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Hedge Fund Survey Overview

By Richard Horwitz

Capital Market Risk Advisors, a financial advisory firm specializing in risk management, released the results of a recent survey on hedge funds as risk management.

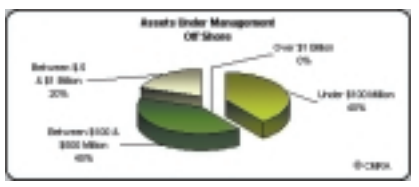
Hedge Fund Types Surveyed

Participants include: Fund of Funds, Managed Futures, Risk Arbitrage, Long/Short and Macro.

Approaches to risk management varied by hedge fund types.

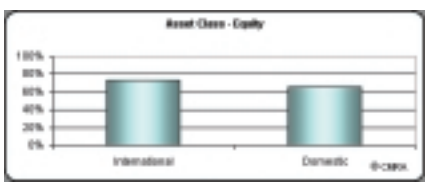
Assets Under Management

Most respondents manage less than $500 million in onshore as well as offshore funds. No respondents manage more than $1 billion in offshore funds.

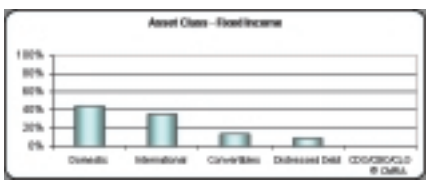


Assets by Class

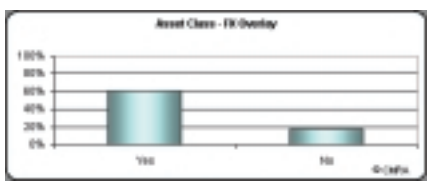
The majority of respondents hold equity assets, with 70% holding international equity and 61% holding domestic assets.



Approximately 43% hold domestic fixed income assets and 33% hold international debt assets. Convertibles and distressed debt are held by approximately 15% of respondents.

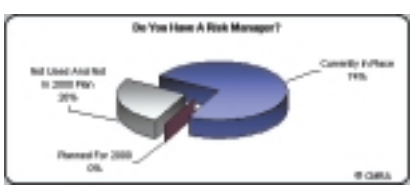


Approximately 60% of respondents reported holding FX overlays.

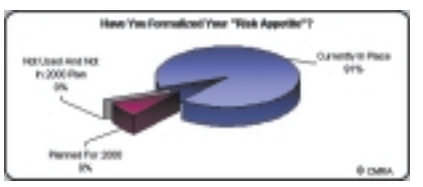


Risk Management

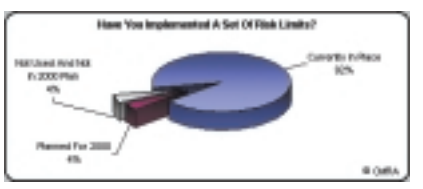
Approximately 75% of respondents have a risk manager, though those that do not are not planning on adding a risk manager.



All respondents by the end of this year will have formalized their "risk appetite".

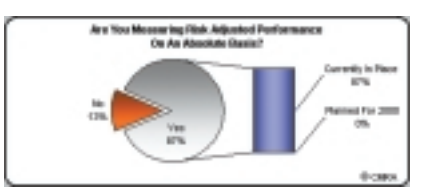


An overwhelming majority of respondents have implemented a set of risk limits.

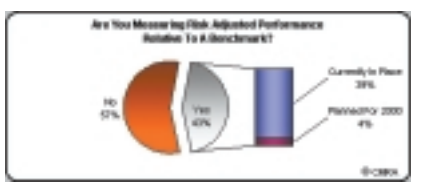


Risk Adjusted Performance

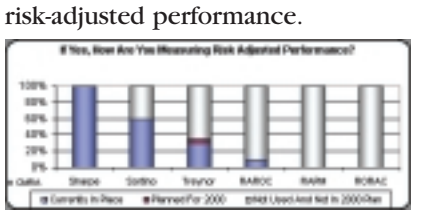
The majority of respondents measure risk-adjusted performance on an absolute basis. Those who do not measure risk adjusted performance generally do not plan to change.



Less than 50% of respondents measure risk-adjusted performance on a relative basis.

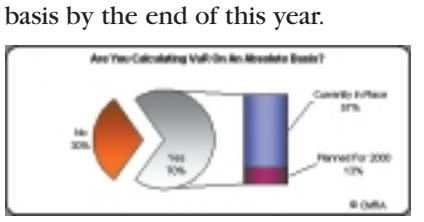


Sharpe and Sortino Ratios are the most widely used tools for measuring risk-adjusted performance.



Calculating / Measuring VaR

Approximately 70% of respondents will calculate VaR on an absolute basis by the end of this year.



However, only 13% of respondents

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Internet Data Sources, an Update

By Philip Chambadal

Finding quality financial content on the web is quite challenging; there are thousands of financial web sites, hundreds of vendors. The web-based financial data market can segmented along these lines:

- single source sites, e.g., Worldvest
- multiple sources aggregators, e.g., quote.yahoo.com
- application vendors revending third party data, e.g., Algorithmics
- financial institutions offering internal and third party data to their clients, e.g., Morgan Stanley Dean Witter.

Single source sites are today the only choice to procure reliable, professional data. In the case of financial institutions, this is usually limited to their clients.

There are a number of issues preventing dissemination of aggregated high quality content on the Web:

See Internet, page 3

A Survey of Real-Time and Historical Sources of Market Data

By Premal P. Vora, Ph.D.

Financial engineers require accurate and timely information in order to be able to price financial assets efficiently. Inaccurate or stale information can lead to inefficient pricing, which can be very costly. Which providers of information do financial engineers use and what are the relative strengths of these providers? In this article, I survey the most important providers of data and news, and I discuss the strengths of each of these providers in light of their respective histories.

The market data and news industry has recognized the need for good information and capitalized on it by providing subscribers with timely and accurate information. The top three providers of real-time and historical information are Bridge Information Systems, Reuters, and Bloomberg.

