

Quantitative Hedging Strategy of PwC

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Abstract. Against the backdrop of global financial volatility, quantitative hedging strategies have emerged as a critical tool for multinational enterprises to mitigate risks. This study employs a case study approach to analyse the implementation and impact of quantitative hedging strategies adopted by PwC, a leading firm in the financial services sector. Focusing on three typical risk categories—foreign exchange risk, interest rate risk, and commodity price risk—the research integrates quantitative methods (e.g., forward contracts, option pricing models, and Monte Carlo simulation) to illustrate PwC’s response strategies under different risk scenarios. Results indicate that these strategies have significantly enhanced financial stability, reduced profit and loss volatility, and improved business predictability. This study argues that combining classic hedging tools with data-driven and computational financial methods provides a risk management framework for other enterprises, supporting them in achieving more stable financial performance amid current market uncertainties. Notably, this integration of traditional hedging instruments and modern computational finance offers practical pathways for multinational enterprises to sustain financial stability in volatile markets.

Keywords: Quantitative hedging strategy; foreign exchange risk hedging; interest rate risk hedging; commodity price risk hedging.

1. Introduction

Multinational enterprises typically face risks such as fluctuations in exchange rates, interest rates, and commodity prices during their business operations. Since the 2008 financial crisis, enterprises are increasingly relying on risk management. Thus, hedging strategies become an indispensable part of management, as they can reduce the fluctuations in the income statement and make the operation of companies more predictable. However, most existing studies focus on the theories and general practices of hedging, resulting in a lack of in-depth exploration into how professional service institutions assist enterprises in addressing diverse financial risks in practice through quantitative models and computational methods. Against this backdrop, this study uses PwC—a globally leading professional services firm—as a case study to analyse its quantitative hedging strategies for foreign exchange, interest rate, and commodity risk management, and explores the implications of these strategies for the risk management practices of multinational enterprises.

Existing research indicates that hedging strategies play a significant role in stabilizing cash flow, reducing financing costs, and enhancing value. Study indicates that in a dominant currency environment, enterprises typically combine financial derivatives with natural hedging to balance foreign exchange exposure and market frictions [1]. Some research also emphasizes that natural hedging and financial hedging may complement or replace each other, depending on the flexibility of a company’s cash flow [2]. Another case study shows that multinational companies will use long-term currency swaps to align the contract terms with the maturity to reduce costs and stabilize foreign currency risks [3]. A review paper also examines the methods employed by multinational companies to manage exchange rate risks, highlighting that combining financial derivatives with natural hedging is more effective, and emphasizing that strategies should match the characteristics of the enterprise [4]. In extreme risk scenarios, simple hedging methods demonstrate stabilization in tail risk management and can be combined with complex models [5]. The latest research has also introduced risk parity, Monte Carlo simulation, and volatility decomposition into the design of quantitative hedging strategies to enhance accuracy [6]. These studies provide a foundation for exploring how

PwC combines traditional derivatives tools with computational methods to construct a systematic quantitative hedging strategy.

Most existing studies have focused on the risk management motivation and hedging tool selection within enterprises, but there is a lack of systematic exploration on how professional service institutions use quantitative and data-driven methods to support the risk management of multinational enterprises. This article takes PwC as an example to analyse its practices in foreign exchange, interest rate, and commodity risk management, and explores how it combines traditional derivatives to conduct quantitative hedging strategies. The research results show that professional service institutions can not only help enterprises stabilize cash flow and reduce financing costs, but also promote the transformation of risk management from experience-driven to data-driven. Theoretically, this paper expands the perspective of hedging strategy research; In practice, it provides references for multinational enterprises to design more risk management plans.

2. Company Description

PricewaterhouseCoopers is one of the world’s Big Four accounting firms. It was formed by the merger of Price Waterhouse and Coopers & Lybrand in 1998, and its headquarters is in London, UK. Until 2024, PwC has offices in 149 countries and regions, employs over 370,000 people, and generates global revenue of 55.4 billion US dollars. As one of the world’s largest professional service networks, PwC’s services cover such areas as assurance, taxation, consulting, and risk management, providing professional support to multinational enterprises, financial institutions, and government organizations. PwC’s core business is focusing on enhancing the transparency and compliance of the capital market, but its most representative business modules are auditing and assurance services, respectively. However, as the business environment becomes increasingly complex, PwC has also continuously expanded into other fields such as risk management, sustainable development, and digital transformation, which enabled it to gradually become an important advisor to clients in areas of corporate governance and financial stability.

