Russell Investments Enterprise Risk Management System

A brief history, rationale and an overview of its advantages

Russell Investments Research

russellinvestments.co.nz

Stanislav Melnikov, CFA, FRM, Managing Director, Investment Risk

Our proprietary Enterprise Risk Management System (ERMS) is designed to provide the transparency necessary for Russell Investments (RI) to effectively manage its risks. Having accurate, timely and comprehensive visibility of one's "bets," whether taken as a principal or a fiduciary, is the foundation from which virtually all basic risk and portfolio management activities are conducted.

This paper provides insights into the catalysts that drove the ERMS creation as well as the rationale for its design. The advantages of ERMS are summarised in the Appendix.

1. The Global Financial Crisis' impact on risk modelling and lessons learned

The Global Financial Crisis (GFC) was a pivotal moment for risk management, regulations and market transparency. In its aftermath, a widely held belief emerged that risk models failed to quantify market and liquidity risks. This presumed failure was then used to explain why so many investors incurred losses far beyond their expectations. The GFC inflicted an enduring scar on the psyche of society, regulators and the financial industry as a whole. It resulted in several developments that had significant implications for risk modelling by asset managers.

New regulations – risk disclosures

The GFC spawned a slew of new regulations aimed to better quantify market and liquidity risks.[1] While the new regulations shared common themes such as requirements for stress testing, liquidity risk evaluation and ongoing timely risk monitoring, the standards for quantification of these measures differed considerably by jurisdiction and regulator. The resulting impact on asset managers meant the creation of diverse and often conflicting regulatory requirements.

New regulations – model risk

Model risk was another area of regulatory focus that was sharpened by the GFC. While the banking industry bore the brunt of those regulations with new rules such as OCC 2011-12 and FRB SR11-7, regulators for asset managers also started to pay attention to model risk as well. While not yet as prescriptive and far-reaching, some new regulations did have explicit model risk management requirements such as independent validation and model back-testing. The bottom line impact on asset managers was that these new requirements made risk modelling more expensive.

Market transparency

The GFC brought an increased demand for greater market transparency, especially for fixed income and derivative markets. This new transparency created datasets for previously unobservable metrics. One important example is the increased insight into fixed income volumes and prices. This new data facilitated the creation of issuer-level credit spreads, which greatly enhanced modelling of corporate credit. Prior to the GFC, corporate credit was typically modelled via factor approximation. Asset managers now have more data to build better risk models.

Model disillusionment

Despite the seemingly sophisticated statistical techniques used in models prior to the GFC[2], losses were often well beyond modelled predictions. Accordingly, the response was a reduction in reliance on model-based analysis and a broad industry skepticism for anything risk model related. The existing modelling paradigm was considered "broken" and "not fit for purpose". Asset managers faced increased difficulty in quantifying risks as well as increased front office skepticism of models' predictions.

The industry faith in risk models was broken. More troublingly, the credibility of risk oversight diminished in many firms at the same time as new regulations called for significant investment in risk modelling. The need for more spending/resources on something perceived to be less useful resulted in adverse developments, including reallocation of modelling resources to develop perfunctory solutions. This environment led to many asset managers delegating risk monitoring and regulatory reporting to vendor solutions. Economies of scale combined with the reputation of an established vendor appeared to be the winning proposition.

Stepping back from widely-held beliefs on model failure during the GFC, let's examine what actually happened. All models are a mathematical representation of reality. However, reality is infinitely complex and cannot be reduced to mathematical formulae. Unfortunately, that is exactly what models do. To make that possible, the complexity of the modelled process gets greatly reduced by making simplifying assumptions that inevitably result in imprecision. Due to these assumptions, no model ever matches reality regardless of sophistication and thus introduces "noise" along with its "signal" or forecast. A detailed understanding of assumptions is of paramount importance in model usage and interpretation.

Going back to the GFC, most model failures can be traced to misunderstanding the model assumptions. One pertinent example was banks using the previous year of historical data to forecast Value at Risk (VaR) on trading books. A key assumption of this VaR approach is that future distributions of returns will be similar to what was observed the prior year. However, if the volatility regime changes, the model will meaningfully deviate from reality. Another example was using factor models with an exponentially weighted moving average (EWMA) or a generalised autoregressive conditional heteroscedasticity (GARCH)-based covariance matrix. The key assumption is that risk factors have a static and linear relationship. However, one of the hallmark traits of a financial crisis is contagion (i.e., the simultaneous sell-off in typically uncorrelated exposures). Assuming static correlations for the purposes of tail risk quantification resulted in an underestimation of risk. Not knowing what the model assumptions were and not adjusting the risk management process to highlight explanatory limitations of what models can provide resulted in what was labeled as "model failure." Ultimately, the "failure" was the improper use of the models rather than the defect in the modelling methodology.

