

CAPITAL MARKETS NEWS

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Solutions on Measuring Operational Risk

Overview

In the past, the banking industry thought measuring operational risk was something akin to mission impossible. As a result, some banks defined operational risk as a non-measurable risk. During the last few years that mindset has dramatically changed, to the point where now discussions on measuring operational risk are actually considered to be trendy. Such a reversal of fortune is due, in part, to recent developments within the Basel Committee on Banking Supervision (thereafter, the Basel Committee), and its decision to allocate regulatory capital for operational risk. I have been asked to give numerous speeches on this topic, both at home and abroad. Following are the three most commonly asked questions about measuring operational risk:

- Why is it necessary?
- How is it possible?
- What are the challenging issues in putting it into practice?

Unfortunately, very few papers or books espouse solutions to these questions based on existing banking practices, as measuring operational risk is a fairly new and esoteric topic. This paper aims to provide readers with possible solutions, or at least hints, on effectively addressing these three questions¹.

Why Is It Necessary?

Over the course of time banks have developed, and have capitalized on, new business opportunities given advances made in IT, deregulation, and intense international competition. These initiatives were welcomed by their customers seeking far more advanced financial services. Operational risk in the past was controlled based on qualitative risk management practices involving checklists and operations manual. It stands to reason that the operational risks banks face today have become more complex than ever before as a result of the faster pace of change in the complexity of their operations, and also due to increased risk awareness. Banks, therefore, have found limits to traditional qualitative operational risk management.

Following are the main reasons why banks try to measure operational risk:

Enhancing the Internal Control Framework

Large banks seek to establish a basis for effective and efficient internal control measures. Subjective judgements on internal control, however, tend to misguide the board of directors and senior managers with wrong priorities in enhancing operational risk management. Operational risk measurement enables banks to establish a criteria of objectivity and comparability in prioritizing risk control among different business lines and risk categories, in order to supplement internal control in a more robust way.

Adequacy of Required Economic Capital for Operational Risk

As market risk and credit risk measurement methods have been developed, large banks have, in turn, established integrated risk management systems to determine whether they hold adequate economic capital or not, compared with

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the risk taking strategies authorized by the board of directors. Thus, it is inevitable for banks to allocate their economic capital to operational risk explicitly. Material events with substantial losses incurred act to remind banks of that necessity.

Enhancement of Performance Evaluation

It is very important to give employees the incentives to enhance operational risk management through various methods such as return on equity

(ROE). It is commonly seen in practice, however, that employees tend to focus on ways to increase return rather than return on equity. Return on equity could be based on measured risk, depending on the balance between risk taking and risk management. Thus, banks seek to allocate economic capital to operational risk based on risk measurement and results of risk assessment, so employees have an incentive to improve risk management. Their improvement, which turns out to be measured and scored, reduces the allocated capital to

their operational risk as their performance evaluation or ROE improves.

How Is It Possible?

There exist both top-down and bottom-up methods in measuring operational risk. The former seeks to estimate it on a macro basis without identifying events or causes of losses, while the latter measures it based on identified events that explain the mechanism of how and why operational risk occurs. Advanced international banks commonly employ these two methods in the following ways: They may start with the top-down method temporarily, in order to allocate their economic capital to operational risk, and then shift to bottom-up methods such as statistical measurement approach and scenario analysis by establishing robust event and loss databases. Or, they may directly start with a combination of bottom-up methods such as statistical measurement approaches and scenario analyses to measure operational risk. In other words, it is necessary to measure operational risk based not only on historical data, but also scenario data with forward looking approaches, given the rapid change in environment surrounding the banking industry.

Chart 1 Examples of Top-Down Method

Approaches	Way to Measure Operational Risk
INDICATOR APPROACH	It is assumed that, for example, gross income or cost is a proxy, and that a certain percentage is regarded as operational risk of banks.
CAPM APPROACH	It is assumed that all the risks are measured based on Capital Asset Pricing Model (CAPM); then, market risk and credit risk, measured separately, are deducted from all risk measured by CAPM.
VOLATILITY APPROACH	Volatility of income is regarded as a risk. For example, volatility of non-interest income, which is regarded as operational risk, is measured.