All provide packages that differ

See Survey, page 2

Rapid Development and Deployment of a Financial Application

By Eugene McGoldrick, Ph.D.

In order to maintain a competitive edge, today's financial services companies, such as banks, investment management firms, and insurance companies, must rapidly develop and deploy complex software into the production environment while spending minimal time on the systems integration effort.

This article describes, by example, the processes of planning, developing, and distributing a typical financial application using the power and flexibility of an application development environment. The first part of the article illustrates how to prepare and plan for application development, including:

- The application development process as it applies to the financial services industry;
- The planning process for a financial application; and

* How to choose the development

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Book Review

Risk Arbitrage: An Investor's Guide

Reviewed by Alexander Workman

While risk arbitrage was quite popular during the 1980's, little has been written since then. Until now. Risk arbitrage has made a comeback, given the record value of M&A deals being transacted and the number of smaller, London-listed companies going private. In addition, Mr. Moore writes that returns from risk arbitrage investment show low correlation to the level of equity indices. This provides opportunities for diversification, and enhanced returns when the market is moving sideways.

The book is well structured, and starts by defining risk arbitrage and presenting some industry background. Throughout, the "Notes from the File" share valuable lessons that the author has himself learned. Three chapters present the fundamental components in turn: return, risk that positions lose money, and the probability of the transaction occurring. Practical tools are presented and their application demonstrated by worked examples. The seminal chapter is "The Risk Arbitrage Decision Process," combining return, risk and probability to determine the investor's risk-adjusted return, which is of ultimate importance to investors, and, how to imply the market's expected probability of the deal succeeding. This is useful information to check the risk arbitrageur's subjective probability estimates of success. The following chapter considers contested takeovers in all their guises, detailing the types of contest and methods of defence. The penultimate two chapters regard running positions and how to manage a risk arbitrage fund - how to trade and hedge positions, and how to monitor the universe of risk arbitrage opportunities using spreadsheets. The final chapter links many threads together by walking the reader through a complete corporate transaction: two firms agreed to merge, but finally a third party walked away with the target. Two appendices contain a tender offer document and a judicial review of a proposed transaction. While the legalese may deter readers, to be comfortable with these documents is essential for the risk arbitrageur given the frequent recourse to the courts during takeovers.

Overall, I found this to be an interesting book, with an intuitively appealing structure. It is short enough to be digested in an afternoon. The "Notes from the File" significantly add to the value of the contents. There is sufficient information for a beginner to commence risk arbitrage investing on paper (without money), to gain some insights to the decision process involved. A must for those interested in risk arbitrage.

Alexander Workman is a Ph.D. candidate at Imperial College, London, where he is investigating issues related to the non-normality of asset-return distributions.

Moore, Keith M., Risk Arbitrage: An Investor's Guide. John Wiley & Sons: August 1999. ISBN: 0471248843. 288 pages.

Buy the Book: http://www.amazon.com/exec/obidos/ASIN/0471248843/financialenginee

FEA Announces Server Edition of VaRworks

Two dozen alliance partners at the FEA partners meeting attended a preview of VaRworks. Server Edition (SE), Financial Engineering Associates new enterprise-level market risk software. VaRworks SE employs a client-server architecture to provide multiple views of common enterprise value at risk (VaR) data and calculations to multiple users. The software incorporates the Whitelight Analytic Server from Whitelight Systems, Inc. to implement data connectivity, active business rules, and multiple client interface types. The beta release is expected in early Q3.

Mark Garman, president of FEA, said, "With our patented VaR drill-down technology and our coverage of all the major deal types and risk methodologies, FEA has always been at the cutting edge of VaR. Weve also had some great reviews of the VaRworks functionality lately. Our frustrations have come from a previous inability to deliver this powerful technology in an enterprise-scalable fashion, other than through a difficult and customized integration of our VaRlib risk library. VaRworks SE is a real breakthrough in that regard, enabling enterprise-wide VaR access via a client-server approach. Beyond the obvious architectural advantages, our integrators will appreciate the easy-to-use toolkits that make database connectivity and custom risk reports a far simpler matter."

RiskMetrics Launches Web-based Risk Measurement Tool

RiskMetrics has launched RiskGrades, an online risk measurement tool for individual investors. Included within the RiskGrades product suite is a guide entitled Return is Only Half the Equation, and a web-based course, Understanding Risk. By using RiskGrades, individuals now have access to the same technology the world's largest institutions use to manage risk.

Survey *CONTINUED*

slightly along one or more of three dimensions of coverage: i) By the nature of the assets covered such as stocks, bonds, options, futures, swaps, and by the nature of the issuer such as corporate, government, and municipal; ii) By geographical location of the issuer or the market such as North America, Latin America, Europe, Asia, and so on; iii) By timeliness such as real-time versus historical and by the length of the history.

The price that subscribers pay depends upon the coverage of the information that is included in the package. In this highly competitive industry, when one provider gets an edge over its competitors by incorporating new features or services, the others quickly incorporate similar features into their systems-frequently partnering with one another, unless the innovator has exclusive agreements with the data vendor. Assuming that the most comprehensive package is purchased from each of these providers, what differences should one expect to find and why?

BLOOMBERG

Bloomberg, L.P. (www.bloomberg.com) is the pioneer in the field. In the early 1980s, Michael Bloomberg conceived the idea of a terminal that would sit on traders' desks that could provide them with the latest news and data.

He built 20 such prototypes and provided them to traders at Merrill Lynch, who really embraced the idea. Since then, "the Bloomberg"-as the terminal is known-has become the standard against which every other provider is compared. Bloomberg's biggest strength is its depth and breadth of coverage of the bond markets and interest-rate related products, particularly for the North American markets.

James Moore, Ph.D., who is a Vice President at Enhance Reinsurance, a reinsurance firm based in New York, says "I use Bloomberg's data to examine historical as well as the current term structure of interest rates and credit spreads."