2. Leveraging lessons from GFC – the creation of ERMS

The cautionary tale of GFC illustrates the key principle of prudent risk modelling: In order to use a risk model effectively, all of its assumptions and mechanics must be thoroughly understood. Herein lies a daunting issue with outsourcing risk modelling to vendors – ceding transparency and control over the modelling process. While the situation is usually not binary (i.e., complete transparency or no transparency), the further removed the modelling process is from the decision makers, the higher the odds that its assumptions are not understood. Without full transparency, it is not possible to use a model for risk and portfolio management activities. Consequently, the end result often ends up being a bifurcation of analytics between regulatory reporting (typically being a "black box" vendor solution) and multiple internal risk systems (typically being simpler factor models focussed on a specific asset class). The end outcome is expensive, inefficient and often confounds rather than improves the actual risk management of the investments.

What are other ways of addressing this problem? One approach is to build a risk system internally – an option that provides maximum transparency and control. Most of the popular market risk quantification techniques are well researched, documented and widely available. Thus, mechanically, building a risk model is reasonably straight forward. A challenge with this approach is the availability and cost of data and computing resources. While data availability and market transparency have increased significantly, so did the costs of the data required to model risk. Granular high frequency data enabled accurate security-level valuation to be used for market risk quantification. Unfortunately, such an approach is very computationally intensive. Only the largest firms can build in-house risk systems, which – even in the best cases – have mixed success. Data, not the actual computations on it, is also one of the main differentiators between various vendor solutions available.

What can an asset manager do to quantify investment risks of its portfolio in the face of this grim reality? The choice is between an opaque process that is useful only to "check the regulatory box" and the in-house build, which is costly, operationally risky and not guaranteed to be a success. And, all approaches are expensive. Russell Investments (RI) faced that choice when its centralised risk management organisation was established in 2010. Instead of starting with a review of potential solutions, RI first defined the principles and objectives that a risk system should achieve.

3. Foundational principles of risk management system

Regardless of its origins, a risk management system must adhere to a basic set of principles:

- **Total portfolio coverage.** Risk quantification must cover all holdings across all asset classes of a portfolio in a coherent and consolidated manner. There must not be any blind spots (e.g., hedge funds, non-traditional asset classes/instruments, etc.).
- **A sound risk modelling approach should consider all key sources of risk.** Since correlations are stochastic (i.e., can be subject to considerable fluctuations), comprehensive scenario analysis capabilities are required to measure tail risk.
- **Transparency (no "black boxes").** Every aspect of every modelling component must be thoroughly understood. Any risk number calculated must be fully explainable.
- **Actionable insights.** Generating countless pages of reports does not necessarily equate to comprehensive risk management. Modelling framework must be flexible and interactive. User should be able to ask model a specific question of interest and receive an answer to that question.
- **High frequency.** Market risk continuously evolves. A risk system must facilitate daily updates at the least.[3]

In our quest to establish an enterprise risk system, we recognised that it would be neither prudent nor possible to create an internal system from scratch to satisfy the principles outlined. Thus, we used an RFP process to review risk model vendor solutions. Many promising systems were considered but none met all of the criteria outlined above. All the leading systems were high frequency, but none provided total portfolio coverage (i.e., there were always asset classes that were either out of scope entirely or the modelling approach lacked robustness). Most systems placed heavy emphasis on reporting with little or no true interactivity. In instances where the modelling approach customisation was available, it usually came at a price of significant complexity. While the complexity is the necessary side effect of modelling approach flexibility, implementation and operation are significantly more labor intensive. Perhaps worse still, it adds additional risks of model misuse in the event where customisations are not fully understood.

