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The Fundamental Review of the Trading Book: Implications for portfolio and risk management in the banking sector

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Synopsis

The Fundamental Review of the Trading Book (FRTB) is the regulatory response of the Basel Committee for Banking Supervision (BCBS) to bank market risk management failings in the financial crisis of 2007-2009. This reform continues to permit the use of banks' proprietary Value-at-Risk (VaR) models but subjects them to additional qualifying criteria within a more prescriptive framework. Essentially these criteria require enhanced alignment of the risk models to the models used for front-office trading through Profit & Loss Attribution Tests (PLA tests) and enhanced backtesting. We examine the impact of these additional criteria and find that the PLA tests demand significant alignment with risk factors such as the market index but that the backtests have low power to reject poor models and provide no incentive to deploy superior risk models.

Introduction and Background

The failings of bank market risk management were laid bare in the events of the financial crisis (2007-2009), including under-capitalisation, excessive leverage, and neglect of liquidity risk. Critics argue that a form of bank self-regulation prevailed centred on propriety Value-at-Risk models, designed as a measure of the potential loss on a portfolio but latterly used to determine regulatory capital requirements for qualifying banks. Regulatory capital is designed to act as a buffer so that bank losses are absorbed and do not spill over into the domestic economy. However, the experienced nationalisation of some private banks and the socialisation of bank losses significantly damaged the credibility of the bank regulatory framework. This prompted a major overhaul of bank regulation, Basel III, wherein the Fundamental Review of the Trading Book (FRTB) is the component that specifically addresses failings in bank market risk regulation. FRTB will significantly increase regulatory capital requirements, primarily to ensure the stability of the financial system and substantially acting as a valve for the availability of credit to the economy.

Issues and Questions Considered

The prerogative for banks to develop their own internal models, including their choice of risk forecasting models, remains central to FRTB, with the BCBS arguing that this is essential to enable a level playing field between banks in different jurisdictions. Banks view the use of internal models as a means of ensuring risk-sensitive capital that rewards good risk management practices, essentially minimising their capital requirements. However, a key concern with the continued use of internal models across the banking system is the lack of homogeneity and high variation in the risk forecasts from banks' proprietary risk models. Indeed, VaR became a cynosure for criticism of bank risk-taking and their under-capitalisation in the 2007-2009 financial crisis. Key criticisms of VaR include (i) the significant variability of VaR-implied capital requirements (ii) the perceived ease with which VaR can be gamed (non-capture of risks) and (iii) that it does not quantify the severity of potential losses. FRTB aims to address these key concerns whilst ostensibly retaining the role of proprietary internal risk models as a means of enabling level playing field competition and risk-sensitive capital. It undergirds their use with additional criteria: (a) Profit & Loss Attribution (PLA) tests, and (b) desk-level backtests. We examine empirically
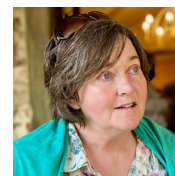
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whether these additional criteria influence risk management and portfolio management practice, specifically portfolio construction and choice of risk model.

The PLA tests advocated under FRTB measure the similarity between the (realised) profit and loss (P&L) distribution of the portfolio as measured under front office pricing, labelled the Hypothetical P&L (HPL); and the (realised) P&L distribution as modelled under risk management models, labelled the Risk Theoretical P&L (RTPL). PLA tests analyse the appropriateness of the risk mappings deployed prior to the application of the risk estimate using a combination of a Spearman rank correlation and Kolmogorov-Smirnov distribution test. Prior industry studies find that most banks use a risk factor mapping approach rather than a full revaluation, which would require modelling each component in the portfolio. Risk factor mapping is a technique used in risk modelling to map large complex portfolios to a manageable number of appropriate risk factors using sensitivities to these risk factors and their covariances. For equity portfolios, the appropriate sensitivity measure is Beta, which captures the sensitivity of the stock to the chosen equity index (risk factor), which is taken to represent the market.

