Risk 25

Reprinted from

Risk

RISK MANAGEMENT | DERIVATIVES | REGULATION

www.numerix.com

DECEMBER 2012

# Numerix wins first place for CVA, FVA & DVA and tops Cross-Asset and Structured Products Pricing

Risk TECHNOLOGY RANKINGS 2012

numerix®
Taking Analytics Further

*Technology firms are trying to help their clients adapt to a world in which new regulations and low trading volumes are putting bank business models under huge pressure. How well are they doing? **Clive Davidson** shares the results of this year's technology rankings*

# Breaking the banks?

Trading and risk management is essentially about anticipating the future – making the right calls in terms of where the market is going, and being prepared in case it veers off course. But banks and other financial institutions are currently focusing on the here-and-now of compliance, pinned back by a welter of new regulation.

These competing concerns came across loud and clear in *Risk*'s technology rankings for 2012, with vendors striving to help their clients achieve the short-term goal of regulatory compliance while meeting the longer-term aim of overhauling trading businesses and integrating fragmented risk management processes.

"Banks continue to battle with the huge burden of regulatory change as aspects of Dodd-Frank and the European Market Infrastructure Regulation are finalised. New swap definitions and swap execution facilities, the introduction of central clearing for over-the-counter derivatives – leading to greater demand for collateral and margin management – along with the move to overnight indexed swap (OIS) pricing and the introduction of legal entity identifiers, are all challenging existing trading systems infrastructures," says Boris Lipiainen, global head of product management at Misys.

Faced with these challenges, nearly 60% of respondents to *Risk*'s rankings say they are planning to increase their technology spend in 2013, with more than half planning to increase their spending by at least 10%. Regulatory compliance and the need to upgrade systems are the main drivers of planned investment (see pages 66–67). Technology vendors are positioning to meet this need by introducing a range of new products and functionality – see *Risk*'s survey of the latest software offerings on pages 50–57.

"Banks are looking to reduce costs while gaining a broader and deeper view of their positions and risk" Boris Lipiainen, Misys

Misys takes this year's top spot in *Risk*'s technology vendor rankings, profiting from the aggregation of votes that has come with its acquisition earlier this year of Turaz – the trading and risk technology business that belonged to Thomson Reuters – to overcome arch-rival Murex, which has dominated the rankings for most of the past decade. Misys topped the equities, foreign exchange, inflation and rates trading systems categories, as well as equities pricing and the category for compliance and reporting. It's a demanding environment, says Lipiainen, in which clients are trying to spend less and do more.

"Banks are looking to reduce costs while gaining a broader and deeper view of their positions and risk. They want to integrate their systems, but in a way that helps them improve what they have today and achieve an improved business approach and agility to react quickly based on faster and more accurate information across business and functional silos," says Lipiainen.

To help banks meet these challenges, Misys has formed an innovation team to develop new components and squeeze functionality out of existing resources. One outcome has been the evolution of Misys Global Risk (MGR) into a framework that links an institution's established technology infrastructure with MGR's risk, regulatory and governance modules to allow intra-day analysis and reporting. One of the early adopters of this approach is Emirates NBD Bank, which integrated the MGR modules for market risk and credit limits management with its existing Misys Kondor+ trading system during its regular systems upgrade cycle.

Misys is also trying to integrate its acquired and in-house suite of trading and risk products, as it has done at Shanghai Pudong Development Bank, which recently went live with Summit FT for risk management and Basel II compliance, consolidating trading and position data from the bank's existing Kondor+ front-office system, and deploying a value-at-risk module to display hierarchical VAR results. Summit FT is a legacy Misys system, while Kondor+ comes from Turaz and the VAR module was developed by Sophis, a business Misys acquired in 2010.

Paris-based Murex was a single percentage point behind Misys in its share of the overall vote, topping the credit and forex pricing segments, as well as the cross-asset trading system, credit and liquidity risk management, system implementation and limit-checking categories.

Maroun Edde, group chief executive of Murex, cites the flexibility of the company's MX.3 platform as a key to its success, enabling it to meet the requirements of a variety of organisations – from global and regional banks or hedge funds, to asset managers, insurance companies, and corporate treasuries. Murex also has a growing client base in emerging markets – Bank of China, for example, recently selected MX.3 to handle its capital market activities. Meanwhile, OTC clearing is quickly becoming an important business area for the firm – following last year's successful implementation of MX.3 at LCH.Clearnet to support its SwapClear service, NYSE Euronext has selected the system as the backbone of the new OTC risk and collateral management services it is building.