Several models we considered used sound modelling approaches and offered an overwhelming advantage for data and computation aspects compared to an internally built solution. One model combined best-in-class modelling based on granular framework[4] (as opposed to factor framework), exceptional data capabilities, full transparency and a high degree of customisation: MSCI RiskMetrics (RM). It turned out to be an ideal foundation on which RI built ERMS. The advantages RiskMetrics offered could never be achieved by an internally built system. Unfortunately, RM could not meet all of RI's regulatory reporting, risk and portfolio management needs in its "off the shelf" configuration. Further, there were key gaps in coverage (especially around hedge funds and other illiquid investments), absence of interactive analytics, slow processing times and extreme complexity/lack of user friendliness.

4. Building ERMS

The approach taken in building ERMS mirrors how RI approaches multi-asset investing: combining best of breed internal and external components with full control and ownership of the final product. We combined vendor components where there was a distinct advantage to do so and internally built where there was not. ERMS provides an optimal balance between leveraging both the operational advantages of the vendor model and organisational fit that is afforded by building an internal solution. A purpose-built infrastructure was created to facilitate this combination while focusing on robustness, upgradeability, abstraction and modularity. In building ERMS, several other additional principles were used:

- **Multiple lenses.** There is never one best model. Gaining maximum insight requires multiple "lenses" (models).
- **Best of breed components.** Where appropriate, we used the best available vendor solutions and customised/calibrated those solutions with internal IP. We used internally built models for areas where vendor solutions fell short.
- **Modular design/open architecture.** The risk modelling field is new and evolving at a rapid pace. It is critical for risk systems to have a modular design allowing their components to be upgraded or replaced without disrupting the overall system. Without constant upgrades, any system quickly becomes obsolete.
- **Consistent assumptions.** Multiple lenses/models framework is only feasible when models use consistent assumptions. All models utilised must be integrated (i.e., able to be used in combination or interchangeably).
- **All models will be wrong.** One must thoroughly understand model assumptions and supplement those with judgement from experienced risk and investment professionals.

The asset coverage gaps of RM were closed by creating an innovative suite of internally developed models, many of them using techniques not found elsewhere in the market place:

- **Russell Alternative Model (RAM)** for hedge funds, illiquid assets and dynamic strategies where conditioning modelling on holdings at a point in time is not appropriate, which is one of the most common assumptions across market risk models.
- **Exposure Mapped Model (EMM)** for holdings where timely position-level transparency is not available.
- **Private Assets Model (PAM)** designed for modelling assets with capital commitment and J-curve payout structure.
- **Regime Assessment Tool (RAT)** provides information on what settings market risk models should use to capture the current market environment, which is based on innovative machine learning approaches.

Concurrent with the development of our proprietary components, RM models were fully dissected and re-calibrated based on RI-specific views and research. The customisation to RM was (and continues to be) significant and based on our research and IP. This research spans a vast spectrum and contemplates topics such as:

- Optimal data frequency
- Optimal methods to estimate covariance matrices
- Creation of hypothetical scenarios such as cost push and demand-pull inflation shocks

Since the implementation of RM in 2011, RI has developed a deep research-focused relationship with MSCI (owner of RM) that extends far beyond the traditional client-vendor arrangement. In several cases, RI research has been used for some modelling enhancements introduced by MSCI for RM. In addition to customising the model settings, RI also influences how RM models are structured and advises on the path for MSCI's future model development efforts.

An absence of interactive analytics was another challenge. Some of the absence was rooted in model sophistication and complexity. For example, performing security-level valuations across complex multi-asset portfolios under hundreds of scenarios and thousands of simulations is an incredibly computationally intensive task that even formidable computational resources cannot solve in a timely manner. As a result, producing analytics on the full set of portfolios that comprise RI's AUM takes almost a full day. Any "what-if" type analysis would extend that time frame even further. In addition, it was impossible to reduce risk measurements to a set of pre-determined reports. A capable risk system must interact with users to allow for a variety of questions with timely answers. No vendors currently provide that capability, as a universe of questions can differ considerably by application/client type.

If one considers how RI operates, the key levers for our investment process are manager and strategy allocations as well as customised completion portfolios and derivative overlays. These levers reduce the dimensionality of the problem from hundreds of thousands of securities to thousands of "building blocks". Our solution was to pre-compute a vast array of risk measurements at a security level overnight and aggregate them into building blocks that became the lowest unit of granularity in our interactive modelling framework. All the "heavy lifting" (i.e., risk calculations for individual securities) is done in the overnight processing and the task of interactive risk analytics (i.e., using the pre-processed building blocks) can be performed in seconds. Similar innovative approaches were taken to facilitate user-defined risk measurements and other necessary flexibility.