Between 2020 and 2025, PwC’s overall profit trajectory reflected post-pandemic recovery followed by growth deceleration. As shown in Fig. 1, PwC UK’s annual net profit stood at approximately £0.94 billion in 2020, rose to £1.17 billion in 2021, and peaked at around £1.54 billion in fiscal year 2022. However, amid global economic uncertainties, rising labor costs, and increasing tax burdens, profits fell to approximately 1.33 billion pounds in 2023 and further declined to 1.14 billion in 2024—highlighting the dual impact of cost pressures and growth slowdown. Preliminary 2025 data suggest that PwC’s profits have slightly recovered to approximately 1.37 billion pounds.

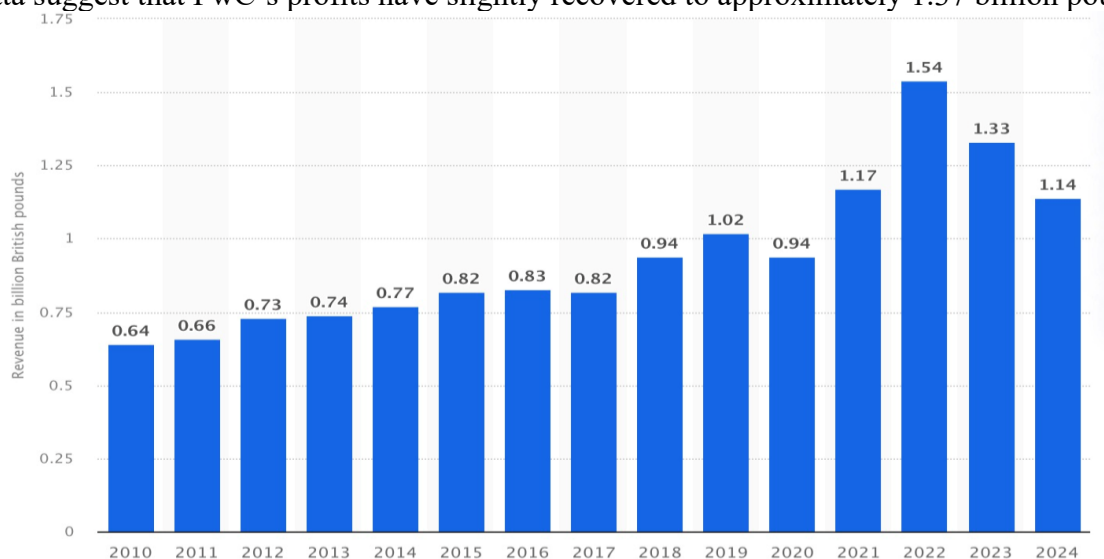


Fig. 1 Total profit of PwC in the United Kingdom from 2010 to 2024

Compared with profits, revenue maintained a continuous expansion. As shown in Fig. 2, the global total revenue was approximately 43 billion US dollars in fiscal year 2020, exceeded 45 billion US dollars in 2021, and continued to rise between fiscal years 2022 and 2024, approaching nearly 60 billion US dollars. This growth reflects PwC’s continuous expansion in auditing, taxation, consulting, risk management, and sustainable development services. The combination of the two shows that while PwC’s revenue continues to grow, its profitability is significantly affected by market cycles and cost structures, but it remains at a high level of over one billion pounds.

