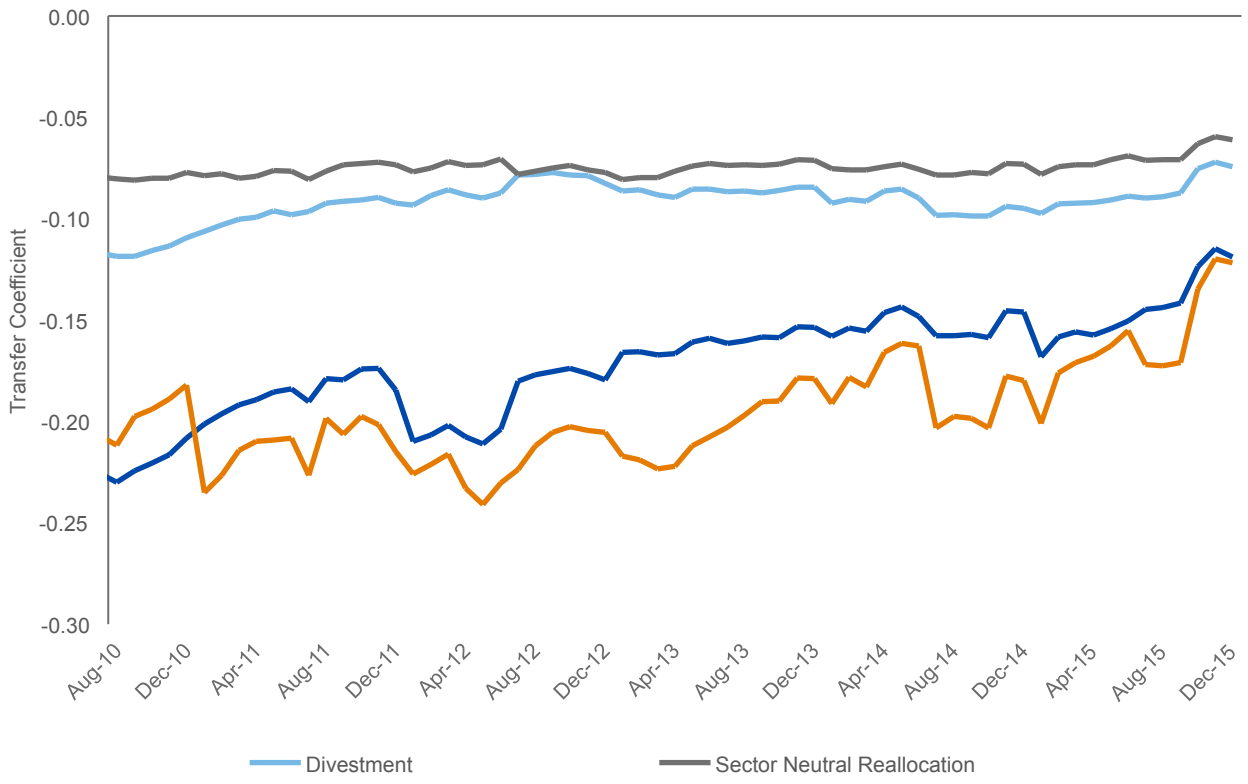
In order to deliver on the intent of the Montréal Pledge, we recommend both a withdrawal from securities with a high carbon footprint and a tilt towards those with a low carbon footprint. In Chart 10, we use a scatter plot with carbon footprint on the x-axis and strategy active weight on the y-axis, to visualise the effectiveness, as of July 2015, of a strategy to overweight low carbon footprint and underweight high carbon footprint. If we look at the Divestment strategy, we can see a distinct set of points in the southeast quadrant – representing the 120 securities with highest contribution to aggregate carbon footprint, which were removed and consequently underweighted. However, we did not reinvest the incurred active share into low-carbon-footprint securities; rather, we redistributed the active share pro-rata across all other securities. This is why we see a somewhat random distribution of overweights in the northwest quadrant.

The higher overweights are larger capitalisation securities that received a larger portion of the pro-rata distributed active share. A similar thing is happening in the Sector Neutral Reallocation strategy, but it is less obvious – because it's happening within each sector, and the chart shows the blend of all sectors. This results in what seems to be an indiscriminate over- and underweighting with respect to carbon footprint. The Risk Model Optimisation strategy shows a distinct pattern of underweighting high-carbon-footprint securities and overweighting low-carbon-footprint securities. However, in an effort to minimise aggregate carbon footprint, the strategy makes decisions to overweight and underweight securities with the same carbon footprint. This is counterintuitive.

The Russell Investments Decarbonisation Strategy underweights high-carbon-footprint securities to the extent allowed by the constraints and allocates the incurred active share to low-carbon-footprint securities to the extent allowed by the constraints. This is made fairly clear by the vast majority of underweights falling into the southeast quadrant and overweights falling into the northwest quadrant. There are very few underweights of low-carbon-footprint securities, and these few are incurred to satisfy constraints.