To make this flexibility possible, a risk analytic data abstraction layer internally referred to as Risk Exposure Measurement Infrastructure (REMI) was created. This is an often-overlooked component in risk system design. Typically, a risk model's general purpose, graphical user interface or canned reports are used as the end point for risk analytics. Inherently, this approach lacks flexibility, requires significant investment in training and rarely results in the true integration for risk or portfolio management processes. As an alternative to GUI and canned reports, custom front ends can be built on top of a vendor model to address the integration and flexibility concerns. Unfortunately, either approach creates an undesirable dependency on a specific model violating our modular design principle. REMI allows ERMS to abstract models from the decision support systems.

Beyond flexibility, REMI allows for the staging, normalisation and enrichment of output from all risk calculators that are used in ERMS. It provides for a wide range of post-processing adjustments. These adjustments include critical fixes of imperfections in vendor models as it is often not possible to control the methodology of process. REMI also facilitates computational efficiency, where all of the investments modelled are structured into building blocks for risk analytics to be pre-calculated overnight. This approach permits the dynamic aggregation of various portfolio constructs on demand. But REMI does more than that: It also includes a comprehensive set of functions that allow various front-end tools to consistently extract and manipulate risk information. This is a crucial element of a modular design. Ultimately, it does not matter which front-end system is asking a question – as long as it is the same question, it always gets the same answer.

As a final stage in the process, all the various modelling components and interactive features were crystallised into our proprietary decision support system layer that was customised to specific use cases, including:

- Risk monitoring and oversight tools that facilitate automated daily risk limit monitoring, modelling assumption transparency, risk dashboards and reporting
- Front office risk tools that allow portfolio managers to integrate comprehensive and sophisticated risk modelling into their portfolio management workflow; the system also includes comprehensive "what-if" capabilities that allow for streamlining of pre-trade risk analysis
- Regulatory reporting solutions that generate appropriate output for each applicable regulation
- Client reporting solutions that address specific client-related requirements

5. Results

ERMS enables the use of one comprehensive system for regulatory, risk oversight and portfolio management activities without sacrificing accuracy, flexibility or transparency. Its modular design removes dependencies on any specific model and facilitates the use of best-of-breed components that can be upgraded at any time. Risk assessment is performed in a consistent way across all applications and risk modelling resources are focused on supporting a single modelling framework, maximising the operational leverage. This focus allows the models to provide risk measurements that extend far beyond traditional basic risk quantification techniques, such as volatility, beta, tracking error and VaR, and include comprehensive stress testing, reverse stress testing[5] and sensitivity analysis. Further, ERMS results are subject to regular back-testing to monitor modelling accuracy.

One of the main premises of multi-asset investing is the risk reduction benefits afforded by diversification via multiple asset classes. To effectively manage multi-asset portfolios, comprehensive and thorough risk analysis is required. As one of RI's key innovations in managing multi-asset portfolios, ERMS is an integral part of RI's multi-asset value proposition.

[1] Examples include UCITS IV (EMEA), CPO-PQR and Form PF (US), Rule 22e-4 (US), Rule SPS 530 (Australia).
[2] Examples of such techniques included: copulas, jump-diffusion stochastic processes, fat tailed distributions, etc.
[3] Updates include market data, terms and conditions, portfolio holdings and risk model calculations.
[4] For more information on differences between granular and factor approaches to modelling market risk refer to: McMurray, John & Melnikov, Stanislav. Measuring Market Risk: Approaches and Inherent Assumptions. The Journal of Investing 22(1): 49-56, January 2013.

[5] The main market risk for a well-diversified multi-asset investor is a correlation shock. Coincidentally, that is one of the hardest dynamics to model, as many models assume correlation structure as a static input derived from history. To address correlation shocks, a robust stress testing program is required. Unfortunately, use of scenario analysis creates a risk framework with a potentially infinite number of measurements. Hence, there is an acute need for ongoing model oversight, design and calibration efforts that help focus modelling resources on metrics that matter most, given the particular market environment and portfolio. Only internally built solutions allow for that feature, as it is impossible for an outsourced approach to consider these important nuances.

