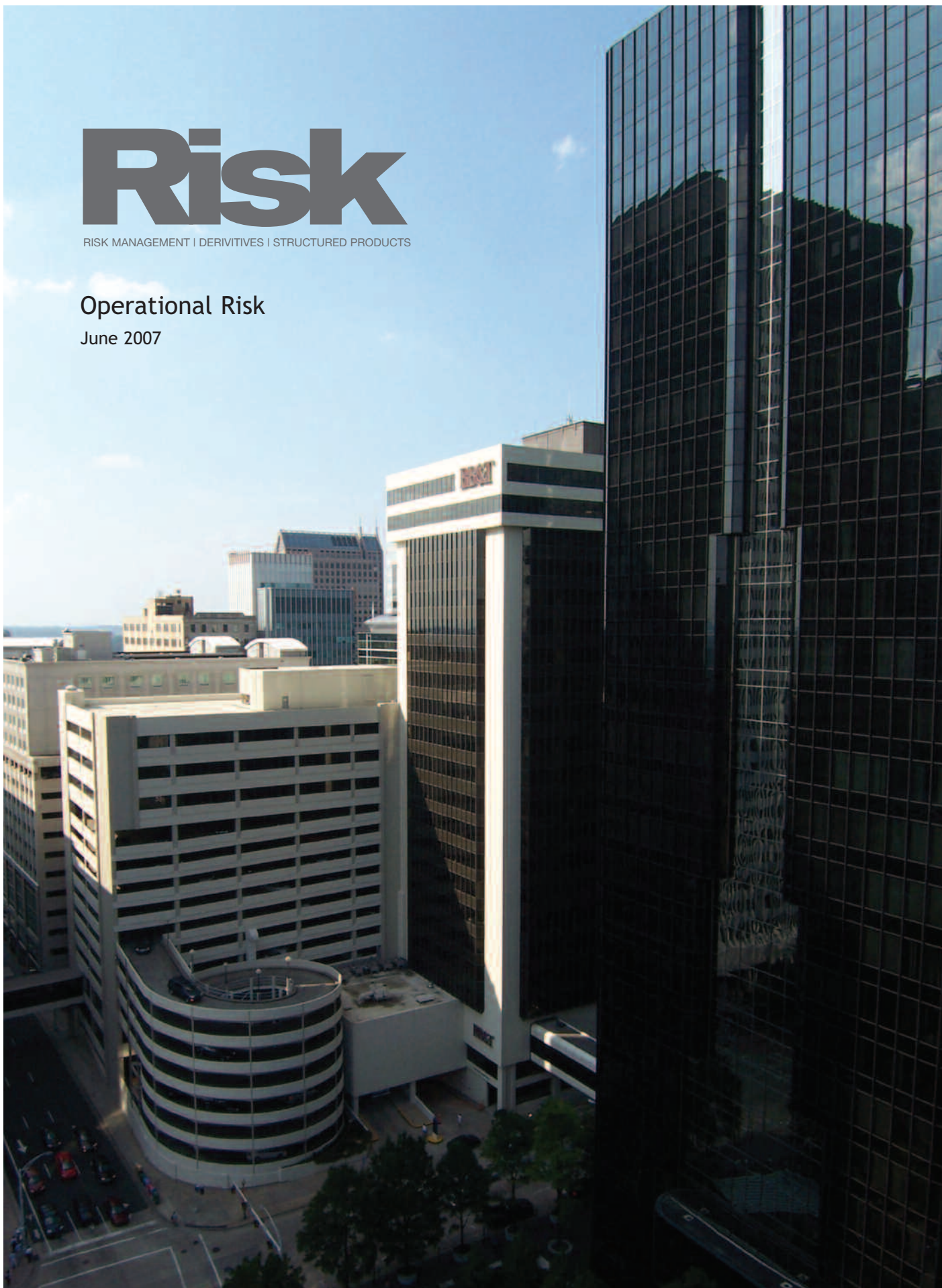# Risk

RISK MANAGEMENT | DERIVITIVES | STRUCTURED PRODUCTS

Operational Risk

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Spreadsheets have long been used by banks to analyze large volumes of data and to develop flexible trading and risk management programmes. The downside is that they are prone to operational risk.

Three years ago, when Dublin-based commercial real estate investment and lending specialist Anglo Irish Bank began to prepare for Basel II, it decided to build a new model for estimating the credit risk of its property deals. The model would comprise two parts - a macroeconomic forecast generator and a cashflow calculator. While the assumptions underlying the economic forecast tool were unlikely to change over time, the changing nature of the property market meant the bank needed flexibility built into the cashflow calculator.