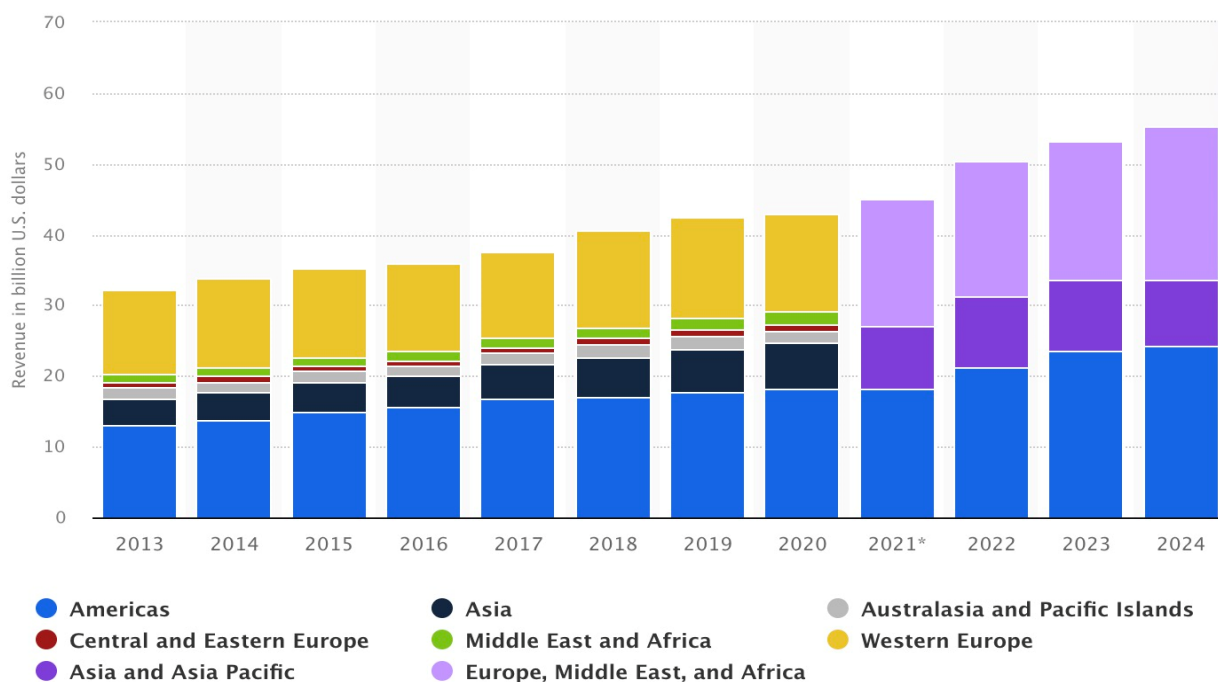


Fig. 2 Aggregated revenue of PwC from 2013 to 2024

Overall, while PwC maintains a steady growth in global revenue, it also faces the challenge of its profit during fluctuations in the macro environment and cost structure. This complex business environment has prompted PwC to innovate in risk management and the application of financial tools. Especially against the volatile foreign exchange, interest rates, and commodity prices, PwC not only offers traditional hedging consulting services, but also combines quantitative models to help clients implement more hedging strategies. The following study will focus on analyzing three typical strategies of PwC in quantitative hedging and exploring the implications of these practices for the financial risk management of multinational enterprises.

3. Foreign Exchange Risk Hedging Strategy

PwC provides foreign exchange risk management consulting services to multinational enterprises, not only relying on traditional derivatives to achieve a stable hedging structure but also optimizing quantitative strategy through data-driven and machine learning [7]. The first part focuses on the application of traditional tools. When PwC helps clients formulate foreign exchange risk management policies, it usually takes forward foreign exchange contracts and foreign exchange options as the main strategy. For short-term cash flows with high certainty, such as accounts receivable within the next three months, it is recommended to use a 90-100% forward contract to lock in the exchange rate to ensure that the budgeted exchange rate is consistent with the actual recorded amount. For long-term cash flows with greater uncertainty, PwC preferred to use options or zero-cost option structures, controlling costs while retaining a certain exchange rate benefit space. PwC also calculates the optimal hedge ratio via statistical models, incorporating clients’ capital inflow/outflow cycles, budgeted exchange rates, and risk tolerance. Additionally, it integrates Value at Risk and scenario

analysis to assess extreme market shocks, thereby dynamically adjusting the proportion of forward contracts and options. This approach enables enterprises to balance hedging costs while complying with IFRS 9 hedging accounting requirements, and enhances the predictability of financial statements.