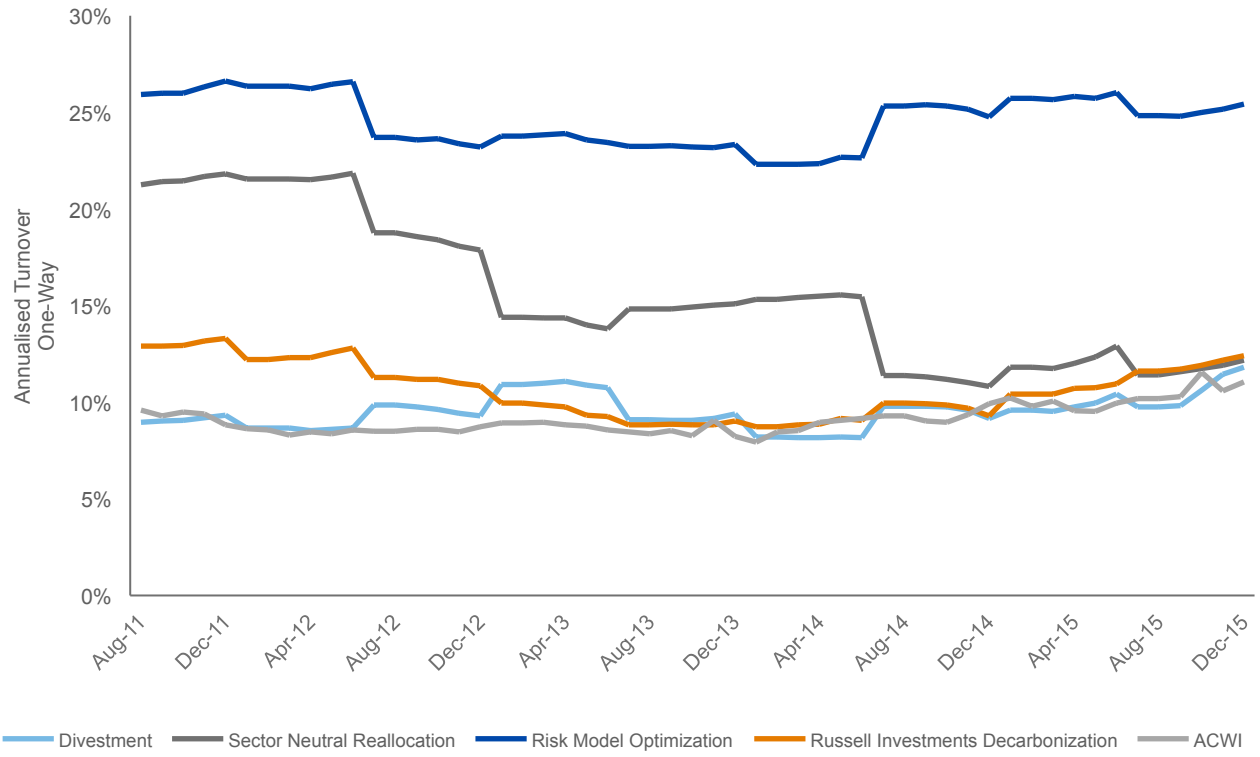
We can calculate the strength of this relationship with a correlation between carbon footprint and active weight; these should be reflected with a negative correlation. The correlation is negative because we are aiming to be underweight high-carbon-footprint companies and overweight low-carbon-footprint companies. This correlation is the definition of the transfer coefficient. Chart 11 shows the transfer coefficient for every month in our analysis. On the right hand side, we see the points that represent December 2015, which coincides to the scatter plots in Chart 10. We see that the Sector Neutral Reallocation strategy has the least significant transfer coefficient, followed by Divestment, then Risk Model Optimisation, and finally Russell Investments Decarbonisation, with the largest magnitude of transfer coefficient. This is consistent with our analysis above. Further, we see that this relationship is consistent through time and thus we can say that the Russell Investments Decarbonisation Strategy delivers a portfolio that more intuitively delivers on the Montréal Pledge.

Chart 11: Transfer Coefficients over time



Source: Russell Investments as of 31 December 2015.

Chart 12: Rolling One-Year Turnover

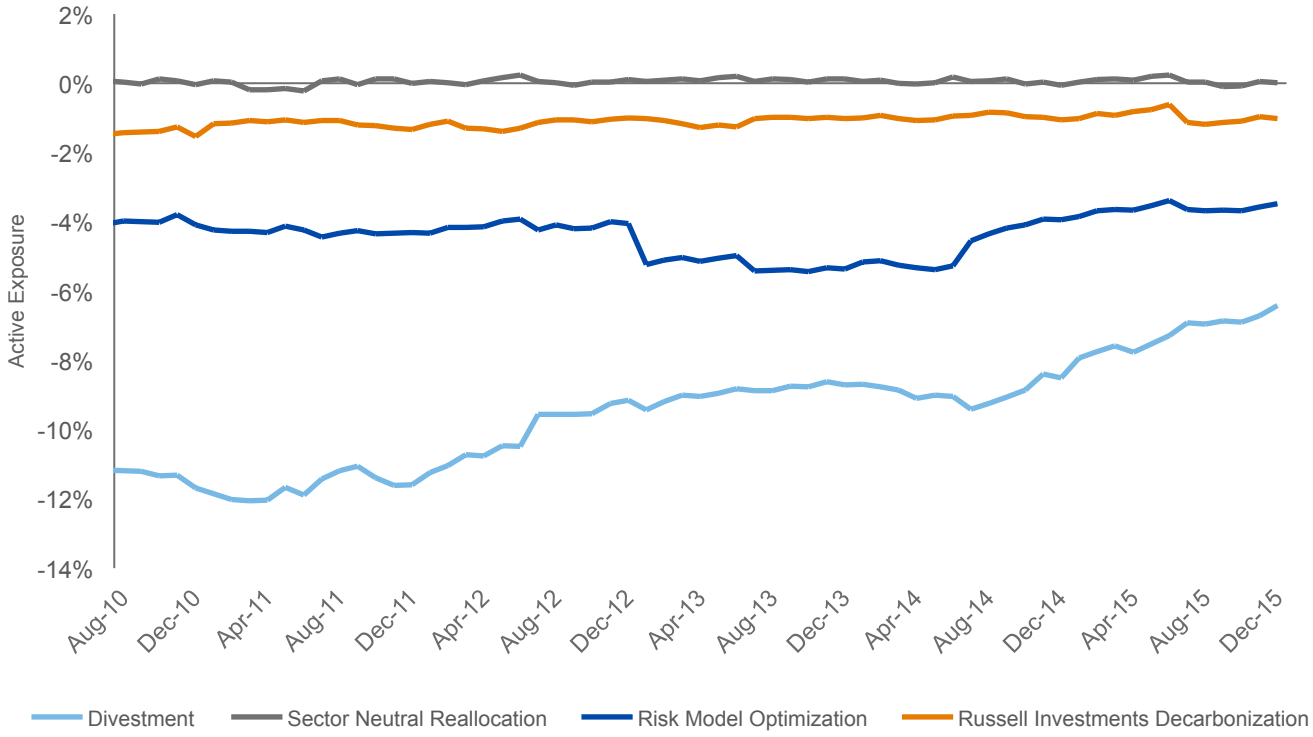


Source: Russell Investments as of 31 December 2015.

