

Financial Risk Manager

Handbook 2001-2002

2002 Update

Philippe Jorion

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Preface

This Web-downloadable document is an update to the Financial Risk Manager Handbook 2001-2002, which was published in the summer of 2001 as a preparation to the Financial Risk Manager (FRM) examination.

This update contains three parts. Part one provides an overview of the major developments in risk management since June 2001. It also reviews the Basel II proposals and proposed changes in accounting reporting standards. The second part consists of a list of corrections and clarifications to the FRM Handbook that were brought to our attention by readers with a keen eye. The third part provides detailed answers to selected questions from the 2001 FRM examination. The questions were selected based on their significance, as well as coverage of new material. Explanations are placed in the context of the topics covered in the handbook.

We thank you for your feedback, which is essential to help us improve future editions. By so doing, you help to maintain the high quality of the FRM designation. Please send your comments to: frmhandbook@garp.com

*Philippe Jorion
Irvine
June 2002*

PART
one

Recent Developments: 2001-2002

1. Overview

September 11

Without a doubt, the most important event of last year was the destruction of the World Trade Center on September 11. The terrorist attacks caused more than 2,700 deaths and at least \$21 billion in direct losses.¹ While direct losses were actually less than those of the 1995 Kobe earthquake, this event was premeditated and hence could be a harbinger of other wide-scale terrorist actions. As a result, September 11 had a major effect on a world economy already struggling in a recession.

September 11 caused major disruptions in financial markets. Downtown Manhattan is the most telecommunication-intensive location in the world. The attack destroyed or damaged data centers for Verizon (the largest U.S. telecommunications firm), Reuters (a major financial data provider), and the Bank of New York (one of the two big securities processing banks in the U.S.). Right after the attack, there were predictions of a meltdown in the financial system. Remarkably, however, trading resumed only after four days of hiatus. This speedy recovery was made possible by collective problem solving, including regulators who injected liquidity into the financial system. But in my view, risk management was also instrumental in engineering this turnaround.

The recovery was facilitated by risk managers' contingency planning process. For example, planning for the run-up to the century date change (Y2K) forced managers to develop strategies to cope with operational failures. As a result of their stress test exercises, risk managers had put in place "hot-backup" data centers, redundant computer systems, and standby dealing rooms. All of these precautionary measures facilitated a quicker recovery after September 11. Risk management can be compared to putting on a safety belt. You do not know what exactly could cause a crash, but the belt will protect you if this occurs.

Defaults: Enron and Argentina

Even apart from the terrorist attacks, 2001 was an eventful year. The U.S. economy officially entered a recession in March. This led to a widening of credit spreads and unprecedented defaults. Standard & Poor's, for instance, recorded 216 worldwide defaults on rated debt, with a value of \$116 billion. Notably, Enron went bankrupt on December 2. This was the biggest corporate default ever, measured in terms of company assets. A year earlier, Enron's stock market capitalization had reached \$66 billion, all of which has evaporated.

Enron has been widely considered as a failure of corporate governance and financial reporting. In its quest to increase the company's share price, top management had used dubious accounting methods to hide liabilities from Enron's balance sheet. The Enron failure has also brought increased scrutiny to executive stock options, which in this case seem to have induced management to inflate earnings artificially.

Another notable default is that of Argentina, which represents the largest sovereign default recorded so far, in terms of external debt. Argentina announced in November a restructuring of its local debt that was more favorable to itself. Some holders of credit default swaps argued that this was a "credit event," since the exchange was coerced, and that they were entitled to payment. Swap sellers disagreed. This became an unambiguous default, however,

¹ International Monetary Fund (2001), *World Economic Outlook* (December), p. 16.

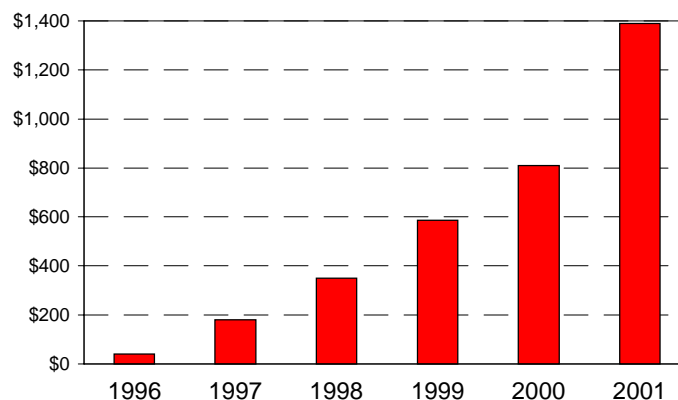
when Argentina announced in December it would stop paying interest on its \$135 billion foreign debt.

Nonetheless, the situation was unresolved for holders of credit swaps that expired just before the official default, some of whom filed lawsuits. These lawsuits hinge on the interpretation of a few sentences in the International Swap and Derivatives Association (ISDA) credit derivatives documentation. This illustrates the legal risk that continues to bedevil the credit derivatives markets. The ISDA is currently working to clarify the definition of a “credit event”.