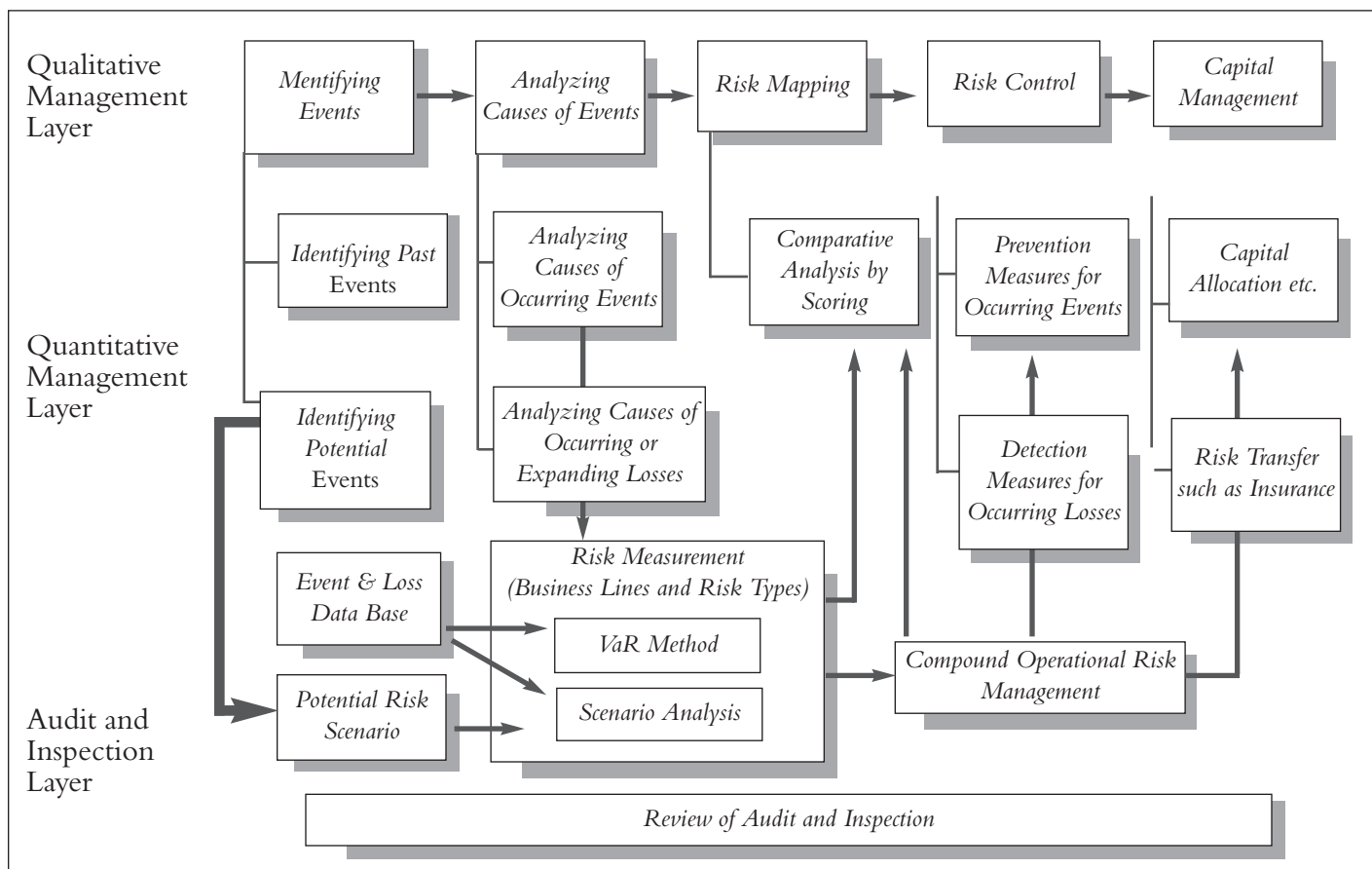
Chart 2 Examples of Bottom-Up Method

Approaches	Way to Measure Operational Risk
STATISTICAL MEASUREMENT APPROACH	The maximum amount of operational risk is measured based on individual events with frequency and severity using Monte Carlo simulation or an analytical solution.
SCENARIO ANALYSIS	As for events with low frequency and high severity, losses would be estimated based on scenarios, with reference to external data and events that occurred at other banks.
FACTOR ANALYSIS APPROACH	Factors related to losses such as transaction volume and error ratios are identified and are taken into account with correlation analysis.
BAYSIAN NETWORK MODEL	Causes and effects of operational risk are modeled. There are cases where this model is used in settlement risk management.