The Divestment and Sector Neutral Reallocation strategies are largely capitalisation weighted portfolios, and consequently they bear the advantage of such portfolios by not incurring a larger amount of turnover, because the weights of the securities naturally

adjust with market movements. This isn't always true, but it is true enough of the time to explain the low turnover of the strategies. The Risk Model Optimisation strategy incurs a significantly higher amount of turnover, because its effort to minimise aggregate carbon footprint is agnostic to the amount of trading needed to get to the optimal portfolio. The Russell Investments Decarbonisation Strategy alleviates this turnover by incentivising less trading in its portfolio construction process. This results in very low turnover – on an order of magnitude similar to that of the benchmark. Only Divestment has lower turnover.

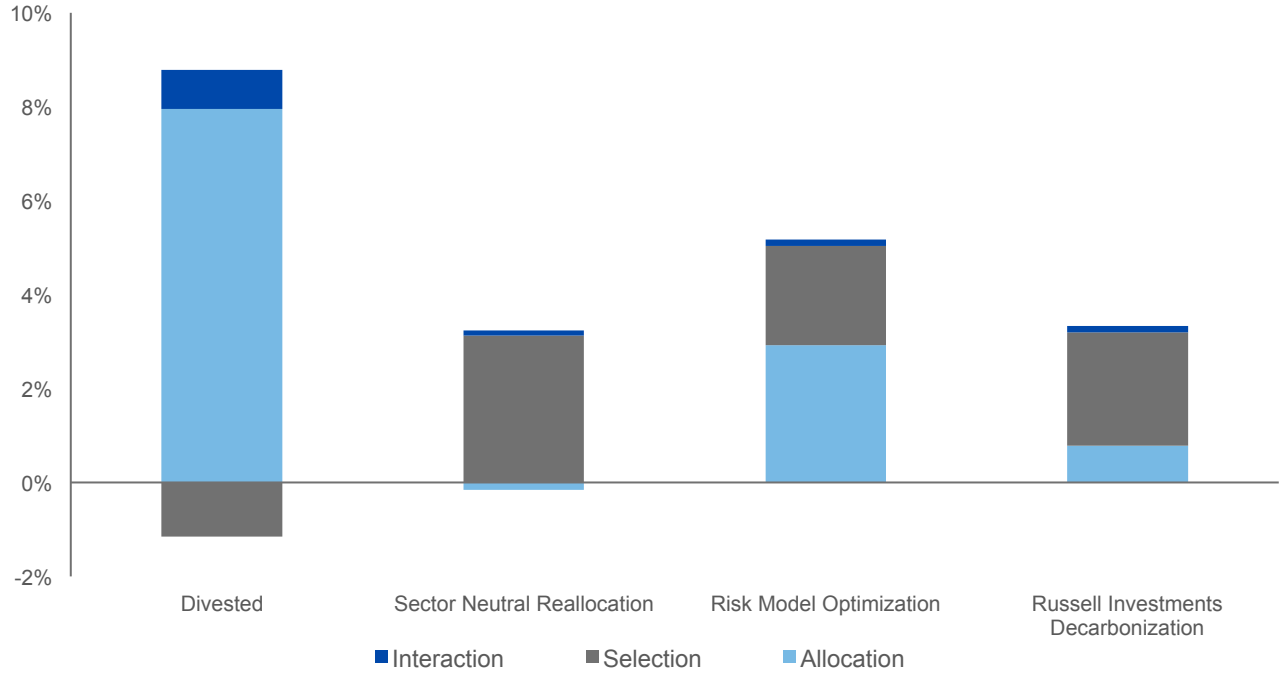
Chart 13: Energy, Materials, and Utilities



Source: Russell Investments as of 31 December 2015.

As expected, we see large sector exposures for the Divestment strategy. The Risk Model Optimisation strategy is constrained at the sector level and sectors are also kept in check via the risk constraint and the covariance matrix. However, when you look at the aggregate weight of the three largest sectors contributing to aggregate carbon footprint – Energy, Materials and Utilities (EMU) – the combined underweight can become a risk issue. The Russell Investments Decarbonisation Strategy takes a conservative stance on sectors, and coupled with incentivising low active-share, this results in very low active exposure, even across the EMUs. Only Sector Neutral Reallocation does a better job of keeping this aggregate exposure low, and that is expected, considering the nature of the strategy.

Chart 14: Sector Brinson Attribution: Cumulative Excess Return (July 2010 – December 2015)



Source: Russell Investments as of December 31st 2015.

To confirm our intuition that active risk was being driven by sector exposures, we conducted a Brinson attribution analysis and determined that the majority of excess return of both the Divestment and Risk Model Optimisation strategies is explained by the allocation between sectors. Divestment is almost exclusively driven by sector allocation, whereas Risk Model Optimisation has slightly more than half of its returns explained by sector allocation. When we compare these two strategies to Sector Neutral Reallocation, which has no sector allocation effect, as expected, and to Russell Investments Decarbonisation, which has a small amount of sector allocation, it becomes clear how we can explain the excess returns of the former two strategies.

The concern is that these excess returns are driven by systematic sector tilts that aren't expected to reliably pay off. The virtue – that they have paid off over the most recent five years – is only a coincidence, and we have no expectation for it to persist. But we do expect the systematic tilt to persist. That leaves Divestment and Risk Model Optimisation exposed to the precise sectors we expect might reverse over the next several years. Even if they don't reverse, both strategies are unnecessarily exposed to these sectors. We feel this is a dimension of risk worth controlling for.

When attribution is broken down by sector, we see a continuation of this pattern, where allocation drives excess return for Divestment and Risk Model Optimisation.

Conclusion

Due to the high concentration of aggregate Carbon Footprint in a small number of firms, it is a relatively simple task to meaningfully reduce the footprint of a portfolio relative to its benchmark. The trick is to do it while maintaining benchmark-like portfolio characteristics and returns.

In this paper we have investigated three common decarbonisation strategies alongside the Russell Investments Decarbonisation Strategy. We also provided a framework for evaluating different strategies and we have utilised this framework in Table 5 to summarise our analysis. In Table 5 we rank each strategy (1 = Most Desired) on the different characteristics required for an effective decarbonisation strategy and then aggregate that in to a final ranking for each strategy.