On January 6, Argentina devalued its currency. The exchange rate promptly moved from 1 peso/dollar to more than 3 pesos. Such moves could have been factored into risk management systems by scenario analysis. What was totally unexpected, however, was the government’s announcement that it would treat differentially loans and deposits, forcing conversion of deposits to dollars but of loans to (devalued) pesos. In effect, this was an attempt to place the brunt of the devaluation on the banking system, which not-so-incidentally is majority foreign-owned. While risk managers had contemplated the effect of a devaluation, few had considered this possibility of such political actions.

Even so, financial markets have been remarkably little affected by these two major failures. In my view, this stability in the financial system can be attributed to the dispersion of risk exposures brought about by risk management techniques and instruments such as credit derivatives. Indeed the credit derivatives market has now reached \$1,400 billion, which is a two-third increase over last year.² This exponential growth is described in Figure 1.

Figure 1. Growth of Credit Derivatives (Billions of U.S. Dollars)



AIB

Among other fiascos, it is worth mentioning the \$691 million loss announced by Allied Irish Banks (AIB) in February 2002. The loss was caused by a “rogue” currency trader, John Rusnak, who was working at Allfirst Financial, a subsidiary of AIB located in Baltimore. AIB commissioned Eugene Ludwig, a former U.S. Comptroller of the Currency, to write an independent report into what had gone wrong. The report concluded that Mr. Rusnak had systematically falsified trading records and exploited a weak risk management system.³

² As of December 2001. See Patel, “The Vanilla Explosion,” Risk (February 2002).

³ This eye-opening report can be downloaded from the site www.aibgroup.com. More details on this story can be found, for example, at www.ft.com/aib.

Like Barings, this was an operational risk problem, or a failure of controls. Rusnak had a daily VAR limit of \$1.6 million only, yet was able to accumulate huge positions that were not recorded in the system. He created bogus options that gave the impression his position was hedged and financed his losses through the sale of actual, but unrecorded options.

The Ludwig report highlights a catalogue of inadequate bank controls and missed opportunities: trades were not confirmed, the trader was allowed to set inputs into the VAR system, and the risk-control unit reported to the same executive in charge of trading. Basically, Allfirst tried to minimize costs in the middle office. For instance, the bank refused to pay for an additional \$10,000 Reuter data feed that would have allowed the risk control unit to have an independent data source. Such miserly savings ended up costing AIB \$691 million, or 60 percent of its earnings in 2001.

Derivatives Markets

The global derivatives markets continued to grow in 2001. As Table 1 shows, OTC contracts grew to \$111.1 trillion in notional amounts, an exchange-traded to \$23.5 trillion, for a total market size of \$133 trillion, up 23 percent from the year before. The largest fraction of this growth can be attributed to interest rate swaps. Remarkably, derivatives markets have more than doubled relative to the first BIS survey in early 1995.

Table 1. Global Derivatives Markets: 1994-2001
(Billions of U.S. dollars)

	Notional amounts			
	1994	1999	2000	2001
OTC Instruments	47,530	88,201	95,199	111,115
Foreign exchange contracts	13,095	14,344	15,666	16,748
Forwards and forex swaps	8,699	9,593	10,134	10,336
Currency swaps	1,957	2,444	3,194	3,942
Options	2,379	2,307	2,338	2,470
Interest rate contracts	26,645	60,091	64,668	77,513
FRAs	4,597	6,775	6,423	7,737
Swaps	18,283	43,936	48,768	58,897
Options	3,548	9,380	9,476	10,879
Equity-linked contracts	579	1,809	1,891	1,881
Forwards and swaps	52	283	335	320
Options	527	1,527	1,555	1,561
Commodity contracts	318	548	662	598
Others	6,893	11,408	12,313	14,375
Exchange-Traded Instruments	8,838	13,528	14,184	23,541
Interest rate contracts	8,380	11,669	12,626	21,614
Futures	5,757	7,914	7,892	9,137
Options	2,623	3,755	4,734	12,477
Foreign Currency Contracts	88	59	95	89
Futures	33	37	74	66
Options	55	22	21	23
Stock index contracts	370	1,800	1,463	1,838
Futures	128	343	342	295
Options	242	1,457	1,121	1,543
Total	55,910	99,870	107,825	132,729

Regulatory Developments

On the regulatory front, the most important developments are the continuing refinements brought to the revision of the Basel Capital Accord. These are covered in Section 2, which discusses the timeline for implementation, as well as major potential modifications.

Finally, Section 3 discusses accounting developments from the Financial Accounting Standards Board (FASB) and International Accounting Standards Board (IASB). Accounting standards have become a hotly debated issue since Enron's bankruptcy, which has exposed flaws in U.S. financial reporting standards.

2. Update on Basel II

2.1 Timeline

In January 2001, the Basel Committee on Banking Supervision issued a set of proposals for a new Capital Accord that would provide a comprehensive update to the 1988 Accord. Originally, the new Accord, called "Basel 2," was to be finalized by year-end 2001, with implementation by the end of 2004.

The Committee received more than 250 comments on its January 2001 proposals. While there was widespread recognition that the proposals were a step in the right direction, there was also some concern that the proposed rules were too complex. In addition, there was some political opposition, notably from the German government, to increased capital requirements for loans to small and medium-size enterprises, which would result in higher borrowing costs for these companies.

In November 2001, the Committee released a list of potential modifications to the initial proposals. The Committee also initiated a set of Quantitative Impact Studies (QIS) to assess the impact of the proposed capital requirements on the banking system.