What Are The Challenging Issues in Putting It Into Practice?

Chart 3 provides readers with a framework for enhancing operational risk management. It is necessary for banks to employ such an enhanced, robust framework when putting quantitative methods into practice. The framework is useful because challenging issues are clearly identified on a firm-wide basis and possible solutions are pursued based on robust coordination and cooperation clearly defined among the board of directors, senior management, risk management sections and business line managers.

Chart 3 A Framework for Enhancing Operational Risk Management



Pitfalls in Enhancing Operational Risk Management Adopting Operational Risk Management Without a Framework

In order to fulfill the aims of measuring operational risk steadily, it is necessary to combine a robust framework for enhancing it with strong management leadership. However, without a robust framework as depicted in the chart 3, instances arise where banks may experience inconsistency in dealing with qualitative risk management and quantitative risk management. It stands to reason that such scenarios will not result in effective and efficient risk control.

Applying Risk Measurement to Risk Management with Material Outstanding Defects

If banks hasten to apply risk measurement to risk management with inadequate definition and inconsistent interpretation

of operational risk and its events, the results of risk measurement will not reflect reality, and business line managers will not be able to rely on these results. If banks measure risk based only on past event data, they might not capture those material potential events with “low frequency and high severity” and, likewise, will not capture the future impact of the changing environment (internally and externally) on future operational losses. It is imperative to apply risk measurement to risk management without material defects.

Common Outstanding Issues

The following issues pose unique challenges to all banks:

Establishing a Robust Database Establish Internal Data with More Practical Classifications

When collecting indirect data, a trade-off exists between objectivity and data

usefulness. To what extent should banks collect indirect losses? How should internal and external auditors check the objectivity of its classification? The answers to these questions depend on the materiality and cost/benefit analyses of collecting indirect data. In any event, it is a prerequisite for banks to put high priorities on collecting robust database.

Supplement Internal Data with External Data

It is very useful to supplement the limits of an internal database with external data, which will also contribute to the development of robust scenario analyses. External databases may be available to banks; however, in the course of implementing them, they may face the challenging risk management issue of mapping that external data into an internal database with differing transaction volume. Questions also in how to supplement internal data with external data and,

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ultimately, how to link external data with scenario analysis?

Establish Qualitative Data Objectively

At many international banks qualitative data, such as self-assessment scoring results, are used for capital allocation to operational risk. This forward-looking approach affords business line managers incentives to improve their risk management through the self assessment process. Consider a situation where huge operational losses occur in a business line. The maximum amount of operational risk, or economic capital charge, allotted to that line becomes so large that line managers might have little incentive to improve their risk management. In utilizing self assessment scoring results, adjustments can be taken into account in allocating economic capital that reflect improvements in the risk management process. To justify these adjustments, qualitative data should be checked objectively by internal auditors.

Developing Sophisticated Risk Measurement Models

It is a prerequisite for banks to establish sophisticated and practical risk measurement models based on the banks' own operations. In measuring the maximum amount of operational risk, challenging issues exist; namely, determining the period of risk measurement, establishing the confidence interval such as 99 percent, 99.9 percent or 99.975 percent, and recognizing the assumption of distribution function. Events with "low frequency and high severity", which could

be captured by a parametric approach, may be explicitly captured by scenario analysis. Since scenario analysis tends to be less objective than the maximum amount of operational risk, it is useful to change assumptions within and between scenario analyses, and to compare their impacts on risk measurement. Another way is to map scenario analyses into loss databases, and re-calculate the maximum amount of operational risk. In either case, it is important to see the results of measured operational risk within ranges depending on various assumptions.

Introducing and Developing Effective Risk Transfer Methods

It is worthwhile to keep abreast of effective risk transfer methods such as insurance or Alternative Risk Transfer (ART). Advanced books on operational risk cover these topics, along with other movements that discuss more effective capital management between capital allocation and risk transfer methods. Insurance companies tend to supply not only traditional BBB (Bankers Blanket Bonds) but also more comprehensive insurance products which cover a wider range of operational risks faced by banks. Given these initiatives, the Basel Committee is considering a move to allow banks to reduce the required capital charge to operational risk, if banks hold sufficient insurance products in an effort to mitigate operational risk.