Appendix A: Key advantages of ERMS

1. Total portfolio coverage using a consistent modelling approach; consistent interpretation of risk numbers across all models and portfolios; ability to combine results (including non-additive measures) across all asset classes:
    a. Public markets
    b. Hedge funds
    c. Private markets
    d. Dynamic strategies (where modelling conditioned on position-level holdings is not appropriate)
2. Modular proprietary design that allows for use of best-of-breed components and seamless integration of internal and external models
    a. Backbone of modelling infrastructure built on MSCI RiskMetrics granular market risk modelling framework, which is heavily customised for Russell Investments proprietary application
    b. Suite of innovative internally built models that are fully and seamlessly integrated into modelling framework (i.e., all models produce exactly the same output using consistent modelling assumptions)
    c. Several risk quantification techniques have been invented internally that are not commercially available elsewhere; examples include:
        i. Reverse stress testing scenarios optimised via Mahalanobis distance (MD) approach
        ii. Factorisation of interest-rate curves (RI-custom approach) used in stress scenario definitions
        iii. Multi-dimensional optimisation for exposure mapping including MD approach
        iv. Factor model conditioning on co-skewness and co-kurtosis
        v. Factor selection approach using the ‘Frisch-Waugh-Lovell’ theorem
        vi. Machine learning approach to detecting shifts in market environments
    d. Specialised in-house built suite of decision support systems that offer on-demand interactive functionality and comprehensive reporting/analysis
    e. Purpose-built database design that facilitates modular system architecture:
        i. Building-block construct that provides abstraction and allows for overnight pre-processing of computationally intensive modelling tasks
        ii. Position-level details on risk analytics, modelling assumptions, error logs and other metadata to help explain portfolio-level results
        iii. Snapshot-based layout that enables time series aggregation
        iv. Multi-layer portfolio structure capabilities with no limit on number of aggregation layers
    f. Sophisticated workflow management process that facilitates a daily analytics refresh in a complex system with robust controls and dependency management using Luigi by Spotify
3. Comprehensive set of risk measurements that consists of:
    a. Basic risk evaluation (forecasting of return distribution): volatility, VaR, CVaR, tracking error, beta, correlation, tail correlation
    b. Stress testing: historical, predictive, reverse; over 200 scenarios available off the shelf with endless possibilities enabled by user defined functionality; scenarios cover variety of past events and a number of hypothetical scenarios; stress testing program is always evolving with new scenarios designed to be relevant to the prevailing market environment
    c. Sensitivity analysis that uniformly covers all investments (e.g., What is the impact of yield curve steepening on equities, fixed income and private markets?)
    d. Exposures: country, currency, sector, credit rating, asset type, etc.

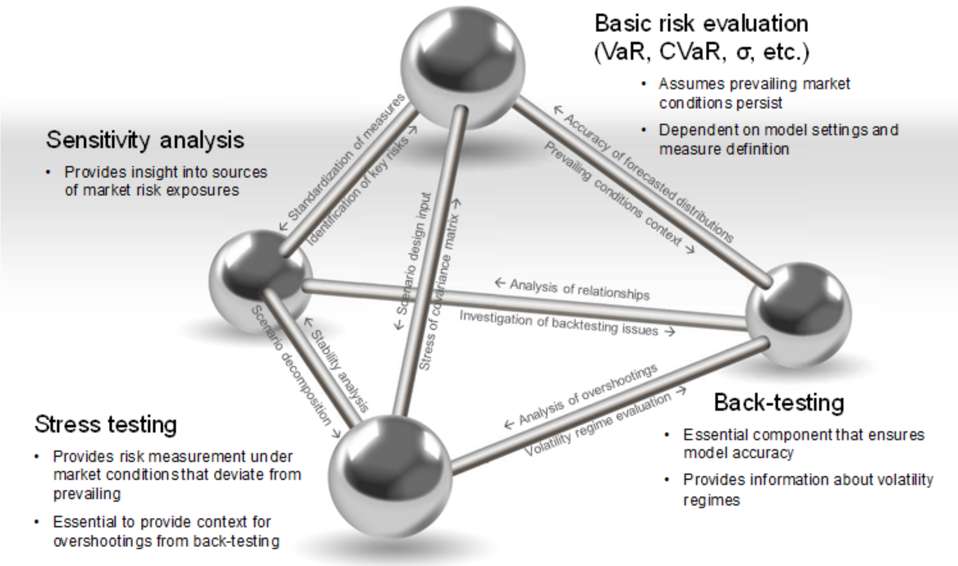
4. Deep in-house modelling expertise that facilitates robust model risk management:
    a. Regular back-testing and other model performance metrics
    b. Complete and comprehensive understanding of every modelling component – no black boxes
    c. Strong focus on understanding assumptions associated with each modelling approach and their impact on model usage and output
5. Unique and proprietary user interface with explicit focus on complex multi-asset, multi-layer portfolios
    a. Portfolio Risk Optimiser (PRO) tool that facilitates interactive risk analysis for existing and hypothetical portfolios
    b. Extensive "what-if" analytic capabilities
    c. Several complimentary tools that allow specialised analysis around derivative overlays, pension surplus risk, market assumptions and other applications
    d. Risk attribution analysis: explain portfolio-level risk numbers at sub-component level (sliced by sub-portfolio or by various exposure measures)
    e. Benchmark-relative analysis; ability to define custom benchmark blends benchmark can be any portfolio of assets (including long/short) or liabilities