The bank hired software and consulting company **Risk Integrated**, based in the Isle of Man, to help with its Basel II preparations. The company wrote the code for the economic forecaster using C++ programming language, but Anglo Irish Bank wanted to continue using a spreadsheet that had been developed in-house for its cashflow calculator. The problem came when the bank tried to track down the original copy of the cashflow calculator spreadsheet. It no longer existed.

"Individual lenders had made changes and improvements to the original spreadsheets as the bank's business grew and expanded," explains Christine Mooney, head of Basel II and the Capital Requirements Directive at Anglo Irish Bank.

Spreadsheets are the epitome of user-friendly flexible technology, but the very features that make them so popular also mean they are prone to error. Unlike programmed applications, it is easy to make changes to spreadsheets - and staff at Anglo Irish Bank had indeed amended every single copy of the spreadsheet in the course of their business activities.

Manual input and changes can lead to mistakes. Although the bank does not admit that any of the changes made by staff led to errors, it was nevertheless forced to rebuild the master cashflow spreadsheet to ensure its consistency. Having done so, it wanted to retain the ability for only authorized staff to make legitimate amendments to meet evolving business requirements, while securing the spreadsheet so that no one else could tamper with its logic or formulas in the future.

Within its Specialized Finance System, an application for pricing and structuring deals in complex asset classes that Risk Integrated implemented at Anglo Irish Bank, is a technology called Enterprise Spreadsheet Platform (ESP). This technology takes business spreadsheets and locks them away behind a screen that prevents unauthorized access, and creates an audit trail of all amendments carried out by the authorized users. ESP includes a web browser interface that enables users to input data to the secure spreadsheet. A computational engine within the platform runs the protected spreadsheet with the new data, outputting the results to a database that users can access (although they cannot access the spreadsheet itself). By using this platform, the bank solved its problem of how to maintain a consistent error-free tamper-proof version, while allowing authorized staff to make changes when necessary. It also eliminated human errors and inconsistencies, says Mooney.

The experience of Anglo Irish Bank prior to its Basel II project is by no means unique. While most banks are vexed by the inconsistencies in their spreadsheets, the lack of controls and monitoring means they are exposed to significant operational risks. One of the most notorious examples is Allied Irish Bank (AIB), which lost close to $700 M in 2002 after trader John Rusnak exploited the lack of spreadsheet controls at AIB's Allfirst subsidiary in Boston to enter fictitious foreign exchange trades.

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Rusnak's manipulation was deliberate, but many spreadsheet errors are inadvertent and result in substantial loss of money and/or reputation. The European Spreadsheet Risks Interest Group, a network of academics, industry individuals and organizations, lists nearly 90 major global spreadsheet-related incidents since 1995, many of them in financial services.

Spreadsheet risk is a problem that financial institutions and their regulators have long recognized, but a lack of effective solutions and regulatory penalties has hampered steps to contain it. The regulatory tide has turned to some degree with the introduction of operational risk and control requirements under Basel II and Sarbanes-Oxley. Technology has also evolved to help companies manage spreadsheet risk, with tools such as ESP from Risk Integrated and others from London-based data management solutions providers ClusterSeven and Xenomorph, and Delhi-based technology company HCL. Even Microsoft itself has recently introduced a number of security improvements in the 2007 version of Excel, the dominant spreadsheet.

Nevertheless, there is a long way to go before spreadsheet risk is fully mitigated in financial services. A key factor is the widespread use of the tool. One major bank is estimated to have around 5 million spreadsheets, while even relatively small organizations can have tens of thousands. Disturbingly, many are critical to how organizations conduct their business.

Although there has been a move over the past decade to replace spreadsheets in trading and risk management with integrated systems - indeed, this has been a key selling point for many third-party trading and risk management systems - they remain widely used as a pricing and risk management tool. "The flexibility, adaptability and sophistication of spreadsheets make them a convenient tool for handling significant amounts of data," observes Stephen Ashton, head of IT business management at Dresdner Kleinwort. "They are user-built, user-defined and user-tested and can also evolve quickly, so don't have the same limitations as many applications."

Because they can be used by individuals as rapid application development tools, spreadsheets are popular in the front office for developing and even trading new products, especially complex structures that do not fit easily into conventional applications. Meanwhile, core front-, middle- and back-office applications often lack adequate reporting and analytical facilities. As a result, it is common for spreadsheets to organically evolve around more formally programmed applications, but outside their audit trail and control sphere.

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While these spreadsheets are often rigorously tested when built, they can become corrupted or inconsistent over time because they are outside the application management process, explains Ashton: "The main area of difficulty with spreadsheets is the change control process."