Table 5: Success Evaluation

RANKS	ACTIVE RETURN	ACTIVE RISK	ACTIVE SHARE	CARBON FOOTPRINT EXPOSURE	TRANSFER CO-EFFICIENT	TURNOVER	OVERALL
Desired Exposure	**Low**	**Low**	**Low**	**< 50%**	**High**	**Low**	
Divestment	4	3	2	2	3	2	3
Sector Neutral Reallocation	2	4	4	2	4	3	4
Risk Model Optimisation	3	2	3	1	2	4	2
Russell Investments Decarbonisation Strategy	1	1	1	2	1	1	1

Source: Russell Investments as of December 31st 2015.

As shown in this paper, all four approaches are effective decarbonisation strategies, and each one excels in different aspects. When we look across the full range of success criteria and alignment with the Montréal Pledge and the Portfolio Decarbonisation Coalition, the Russell Investments Decarbonisation Strategy provides the best combination of robustness, intuition and transparency.

Russell Investments maintains an active research agenda on the incorporation of Environmental, Social and Governance considerations in investment portfolios. In future research, we will explore how the Russell Investments Decarbonisation Strategy may be applied to active portfolios to achieve similar decarbonisation objectives.

Appendix 1 – Russell Investments Portfolio Decarbonisation Strategy

We implement our strategy via the use of an optimiser, because of the unmatched ability of an optimiser to manage a wide array of constraints. Because we do not employ a covariance matrix, our optimisation is completely linear

Investable securities

Our benchmark is the MSCI All Country World Index (ACWI). This also acts as our universe of investable securities.

Incentives

The optimisation problem requires an objective function that defines the thing we are maximising or minimising. Our objective function has three terms whose sum we are minimising within our constraints.

- **Transaction Costs**

  We use simple cost model where all costs are assumed to be 50 bps of traded value.

- **Ticket Charges**

  By incentivising lower ticket charges we keep down the number of trades and the number of names in the portfolio.

- **Active Share**

  This incentive enables us to only take on active share when it's necessary.

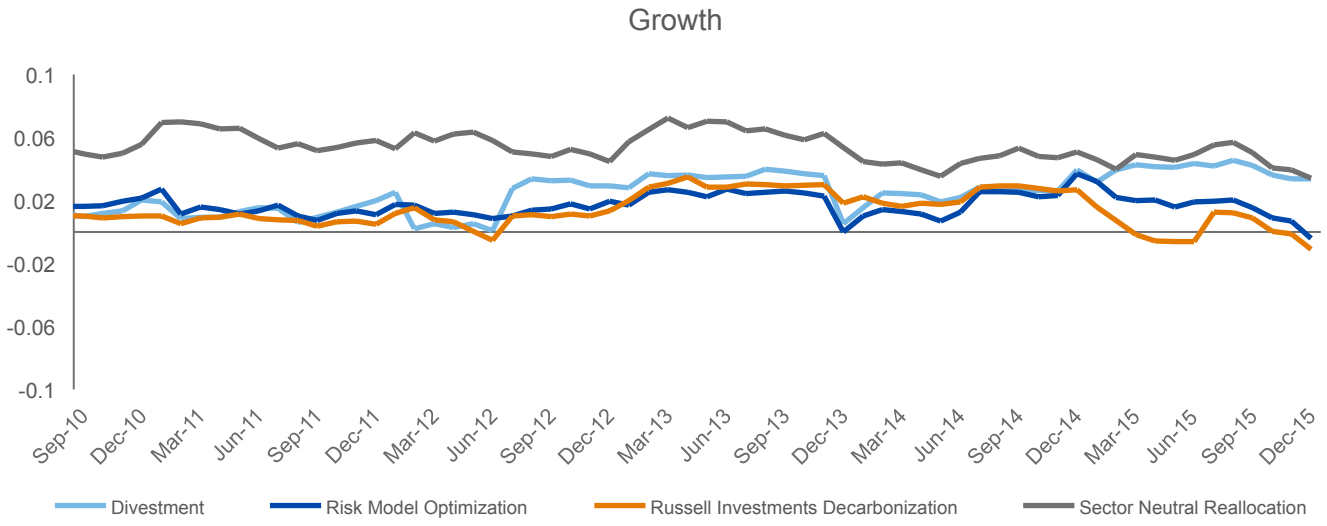
Constraints

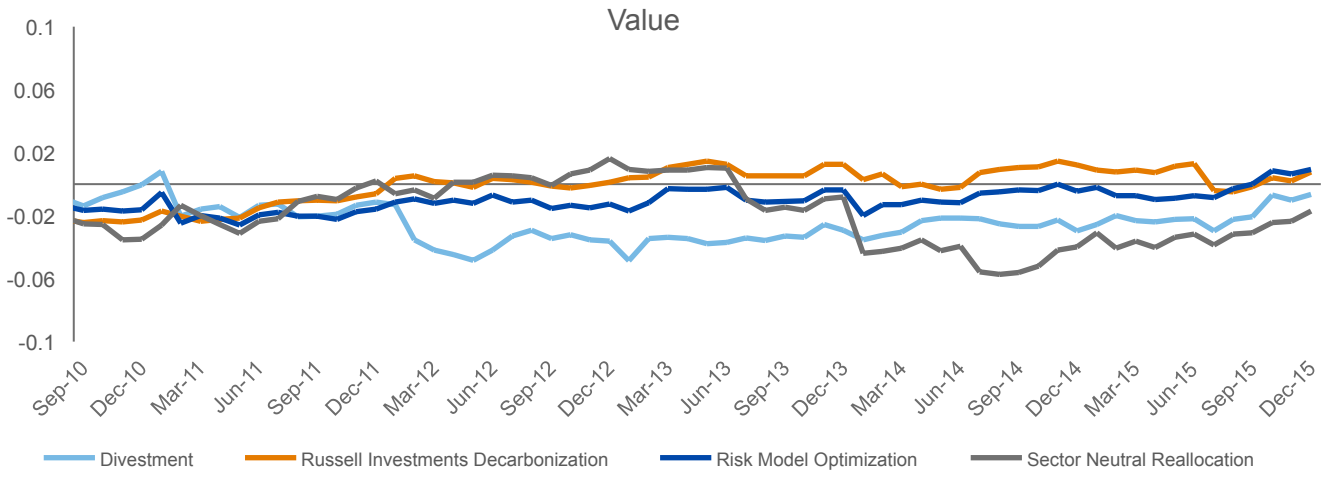
To ensure a benchmark like return, we employ several risk related constraints among a few others.