— Junji Hiwatashiⁱⁱ

ⁱ The reference is "Advancing Operational Risk Management Using Japanese Banking Experiences", which was published in the homepage of the working paper in the Federal Reserve Bank of Chicago.

ⁱⁱ Examining Officer and Manager of the Bank of Japan was seconded to the Federal Reserve Bank of Chicago during the summer 2002. The opinion in this paper is the author's personal view and does not necessarily represent the Bank of Japan or the Federal Reserve Bank of Chicago.

OneChicago and Nasdaq Liffe: Two New Exchanges to Trade Securities Futures¹

The Commodity Futures Modernization Act (“CFMA”), signed into law in December 2000, repealed the Shad-Johnson Accord to allow, for the first time, the trading of single stock futures and futures on narrow-based indices (thereafter “securities futures”) in the US.² With derivatives exchanges, electronic communication networks (“ECNs”) and equity exchanges in the US preparing to offer these new products, attention in Chicago has focused on the rising rivalry between two new ventures: OneChicago and Nasdaq Liffe Markets.

OneChicago

OneChicago, LLC represents a partnership between the three derivatives exchanges in Chicago — the CBOE, CME and CBOT — created with the sole purpose to trade securities futures. OneChicago was structured as a for-profit, limited liability company, privately held and owned by the three participating exchanges with some management ownership. The CBOE and CME have a considerably larger stake in the partnership than CBOT.³ William J. Rainer, who served as Chairman of the CFTC, serves as Chairman and Chief Executive Officer of OneChicago; members on the Board of Directors are drawn from the three participating exchanges.

The joint venture attempts to take advantage of the three exchanges’ combined resources, while providing the most flexibility to its users. The three participating exchanges have agreed to use the CFTC as their lead regulator, and the Commission granted the new exchange a contract market designation in June 2002. OneChicago will also notice register with the SEC as a national securities exchange. The CME will serve as the regulatory organization for the new exchange, responsible for all market and financial surveillance and trade practice investigations. The National Futures Association (“NFA”) will provide dispute resolution services.

Members of the three Chicago derivatives exchanges automatically gain membership to OneChicago and, interestingly, membership in the new exchange exists only through membership in the participating exchanges.⁴ OneChicago will be an entirely electronic exchange using CBOEdirect™, the electronic trading system of the CBOE, as its trading engine. CME members can trade via connections to CBOEdirect™ through access points to GLOBEX®, CME’s electronic trading system. CBOT members will have to trade through either of the two engines.

In order to promote liquidity in its products, OneChicago developed a trading model supported by appointed market makers called Lead Market Makers (“LMM”). For each of the security futures products traded, OneChicago plans to enter into a contract with a LMM, who will be obligated to provide continuous, two-sided markets for all expiration months in the products allocated to it. LMMs will need to connect through CBOEdirect™ to have the capacity to enter two-sided quotes. The concept has been met with interest on the part of the combined membership of OneChicago and twenty-two member firms have been approved to serve as LMMs.

Clearing arrangements for OneChicago are through the Options Clearing Corporation (“OCC”) and the CME clearinghouse. Clearing members with dual clearing membership at the OCC and the CME have an option to clear with either clearinghouse for a year; thereafter, they need to clear through the OCC. Clearing members with membership at only one clearinghouse, be it the OCC or the CME clearinghouse, will continue to clear with their respective clearinghouse. Transaction fees will be received by OneChicago and clearing fees by the CME clearinghouse or the OCC, depending on the clearing relationship. Members will get a bundled price.

OneChicago plans to start with at least 75 single-stock options and at least 20

narrow-based indices. Several critical questions on the construction of these indices had to be resolved in terms of what the market would find most attractive. Matters under investigation entailed settlement (cash or physical), number of constituent securities (construction of “broad” versus “very narrow” indices), and calculation of index (weighting by market capitalization versus price). OneChicago has already made available an initial list of sector-specific narrow-based indices, each comprised of four to five stocks. Eight sectors are represented: airlines, biotech, computers, defense, investment banking, oil services, retail and semiconductor components.