In May 2002, the Committee announced that implementation had been pushed back to the end of 2006. It plans to launch a new QIS study in October 2002, with more than 300 banks involved in the exercise. New proposals will be issued in spring 2003, with final rules published by the end of 2003.⁴

2.2 Potential Modifications

The following is a summary of the proposed modifications to the January 2001 document. These are described in more detail in the document www.bis.org/bcbs/capotenmodif.pdf.

2.2.1 Operational Risk

⁴ The latest news on the Basel II proposals can be found at www.bis.org/publ/bcbsca.htm. The latest postponement is described in "Capital requirement plan for banks delayed," *Financial Times*, May 13, 2002

The Committee has concluded that the target 20% allocation of regulatory capital to operational risk is too high. This has been reduced from 20% to 12%, with a further reduction potentially available under the Advanced Measurement Approach (AMA).

2.2.2 Risk Weight Curves

The Committee has provided a new set of corporate, retail, and residential mortgage risk weight curves. These curves relate the probability of default (PD) to capital requirements. For instance, the corporate risk weight curve has been modified as indicated in Table 2. The curve is less steep and generally lower than in the original 2001 document. For instance, the capital charge for a loan with a 1% probability of default is now 8.0% of the notional instead of 10.0%.

Table 2. Corporate Weight Curve

Probability of Default (bp or %)	IRB Capital Requirement (Corporate)	
	Original	Modified
3 bp	1.1%	1.4%
10 bp	2.3%	2.7%
25 bp	4.2%	4.3%
50 bp	6.4%	5.9%
75 bp	8.3%	7.1%
100 bp	10.0%	8.0%
1.25%	11.5%	8.7%
1.50%	12.9%	9.3%
2.00%	15.4%	10.3%
2.50%	17.6%	11.1%
3.00%	19.7%	11.9%
4.00%	23.3%	13.4%
5.00%	26.5%	14.8%
10.00%	38.6%	21.0%
20.00%	50.0%	30.0%

2.2.3 Credit Risk Mitigation (*Section 31.4.3 in FRM Handbook*)

Previously, risk weights were computed using a w factor, which represents a “floor” to cover residual risks. For most transactions, w was set at 15%. This floor is now eliminated, and risks will be assessed through pillar two, or supervisory review.

3. Update on Accounting Standards

3.1 Financial Accounting Standards (FAS)

3.1.1 The Enron Fallout

The Enron failure has highlighted deficiencies in the application of U.S. financial reporting standards. Enron made extensive use of “special-purpose entities” (SPEs), which are financial vehicles used to convert income-producing assets, such as loans, bonds, credit-card receivables, or pipelines into cash. In a “clean” securitization process, a company transfers assets to an SPE, in return for cash, accounting for the deal as a sale, thus removing the assets from the balance sheet.

In the case of Enron, however, the company still kept an equity stake in the SPE. Even so, Enron was not required to consolidate, i.e. include, its interests in the SPE on its balance sheet. This was allowed because the SPE was structured to have “sufficient independent economic substance,” which was defined as a situation where outside investors have an equity stake of at least 3% of the SPE’s capital. Enron only had to show “equity in the SPE affiliate” on its balance sheet. The end result was that Enron was able to move assets and debt out of its balance sheet, artificially lowering its leverage. This increased Enron’s credit rating and made its stock look more desirable than it really was.⁵

Furthermore, Enron gave outside investors guarantees of the SPE’s performance. In most cases, such support operations are “optional.” Problems arise with explicit guarantees, however. Enron’s most controversial SPEs carried guarantees that effectively placed all the risk on Enron itself without being reflected on Enron’s balance sheet.

When the SPEs began to perform poorly, Enron was obligated to prop them up with cash or its own shares. As the size of those liabilities became clear, Enron’s stock collapsed and the company was forced into bankruptcy. Compounding the scandal were conflicts of interest created by some Enron executives’ personal holdings in the SPEs.

The FASB is currently revising its rules to make it harder for companies to keep SPEs off the books. The new proposal is based on two provisions. First, to qualify for off-balance sheet treatment, a SPE must contain at least 10% of outside equity, up from the current 3%. Second, the outside equity should really be at risk, and as such cannot be covered by side agreements with the parent company.

In addition, the FASB is reexamining the accounting treatment of guarantees. Banks, for instance, provide financial letters of credits, which are among the riskiest lines of credit they can extend. They are called upon only at the worst possible time, i.e. when the bank’s client is failing. Guarantees are also commonly found in SPE situations, as was the case with Enron. The new rules would require the guarantor to recognize a liability equal to the market value of the guarantee at inception.

⁵ For more details, see: Special Investigative Committee of the Board of Directors of Enron Corp. (2002), *Report of the Investigation* (“Powers Report”), Enron.