Additionally, Bloomberg has, since its inception, provided research and analytical calculations on the bond-market currently unavailable from its rivals. This feature alone makes Bloomberg's service attractive to many subscribers. One drawback, notes Moore, is that "Their methodology is not always as transparent as it should be." However, he goes on to state that "Most of the time it's a matter of calling them and talking to the right person." Indeed, one of Bloomberg's strengths is its helpful support staff who are available to answer user questions. However, the demand for Bloomberg customer support is driven partly by the fact that Bloomberg uses a proprietary interface that requires a learning curve and one that even experienced users occasionally find difficult to navigate.

After many false starts in the 1980s and the early 1990s, Bloomberg's two biggest competitors now come close to matching its functionality and its breadth of news and data coverage. For coverage of certain specific markets, described below, they have even surpassed it. As a result they have been able to eclipse Bloomberg as measured by the number of terminals in use. Bloomberg's cost, $1,500 a month per terminal (quantity discounts are offered, though), has fueled competitor growth as Bloomberg appeals only to users who can justify the price.

The internet has fueled recent subscriber growth, new demand from individuals and small firms that can now compete in the market. With the attractive pricing offered by Bridge and Reuters on certain packages, they have been able to grab these individuals and small firms.

Subscribers have another complaint about the Bloomberg service. Bloomberg has tried hard to address subscriber concerns that the Bloomberg system was closed. Subscribers could not save the data displayed on the screen or apply their own analytical models to it. This characteristic is a remnant of the early days of Bloomberg when providers of proprietary data like Merrill Lynch did not want to lose their competitive edge to their broker/dealer rivals.

Bloomberg introduced the Open Bloomberg system in 1995 that allows Bloomberg data to be displayed on Windows NT-based or UNIX-based workstations and the Bloomberg Source for Data that acts as a data feed to third-party platforms so that users can apply their analytical models to historical data available from Bloomberg.

BRIDGE

Bridge Information Systems (www.bridge.com) has come from behind to pose a serious challenge to Bloomberg and Reuters. Depending on to the information source, Bridge currently holds either the number one or two position in terms of terminals installed in the U.S.

Bridge, originally geared towards trading and trading systems, has grown in its capacity to provide news by acquiring Knight/Ridder News Service in 1996 and its roughly 300 reporters throughout the world. Bridge has grown this reporter count to more than 600. Its ability to provide real-time and historical data has grown, thanks to its acquisition of Telerate, formerly a subsidiary of Dow Jones & Co, in 1998.

There are four characteristics of Bridge that make it attractive to its customers: for most services that it provides, it has the lowest prices of the three providers-some packages appeal to even individual investors. Its systems are open so that customers can save the data on their own computers or apply their proprietary analytical models to it. It has the best real-time coverage of Treasury securities and municipals thanks to exclusive contracts with Cantor Fitzgerald, Chapdelaine & Co., and GovPX. Finally, Bridge has the most flexible and powerful system for charting data based on its Athena Graphics charting software.

REUTERS

Reuters (www.reuters.com): Apart from the comprehensive coverage it has for the North American markets (Reuters provides the data feed to Yahoo and a number of other websites that display stock quotes), Reuters is particularly strong in European data and news. Its coverage of other international markets is also unparalleled. This is due to the fact

See Survey page 3

Extrapolating VaR by the Square-Root Rule

By David Blake, Ph.D., Andrew Cairns, Ph.D., and Kevin Dowd, Ph.D.

Most of the literature on VaR estimation deals with VaR over a daily horizon, where we are concerned with possible losses over the next trading day. However, there are many circumstances in which we wish to estimate VaRs over a longer horizon, such as a week or a month. So how can we estimate VaR over longer horizons than a day?

The square-root rule

One common answer is to use the square-root rule. If VaR(h) is the VaR over a horizon period of h days, and VaR(1) is the VaR over one day, this rule tells us that we can obtain the former from the latter by multiplying it by the square root of h, viz:

$$VaR(h) = VaR(1)\sqrt{h} \quad (1)$$

Such scaling is widely used, and is enshrined prominently in the Market Risk Amendment to the Basle Accord for horizons of up to 10 days. Unfortunately, this rule is highly unreliable, and often gives gross overestimates of VaR.

A correct approach

To see what is wrong with the square-root rule, we should go back to first principles. Suppose we have a portfolio that generates a daily return with mean μ and standard deviation (or volatility) σ. If the returns are generated by a normal or Student-t distribution, and we have a horizon of h days, then the VaR is:

$$VaR(h) = -\alpha_{df}\sigma\sqrt{h} - \mu h \quad (2)$$

where α_{df} is the confidence level parameter corresponding to the chosen confidence level and assumed return distribution, and df is the relevant number of degrees of freedom.[1] As is clear from (2), the first term in our VaR equation is positive and rises with the square root of h, whilst the second term is negative and proportional to h itself. Depending on the parameter values, the first term may or may not dominate for short horizon periods, but as h rises further, the second term becomes more important and eventually dominant. Hence the VaR *must* eventually become negative as h continues to rise, even though it may initially be positive and possibly rise for a while when h begins to rise.

Problems with the square root rule

The main problem with the square root rule is that it makes no allowance for the impact of the ($-\mu h$) term in (2). The square-root rule only gives us an accurate estimate of VaR if the daily mean return is zero, in which case (2) collapses to:

$$VaR(h) = -\alpha_{df}\sigma\sqrt{h} \quad (3)$$

and the square-root rule is obviously valid. Unfortunately, most firms don't hold risky portfolios with mean daily returns of zero.

However, in the more likely case where the mean return is positive, the square-root rule clearly involves an error that rises proportionately with the horizon h, and so becomes increasingly big as the horizon gets longer. To give an illustration, if we assume normality and have μ = \$9m and σ = \$15m—parameters that are about right for a firm like J. P. Morgan —we get the true VaRs and square-

See VaR page 7

Survey *CONTINUED*

that it is the oldest and one of the largest news organizations in the world. Although Bridge may have the most installations in the U.S., Reuters has the unquestionable lead worldwide.