Overall, regulatory and market changes have led many banks to focus on simpler products with lower margins, says Edde – making up for the decreased profitability on a per-trade basis by boosting trading volumes. In turn, that requires new business models. One response is for institutions to develop client business through electronic distribution of products. Murex recently helped a major South-east Asian bank to use its MX.3-based capital markets platform to distribute financial products through 300 local agents – including quote requests, client customisation and trade execution – all of which is integrated with the platform's downstream trading and straight-through processing capabilities. Large corporate clients are also able to deal on the platform through an internet link, says Edde.

The biggest mover in this year's rankings is California-based Calypso Technology – up from seventh last year to third overall in 2012. The company topped the credit and structured products trading system categories, as well as the systems support, collateral management and optimisation, and central counterparty clearing categories. The attention Calypso has paid to back-office functions – for a long time the unglamorous and somewhat neglected end of the trading systems business – has paid off with the move to mandatory OTC derivatives clearing and the now-crucial role of collateralisation. A number of central clearers, including the Singapore Exchange and Tokyo Stock Exchange, are using Calypso to support their clearing services, and the company has drawn on this experience to develop OTC derivatives clearing functionality for banks and other market participants.

"The swaps market is undergoing a revolutionary change," says Charles Marston, chief executive of Calypso Technology. "As the rules for OTC clearing crystallise, we are observing more enquiries for associated clearing functions, such as OTC valuation, margin calculation and optimisation, collateral management and optimisation, and interfaces to the various arms of the new OTC ecosystem."

With various firms racing to offer services in this new market, speed of implementation is a key requirement, says Marston. To this end, Calypso has invested heavily in enabling recent customers to go live with new businesses or system upgrades in less than four months, he says. A case in point is Connecticut-based Pierpont Derivatives, which bought the Calypso system to support the launch of a new OTC swap trading business. The firm's trading desk is using the platform for trade pricing and capture, profit-and-loss consolidation and risk management for interest rate swaps, futures and Treasury bonds. The system has also enabled Pierpont to clear interest rate swaps through its clearing broker or futures commission merchant at CME Group and SwapClear.

Pennsylvania-based SunGard took fourth place overall, topping the asset and liability management category and performing well across the risk management categories. Peter Banham, head of strategy for SunGard's capital markets business, echoes the argument that banks need to marry short- and long-term objectives by interpreting and translating the core principles of Basel III, Dodd-Frank and other regulatory initiatives into a competitive business strategy.

"The reality is most firms have been tracking the roll-out of these regulatory initiatives for some time, and any institution with an eye to global growth and competitive differentiation will be actively looking at ways to structure their businesses to best take advantage of the new rules. For many of our customers, the necessity of regulatory compliance has given the risk function a louder voice and a larger budget – at least in comparative terms – with which to plan a future where the language of risk becomes the language of the institution," he says.

As part of this, some larger banks are offloading elements of the technology function to vendor firms, allowing them to focus on their core business. "We are engaged with multiple customers, helping them outsource operational overheads to SunGard. We take over the day-to-day management of their total infrastructure, allowing them to reduce and refocus their internal technology resources on servicing their own clients and competing as a financial institution, not a part-time technology development company," says Banham. Nordic bank Nordea is among the first to take this step, hiring SunGard to implement and run its Apex securities finance system, Adaptiv Analytics risk analytics and Front Arena for fixed-income order routing and management.

Elsewhere, IBM Risk Analytics topped

"As capital becomes more expensive, our clients are looking to their risk technology to help optimise everything" Michael Zerbs, IBM Risk Analytics

### How the poll was conducted

*Risk* polled thousands of banks, hedge funds, pension funds, insurance companies and corporate treasurers for this year's technology rankings, and received 1,012 valid responses.

Respondents were asked to vote for the technology vendors that provide the best product offering across a number of categories, including enterprise risk management, risk capital calculation, front- to back-office trading systems, and pricing and analytics.

Participants were asked to base their votes on functionality, usability, performance, return on investment and reliability. Nominated technology companies were awarded three points for a first-choice vote, two for a second-choice vote and one point for a third-choice vote.