3.1.2 Update on FAS 133 (*FRM Handbook page 609*)

Definition of Derivative

FAS 133 provides a formal and complete definition of a **derivative instrument**. This is defined as a contract with all three of the following characteristics:

- (i) It has one or more *underlyings* and one or more *notional amounts*. The underlying is that from which the contract derives its value (e.g. an asset price, reference rate or index--- such as a stock, bond, currency, or a commodity). The underlying is a market-related characteristic that gives rise to changes in value. As an example, the value of a futures contract for oil will change as the price of oil changes; the underlying is the price of oil, not oil itself. The notional amount is a number of currency units, shares, or other physical units specified in the contract. The payoff on the derivative instrument is a function of the notional and the underlying. For instance, a NYMEX oil futures contract has a notional of 1,000 barrels. The dollar payment is the change in price per barrel times the notional.
- (ii) It requires an *initial investment* of zero or “smaller” than would be required for other types of contracts that would be expected to have a similar response to changes in market factors. For instance, the initial investment in a forward or swap contract is zero. For an option, the premium is much less than the cost of taking an equivalent position in the underlying asset.

In May 2002, the FASB proposed an amendment as follows:

- a. For an option-based contract, it has an initial net investment equal to the fair value of the option component.
- b. For other types of derivatives, it requires an initial net investment that is less than 5 percent of the fully prepaid amount.

The purpose of this amendment is to eliminate the subjective evaluation of “smaller,” and to ensure consistency in the accounting treatment of contracts with comparable characteristics, including SPEs. Note that currently, this is just a proposal.

- (iii) Its terms require or permit *net settlement* (e.g. interest rate swaps). Alternatively, there is a market mechanism for net settlement (e.g. liquidating a futures contract by going back to the exchange). Or, the asset to be delivered is readily convertible into cash or is itself a derivative instrument (e.g. an option on futures).

Notwithstanding these conditions, the following contracts do not fall in this category:

- (a) “regular-way” securities trades (e.g. a transaction to purchase a stock to be settled in the normal 3-day period)
- (b) normal purchases and sales (of non-financial instruments such as machinery, in the course of normal business)
- (c) traditional insurance contracts (such as life insurance or property and casualty insurance, where the payoff is the result of an identifiable event instead of the change in the underlying)
- (d) certain financial guarantee contracts (where the payoff is a credit event instead of the change in the underlying, but only when the buyer of the guarantee is exposed to a loss on the underlying asset)
- (e) certain Over-The-Counter contracts, such as weather derivatives, options on real estate and capital goods (which are not readily convertible into cash)
- (f) derivatives that serve as an impediment to sales accounting.

To these, the May 2002 proposed amendment adds investments in life insurance, certain investment contracts, and loan commitments.

In addition, FAS 133 excludes:

- (g) contracts indexed to an entity's own stock, and
- (h) executive stock options.

Another provision of FAS 133 is the treatment of *embedded derivatives*. An example would be a structured note where the payoff is a function of the return on the S&P index. Under FAS 133, such "hybrid" instrument should be split between the "host contract" and the "embedded derivative" if and only if all of the following conditions are met. When this is the case, the embedded derivative component is subject to the FAS 133 rules.

- (1) The economic characteristics of the contract and embedded derivative are not "clearly and closely related."
- (2) The fair market value for the hybrid contract otherwise would not be reported on the balance sheet.
- (3) The embedded derivative would meet the definition of a derivative on a stand-alone basis.

A few examples illustrate these rules. Hybrid securities held in the trading portfolio do not need to be separated, because they are marked-to-market anyway (condition (2) is not satisfied).

In other situations, one has to interpret the terms "clearly and closely related". Consider a corporate callable bond. Conditions (2) and (3) are satisfied. Condition (1), however, is not satisfied. The call option to the issuer involves an underlying, the interest rate, which also drives the value of the host contract, which is straight debt. The host contract and derivative are closely related. So, there is no need to separate the components.

Consider next a convertible bond. Conditions (2) and (3) are satisfied. The option feature is driven by the stock price, which is not related to the interest rate in the host bond contract. As a result, condition (1) is generally satisfied. FAS 133 thus requires an investor in a convertible bond to separate the option feature from the host contract. On the other hand, this does not apply to the issuer of a convertible bond, since the derivative is indexed to the entity's own stock (condition (3) is not satisfied due to exclusion (g)).

General Evaluation of FAS 133

FAS 133 was widely viewed as a complex set of standards. The initial rules were published in a 245-page document, which is comparable to a course textbook. Later amendments are also very long. When the standards were initially proposed, there was some opposition, in part due to the complexity but also coming from banks that feared that derivatives usage would be adversely affected. Far from it, however, derivatives have continued their unabated growth.

The fear was that FAS 133 would increase the volatility of reported earnings. This is not always the case, however. When constructed as effective hedges, adding derivatives has a minimal impact on earnings volatility. FAS 133, however, does penalize "macro hedges."

Hedging treatment is only allowable when hedging effectiveness is high and is defined in terms of one class of risk only. Thus, macro hedging does not benefit from hedge treatment and any movement in derivatives value will flow into earnings. Similarly, FAS 133 could discourage the trend toward firmwide risk management.

As an example, consider a car manufacturer that has a yen exposure not because it exports to Japan but because its competitors are Japanese. The firm has no yen transactions on its books, but would reduce its risk by hedging its yen exposure. Such a hedge does not qualify for hedge accounting. Derivatives profits and losses have to be shown in earnings.

On the other hand, the hedge should offset movements in operating cash flows. When the yen depreciates, domestic sales and profits should suffer but at the same time gains should accrue on the hedges. So, there should be some economic offsets in earnings.