Despite their vulnerability, regulators are not necessarily opposed to their use, as many in the industry assume. "The FSA does not proscribe the use of spreadsheets or any other form of user-developed IT," says Dean Buckner, IT specialist at the UK Financial Services Authority (FSA). However, where they are used in critical applications, there should be controls appropriate to the risk. For example, clear end-user policies and allocation of responsibility. This was often ignored by IT departments, which considered them insignificant end-user tools, while business units sidestepped responsibility for controlling their use. Recent regulation has forced improvements, but many IT directors still pass the buck, Buckner adds.

The FSA expects to see basic controls, such as the maintaining of audit trails with tamper-proof records of changes for all business-critical spreadsheets, as well as version control, backup, code testing, and maintenance programmes. There also needs to be a segregation of duties in terms of who can amend and who can use the spreadsheet. Good end-user training would overcome many of the dangers, although developing training schemes is hampered by a lack of agreed best practice and accreditation schemes, says Buckner.

The FSA requirements have encouraged some banks to seek solutions from third-party vendors. Dresdner Kleinwort, for instance, began testing ClusterSeven's technology in mid-2005 with a sample of spreadsheets from its product control division, used to create traders' profit and loss figures and other product control functions. "This area houses some of the bank's most complex and sophisticated spreadsheets and its most experienced spreadsheet jockeys, so we knew we would give the system a thorough workout," says Ashton.

A series of test scenarios proved the technology would enable the bank to manage its spreadsheets like it did other business applications, with full audit trails and controls. Dresdner Kleinwort has since implemented the platform for all spreadsheet users across its product control and statutory and regulatory reporting areas in London. "We can configure the technology to take all the manual efforts away from ensuring only the right changes occur in our spreadsheets," adds Ashton.

While vendors such as **Risk Integrated** and ClusterSeven have been developing third-party tools to help manage the operational risks of spreadsheets, Microsoft has been addressing some of the issues in its latest version of Excel. According to James Burns, chief technology officer for Microsoft UK, the operational problems of Excel lie in the fact that it was designed as a client (that is, individual desktop) application, while application control is best undertaken in a server (that is, corporate or department system level) environment.

To overcome this, Microsoft, which itself discovered recently that it had 42 business-critical spreadsheets in its treasury, recommends using Excel in conjunction with its Office SharePoint Server 2007 product, a suite of server applications that includes content management, a search engine, management of web applications and systems monitoring and auditing.

Firms can secure their spreadsheets within SharePoint Server 2007, controlling and monitoring access in a manner similar to the technology offered by vendors such as **Risk Integrated** and ClusterSeven. However, there are a number of issues for banks to consider before embarking on this path.

For a start, upgrades can be huge undertakings lasting a year or more, and the greater the novelty and complexity of the upgrade, the more taxing the task, not only technically but in terms of training and support.

In addition, the current beta version of SharePoint Server 2007 does not support Excel spreadsheets extended with Visual Basic for Applications (VBA), a programming language widely used for tailoring and enhancing Excel applications. Burns explains this is because SharePoint Server 2007 is built using Microsoft's .Net web-orientated technology, and therefore offers ways of using Excel in a modern web-based environment. Again, this has caused alarm at many organizations, where a high proportion of their spreadsheets have VBA extensions. (Other spreadsheet management technologies, such as those from **Risk Integrated** and HCL, get round the problem by taking the Excel applications with VBA extensions and wrapping them in C++ code so they can be manipulated in a web environment.)

Nonetheless, two advances with Excel 2007 have been welcomed by the derivatives trading and risk management communities: the increase in rows from 65,000 to 1 million and columns from 256 to 16,000, and the ability to multi-thread (split calculations into numerous threads that can be computed in parallel on multiple processors). The former will help with tasks such as calculating value-at-risk over more than one year, while the latter will speed up tasks such as Monte Carlo pricing or exposure simulations. "Multi-threading and the increase in rows and columns are the biggest advantages of Excel 2007," says Richard Yolland, head of business process architecture and solutions at Commerzbank in London.