Methodology

Profit & Loss Attribution Test
To test the impact of the PLA tests, we design a range of portfolios to examine whether particular characteristics (value or equal weighting, market capitalisation or Beta ranking) promote or impede the likelihood of passing the tests. We further include a range of Exchange-Traded-Funds to represent typical market-traded portfolios. Without loss of generality, and to avoid generating results influenced by risk factor dependency modelling (such as covariance matrices or copulas), we designed portfolios that could be mapped to a single risk factor. We selected the S&P 500 as our risk factor and systematically constructed alternative portfolios from constituent stocks. In this way, our experiment design tests the relevance of different portfolio characteristics on the propensity for the portfolio-to-risk-factor-mapping to pass the PLA tests.

Desk-Level Backtests
To examine the second of the additional FRTB criteria, the desk-level backtests, we use the same range of portfolios and review the strength of the FRTB backtests to reject poorly performing risk models. We compare their strength to other available backtests using the same data restrictions (FRTB specifies a 250-day rolling calibration period and 250-day backtesting period). Ultimately, we wish to determine if the introduction of these desk-level backtests incentivise banks to deploy superior risk models.

Our analysis reviews four popular VaR models: (1) Normal Linear (NL) VaR (2) Historical Simulation (HS) VaR (3) Exponentially Weighted Moving Average (EWMA) VaR, and (4) GARCH(1,1) VaR. These risk models are chosen because they (or close variations) are the most popular models deployed by banks whilst offering sufficiently different performance levels for our analysis.

Outcomes and Findings

Profit & Loss Attribution Test
The results from the analysis of the PLA test imply that trading desk portfolios must be strongly aligned to the risk factors used for market risk analysis in order to pass both the correlation and distribution tests. Further, that they must hold the highest capitalisation stocks of the index plus a critical mass of such stocks and that the weighting must be proportional to the stock's weighting within the index (value weighted). This means that passing the PLA tests will significantly affect construction of portfolios and encourage greater levels of passive management. This is clearly very restrictive from a portfolio management perspective and may prompt banks to reconsider the risk management practice of using risk factors to model the risk in the bank's portfolios, replacing it with the more onerous full revaluation. In some cases, it may cause banks to reconsider their use of internal models.

Desk-Level Backtests
Next, we look at the results from the analysis of the FRTB desk-level backtests. Prior studies have characterised the Normal Linear VaR and EWMA VaR as having unreasonable assumptions, thus leading to slow reactions to market turbulence and the underestimation of the portfolio risk. However, we find no incentive through the FRTB desk-level backtests to discontinue the use of these flawed models. Furthermore, we demonstrate that the FRTB desk-level backtests have low power to reject poorly performing models relative to alternative backtests under the same data restrictions. This indicates that the choice of risk model is not the dominant concern of the FRTB framework. Conversely, the high power of the PLA tests to reject banks' risk attributions suggests a changed focus to incentivising portfolio reform. This is consistent with the findings of Burchi (2013), who argues that the increased complexity of the regulatory framework nullifies the significance of the choice of resolution model. While the PLA tests may incentivise more conservative portfolio construction, it also directs bank portfolios towards increased homogenisation, which may have the unintended consequence of heightened systemic risk.

Future Direction
FRTB is due to be implemented in January 2023. Given ongoing crises relating to climate, war, and political uncertainty, fuelling financial and social frailty, bank regulation effectiveness ensuring stability has never been more significant. The findings from this study form the foundation for further ongoing research reviewing its realised impact on bank portfolios and risk management practices. We are currently exploring the ESG investment space in more detail and moving the quantitative impact study towards more complex curve exposure settings (for example, interest rates and commodities).

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Forthcoming Research Bulletin
Title: Toward a non-organizational theory of HRM? A complex adaptive systems perspective on the HRM ecosystem in (con)temporary organising.

Authors:
Burke, C.M. and Morley, M. J.

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