3.2 International Accounting Standards (IAS)

The International Accounting Standards Committee (IASC) was set up in 1973 to champion global accounting standards. IASC was superseded by the International Accounting Standards Board (IASB) in 2001. International securities regulators gave IASB a mandate to devise common reporting standards acceptable for listing on any stock exchange. The European Union, in particular, will require all EU companies to comply with IASB standards by 2005.

IASB publishes its Standards in a series of pronouncements called International Financial Reporting Standards (IFRS). It has also adopted the body of Standards issued by the IASC. Those pronouncements continue to be designated “International Accounting Standards” (IAS). IASB has started the revision process for 12 of the 34 active standards. Its proposals include stricter reporting for special purpose companies (SPC), which were involved in the Enron scandal.⁶

There are also differences of opinion with respect to the philosophy of accountings standards. Should they be guided by principles or by detailed rules? Both approaches have strengths and weaknesses. U.S. regulators tend to emphasize prescriptive rules, which may encourage companies to exploit loopholes in the system. Indeed, Enron devoted much effort to “game” the financial reporting system. Enron may have followed the letter, but certainly not the spirit of the system. On the other hand, guiding principles may give too much leeway in interpretation. A proper balance between the two approaches will be required.

The FASB is not bound to adopt IASB’s standards, although each has agreed to try to converge to the highest quality accounting treatment. (This is an agreement in principle, though.)

Among important standards are:

IAS 30: Disclosures in the Financial Statements of Banks and Similar Financial Institutions

IAS 32: Financial Instruments: Disclosure and Presentation

IAS 33: Earnings per Share

IAS 34: Interim Financial Reporting

⁶ For further details, see the site www.iasc.org.uk

IAS 37: Provisions, Contingent Liabilities and Contingent Assets
 IAS 39: Financial Instruments: Recognition and Measurement

3.2.1 IAS 37

IAS 37, which came in force after July 1999, deals with provisions, contingent liabilities and assets. The key principle is that a provision should be recognized only when there is a liability i.e. a present obligation resulting from past events. IAS 37 thus aims to ensure that only genuine obligations are recognized in the financial statements, unlike contingent liabilities. (*FRM Question 57 deals with IAS37; the answer is explained in Part 3.*)

IAS 37 requires a firm to make provisions on the balance sheet if, and only if:

- a present obligation (legal or constructive) has arisen as a result of a past event (the obligating event),
- payment is probable ('more likely than not'), and
- the amount can be estimated reliably.

An obligating event is an event that creates a legal or constructive obligation and, therefore, results in a company having no realistic alternative but to settle the obligation. A *constructive* obligation arises if past practice creates a valid expectation on the part of a third party, for example, a retail store that has a long-standing policy of allowing customers to return merchandise within, say, a 30-day period. A *legal* obligation arises when a lawsuit is filed as a result of a past event and there is a high probability of a settlement.

3.2.2 IAS 39

IAS 39, which came in force after January 2001, deals with financial instruments (except specific categories under other rules). Covered instruments include:

- Cash
- Demand and time deposits
- Commercial paper
- Accounts, notes, and loans receivable and payable
- Debt and equity securities
- Asset-backed securities, such as collateralized mortgage obligations, repurchase agreements
- Derivatives
- Leases, right and obligations of insurance contracts and pension contracts

The key principle behind IAS 39 is that all financial instruments must be recognized on the balance sheet. Initial measurement is at cost, which is the fair value of whatever was paid or received. Subsequent measurement depends on the category, as shown in Table 3. For derivatives, changes in values must flow into earnings, except for hedges. Note that this is broader than FAS 133, which only applies to derivatives.

Hedge Accounting

For accounting purposes, hedging means designating a derivative financial instrument as an offset in net profit or loss to the change in fair value or cash flows of a hedged item. The designation must be in writing, up front, and be consistent with an established risk management strategy. As with FAS 133, IAS 39 recognizes *fair value hedges*, *cash flow hedges*.

Table 3. Measurement Method for Financial Instruments

Financial Instrument	Description	Measurement Basis
Held-to-maturity investments, loans and receivables	Fixed maturity investments that the company intends to hold to maturity	Amortized <u>cost</u> , subject to impairment recognition
Available for sale financial assets	Includes: <ul style="list-style-type: none"> • Fixed maturity investments that the enterprise either does not intend or is not able to hold to maturity • Equity investments with a quoted market price, or whose fair value can be estimated 	<u>Fair value</u> : Company has a one-time, firm-wide choice of reporting changes in fair value (a) in net profit or loss or (b) in equity until the asset is sold, at which time the cumulative gain or loss is reported in net profit or loss
Financial assets/liabilities held for trading	Financial assets/liabilities acquired for the purpose of generating a profit from short-term fluctuations in price (including all derivatives)	Fair value, changes in fair value in net profit or loss
Other financial liabilities	Most financial liabilities, other than those held for trading	Original amount less principal repayments and amortization of discounts and premiums



PART
two

Clarifications and Corrections

Corrected entries are in **bold**.

P.22. (Clarification-insert following boxed text after last paragraph)

Note that modified duration should be computed consistently with the compounding method for yields. Here, we use semi-annual compounding and a 6% annualized yield, which explains why Macaulay duration is divided by $(1+6/200)=1.03$. Had we used annual compounding, the correction would have been $(1+6/100)=1.06$. The modified duration depends on the compounding method since it is applied to a change in yield that itself depends on the compounding method.