Viraj Shah, a London based Senior Dealer in the Treasury Sales Division of KBC Bank, says, "We use all three of these services as they have their relative strengths. However, Reuters is the service of choice in the foreign exchange market...the news is timely and accurate, and they also provide systems for trading foreign exchange and foreign exchange derivatives. Another benefit is that we are able to get third-party analysis of the foreign exchange market on Reuters' systems."

While Bloomberg and Bridge are focused on providing data, news, and trading systems, Reuters is more diversified in its operations. One such operation is risk management software and systems. Its flagship risk management software products, KVAR+ and KONDOR+, allow an organization to track and manage its exposure to different kinds of risks right from the transaction level all the way to the organization-wide level. From the perspective of this article, the important characteristic of these two pieces of software is that they are able to directly accept data feeds from Reuters or from other providers. Thus, Reuters has one of the most complete suite of packages that financial engineers can use.

OTHER PROVIDERS

Apart from these top three providers of real-time data and news, there are a number of providers who do not have quite the market share of the three dominant players, but are highly respected in the financial community. Thomson Financial News (www.tfn.com) is the undisputed leader in this group. According to some industry estimates, Thomson has eclipsed Bloomberg, and maybe even Reuters, in terms of number of terminals installed, particularly when worldwide installations are accounted for.

In many respects, Thomson is more like Reuters than Bloomberg or Bridge. For instance, its parent is a publicly-held firm with a number of divisions each focused on a particular segment of the market. Among them are comprehensive news gathering, reporting, and publishing divisions. Some Thomson innovations, like First Call-an analyst report gathering and distributing system, have emerged based on the synergies arising from being diversified.

On August 5, 2000, Thomson announced that it will be merging with Primark Corp. (www.primark.com), another leading provider of financial information. With this merger, Thomson will add to its existing line-up such popular databases as Datastream, Disclosure, and I/B/E/S.

Others that deserve an honorable mention include Standard & Poor's Comstock (www.spcomstock.com), FAME (www.fame.com), and the Broker Services Group of Automatic Data Processing (bsg.adp.com). Each of these providers has its own strengths, but currently does not hold the market share held by the other providers. Some are perfectly happy in their current position because they are maximizing their profits given the existing technological constraints. Others have ambitions to be bigger players in the industry and they hope to capitalize on the rapid changes that characterize this industry.

DATA FOR ACADEMIC RESEARCH

The above-mentioned providers cater to the financial asset management industry where timeliness is crucial for efficient pricing of financial assets while length of history is typically not as crucial. For the demand for financial data coming from the academic research market, the opposite is true, i.e., timeliness may not be important but long length of history is.

Other providers have capitalized on the demand from this segment of the market. The two most well-known are The University of Chicago's Center for Research in Security Prices (www.crsp.com), or "CRSP" as it is fondly known, and Standard & Poor's COMPUSTAT (www.compustat.com).

CRSP focuses on equity prices, returns, and volumes. CRSP's daily equity data goes back to 1962 while their monthly data stretches all the way back to 1926. CRSP also provides daily and monthly U.S. Treasury security prices and returns going back to 1926, and a unique mutual-fund database that is free of any survivorship biases.

COMPUSTAT provides annual and quarterly Income Statement, Balance Sheet, and Cash Flow Statement data on U.S. corporations going back, in many cases, to 1950. One of the strengths of COMPUSTAT's data is that it is adjusted to reflect differences in reporting practices across firms so that every item appearing in their database is consistent across firms.

Similar data is available for firms based in Hong Kong, Indonesia, Japan, Korea, Malaysia, Singapore, Taiwan, and Thailand from the Pacific-Basin Capital Markets Research Center (www.cba.uri.edu/PACAP). However, the data does not as far back as the data in CRSP or in COMPUSTAT.

In addition to their industrial database, which covers industrial firms, COMPUSTAT has two special databases focused solely on banks and utilities respectively. The Federal Deposit Insurance Corporation (www.fdic.gov) provides another independent source of bank data frequently used in studies of bank performance.

Much academic research activity is focused on the impact of institutional features on the characteristics of financial asset trading activity. In order to study this link, researchers have access to the trade and quote data (TAQ) for stocks traded on the NYSE, the AMEX, and on the NASDAQ. Another stream of research examines the relationship between ownership structure and a myriad of issues related to firm performance. Ownership structure is typically derived from proxy statements filed with the Securities and Exchange Commission (www.sec.org) and redistributors of that data.

Additionally, considerable work has been done on efficiency in the equity-based options markets. Most of this work has relied on the Berkeley Options Database (www.haas.berkeley.edu/finance/bodb.html) that contains trade and quote data from the Chicago Board Options Exchange (www.cboe.com). Unfortunately, the CBOE has suspended distribution of their trade and quote data and it is currently unknown when they may resume. End of day closing prices are still available from designated data vendors. The Futures Industry Institute (www.fiafii.org) has been providing data on prices and volume on futures and options from exchanges that supply data to it.

Taken together, these sources of academic data fuel much of the research published in the top finance journals. Other finance-related academic research has been published based on data from Canada, Europe, and Asia. The sources of data vary from year to year and they are too numerous to cover in a survey of this sort.

Premal P. Vora, Ph.D., is Research Specialist and Technical Director of Wharton Research Data Services (wrds.wharton.upenn.edu), an innovative web-based data management service that provides seamless delivery of data from multiple sources onto UNIX workstations and PCs. It is located at The Wharton School of The University of Pennsylvania. He received his Ph.D. in Finance from Penn State in 1991.

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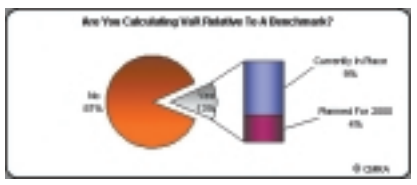
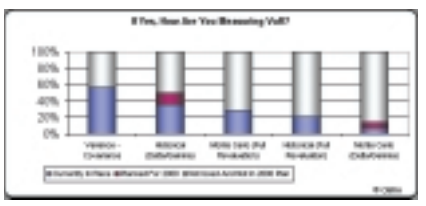
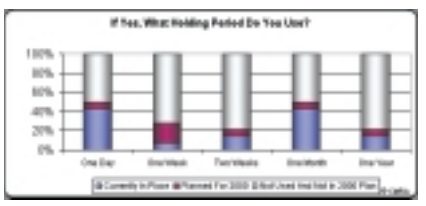
calculated VaR on a relative basis.