Nasdaq Liffe Markets

Encouraged by the success of its single stock futures, the universal stock futures (“USF”), LIFFE announced in March 2001 the creation of Nasdaq Liffe Markets, LCC (“NQLX”), a joint venture with Nasdaq Stock Market®, to develop a single stock futures market based on global stocks for US and European customers. The new exchange is jointly owned by the two parent companies with equal board representation.

In August 2001, NQLX received conditional designation as a contract market for securities futures from the CFTC and will register as a national securities exchange for securities futures with the SEC. It has also been recognized as an overseas investment exchange in the UK by the UK Treasury. This will allow NQLX to provide direct access to its market to members in the UK. NQLX’s regulatory function is operated by NASDR, and it will operate as a fully electronic, independent exchange. Its products will be listed on LIFFE CONNECT™, LIFFE’s electronic trading platform. Trades will be executed with a central limit order book on a strict price-time priority.

NQLX has two types of membership: clearing and non-clearing members. NQLX members must meet the specific

OneChicago and Nasdaq Liffe *continued*

minimum financial thresholds, ethics standards, and volume requirements for their membership category. Clearing arrangements are with the OCC. A clearing member must be a clearing member of the OCC; a non-clearing member has direct market access through LIFFE CONNECT™ without clearing responsibilities.⁵ Further, in January 2002, NQLX entered into an agreement with the Board of Trade Clearing Corporation under which BOTCC will process give-up related brokerage payments for NQLX member firms. As is customary in the exchange world, NQLX will charge its members a standard transaction fee and the OCC will levy a clearing charge. NQLX anticipates that it will trade futures contracts on Nasdaq100® and Nasdaq composite stock indices, single securities, and possibly narrow-based indices and options on securities futures.

Contract specifications are for the most part identical between OneChicago and NQLX, although some differences might exist (e.g., delivery months, position limits). On both exchanges prices will be quoted in dollars. Each contract will be for 100 shares of stock with a tick size (minimum price movement) of \$0.01 per share (\$1.0 per contract). Trading will be synchronous across the two exchanges and will cease when the underlying shares cease to trade in the cash market. Although fungibility across exchanges is an open issue to be decided by each exchange,⁶ in practical terms it could be handled by the OCC, as in the equity options market. The last trading day will be the third Friday of the delivery month, and contracts will be physically settled.

More Competition

OneChicago and NQLX aren't the only entities with aspirations to offer securities futures. In September 2001, the American Stock Exchange ("AMEX") announced its plans to list and trade single stock futures on its own trading floor. The only exchange to use the open outcry venue for trading the new products, AMEX hopes to leverage the success of its specialist market structure and the deep liquidity of the Wall Street firms that

trade on its floor to win market share. Further, AMEX has already a clearing arrangement in place with the OCC.

In February 2002, the CFTC granted contract market designation to Island Futures Exchange, LLC, a new entity operated by Island Holdings, LLC, which runs and operates Island ECN, an Alternative Trading System with 700 subscribers, both broker-dealers and institutions. The OCC will provide clearing and settlement services for the new exchange and the NFA will perform certain self-regulatory functions.⁷ Only clearing members of the OCC can be clearing members for Island Futures Exchange; they must meet the OCC's minimum capital requirements.

Considerable optimism exists in the US for the success of securities futures, and more exchanges might decide to list the new products. It is expected that hedge funds will enter the market first, followed by arbitrageurs when the market is deep enough to handle large trades, and subsequently by more conservative institutional investors, such as pension and mutual funds. The entry of hedge funds into the market is critical, judging from the experience in Europe. In the UK, the main users of USF at LIFFE⁸ have been mainly indexers looking to enhance performance; hedge funds do not appear to have endorsed the product. As a result, volume has been sporadic and regular flows have not emerged. In contrast, the five single stock futures contracts listed on MEFF, the Spanish derivatives exchange, have witnessed considerable success with hedge funds trading heavily in these instruments.

Security Listings

The success of securities futures will depend on the selection of the right underlying security to build liquidity and critical mass to attract more volume.⁹ The Chicago derivatives exchanges combine outstanding experience in options and broad-based equity futures, and have worked diligently to select the final list of first instruments to be listed. Market capitalization, volatility, customer demand and preferences are some of the variables

driving the selection of listings. NQLX devised a complex algorithm to select the underlying instruments for single stock futures from the combined universe of S&P500® and Nasdaq100® indices, looking for securities with a high degree of specific risk to the index that would not be well hedged with the broad-based index future. Different market regimes were examined, since variance-covariance matrices of returns are not static over time, and volatility and implied volatility measures were factored into the selection process as well.