P.25. (Correction-change entries in fourth line from bottom of page and in Table 1-3)

The entries x_1 and x_2 should be changed to $x_1=$ **0.817** and $x_2=$ **1.354**. The corrected table is as follows. Note that this assumes semi-annual compounding.

	Target	Bond 1	Bond 2	Portfolio
Maturity	10	1	30	
Coupon	6%	0%	0%	
Yield	6%	6%	6%	
Price	\$100.00	\$94.26	\$16.97	
Mod Duration	7.44	0.97	29.13	7.44
Convexity	68.78	1.41	862.48	199.26
Number (x_i)	1	0.817	1.354	
Dollar Amount	\$100.00	\$77.02	\$22.98	\$100.00
Weight (w_i)		77.02%	22.98%	100.00%

P.50. (Clarification-insert “jointly” in sentence 3 lines from bottom and in “key concept sentence; add boxed paragraph below as footnote at end of “In other words...” sentence)
 “A linear combination of normal variables has itself a normal distribution.” Insert **jointly** before normal.

Footnote:

Strictly speaking, this is only true under either of the following conditions:
 1) the univariate variables are independently distributed, or
 2) the variables are multivariate normally distributed (this invariance property also holds for jointly elliptically distributed variables).

P. 52. (Clarification-replace the second and third paragraphs as follows)
 (The notations in the first paragraph are now more consistent with those in the next paragraph)

A random variable X is said to have a **lognormal distribution** if its logarithm $Y=\ln(X)$ is itself normally distributed. This is often used for continuously compounded returns, defining $Y=\ln(P_1/P_0)$. Because the argument X in the logarithm function must be positive, the price P_1 can never go below zero. Large and negative large values of Y correspond to P_1 converging to, but staying above, zero.

The lognormal density function has the following expression

$$f(x) = \frac{1}{x\sqrt{2\pi\sigma^2}} \exp\left[-\frac{1}{2\sigma^2}(\ln(x)-\mu)^2\right], x > 0 \quad (2.44)$$

Note that this is more complex than simply plugging $\ln(x)$ in Equation (4.), as x also appears in the denominator. Its mean is

$$E[x] = \exp\left[\mu + \frac{1}{2}\sigma^2\right] \quad (2.45)$$

and variance $V[X]=\exp[2\mu+2\sigma^2]-\exp[2\mu+\sigma^2]$. The parameters were chosen to correspond to the mean and variance of the normal variable, $E[Y]=E[\ln(X)]=\mu$ and $V[Y]=V[\ln(X)]=\sigma^2$.

Conversely, if we set $E[X]=\exp[r]$, the mean of the associated normal variable is $E[Y]=E[\ln(X)]=(r-\sigma^2/2)$. This adjustment is also used in the Black-Scholes option valuation model, where the formula involves a trend in $(r-\sigma^2/2)$ for the log-price ratio.

P.336. (Correction-change \$205,055 in line 3 from bottom of page)

Solution to example 13-4. The computations are correct but there is a typo in the final answer, which should be \$206,055. This is indeed close to answer (c), which is \$206,036.

P.423. (Correction-replace entry of 1.6595 in two lines by 1.6637)

Last line and fourth line from bottom. The current spot rate should be **1.6637** instead of 1.6595. The answer is correct.

P.441. (Clarification-insert in sentence 8 lines from bottom)

“... otherwise, with probability p_i , **such that $E[b_i]=p_i$** ,”

(Clarification-insert in Equation (18.3))

$$E[CL] = \sum_{i=1}^N E[b_i] \times CE_i \times (1 - f_i) = \sum_{i=1}^N p_i \times CE_i \times (1 - f_i)$$

P.454. (Clarification-replace explanation for Example 18-7 by following framed text)

Solution to example 18-7. FRM Exam 2000--Question 51 (A similar question is 38 in FRM 2000 Exam). The explanation of the solution uses a shortcut, which is an approximation.

a) We first build a table of joint probabilities for the four events of joint defaults for the two assets. We know that $P(1=\text{default}, 2=\text{default})=3\%$. Hence, $P(1=\text{default}, 2=\text{no default})=10\%-3\%=7\%$. Similarly, $P(1=\text{no default}, 2=\text{default})=20\%-3\%=17\%$. The remaining probability must be 73%.

	1=Default	1=No default	Total prob. for 2
2=Default	3%	17%	20%
2=No default	7%	73%	80%
Total prob. for 1	10%	90%	

Next we list the probabilities of each event and associated losses. For instance, when 1 defaults but not the other, the loss is £60m, with probability of 7%. This gives a total expected loss of $7\% \times 60 + 17\% \times 60 + 3\% \times 120 = \mathbf{\text{£18 million}}$.

Event	Probability	Loss	Prob. times loss
1=Default 2=No	7%	60	4.2
1=No, 2=Default	17%	60	10.2
1 & 2=Default	3%	120	3.6
Total			18

This is closest to answer (a).

P.757. (Correction-replace explanation for Example 31-2 by following boxed text)

The answer for question 189/Regulation for FRM Exam 1999 is incorrect. The correct choice is (d), which is that only equity (from the choice given) is part of Tier 1. If both Tier 1 and 2 are considered, then (c) is the correct answer, as subordinated debt would be allowed as well.

d) Allowable capital for Tier 1 includes equity capital only (item (I)). Subordinated debt (item (IV)) counts for Tier 2 capital but not Tier 1 capital.