The Variance/Covariance and Historical (Delta/Gamma) methods are the most widely used methods for calculating VaR.

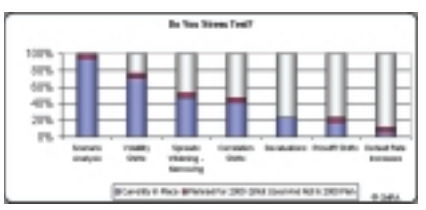


Respondents applied differing holding periods to calculate VaR. Daily and monthly were the two most frequently selected.

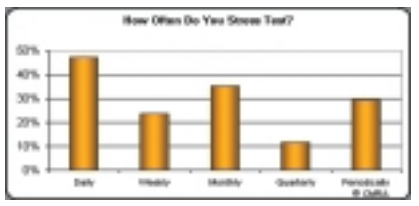


Stress Testing

Scenario Analysis (actual scenarios such as the Russia/LTCM crisis and the Tequilla crisis) and Volatility Shifts are the two most widely used stress testing techniques.

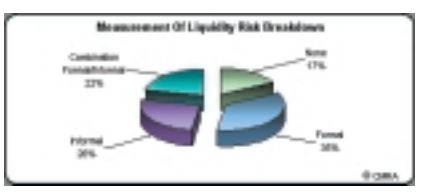


Respondents are split on the frequency of stress-testing, though the majority stress test at least weekly.

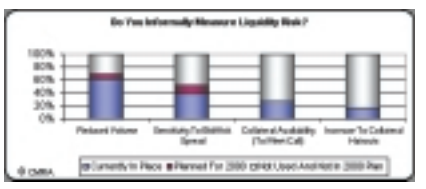


Measuring Liquidity Risk

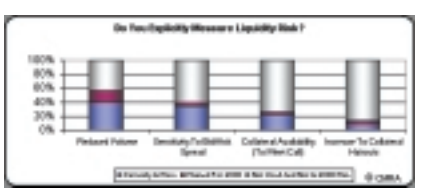
More than 80% of respondents measure liquidity - split relatively evenly among those that do it formally, those that do it informally and those that employ a hybrid of formal and informal means.



Informal measurement of liquidity risk is practiced at slightly higher levels than explicit measurement.

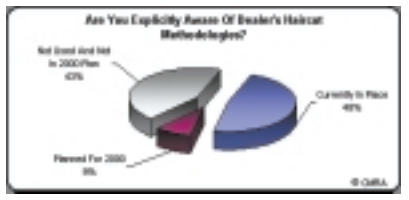


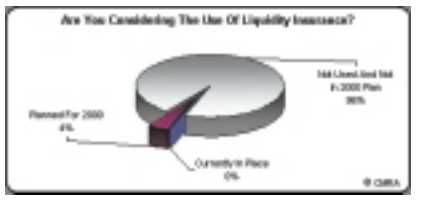
Whereas over 60% measure liquidity risk in terms of reduced volume on an informal basis, less than 40% do so on an explicit basis.



The majority of respondents will be aware of the dealers' haircut methodologies by the end of the year.

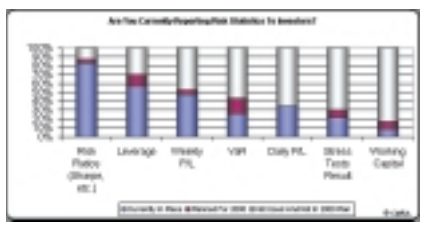
Most respondents do not use and do not plan to use liquidity insurance.



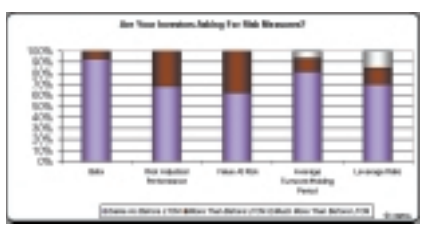


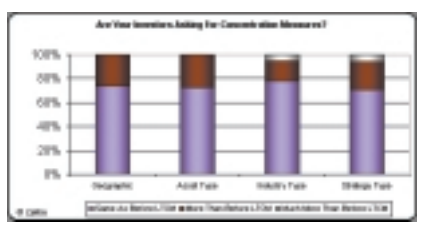
Investors' Interest in Risk Measures

Risk ratios are the most commonly reported risk statistic to investors, followed by leverage. VaR is currently only reported by 26% of respondents.

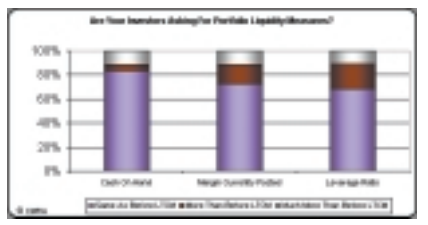


The majority of respondents have not increased their risk reporting since the LTCM crisis. The biggest increase has been in VaR and Risk Adjusted Performance.

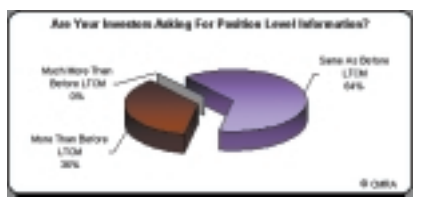




Approximately 30% of respondents said that investors were asking for increased reporting on concentration measures.



Approximately 20% to 30% of respondents said that investors were requesting increased reporting on liquidity.



More than a third of respondents stated that investors have increased their demand for position-level information.