Appendix B: Market risk measurement framework supported by ERMS

Market risk

Market risk is a risk of change in market value of investments and/or level of earnings (yield) due to movements in market prices. Market risk calculations should, at a minimum, consider changes in equity and commodity prices, interest rates, exchange rates, implied volatilities and inflation. The market risk measurement framework employed by Russell Investments considers four dimensions for risk assessment (see Exhibit 1):

Exhibit 1: Market risk measurement framework



Basic risk evaluation is based on profit and loss simulations to estimating probability distribution of future outcomes. When possible, non-parametric approaches such as historical simulation are considered as an addition. Basic risk evaluation refers to commonly used distributional measures such as Volatility, Tracking Error and Value at Risk that forecast variability of asset returns distributions under a specific set of assumptions or market conditions. If asset returns were normally distributed, then mean and standard deviation or volatility would fully describe risk and there would be no need for other measures outside of basic risk evaluation. Unfortunately, asset returns typically have tails that are fatter than normal distribution and the shape of the distribution is not symmetrical. Thus, more than one measure is required to describe the infinitely complex reality that cannot be perfectly reduced to a mathematical formula. These measurements typically rely on the assumption that volatility correlates across time (e.g., high volatility yesterday makes it more likely that high volatility will be experienced today). Also, these measurements often assume static correlations that are derived from historical experience. While they are an indispensable component of any market risk analysis, the measurements that fall into this category lack precision or appropriate assumptions for the tail-risk analysis. A good example of misuse of basic risk evaluation is the pre-GFC practice employed by some banks to use historical VaR with one-year lookback to set their capital levels. In this situation, if the past year was during low volatility environment, the measurement will grossly understate the amount of tail risk regardless of what percentile is used for VaR. When used as the only component of the market risk framework, these measurements can be dangerous and misleading.

Stress testing provides insight into performance under extreme market conditions. Stress testing is a specialised set of measurements that are designed to focus on measuring the tails of return distribution. It is a broad category that includes several groups of measurements: stressed return simulations, scenario analysis and reverse stress testing. These stress measurements help dimension how things could go poorly for the portfolio, provide important context (or a ceiling) for the other measurements and help identify sources of portfolio vulnerabilities. One of the key features of stress testing is an explicit assumption that certain market relationships and correlations differ significantly from historical norms. In general, modelling and forecasting correlations is much harder than volatilities. Stress testing typically involves a heavy dose of art to supplement the science.