PART
three

Selected FRM Questions and Answers

Part I. Quantitative Methods

FRM Question 104.

When the maturity of a plain coupon bond increases, its duration increases:

- Indefinitely and regularly
- Up to a certain level
- Indefinitely and progressively
- In a way dependent on the bond being priced above or below par

FRM Question 68.

EVT, Extreme Value Theory, helps quantify two key measures of risk.

- The magnitude of an 'X' year return in the loss in excess VaR
- The magnitude of VaR and the level of risk obtained from scenario analysis
- The magnitude of market risk and the magnitude of operational risk
- The magnitude of market risk and the magnitude of credit risk

FRM Question 82.

The VaR of one asset is 100; the VaR of another asset is 150. If their combined VaR is 220, what is their correlation?

- 0.92
- 0.53
- 0.53
- 0.92

FRM Question 76.

A martingale is a:

- Zero-drift stochastic process.
- Chaos-theory-related process.
- Type of time series.
- Mean-reverting stochastic process.

Answer to FRM Question 104-see Section 1.2.4.

- With a fixed coupon, the duration goes up to the level of a consol with the same coupon.

Answer to FRM Question 68-see Section 2.4.2.

a. EVT allows risk managers to smooth distributions in the tails, i.e. beyond the usual VAR confidence levels. Answers (c) and (d) are too general. Answer (b) is also incorrect as EVT is based on historical data instead of scenario analyses.

Answer to FRM Question 82-see Section 3.3.

- This assumes jointly normal distributions. Then VAR is proportional to the volatility. Since $\sigma^2 = \sigma_1^2 + \sigma_2^2 + 2\rho\sigma_1\sigma_2$, we have $\rho = (220^2 - 100^2 - 150^2) / (2 * 100 * 150) = 0.53$

Answer to FRM Question 76-see Section 4.1.

- A martingale is a stochastic process with zero drift $dx = \sigma dz$, where z is a Wiener process, i.e. such that $dz \sim N(0, dt)$. The expectation of future value is the current value: $E[x_T] = x_0$.

Part II. Capital Markets

FRM Question 93.

Calculate the price of a 1-year forward contract on gold. Assume the storage cost for gold is \$5.00 per ounce with payment made at the end of the year. Spot gold is \$290 per ounce and the risk free rate is 5%.

- a. \$304.86
- b. \$309.87
- c. \$310.12
- d. \$313.17

FRM Question 89.

Estimate the forward rate of a 6-month EUR/USD foreign exchange rate contract. USD LIBOR is 6% and EURIBOR is 4%. The current exchange rate is 0.8800 USD per EUR.

- a. 0.9240
- b. 0.9064
- c. 0.8976
- d. 0.8888

FRM Question 111.

Consider the following bearish option strategy of buying one at-the-money put with a strike price of \$43 for \$6, selling two puts with a strike price of \$37 for \$4 each and buying one put with a strike price of \$32 for \$1. If the stock price plummets to \$19 at expiration, calculate the net profit/loss per share of the strategy.

- a. -2.00 per share
- b. Zero – no profit or loss
- c. 1.00 per share
- d. 2.00 per share

FRM Question 77.

Given the following volatilities for foreign exchange rates:

JPY/USD at 9%

JPY/EUR at 11%

EUR/USD at 7%,

What is the correlation between JPY/EUR and EUR/USD?

- a. -58%
- b. 62%
- c. 34%
- d. -34%

FRM Question 95.

The option-adjusted duration of a callable bond will be close to the duration of a similar non-callable bond when the:

- a. Bond trades above the call price.
- b. Bond has a high volatility.
- c. Bond trades much lower than the call price.
- d. Bond trades above parity.

FRM Question 119.

A corporate bond is convertible at 40 and the corporation has called it for redemption at 106. The bond is currently selling at 115 and the stock's current market price is 45. Which of the following would a bondholder most likely do?

- Sell the bond.
- Convert the bond into common stock.
- Allow the corporation to call the bond at 106.
- None of the above.

FRM Question 117.

What is the main reason why convertible bonds are generally issued with a call?

- To make their analysis less easy for investors.
- To protect against unwanted takeover bids.
- To reduce duration.
- To force conversion if in-the-money.

FRM Question 70.

Consider the following 6x9 FRA. Assume the buyer of the FRA agrees to a contract rate of 6.35% on a notional amount of 10 million USD. Calculate the settlement amount of the seller if the settlement rate is 6.85%. Assume a 30/360 day count basis.

- 12,500
- 12,290
- +12,500
- +12,290

FRM Question 73.

The following instruments are traded, on an ACT/360 basis:

3-month deposit (91 days), at 4.5%

3-6 FRA (92 days), at 4.6%

6-9 FRA (90 days), at 4.8%

9-12 FRA (92 days), at 6%

What is the 1-year interest rate on an ACT/360 basis?