Richard Horwitz is a Vice President at Capital Market Risk Advisors, Inc., a consulting firm headquartered in New York that specializes in risk management, valuation, strategy, and independent risk oversight. Horwitz received his undergraduate degree in Electrical Engineering from MIT and his MBA from the Sloan School of Management at MIT.

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49-Banking (non-Asset Mgt.)
50-Insurance
51-Exchange
52-Financial Eng./Risk Mgt.
54-Other Financial

OTHER FUNCTIONS
57-Software/Hardware
60-Government
62-Academic Institution
64-Student
65-Accountancy/Legal/Consultancy
68-Media
69-Other (please specify)
_____

2. What best describe your job title? Insert one number in the square. ☐

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2-EVP/SVP/VP/AVP/GM/Treasurer
3-Director/Department Manager/Managing Director/Head
4-Manager (other)
5-Financial Engineer/Financial Analyst
7-Accountant/Lawyer/Consultant
8-Government Official
9-Professor
10-Student
11-Other (please specify)
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THE FINANCIAL APPLICATION DEVELOPMENT PROCESS

The financial application development process involves the concerted efforts of many financial professionals, including academic researchers, quantitative researchers, application developers, and system integration specialists. End-users, such as analysts, traders, and external customers, provide continual feedback to improve the application.

Academic researchers develop theoretical models in the areas of fixed income, derivatives, equities, asset allocation, risk management, and foreign exchange modeling. Quantitative researchers take these models and modify them for implementation, creating prototype analytics or tools in the process.

Application developers use aggregations of these analytics to create applications, which are then deployed for initial testing by end-users. Based on the results of these tests, the algorithms contained in the applications are modified and then re-deployed. Both polished analytics and finished end-user applications emerge from this iterative process. Groups of finished analytics, which pertain to the same task or application area in finance, are often bundled together into *modules* or *libraries*. Application developers can link these libraries with other user interfaces (UIs) to form more sophisticated financial applications.

Figure 1 illustrates the application development process.

PLAN THE APPLICATION

Planning is the most important step in the application development process. The decisions made at the beginning determine the content and deployment of the application. For example, a decision to deploy an application to users' desktops as a stand-alone, executable application rather than take a client-server or Web deployment approach would make changing the underlying analytics impossible without re-deploying all or part of the application.

Define the Requirements

To illustrate the planning process we will prepare to build a basic version of an application for pricing simple and combination[1] equity options. We planned our sample application based on the questions and answers shown in Table 1.

CHOOSE THE BEST DEVELOPMENT ENVIRONMENT

There are many Integrated Development Environments (IDEs) available for application development; each bundled around one or more programming languages. Microsoft's Visual Studio can be equipped for C/C++, Java, and Visual Basic development. Visual Cafe offers one of the more robust environments for Java development. MATLAB, from The MathWorks, Inc., provides a comprehensive environment for application development and deployment using the MATLAB programming language. Other products are also popular with financial quantitative analysts, such as MathSoft's S-Plus. Some of these use proprietary programming languages, providing a more limited environment for application development.

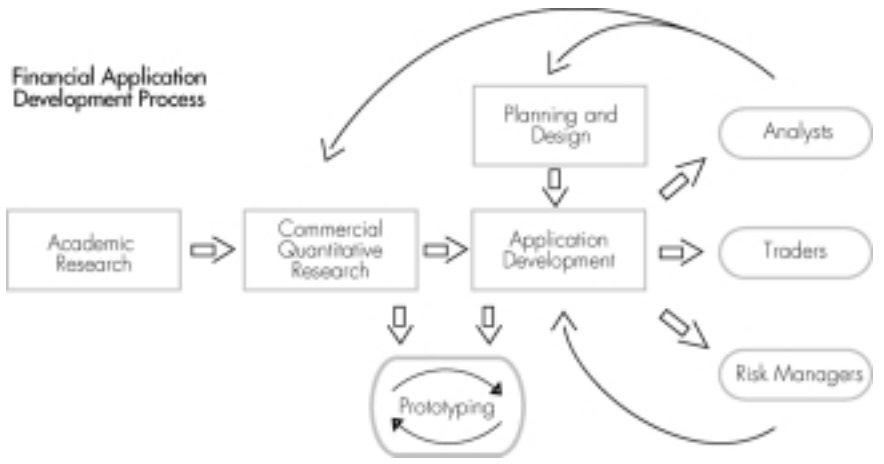

Figure 1: The Financial Application Development Process

We will use the term "development environment" (DE) to refer generically to an IDE bundled around four popular programming languages: C/C++, Java, Visual Basic, and MATLAB. We will refer to each DE by the name of the underlying programming language being used. We believe that no generality will be lost in the simplification.

Choosing the correct DE for an application development project is sometimes difficult in that DEs are not clear substitutes for one another. Each has its relative strengths and weaknesses.

Java's platform independence and Web deployment capabilities make it a good choice when the resulting application must run on both PC and UNIX workstations and be available over the Web. C/C++ is perhaps the most widely used commercial programming language in the world and has superior performance characteristics when compared to Java. C/C++ and, to a lesser extent, Java are popular choices for large-scale financial application development because there are numerous mathematical and financial function libraries available for both platforms. However, both languages have limitations because they are compiled languages. Financial markets require short cycle-times for application development and frequent changes to underlying analytics. Developing a financial application in a compiled language can slow down development and testing processes.

Visual Basic is one of the more popular DEs for application development in use today at banks and investment management firms. This is due primarily to its ease of use (an important consideration when developers are not typically information technology [IT] people) and the fact that it is both an interpreted and compiled language. Visual Basic lacks sophisticated embedded mathematical and financial functionality and is not directly portable to UNIX, limiting its usefulness for large-scale, multi-platform financial application development.

MATLAB is gaining widespread popularity as a DE for financial application development. Developers can automatically generate C/C++ code from MATLAB code and include C/C++ and Java routines in MATLAB programs. Its vast built-in mathematical and financial functionality, the fact that it is both an interpreted and a compiled programming language, and its platform independence make it well suited for financial application development. MATLAB provides a substantial set of tools to enable rapid prototyping, development, and testing of the application and it provides a large suite of readily available functions via MATLAB core features, as well as the Financial, Statistics, and Database Toolboxes, to enable developers to quickly assemble very sophisticated applications.