Only technology end-users were allowed to vote. *Risk* conducted a comprehensive due diligence process and disqualified any votes that were felt to be unfair. These include people voting for their own firm, or relatives of someone who works in that company voting for the firm, multiple votes from the same person, multiple votes from the same IP address, proxy votes on behalf of customers, votes by people who choose the same firm indiscriminately throughout the poll, votes by people clearly not involved in the business areas covered by the poll, and block votes from groups of people on the same desk at the same institution voting for the same firm. The editor's decision is final in determining the validity of votes.

Last year, *Risk* changed the way it calculates its top 20 winners, basing it on share of the overall vote rather than the number of first, second and third places as in previous years. The new methodology was retained for the 2012 rankings.

categories for enterprise market risk management, Basel III compliance and risk dashboards, as well as both operational risk management categories and the enterprise risk category overall. The company combines the Algorithmics financial risk analytics business, which it acquired in 2011, with its OpenPages governance, risk and compliance software, Cognos business intelligence software and data models and data management technology.

Michael Zerbs, vice-president at IBM Risk Analytics, says a major impact of the new regulations is not only a demand for compliance functionality, but for more effective risk analytics across the board. "As capital becomes more expensive, our clients are looking to their risk technology to help optimise everything. Capital management is about the effective integration of the front and middle office to better manage scarce resources. Whether it is credit valuation adjustment (CVA), debit valuation adjustment (DVA), funding valuation adjustment (FVA) or collateral management, risk technology can help institutions manage capital more efficiently by calculating with accuracy and speed how much and what type of capital should be used and where," says Zerbs.

> "We are engaged with multiple customers, helping them outsource operational overheads to SunGard"
>
> Peter Banham, SunGard

New York-based Numerix, which topped the structured product and cross-asset pricing analytics categories – and finished seventh overall – has always prided itself on keeping ahead of the curve of industry analytics, being among the first to support overnight indexed swap discounting, and pricing for CVA, DVA and FVA, another category where it finished top. With the reliability of models still widely questioned as a result of the crisis – an issue that came to the fore again in the aftermath of the credit trading losses suffered by JP Morgan earlier this year, in which a faulty VAR model was implicated – the company recently introduced automated testing to understand how models behave and their limitations under extreme market scenarios. The service also aims to ensure proper implementation. Banque Internationale à Luxembourg and Belgium-based Belfius Bank are among the institutions now using Numerix for model validation.

"We see an opportunity for creating modelling standardisation," says Steven O'Hanlon, president and chief operating officer of Numerix. "As models and methods can vary across front-office desks, deriving consistent and correct valuations across an enterprise remains a challenge, especially for model risk management and product control functions."

To address this challenge, Numerix introduced the CrossAsset Integration Layer in September, a centralised framework of pre-defined templates of validated models, curves and financial instrument definitions where new financial instrument types, trade definitions and models can be rapidly integrated and re-used across various technology platforms, improving model risk management and product control functions, says O'Hanlon.

Meanwhile, California-based Moody's Analytics won the economic and regulatory capital calculation categories and was placed eighth overall. "As a result of regulation, capital has become a big issue with our customers," says Jodi Alperstein, managing director of Moody's Analytics enterprise risk solutions group. In response, the company has focused on evolving its software to help customers optimise capital and deploy it more efficiently. Another key area of attention has been the tighter integration of its various credit and other risk management applications "to provide a more holistic view of risk", says Alperstein. Last December, the company acquired insurance risk management analytics specialist Barrie & Hibbert, and is incorporating its economic scenario generator and proxy liability modelling tools, in particular, to strengthen its package for Solvency II compliance.

New York-based Savvysoft topped the inflation and rates pricing analytics categories, and took tenth place overall, continuing to punch above its weight as a boutique developer among major software houses. A clue to its success lies in its third position in the rankings' new innovative specialist category – Savvysoft has consistently been at the leading edge in responding to new analytical challenges in the industry. For instance, its OTC Backtesting&Risk system, launched in November and available via Bloomberg's App Portal, enables users to create a time series of historical prices for any type of OTC derivative, exchange-traded option, bond, stock or future by simply specifying the instrument characteristics, start- and end-date and frequency. The software calculates a time series of mark-to-model prices displayed as a graph over time or distribution of returns. It also uses historical simulation to calculate CVA.

"The system can save risk managers, derivatives structurers and derivatives investors hours that would be spent generating mark-to-model historical prices to calculating not only VAR and CVA, but also performing the what-if analysis that is so critical in zeroing in on optimal structures for OTC instruments," claims Rich Tanenbaum, president of Savvysoft.