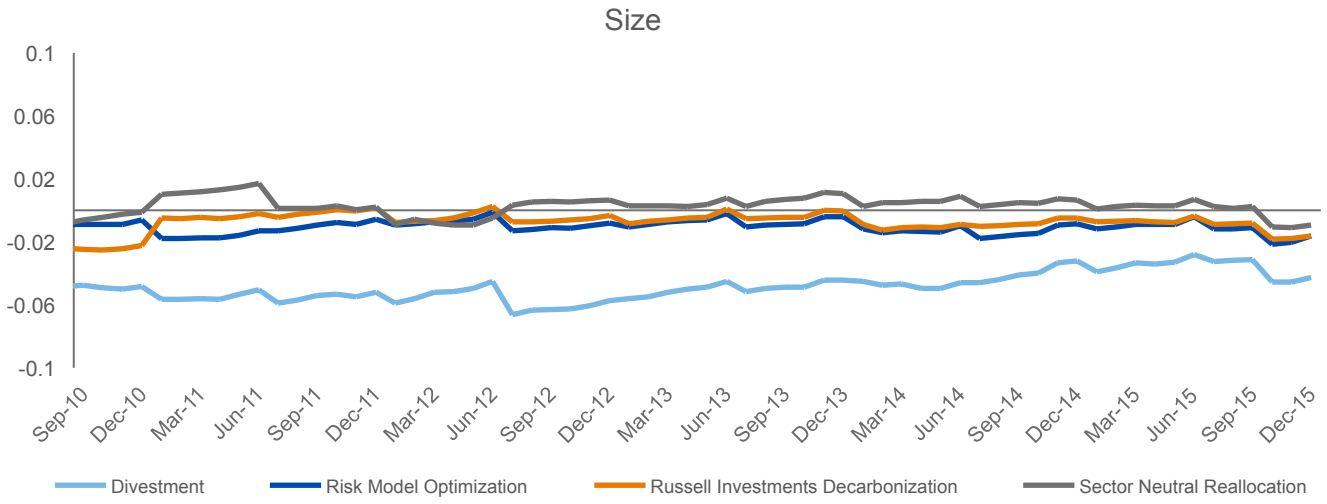
- All holdings must be at least 2 bps.
- All assets must be within -50 bps to 20 bps relative to benchmark.
- All countries must be within -20 bps to 20 bps relative to benchmark.
- All industries must be within -50 bps to 30 bps relative to benchmark.
- All sectors must be within -50 bps to 30 bps relative to benchmark.
- Any asset with missing Carbon Footprint data is held at benchmark weight.
- Aggregate Carbon Footprint must be less than 45% of benchmark.