Secondly, when PwC manages foreign exchange risks for multinational clients, it is promoting the quantitative upgrade of hedging strategies through data-driven and machine learning. On the data side, PwC aggregates real-time data such as accounts receivable, procurement contracts, budget exchange rates, and subsidiary capital pools to form a foreign currency cash flow curve for the next 3 to 12 months. For foreign currency financing or cross-border merger projects, it integrates macro indicators such as the US dollar index, interest rate differential changes, and central bank policy. On the modeling side, PwC's Model Risk Management Platform allows for managing and back-testing multiple predictive models. In projects, LSTM neural networks and random forests are often used to replace ARIMA/GARCH, which are more sensitive to nonlinearity and unexpected events. Using VaR and CVaR to measure the tail risk, a Monte Carlo simulation is used to calculate the profit and loss distribution of the hedging portfolio under extreme exchange rate fluctuations at the same time. On the execution side, PwC directly empowers the prediction results into the enterprise fund management system, automatically generates forward and option portfolio recommendations, and can adjust the Dynamic Hedge Ratio in real time according to fluctuations, helping CFOs make decisions under the IFRS 9 hedge accounting framework and achieve the quantitative closed loop of prediction - evaluation - transaction.

The third part discusses the limitations in practice and the directions for optimization. Although PwC's quantitative hedging framework is relatively mature in theory, it is still disturbed by geopolitics and policy changes. The quality of data within enterprises varies greatly, and incomplete historical cash flow data or inaccurate classification can weaken the training effect of the model. Furthermore, the strict requirements of IFRS 9 on hedging accounting have limited the flexibility of some clients in terms of tool selection and combination. In response to these challenges, PwC is attempting to enhance robustness through combined strategy optimization and a real-time back-testing platform. For example, it automatically adjusts positions through Dynamic Hedge Ratio regulation when fluctuations are severe. And the predicted distribution is continuously revised by using Bayesian updating in combination with the latest macro data. With the improvement of API-based data access and cloud computing environments, PwC is expected to provide end-to-end quantitative hedging solutions in the future, further shortening the time gap from prediction to execution, and helping enterprises achieve higher agility and accuracy in foreign exchange risk management.

4. Interest Rate Risk Hedging Strategy

When PwC provides interest rate risk management consulting services to multinational enterprises and financial institutions, it usually first conducts a systematic analysis of the client's debt structure, cash flow cycle, interest rate sensitivity, and future financing needs, helping enterprises stabilize financial costs and income statements in a volatile market. Commonly used tools include forward rate agreements, interest rate swaps, and interest rate options, which reduce the impact of interest rate fluctuations on borrowing costs and investment returns by converting future floating interest rates to fixed rates or locking them within a preset range. The advisory team also establishes phased hedge ratios based on clients' financing periods and industry characteristics—for instance, 90-100% coverage for short-term cash flows, 70-90% for medium-term cash flows, and 50-70% for long-term cash flows—to balance cost control and flexibility. These strategies enable clients to maintain budget predictability during periods of rapid interest rate increases, reducing volatility in financial statements and cash flows [8].

Based on traditional derivatives, PwC is increasingly introducing quantitative finance to optimize interest rate risk management. The advisory team will quantitatively assess the potential loss range under extreme interest rate changes through VaR and scenario simulation, and fit and predict the

future interest rate trend while incorporating ESG and climate factors into its analysis with the help of yield curve models such as Nelson-Siegel or Hull-White. In response to a highly uncertain market environment, PwC also uses Monte Carlo simulation tests to examine the risk distribution of different hedging ratios, thereby designing portfolios more precisely. In some projects, they take macroeconomic factors, historical market data, and changes in central bank policies as input and use machine learning to improve the accuracy of interest rate predictions and optimize the timing and proportion of clients' hedging execution. This approach combines quantitative modeling with big data analysis, enabling interest rate risk management to no longer rely on static allocation, but to adjust strategies based on real-time market information, helping enterprises stabilize financing costs while retaining a certain space for returns [9].

Although PwC has widely adopted quantitative methods in interest rate risk management, there are still certain limitations. Firstly, many yield curve models assume that the market is stable, and interest rates follow a normal distribution. This may fail during black swan events or periods of sharp interest rate hikes, causing hedging strategies to deviate from expectations. Secondly, the effectiveness of the model relies on high-quality customer data. However, in some enterprises, internal data lacks unified standards, which limits the accuracy of prediction and scenario analysis. Furthermore, accounting standards and regulatory requirements impose restrictions on the disclosure of derivatives and the accounting treatment of hedging, which restrict strategies between flexibility and cost efficiency. In the future, PwC can further introduce high-frequency and real-time market data, combining stress testing and counterfactual scenario analysis to enhance the robustness of the model. At the same time, promote the integration of hedging strategies with the enterprise's ERP financial system automation to enhance execution and monitoring efficiency, thereby achieving more dynamic and compliant interest rate risk management.