Second in the innovative specialist category is London-based OpenGamma, which has been building a trading and risk system on open technology standards, and which *Risk* highlighted as a vendor to watch in its 25th anniversary issue (*Risk25* July 2012, page 44, *www.risk.net/2193229*). But the category was won by British Columbia-based Fincad. The company has been providing derivatives analytics since 1990, and its F3 generic pricing tool – introduced in 2009 – has proved particularly inventive. F3 enables users to generically represent, without programming, almost any financial structure or payout, including its related market data, financial model and the numerical methods used for valuation. This makes it relatively quick and easy to develop new products including complex structures, and F3 has proved popular among product structurers and those who have to value diverse portfolios that include exotic products. F3 also provides the ability to calculate the first-order risk of portfolios without the time-consuming requirement of bumping – in which yield curves are moved up and down – to see how market moves affect them.

The trends – and pressures – highlighted in these rankings are unlikely to evaporate soon. Regulations such as Dodd-Frank and Basel III are only beginning to bed down, with their full impact on market operations and business models and practices still unclear. Banks cannot wait to see how all this plays out – they must comply with these new regimes while remaining competitive and commercially successful – and technology is becoming increasingly vital for this, especially in derivatives trading and risk management. How well individual vendors respond to these needs will go a long way towards determining the results of next year's rankings. ■

## OVERALL

### Overall

| 2012 | 2011 | Vendor | % |
|---|---|---|---|
| 1 | 2 | Misys | 11.2 |
| 2 | 1 | Murex | 10.2 |
| 3 | 7 | Calypso | 8.2 |
| 4 | 5 | SunGard | 7.9 |
| 5 | 4 | IBM Risk Analytics | 7.1 |
| 6 | 8 | Bloomberg | 6.4 |
| **7** | **6** | **Numerix** | **6.1** |
| 8 | 9 | Moody's Analytics | 5.5 |
| 9 | 10 | SAS | 4.6 |
| 10 | 11 | Savvysoft | 4.0 |

### Pricing and analytics

| 2012 | 2011 | Vendor | % |
|---|---|---|---|
| 1 | 1 | Murex | 14.6 |
| **2** | **2** | **Numerix** | **13.5** |
| 3 | 3 | Savvysoft | 10.4 |
| 4 | 4 | Misys | 9.6 |
| 5 | 8 | Bloomberg | 7.8 |
| 6 | 6 | Calypso | 6.9 |
| 7 | 5 | Fincad | 6.0 |
| 8 | | Pricing Partners | 5.3 |
| 9 | | RiskVal | 4.8 |
| 10 | | Quantifi | 4.2 |

### Trading systems

| 2012 | 2011 | Vendor | % |
|---|---|---|---|
| 1 | 1 | Misys | 13.5 |
| 2 | 2 | Murex | 11.6 |
| 3 | 4 | Calypso | 10.2 |
| 4 | 6 | Bloomberg | 8.2 |
| 5 | 5 | SunGard | 7.8 |
| 6 | 7 | OpenLink | 7.4 |
| 7 | 8 | Wall Street Systems | 6.8 |
| 8 | 9 | SuperDerivatives | 5.6 |
| 9 | | Linedata | 5.4 |
| 10 | | GFI Fenics | 4.5 |

### Enterprise-wide risk management – market, credit, counterparty, liquidity, aggregation, Basel III

| 2012 | 2011 | Vendor | % |
|---|---|---|---|
| 1 | 1 | IBM Risk Analytics | 10.7 |
| 2 | 4 | Misys | 10.5 |
| 3 | 3 | Murex | 10.4 |
| 4 | 2 | SunGard | 9.3 |
| 5 | 6 | Moody's Analytics | 7.9 |
| 6 | 9 | Calypso | 7.2 |
| **7** | **8** | **Numerix** | **6.7** |
| 8 | 10 | Bloomberg | 6.6 |
| 9 | | Quantifi | 5.7 |
| 10 | | Oracle | 5.0 |

### Enterprise-wide operational risk management

| 2012 | 2011 | Vendor | % |
|---|---|---|---|
| 1 | na | IBM Risk Analytics | 13.1 |
| 2 | | Chase Cooper | 11.6 |
| 3 | | SAS | 10.4 |
| 4 | | Misys | 10.3 |
| 5 | | Oracle | 9.6 |
| 6 | | SunGard | 9.4 |
| 7 | | Methodware | 7.6 |
| 8 | | Wolters Kluwer | 5.6 |
| 9 | | SAP-Sybase | 5.3 |
| 10 | | Fernbach | 4.8 |