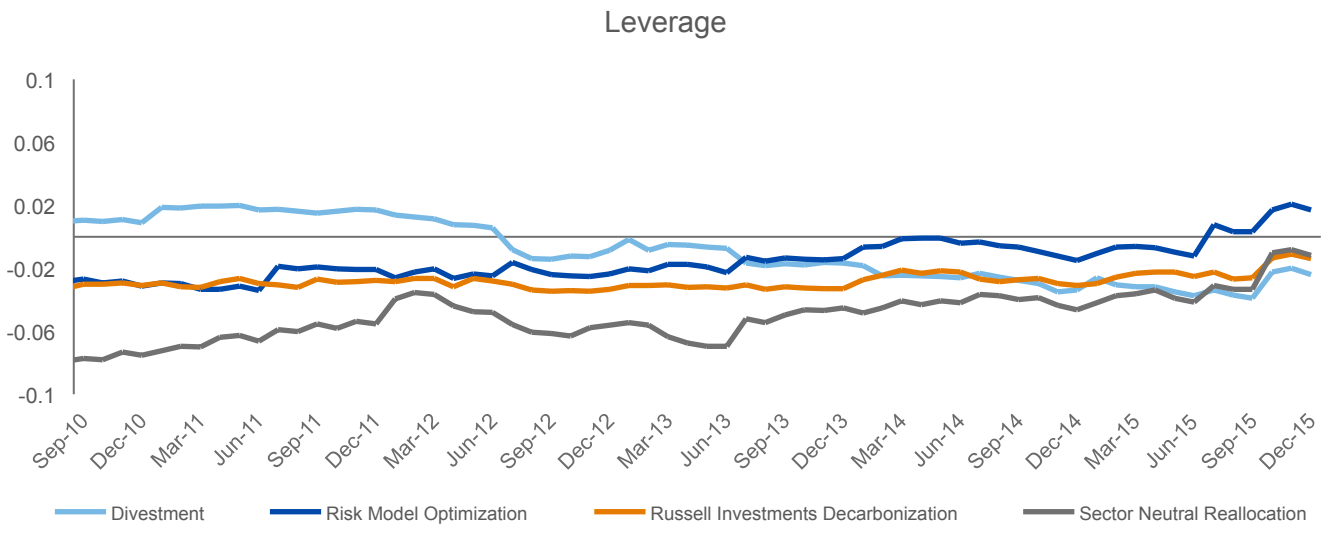
Appendix 2 – Style Exposure

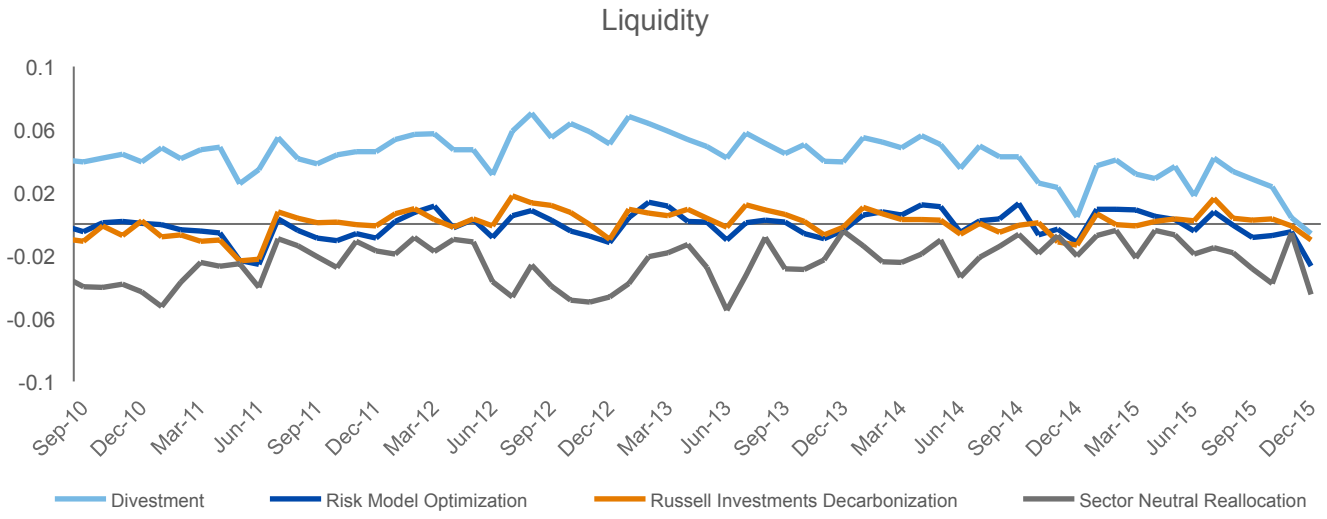
Chart 15








Leverage
0.1
0.06
0.02
-0.02
-0.06
-0.1
Sep-10
Dec-10
Mar-11
Jun-11
Sep-11
Dec-11
Mar-12
Jun-12
Sep-12
Dec-12
Mar-13
Jun-13
Sep-13
Dec-13
Mar-14
Jun-14
Sep-14
Dec-14
Mar-15
Jun-15
Sep-15
Dec-15
Divestment
Risk Model Optimization
Russell Investments Decarbonization
Sector Neutral Reallocation


Liquidity
0.1
0.06
0.02
-0.02
-0.06
-0.1
Sep-10
Dec-10
Mar-11
Jun-11
Sep-11
Dec-11
Mar-12
Jun-12
Sep-12
Dec-12
Mar-13
Jun-13
Sep-13
Dec-13
Mar-14
Jun-14
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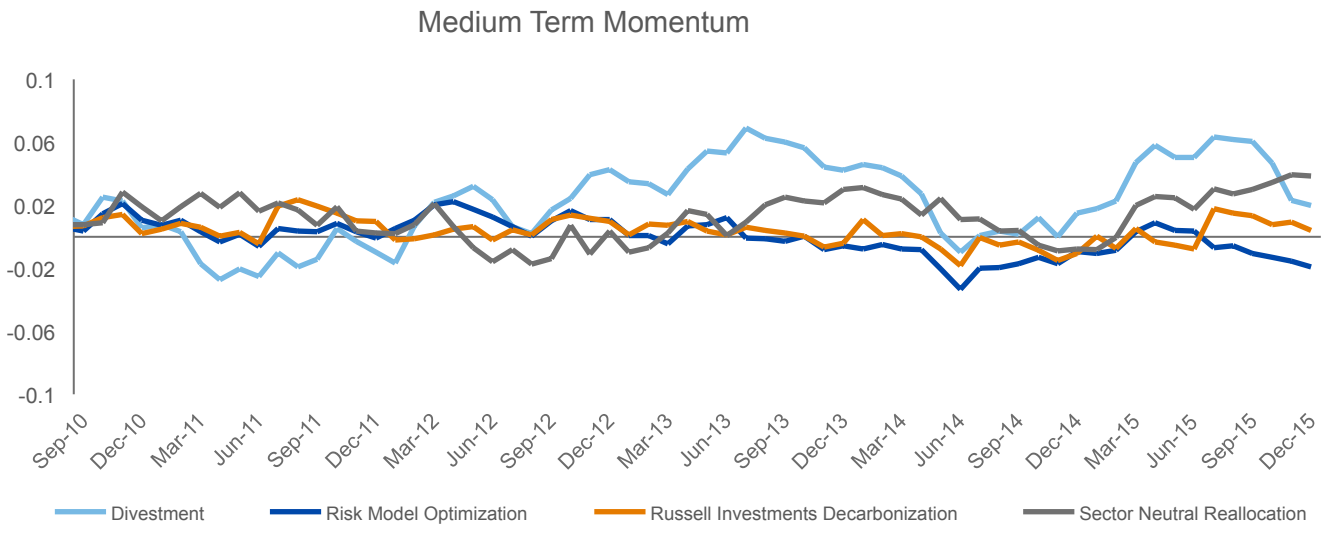
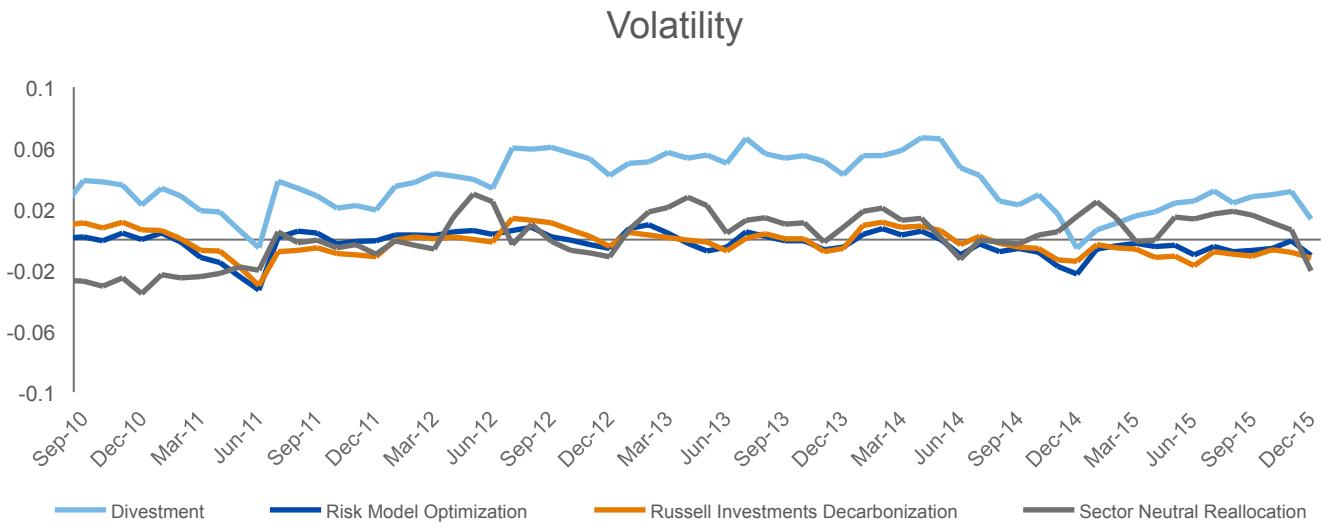
Dec-15
Divestment
Risk Model Optimization
Russell Investments Decarbonization
Sector Neutral Reallocation