To determine which of the four DEs discussed in this paper is best for the development of our application, we will turn to the application's requirements. These can be separated into four categories:

- Built-in functionality;
- Connectivity and reporting;
- Deployment capabilities; and
- Performance.

Let's look at the DEs and compare them against our requirements in each of these categories.

Built-In Functionality

Our goal is to provide end-users with pricing capabilities for simple and combination equity options using the Black-Scholes option pricing model. This requires an implementation of the model in the underlying programming language. Of the four DEs, only MATLAB contains an implementation of the model. The model is available for Visual Basic and C/C++ as part of several third-party financial function libraries, but is not available for Java.[2] Due to its relative simplicity, the model could also be implemented directly by the developer either in Visual Basic, C/C++ or Java, but this would require additional time and resources for developing and testing.

Connectivity and Reporting

Visual Basic and C/C++ provide database connectivity through the Open Database Connectivity (ODBC) protocol. Java provides database connectivity through the Java Database Connectivity (JDBC) protocol. MATLAB provides direct database connectivity through the MATLAB Database Toolbox and also provides access to both ODBC and JDBC functionality from within MATLAB. Visual Basic, C/C++, and Java provide access to spreadsheets[3] through Active X.

There are several third-party products, such as Crystal Reports, to provide reporting capabilities for applications built using Visual Basic, C/C++, or Java. MATLAB provides reporting capabilities using the MATLAB Report Generator.

Deployment Capabilities

For cross-platform deployment, Visual Basic is not portable to UNIX. Visual C/C++ requires a native UNIX compiler to compile the code, and Java requires a native runtime environment when deploying on UNIX. MATLAB is a cross-platform DE, so an application developed in MATLAB will work on any Windows, UNIX, or Linux machine.

Visual Basic and C/C++ require additional development for Web deployment. Java allows the user to generate applets directly for Web deployment with only a small amount of

SEE RAPID PAGE 7

What is the purpose of the application?	Called the Option Pricing Tool, the application will value simple and combination equity options using the Black-Scholes pricing model
How many total and concurrent users?	20 traders and analysts 20 off-site partners 50 customers 90 total No more than 20 concurrent users
What sort of interface is required?	A graphical user interface (GUI)
What sort of data connectivity is required?	Common databases and Excel spreadsheets
What reporting capabilities are required?	Simple reports based on output, made available in hard copy, electronically, and in HTML versions
What are the target platforms for deployment?	PCs running Microsoft Windows UNIX workstations (UNIX server using X Windows) PCs via the Internet
Is processing time important?	Fast computation of the value of an option is required
Will underlying models or analytics be changed frequently?	Yes, we will need to price additional types of combination options
Must specific costs be accounted for in building and deploying the application?	Cost is important, but we will explore different options before making cost decisions

Table 1: Rapid Development and Deployment of a Financial Application

Requirements	Visual Basic	C/C++	Java	MATLAB
Black-Scholes equity option	Through third-party products	Through third-party products	Through third-party products	–
Database connectivity	Through ODBC	Through ODBC	Through JDBC	–
Spreadsheet connectivity	Through Active X	Through Active X	Through Active X	–
Cross platform deployment	X^a^	Using native compilers	Using native runtime environment	–
Reporting capabilities	Through third-party products	Through third-party products	Through third-party products	–
Web deployment	Requires additional development	Requires additional development	–	–
Compiled-speed performance	–	–	–	–
Desktop deployment costs scale with the number of users	No	No	No	Yes^b^ No, if deployed as an executable
Web deployment costs scale with the number of users	No	No	No	No

^a^There are third-party emulation products that will allow Windows DLLs and executables to run on UNIX, but performance issues limit their usefulness for financial application development.
^b^MATLAB Runtime Server allows for deployment of MATLAB applications at a significantly reduced cost.

Table 2: Choosing the Right Development Environment

Book Review

Insurance and Weather Derivatives

Reviewed by Peter Brewer

This book contains a series of articles covering developments in the areas of Insurance Derivatives, Securitisation and Weather Derivatives. The Weather Derivatives section comprises four articles written by key industry players. It serves as a useful introduction to the weather derivatives market for the newcomer.

The first article provides a broad introduction to weather derivative instruments, contrasting them with weather insurance products. It looks at the weather risk market in terms of the energy chain, from producers through to consumers. The article gives an overview of the most common type of weather derivative presently traded, those based on "degree days". Finally, valuation of weather derivatives is touched on.

The second article presents the current state of the weather derivatives market and summarises the types of deal that have been entered into to date.

The final two articles provide a more in-depth analysis of pricing degree day instruments and cover issues such as:

- Establishing correlations between revenue streams and temperature variables;
- Use of historical data to extrapolate valuations, including a brief look at the appropriate selection of data and 'de-trending' issues;
- Introduction to stochastic temperature modelling;
- Using value at risk techniques in the context of weather derivatives.

Some of the articles in the book are freely available in the public domain, and this may deter potential purchasers interested in weather derivatives from buying the book. In addition, the book would benefit from some advanced articles covering the use of more sophisticated valuation techniques. As it stands, however, this book is a useful introduction for newcomers to this rapidly growing market, with well chosen articles that provide a good basic grounding.

Insurance and Weather Derivatives: From Exotic Options to Exotic Underlyings by University Paris IX Dauphine. Risk Books: October, 1999. ISBN: 189933257X. 300 pages.

Buy the book: http://www.amazon.com/exec/obidos/ASIN/189933257X/financialenginee

Peter Brewer is CEO of Weather Risk Advisory.

VaR *CONTINUED*

root VaRs illustrated in the Figure. The true VaR rises slightly as h increases from 1, but then turns downwards and becomes negative by the time h is 7 or 8, and gets more and more negative as h continues to rise. By contrast, the square-root rule has VaR rising continuously as the horizon increases. The square-root rule therefore produces a VaR that is increasingly inaccurate as the horizon increases.