### Pricing and analytics

Commodities

| 2012 | 2011 | Vendor | % |
|---|---|---|---|
| 1 | 2 | Bloomberg | 16.3 |
| 2 | 1 | Murex | 12.8 |
| **3** | **4** | **Numerix** | **10.1** |
| 4 | 3 | Savvysoft | 9.7 |
| 5 | 5 | Fincad | 8.9 |

Credit

| 2012 | 2011 | Vendor | % |
|---|---|---|---|
| 1 | 1 | Murex | 14.7 |
| **2** | **3** | **Numerix** | **12.8** |
| 3 | | Bloomberg | 11.6 |
| 4 | 2 | Savvysoft | 10.8 |
| 5 | 4 | Calypso | 9.4 |

Equities

| 2012 | 2011 | Vendor | % |
|---|---|---|---|
| 1 | 1 | Misys | 16.9 |
| 2 | 2 | Murex | 13.6 |
| **3** | **4** | **Numerix** | **12.7** |
| 4 | 3 | Savvysoft | 11.4 |
| 5 | | Bloomberg | 8.2 |

Forex

| 2012 | 2011 | Vendor | % |
|---|---|---|---|
| 1 | 3 | Murex | 15.2 |
| 2 | 2 | Misys | 12.6 |
| **3** | **4** | **Numerix** | **11.1** |
| 4 | 5 | Bloomberg | 10.0 |
| 5 | | Savvysoft | 8.7 |

Risk TECHNOLOGY RANKINGS 2012

## Pricing and analytics, cont'd

### Inflation

| 2012 | 2011 | Vendor | % |
|---|---|---|---|
| 1 | 2 | Savvysoft | 14.6 |
| 2 | 1 | Misys | 13.1 |
| 3 | 3 | Murex | 10.0 |
| **4** | **4** | **Numerix** | **9.2** |
| 5 | 5 | Fincad | 8.4 |

### Structured products

| 2012 | 2011 | Vendor | % |
|---|---|---|---|
| **1** | **1** | **Numerix** | **17.2** |
| 2 | 3 | Murex | 15.6 |
| 3 | 2 | Savvysoft | 13.1 |
| 4 | | Bloomberg | 10.1 |
| 5 | 5 | Calypso | 9.2 |

### Rates

| 2012 | 2011 | Vendor | % |
|---|---|---|---|
| 1 | 1 | Savvysoft | 13.2 |
| **2** | **4** | **Numerix** | **13.1** |
| 3 | 3 | Murex | 12.2 |
| 4 | 2 | Misys | 11.9 |
| 5 | 5 | Fincad | 9.8 |

### Cross-asset

| 2012 | 2011 | Vendor | % |
|---|---|---|---|
| **1** | **1** | **Numerix** | **16.8** |
| 2 | 2 | Murex | 16.3 |
| 3 | 4 | Calypso | 11.5 |
| 4 | 3 | Savvysoft | 9.9 |
| 5 | | Misys | 9.7 |

## Trading systems

### Commodities

| 2012 | 2011 | Vendor | % |
|---|---|---|---|
| 1 | 3 | OpenLink | 14.0 |
| 2 | 1 | Murex | 12.4 |
| 3 | 2 | Misys | 11.3 |
| 4 | | Bloomberg | 10.6 |
| 5 | 5 | Calypso | 9.4 |

### Inflation

| 2012 | 2011 | Vendor | % |
|---|---|---|---|
| 1 | 1 | Misys | 16.3 |
| 2 | 3 | Murex | 15.7 |
| 3 | 4 | Calypso | 12.7 |
| 4 | | Bloomberg | 9.5 |
| 5 | 5 | SunGard | 8.7 |

### Credit

| 2012 | 2011 | Vendor | % |
|---|---|---|---|
| 1 | 1 | Calypso | 15.9 |
| 2 | 2 | Murex | 13.7 |
| 3 | 3 | Misys | 11.9 |
| 4 | | Bloomberg | 10.4 |
| 5 | 5 | SunGard | 9.1 |