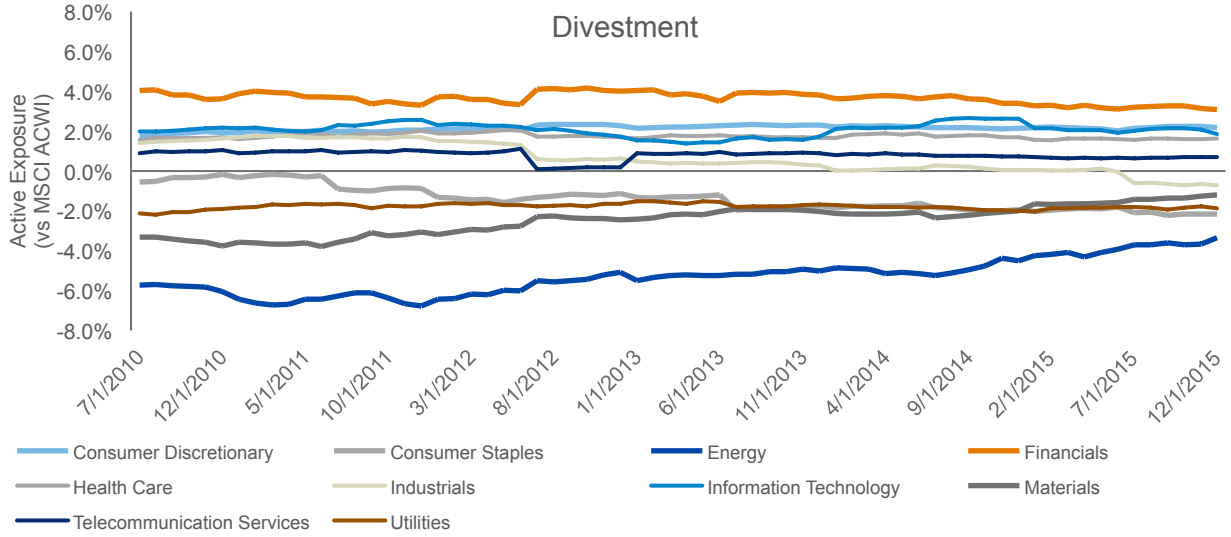


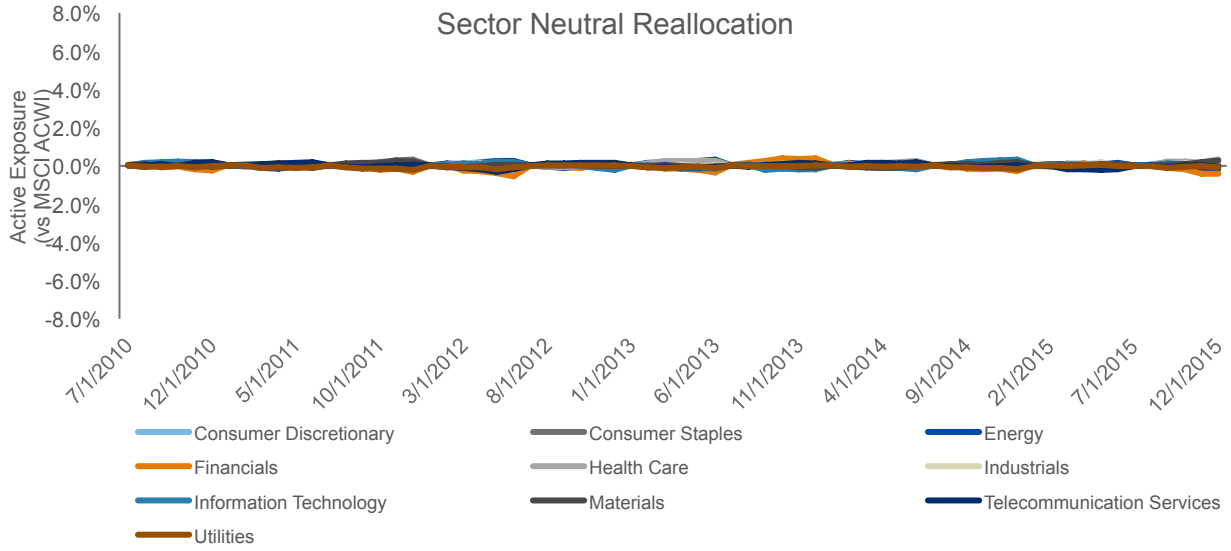
Source: Russell Investments and MSCI as of 31 December 2015.