OneChicago and NQLX announced their initial listing for stock futures trading earlier this year. This preliminary list consists of 71 underlying stocks for OneChicago and 50 for NQLX. These are drawn a variety of sectors, somewhat skewed towards pharmaceuticals & biotechnology, computers & software and the communications sector. Diversified financial services firms are well represented and include Bank One, Bank of America, Citigroup, JP Morgan Chase, Merrill Lynch, and Morgan Stanley Dean Witter. Not surprisingly, 43 securities futures contracts are common to both lists, placing the rivalry between the two exchanges in sharp focus. NQLX intends to enrich its offerings with additional securities futures and, contrary to OneChicago, it does not plan to offer narrow-based indices at this time.

Looking Ahead

The prospects appear favorable for OneChicago and Nasdaq Liffe. The CBOE-CME-CBOT joint venture is a historic development in Chicago, combining the experience and expertise of the three leading US derivatives exchanges. Grounded in pragmatism, OneChicago promises to unite Chicago liquidity on one screen. There are approximately 7,000 members at the three exchanges, not counting for duplication, who will gain automatic access to the exchange through their membership in the participating exchanges. The LMM market model will ensure a two-sided market with continuous bids and offers. NQLX hopes that the strength of

Nasdaq's brand and its pre-eminent position in the US equity market will make it particularly attractive to institutional investors first and, subsequently, to the retail market in the US and later in Europe. NQLX has positioned itself more as a global exchange thanks primarily to the broad distribution of LIFFE CONNECT,™ which can be accessed from over 400 sites in 24 countries. The reach of the network will increase now that LIFFE has merged into Euronext.¹⁰ Network externalities will work in favor of NQLX's products, while LIFFE's USF experience assures that the system has the technical capacity for smooth trading.

This summer the CFTC and the SEC approved customer margin rules for single stock futures, a regulatory hurdle that had received much attention. While the tax treatment of these products is still to be determined, NQLX and OneChicago remain hopeful to begin trading securities futures later this fall.¹¹ Given that liquidity in the futures markets has traditionally gravitated to one exchange, it will be interesting to see who will be the winner once trading begins.

— Gloria Ikosi

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¹ Special thanks to William J. Rainer for his time and generosity in granting me a telephone interview in March 2002.

² The new Act recognizes that securities futures can be viewed as both securities and futures and places the new products under the joint regulation of the Commodity Futures Trading Commission ("CFTC") and the Securities and Exchange Commission ("SEC").

³ CBOE and CME will have approximately a 40% stake; CBOT's stake is around 10%.

⁴ In other words, a new member should decide what type of seat they need to have in one of the three exchanges; with the appropriate membership plan at the participating exchange, they will automatically become a member of OneChicago.

⁵ A membership list on the NQLX website (www.nqlx.com) lists 29 pre-approved clearing members and 25 pre-approved non-clearing members.

⁶ NQLX supports the idea of fungibility.

⁷ These will include market and financial surveillance, audits, trade practice investigations, and dispute resolution. NFA will process applications from Island members.

⁸ LIFFE introduced its UFS in January 2001 with the launch of 25 single stock futures based on highly traded and well capitalized stocks. The initial list covered eight countries, five sectors and three currencies. Since then, the number of contracts listed expanded to 97, covering 11 countries, 12 sectors, and denominated in five currencies. Trading volume in 2001 has been encouraging, with around 2.4 million USF contracts with a notional value of £5.43 billion (€ 8.80 billion).

⁹ Two research reports by the TowerGroup discuss the prospects of single stock futures and will be released this summer. Based on a press release, the reports support the thesis that, in the long-term, single stock futures will be a success, although volume might take time to build. Interest in these products on the part of retail investors is also anticipated.

¹⁰ In October 2001, LIFFE was taken over by the Paris-based derivatives exchange, Euronext. London will become the European hub for Euronext's derivatives business, which will migrate onto LIFFE CONNECT™

¹¹ Thirty days after the publication of margin rules in the Federal Register would give a theoretical terminus post quem for the onset of trading of these products.

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