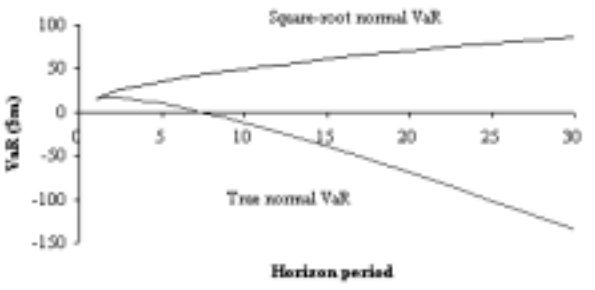

Figure 1: True VaR vs. Square-Root VaR

In fact, the square root rule can perform extremely poorly even for low horizons, such as the 5-10 day horizon for which it is often used and sanctioned by bank regulators. For example, if we take a 5-day horizon, the true normal VaR in the case above is $10.17m, but the square root rule gives us an estimate of $35.05m, which is an over-estimate by a factor of over 3; and if we take a holding period of 10 days, our true VaR is almost –$12m, whilst our square-root estimate is almost $50m, which is way out and of wrong sign. This example clearly shows that the square-root rule can be very inaccurate, even for the low horizons for which it is commonly believed to have some plausibility.

In short, we should try to avoid estimating VaR using the square-root rule, as this rule can give very misleading results for relatively short horizons, and even more misleading results for longer ones.

David Blake is with Birbeck College. Andrew Cairns is with Heriot-Watt University. Kevin Dowd is with the University of Sheffield.

Note

[1].We can regard the normal as a special case of the Student-t distribution with an infinite number of degrees of freedom. If our distribution is normal, then $a_{df} = -1.645$ for a 95% confidence level, and so forth.

Rapid *CONTINUED*

additional work. MATLAB provides complete Web deployment capabilities through MATLAB Web Server while requiring only that developers build some simple HTML forms as the interface to the application.

Executables developed with the MATLAB Compiler and delivered to end-users can be done at no additional charge. Standard desktop deployment of a MATLAB-based application increases in cost as the number of users increase. However, MATLAB Runtime Server allows you to deploy applications on top of MATLAB at a significantly reduced cost. All DEs allow for Web deployment with no scaling of deployment costs as the number of users grows.[4]

Performance

Visual C/C++ and Java are compiled languages. Applications built using either of them will, by definition, run at compiled speeds. MATLAB and Visual Basic are interpreted languages. Applications built using them will run at slower speeds than their compiled counterparts. Visual Basic code can be compiled using the native compiler that ships with Microsoft's IDE for Visual Basic to create Dynamic Link Libraries (DLLs) and stand-alone executables for Windows only. MATLAB code, on the other hand, can be compiled for any Windows or UNIX platform using the MATLAB Compiler. Developers can generate C and C++ code directly from their MATLAB code, which can then be compiled using most popular compilers. The MATLAB Compiler can also generate DLLs and stand-alone binary executables[5] for any platform.

Summary

Table 2 summarizes the requirements for the application (derived from our answers to the questions) and indicates whether a particular DE meets those requirements.

Based on the requirements of our application and the capabilities of each DE, we will use MATLAB to outline the development of our option pricing tool in a subsequent article. While we employ MATLAB, financial application development can be also be accomplished using one of the other DEs discussed.

Eugene McGoldrick, Ph.D. is the Development Manager, Financial Products at The MathWorks, Inc. His email address is emcgoldrick@mathworks.com.

Notes

A combination equity option refers to a derivative position comprised of two or more equity option positions such as a straddle. For a detailed discussion of combination options, see, for example, Hull, John C., Options, Futures, and Other Derivative Securities. Upper Saddle River, NJ: Prentice-Hall. 1997. pp. 187-190.

[2] The author was not aware of any such library at the time of this writing.

[3] Throughout this paper, the term "spreadsheet connectivity" refers to connectivity to Microsoft Excel since this is the most prevalent spreadsheet on the market today.

[4] Hardware related costs, of course, would continue to scale with the number of users.

[5] With the use of the MATLAB C/C++ Math Library.

Internet *CONTINUED*

Large Aggregators Economics

The large aggregators, like Reuters, Bloomberg and Bridge only provide very small subsets of their content; usually stock prices from US exchanges, prnewswire and businesswire. The same applies to application vendors and financial institutions: the large vendors make it prohibitive for third parties to resell their content to web users. The Reuters or Bloomberg client is typically paying between $500 to $1500 per month and these vendors do not wish to cannibalize their revenues.

Lack of Data Modeling Technology

Vendors who sell US equities-related content use Tickers as the key to index their content. It is very easy for a Portal vendor to present US equities content in a seamingly integrated fashion. For US Fixed Income or derivatives, and for any non-US financial instrument, there is no common access method for content: vendors use local codes, Sedols, valoren, company name, Isin's, Quick codes, etc. and most portals today do not have the data and meta-data management technology required to manage content coming from disparate sources.

Lack of Adequate Portal Technology

Vendors are usually focused on a specific data type: real time data, news, time series, fundamental data. Legacy middleware solutions like Tibco only provide for dissemination of delayed quotes and news, and cannot cope with complex data types or real time data. Until recently, Financial Portals have been built as custom, proprietary solutions.

For these reasons, quality aggregated content is not currently available on the web. The only solution today is to go to each vendor's site and access each desired data set separately. Examples of high quality vendors available are DataStream, Worldvest, First Call, RiskMetrics.

Below are a two sites that give a good list of available content:

University of Ohio has done a good job at indexing content on the Web: http://www.cob.ohio-state.edu/dept/fin/osudata.htm

StreetEye also offers a very comprehensive index of financial web resources: http://www.streeteye.com/index/index.html

Philip Chambadal is the President of MetaMatrix (http://www.metamatrix.com/)*, a content integration platform provider. Its product is designed to logically integrate all of the information assets of the Enterprise.*