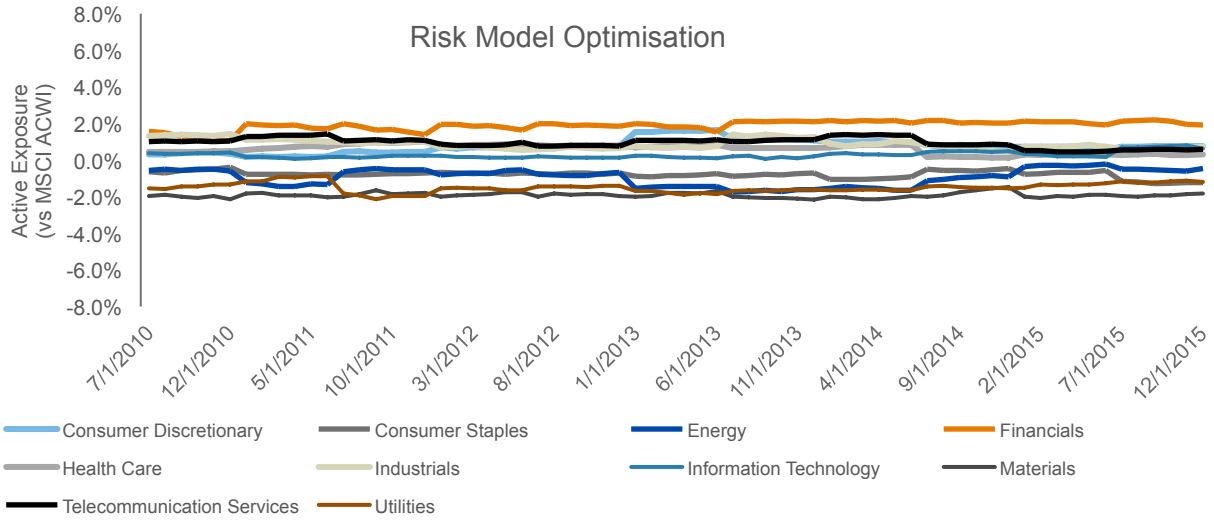
Both Divestment and Sector Neutral Reallocation strategies exhibit noticeable style deviations. Some of the more notable deviations include Divestment's exposure to negative size, positive liquidity, and positive volatility. Sector Neutral Reallocation has a persistent tilt towards positive Growth. Both Risk Model Optimisation and Russell Investments Decarbonisation seem well behaved with the exception that Risk Model Optimisation seems to have developed a positive leverage tilt more recently. In relation to other exposures that are prevalent in these strategies Style exposures are relatively small. We wouldn't expect to see large performance deviations based on Style exposures.

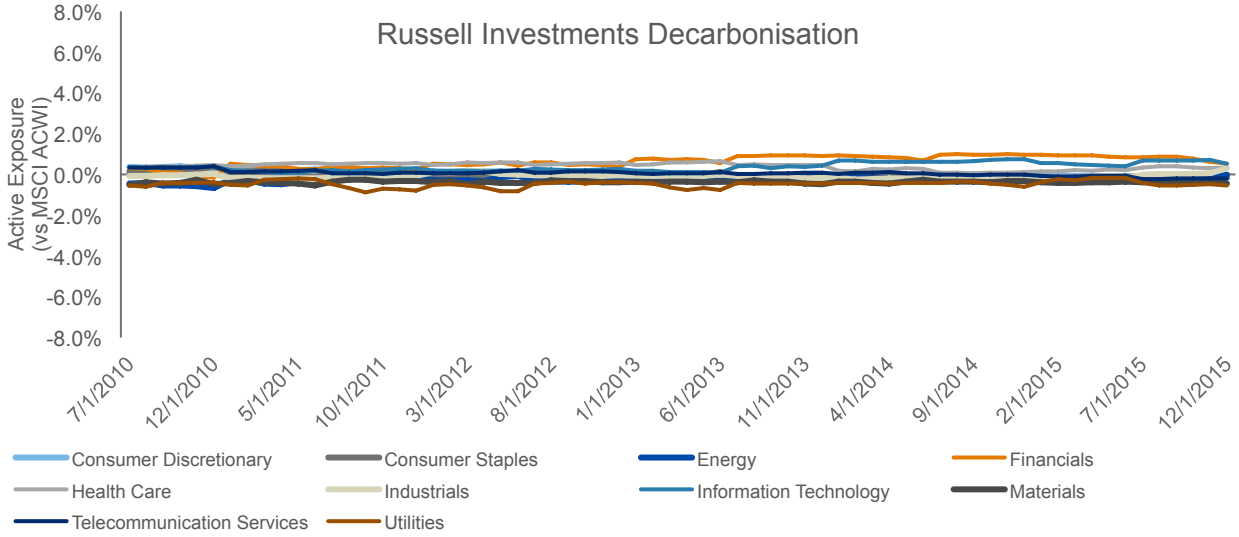
Appendix 3 – Sector Exposures

Chart 16









Source: Russell Investments and MSCI as of 31 December 2015

Appendix 4 – Country Code / Country

US	United States	ID	Indonesia
JP	Japan	TH	Thailand
CN	China	PH	Philippines
GB	United Kingdom	CL	Chile
CA	Canada	SE	Sweden
FR	France	DK	Denmark
DE	Germany	NO	Norway
HK	Hong Kong	IE	Ireland
CH	Switzerland	SG	Singapore
AU	Australia	LU	Luxembourg
IN	India	TR	Turkey
KR	Korea	QA	Qatar
TW	Taiwan	CZ	Czech Republic
ZA	South Africa	PT	Portugal
ES	Spain	CO	Colombia
IT	Italy	AT	Austria
RU	Russia	GR	Greece
MY	Malaysia	IL	Israel
MX	Mexico	NZ	New Zealand
NL	Netherlands	AE	United Arab Emirates
BR	Brazil	HU	Hungary
BE	Belgium	PE	Peru
PL	Poland	EG	Egypt
FI	Finland		

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Russell Investments provides strategic advice, world-class implementation, state-of-the-art performance benchmarks and a range of institutional-quality investment products, serving clients in more than 35 countries. Russell Investments provides access to some of the world's best money managers. It helps investors put this access to work in defined benefit, defined contribution, public retirement plans, endowments and foundations and in the life savings of individual investors.

FOR MORE INFORMATION:

Speak to Nicki Ashton, Head of Strategic Partnerships on **02 9229 5521** or email **mailto:nashton@russellinvestments.com.**

Or visit **www.russellinvestments.com.au.**