Commerzbank is currently designing a new architecture for its market risk reporting that up until now has primarily used Excel as a front-end viewer and data analysis tool. "With the growing complexity of instruments and the increasing number of positions, we have extrapolated forward six to 12 months and realize that our spreadsheet reporting and data analysis tools will take too long," says Yolland.
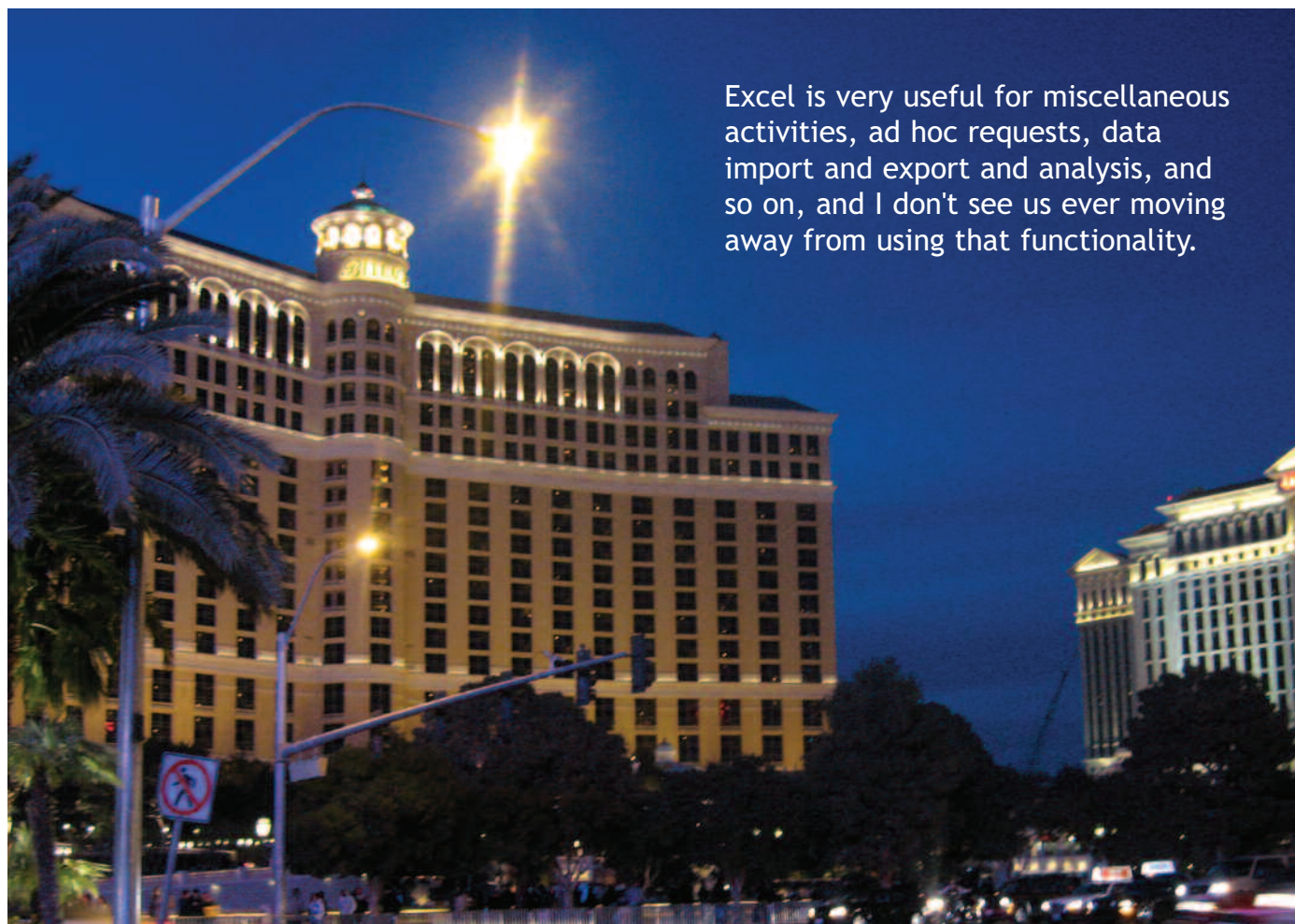
The bank's plan for the new architecture involves switching time-consuming data aggregation tasks away from Excel on to a high-performance computing grid. The bank also plans to use a specialized reporting package, and is currently evaluating vendors such as Business Objects and Accentuate, both based in California, and London-based Fractal:Edge, all of which offer sophisticated data visualization and analysis.

"So, instead of risk managers and analytical staff waiting anywhere from 30 seconds to 30 minutes for single reporting spreadsheets to refresh, the new architecture will perform the calculations more quickly and staff to spend more of their day on intellectually intensive tasks," explains Yolland.

This does not mean the bank is abandoning Excel. "Excel is very useful for miscellaneous activities, ad hoc requests, data import and export and analysis, and so on, and I don't see us ever moving away from using that functionality," says Yolland.

The bank's risk control department already has a number of security policies and change control procedures in place around its spreadsheet use, but Yolland says the new control features in Excel 2007 and SharePoint Server 2007 will possibly enable enhanced and increasingly integrated versioning control with Excel in the future.

In a fast-moving and competitive industry such as financial services, the flexibility and intuitive ease of spreadsheets mean they are just too useful to ever disappear, no matter what the operational risk or performance concerns are. With Microsoft beginning to address some of these concerns in the core technology, and with third-party vendors offering products that retain many of the advantages of spreadsheets while containing their risks, the use of this tool is only likely to increase in the future.

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