5. Commodity Price Risk Hedging Strategy

In commodity risk management, PwC integrates ESG (Environmental, Social, and Governance) and climate factors into its hedging strategies to support enterprises in maintaining cost stability and meeting sustainable development goals amid price volatility. PwC's clients primarily include enterprises in sectors highly sensitive to raw material and energy prices, such as energy, manufacturing, aviation, and heavy industry. Commonly used hedging tools include futures, forwards, options, and commodity swaps, which are used to lock in purchase or sale prices and reduce fluctuations in profits and cash flows. PwC integrates carbon emission costs, supply chain ESG ratings, and climate scenario analysis into Risk assessment, quantifies potential losses, and determines appropriate hedging ratios through Value at Risk and stress tests. This approach enables enterprises to plan their funds and procurement earlier when facing sharp changes in energy prices and tightened carbon policies [10].

PwC helps enterprises identify potential shocks in advance and optimize hedging strategies by integrating ESG data and climate risk early warning systems with quantitative analysis. The company will utilize historical prices and carbon emissions trading data to establish reference price ranges for bulk commodities and dynamically update risk exposure in combination with climate events such as extreme weather and policy adjustments. When carbon prices suddenly rise or supply chains are disrupted by climate disasters, PwC assesses the financial impact through scenario stress tests and factor sensitivity analysis and quickly adjusts hedging positions. This approach is more forward-looking than traditional static hedging. It can issue timely warnings when the external environment undergoes sudden changes, enabling enterprises to take the initiative in cost control and cash flow stability.

Although the introduction of ESG and climate data has enhanced the forward-looking nature of commodity risk management, there are still some limitations in practice. ESG data lacks a unified standard, and enterprises' disclosures are often delayed or incomplete, which affects the accuracy of the model. What's more, climate prediction models have a relatively high degree of uncertainty under

extreme events, which still poses a risk of failure for hedging strategies. ESG strategy within an enterprise may conflict with its short-term financial goals, increasing the difficulty of hedging execution. In the future, real-time ESG data interfaces and meteorological monitoring can enhance data timeliness, improving the robustness of stress tests by multi-scenario analysis and statistical resampling. In addition, deeply integrating PwC's analysis platform with the enterprise's ERP and supply chain systems can achieve a closed loop from data to hedging execution.

6. Conclusion

This study summarizes PwC's application of quantitative hedging methods in foreign exchange, interest rate, and commodity risk management. Findings indicate that PwC is not limited to traditional derivative instruments but instead integrates data-driven models and scenario simulation to implement dynamic risk management. In foreign exchange hedging, for example, PwC uses optimal hedge ratios and scenario analysis to stabilize clients' cash flows. In interest rate risk management, extreme scenario losses are evaluated through yield curve modelling and Monte Carlo simulation. Commodity hedging introduces a price prediction and risk early warning system to optimize hedging. Overall, these strategies help enterprises reduce financial risks, control costs, and improve the efficiency of capital utilization. When formulating hedging policies, enterprises should consider their own business cycles, cash flow structures, and risk preferences, flexibly adjust hedging ratios, and adopt quantitative tools to enhance the quality of decision-making.

This study contributes to sorting out how professional service institutions apply quantitative financial methods to enhance the effectiveness of risk management, filling the gap in relevant literature that lacks empirical and model-based analysis of consulting practices. The research provides enterprises with a referenceable quantitative risk management framework and offers enlightenment for the academic community to understand the role of consulting firms in the application of financial engineering. In the future, it can be expanded in three directions: The first is to verify the effectiveness of the strategy by combining larger samples and data; The second is to explore the application of artificial intelligence and big data in hedging optimization; The third is to study how to achieve strategy automation and real-time adjustment. Through the further integration of technology and data, risk management will become more precise and efficient, providing enterprises with stronger stability and competitiveness in the complex financial environment.

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