### Rates

| 2012 | 2011 | Vendor | % |
|---|---|---|---|
| 1 | 1 | Misys | 15.1 |
| 2 | 3 | Murex | 14.0 |
| 3 | 4 | Calypso | 12.3 |
| 4 | | Bloomberg | 9.4 |
| 5 | 5 | SunGard | 8.6 |

### Equities

| 2012 | 2011 | Vendor | % |
|---|---|---|---|
| 1 | 1 | Misys | 14.7 |
| 2 | 2 | Murex | 13.0 |
| 3 | 5 | Calypso | 11.9 |
| 4 | | Bloomberg | 9.7 |
| 5 | 4 | SunGard | 9.3 |

### Structured products

| 2012 | 2011 | Vendor | % |
|---|---|---|---|
| 1 | 1 | Calypso | 16.5 |
| 2 | 2 | Misys | 14.5 |
| 3 | 4 | Murex | 10.7 |
| 4 | 5 | Bloomberg | 10.0 |
| 5 | | SunGard | 9.3 |

### Forex

| 2012 | 2011 | Vendor | % |
|---|---|---|---|
| 1 | 1 | Misys | 14.7 |
| 2 | 4 | Murex | 13.1 |
| 3 | 3 | Bloomberg | 10.8 |
| 4 | | Calypso | 9.1 |
| 5 | | GFI Fenics | 9.0 |

### Cross-asset

| 2012 | 2011 | Vendor | % |
|---|---|---|---|
| 1 | 1 | Murex | 16.4 |
| 2 | 2 | Calypso | 14.2 |
| 3 | 3 | Misys | 12.0 |
| 4 | 5 | Bloomberg | 9.5 |
| 5 | | SunGard | 9.3 |

## Enterprise-wide risk management

### Enterprise-wide market risk management

| 2012 | 2011 | Vendor | % |
|---|---|---|---|
| 1 | 1 | IBM Risk Analytics | 15.2 |
| 2 | 2 | Murex | 13.6 |
| 3 | 4 | Misys | 11.7 |
| 4 | 3 | SunGard | 10.5 |
| 5 | | Calypso | 9.7 |

### Liquidity risk management

| 2012 | 2011 | Vendor | % |
|---|---|---|---|
| 1 | 1 | Murex | 16.2 |
| 2 | | Calypso | 14.2 |
| 3 | 3 | Misys | 12.7 |
| 4 | 2 | SunGard | 9.5 |
| 5 | 4 | IBM Risk Analytics | 8.7 |

### Enterprise-wide credit risk management

| 2012 | 2011 | Vendor | % |
|---|---|---|---|
| 1 | 3 | Murex | 15.2 |
| 2 | 4 | Misys | 13.1 |
| 3 | 1 | SunGard | 12.8 |
| 4 | 2 | IBM Risk Analytics | 10.0 |
| 5 | 5 | Moody's Analytics | 9.1 |

### Basel III compliance

| 2012 | 2011 | Vendor | % |
|---|---|---|---|
| 1 | 2 | IBM Risk Analytics | 15.9 |
| 2 | 4 | Misys | 14.9 |
| 3 | 3 | SunGard | 12.7 |
| 4 | 1 | Moody's Analytics | 12.1 |
| 5 | 5 | SAS | 8.4 |

### Credit valuation adjustment/debit valuation adjustment/funding valuation adjustment calculation

| 2012 | 2011 | Vendor | % |
|---|---|---|---|
| **1** | **1** | **Numerix** | **15.9** |
| 2 | 4 | Murex | 15.8 |
| 3 | 5 | Misys | 10.3 |
| 4 | 2 | IBM Risk Analytics | 9.6 |
| 5 | | Calypso | 8.3 |

### Risk dashboards

| 2012 | 2011 | Vendor | % |
|---|---|---|---|
| 1 | 1 | IBM Risk Analytics | 16.9 |
| 2 | 3 | Murex | 13.7 |
| 3 | 2 | Misys | 12.8 |
| 4 | 4= | SunGard | 9.4 |
| 5 | | Quantifi | 8.1 |

## Enterprise-wide operational risk management

### Risk control and self assessment, key risk indicators and internal loss management

| 2012 | 2011 | Vendor | % |
|---|---|---|---|
| 1 | 3 | IBM Risk Analytics | 15.2 |
| 2 | 4 | Chase Cooper | 12.5 |
| 3 | 5 | Misys | 11.7 |
| 4 | 2 | SAS | 9.5 |
| 5 | | Oracle | 9.4 |