Exhibit 2: Stress testing methodology

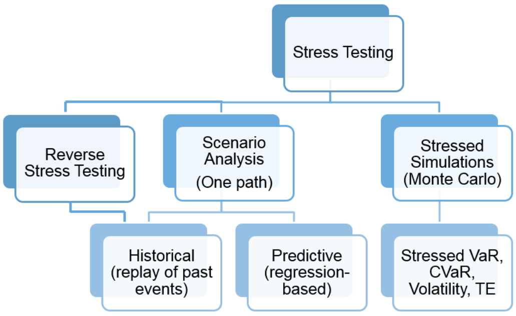
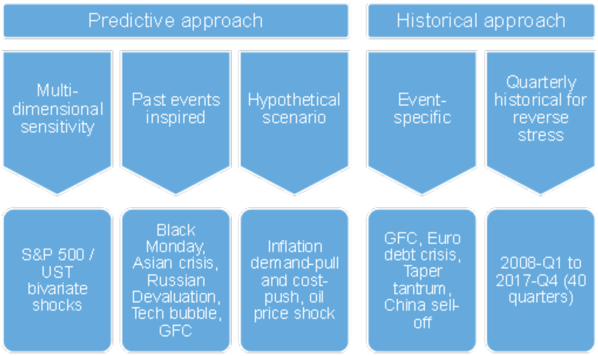
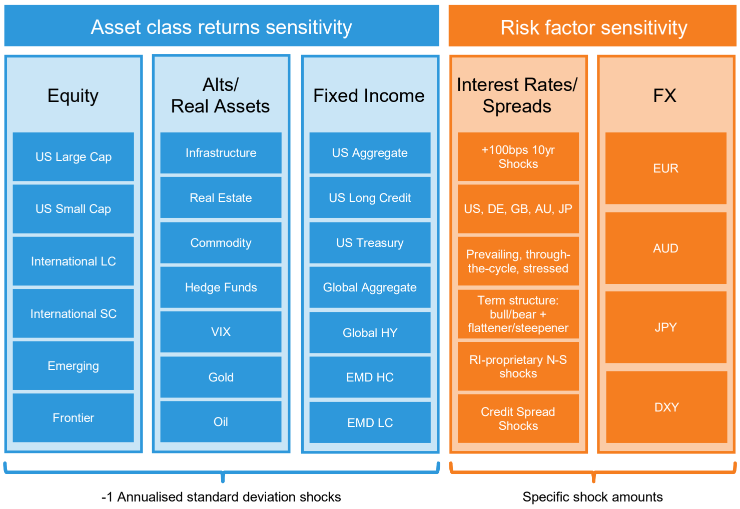


Exhibit 3: Stress scenario used by Russell Investments



Sensitivity analysis is used to identify direct and indirect sources of market risk exposure. It is critically important that sensitivity measures have the same interpretation across all assets analysed. For example, the interpretation of interest rate sensitivity measure such as shock to the 10-year U.S. Treasury rate must be consistent across equity, fixed income and alternative investments as all holdings have price sensitivity to interest rate movements – not just bonds where duration can be explicitly calculated.

Exhibit 4: Sensitivity analysis dimensions used by Russell Investments



Back-testing is an essential component of the market risk framework that is used to periodically assess market risk model accuracy. This is a process of comparing forecasted outcomes to the actual returns. The models are only useful if they reflect reality and there is a whole science built around testing whether models are accurate or not. Furthermore, back-testing can be used to obtain information about the current state of the market environment, which can be used as a tool to help interpret model forecasts.

About Russell Investments

Russell Investments is a global asset manager with a unique set of capabilities that we believe is essential to managing your total portfolio and to meeting your desired outcome. At Russell Investments, we stand with you, whether you're an institutional investor, a financial adviser, or an individual guided by an adviser's personalised advice. We believe the best way to reach your desired outcomes is with a multi-asset approach that combines: asset allocation, capital markets insights, factor exposures, manager research and portfolio implementation.

For more information

Call Russell Investments at **64 9357 6633** or

visit **russellinvestments.co.nz**

Important information

The information contained in this publication was prepared by Russell Investment Group Limited on the basis of information available at the time of preparation. This publication provides general information only and should not be relied upon in making an investment decision. Before acting on any information, you should consider the appropriateness of the information provided and the nature of the relevant Russell Investments' fund having regard to your objectives, financial situation and needs. In particular, you should seek independent financial advice and read the relevant Product Disclosure Statement or Information Memorandum prior to making an investment decision about a Russell Investments' fund. Accordingly, Russell Investment Group Limited and their directors will not be liable (to the maximum extent permitted by law) for any loss or damage arising as a result of reliance being placed on any of the information contained in this publication. None of Russell Investment Group Limited, any member of the Russell Investments group of companies, their directors or any other person guarantees the repayment of your capital or the return of income. All investments are subject to risks. Significant risks are outlined in the Product Disclosure Statements or the Information Memorandum for the applicable Russell Investments' fund. Past performance is not a reliable indicator of future performance. The Product Disclosure Statements or the Information Memorandum for the Russell Investments' funds (as applicable) are available by contacting Russell Investment Group Limited on 09 357 6633 or 0800 357 6633.