### Capital calculation

| 2012 | 2011 | Vendor | % |
|---|---|---|---|
| 1 | 2 | IBM Risk Analytics | 16.2 |
| 2 | 4 | Chase Cooper | 13.6 |
| 3 | 5 | Misys | 10.2 |
| 4 | 3 | SAS | 10.1 |
| 5 | | SunGard | 8.6 |

## Risk capital calculation

### Regulatory

| 2012 | 2011 | Vendor | % |
|---|---|---|---|
| 1 | 1 | Moody's Analytics | 14.7 |
| 2 | 3= | Misys | 12.9 |
| 3 | 2 | IBM Risk Analytics | 11.4 |
| 4 | 3= | SunGard | 10.8 |
| 5 | | Oracle | 8.8 |

### Economic

| 2012 | 2011 | Vendor | % |
|---|---|---|---|
| 1 | 4 | Moody's Analytics | 14.2 |
| 2= | 1 | IBM Risk Analytics | 12.1 |
| 2= | 3 | Misys | 12.1 |
| 4 | 2 | SunGard | 10.2 |
| 5 | | Oracle | 10.1 |

## System support and implementation

### System implementation efficiency

| 2012 | 2011 | Vendor | % |
|---|---|---|---|
| 1 | 2 | Murex | 17.4 |
| 2 | 1 | Calypso | 14.0 |
| 3 | 3 | Misys | 11.6 |
| 4 | | Bloomberg | 10.4 |
| **5** | | **Numerix** | **10.2** |

### Systems support

| 2012 | 2011 | Vendor | % |
|---|---|---|---|
| 1 | 3 | Calypso | 13.9 |
| 2 | 1 | Murex | 13.8 |
| 3 | 2 | Misys | 12.1 |
| **4** | | **Numerix** | **9.6** |
| 5 | 5 | Bloomberg | 9.3 |

## Others

### Limit checking

| 2012 | 2011 | Vendor | % |
|---|---|---|---|
| 1 | 1 | Murex | 15.1 |
| 2 | 2 | Misys | 13.6 |
| 3 | | Calypso | 13.0 |
| 4 | 5 | IBM Risk Analytics | 10.1 |
| 5 | 4 | SunGard | 8.5 |

### Regulatory compliance and reporting

| 2012 | 2011 | Vendor | % |
|---|---|---|---|
| 1 | 2 | Misys | 14.2 |
| 2 | | Lombard Risk | 12.9 |
| 3= | | SunGard | 11.4 |
| 3= | 3 | IBM Risk Analytics | 11.4 |
| 5 | 1 | Moody's Analytics | 10.0 |

### Collateral management and optimisation

| 2012 | 2011 | Vendor | % |
|---|---|---|---|
| 1 | 4 | Calypso | 13.2 |
| 2 | 1 | IBM Risk Analytics | 12.8 |
| 3 | 3 | Misys | 11.4 |
| 4 | 2 | Murex | 11.2 |
| 5 | 5 | Lombard Risk | 9.4 |

### Data vendor

| 2012 | 2011 | Vendor | % |
|---|---|---|---|
| 1 | 1 | Bloomberg | 21.0 |
| 2 | 2 | Thomson Reuters | 15.4 |
| 3 | 3 | Markit | 11.9 |
| 4 | 4 | SuperDerivatives | 10.8 |
| 5 | 5 | Interactive Data | 10.2 |

### Asset and liability management

| 2012 | 2011 | Vendor | % |
|---|---|---|---|
| 1 | 2 | SunGard | 14.1 |
| 2 | 3 | Misys | 14.0 |
| 3 | 1 | QRM | 12.7 |
| 4 | 4 | IBM Risk Analytics | 10.4 |
| 5 | | Kamakura | 8.5 |

### Most innovative specialist vendor

| 2012 | 2011 | Vendor | % |
|---|---|---|---|
| 1 | | Fincad | 9.7 |
| 2 | | OpenGamma | 9.1 |
| 3 | | Savvysoft | 8.5 |
| 4 | | RiskVal | 6.9 |
| 5 | | Quantifi | 6.4 |

### Central counterparty clearing support

| 2012 | 2011 | Vendor | % |
|---|---|---|---|
| 1 | | Calypso | 15.0 |
| 2 | | Murex | 14.2 |
| 3 | | Misys | 12.9 |
| 4 | | MarkitServ | 9.5 |
| 5 | | SunGard | 8.8 |