- 5.19%
- 5.12%
- 5.07%
- 4.98%

Answer to FRM Question 93-see Section 5.2.3.

b. Assuming continuous compounding, the present value factor is $PV = \exp(-0.05) = 0.951$. We must have $F \times PV = (S + C \times PV)$, since the storage cost C must be evaluated as of now. This gives $F = (\$290 + \$5 \times 0.951) / 0.951 = \309.9

Answer to FRM Question 89-see Section 5.2.3.

d. Assume continuous compounding. Then $F \times PV(\$1) = S \times PV(1)$, and $F = \$0.88 \times \exp(-0.04/2) \times \exp(0.06/2) = 0.888$. Note that the price of the Euro is more expensive forward than spot, as Euro rates are lower than US rates.

Answer to FRM Question 111-see Section 6.1.3.

d. All of the puts will be exercised, leading to a payoff of $+(43-19)-2(37-19)+(32-19)=+1$. To this, we add the premiums, or $-6+2(4)-1=+1$. Ignoring the time value of money, the total payoff is \$2.

Answer to FRM Question 77-see Section 6.2.2.

a. This is the Margrabe formula, Equation (6.20). We have $\sigma_{23}^2 = \sigma_{12}^2 + \sigma_{13}^2 - 2\sigma_{12}\sigma_{13}\rho$. So, $\rho = (9^2 - 7^2 - 11^2) / (2 * 7 * 11) = -0.578$. Note that the order is important. This derived from the log-relationship, $\ln S(\text{JPY}/\text{USD}) = \ln S(\text{JPY}/\text{EUR}) + \ln S(\text{EUR}/\text{USD})$

Answer to FRM Question 95-see Section 7.5.2.

c. A callable bond, or MBS, will trade like a regular bond when the option is out-of-the-money. Since the borrower will exercise the option if the bond price tends to go higher than the strike price, the option will be OTM when the bond price is low. Answers (a) and (d) are the same and wrong. Alternatively, the value of the option will be low if the volatility is low. So, (b) is also wrong.

Answer to FRM Question 119-see Section 9.2.2

a. The conversion rate is expressed here in terms of the conversion price. The conversion rate for this bond is \$100 into \$40, or 1 bond into 2.5 shares. Immediate conversion will yield $2.5 \times \$45 = \112.5 . The call price is \$106. Since the market price is higher than the call price and the conversion value, and the bond is being called, the best value is achieved by selling the bond.

Answer to FRM Question 117-see Section 9.2.2.

d. Companies issue convertible bonds because the coupon is lower than for regular bonds. In addition, these bonds are callable in order to force conversion into the stock at a favorable ratio. In question 119, for instance, conversion would provide equity capital to the firm at the price of \$40, while the market price is at \$45.

Answer to FRM Question 70-see Section 8.1.

b. The seller of an FRA agrees to receive fixed. Since rates are now higher than the contract rate, this contract must show a loss. The loss is $\$10,000,000(6.85\% - 6.35\%)(90/360) = \$12,500$ when paid in arrears, i.e. in 9 months. On the settlement date, i.e. in 6 months, the loss is $\$12,500 / (1 + 6.85\% \cdot 0.25) = \$12,290$.

Answer to FRM Question 73-see Section 8.1

c. We can compute the future value factor for each leg: for 3-mo, $(1 + 4.5\% \cdot 91/360) = 1.011375$, for 3x6, 1.011756, for 6x9, 1.01200, for 9x12, 1.01533. The product total is $1.05142 = (1 + r \cdot 365/260)$ for 365 days, which gives $r = 5.0717\%$.

Part III. Market Risk Management

FRM Question 114.

Rank the following portfolios from least risky to most risky. Assume 252 trading days a year and there are 5 trading days per week.

	Portfolio	VaR	Holding Period in Days	Confidence Interval
	1	10	5	99
	2	10	5	95
	3	10	10	99
	4	10	10	95
	5	10	15	99
	6	10	15	95
a.	5,3,6,1,4,2			
b.	3,4,1,2,5,6			
c.	5,6,1,2,3,4			
d.	2,1,5,6,4,3			

FRM Question 100.

Stress testing is best defined as:

- The absolute maximum loss that a portfolio can incur.
- As alternative to risk measurement to replace VaR.
- A 99% confidence level of risk.
- A way of identifying extreme price changes on a portfolio.

FRM Question 101.

What is the scenario most used for stress-test of firm-wide positions?

- The 1987 equity crash
- Money tightening by central banks
- Failure of a specific country
- Widening of credit spreads

FRM Question 122.

What is the most important consequence of an option having a discontinuous payoff function?

- An increase in operational risks, as the expiry price can be contested or manipulated if close to a point of discontinuity
- When the underlying is close to the points of discontinuity, a very high gamma
- Difficulties to assess the correct market price at expiry
- None of the above

FRM Question 86.

If two securities have the same volatility and a correlation equal to -0.5 , their minimum variance hedge ratio is:

- 1:1
- 2:1
- 4:1
- 16:1

FRM Question 96.

A company anticipates the purchase British pounds in 6 months. The standard deviation of the change in British pounds over a 6-month period is calculated to be 9%. The company chooses to hedge their exposure by buying future contracts on EUR. The standard deviation of the change in the futures price over a 6-month period is calculated to be 10% and the correlation coefficient between British pounds and EUR is 0.70. Calculate the optimal hedge ratio.

- a. 1.0
- b. 0.90
- c. 0.70
- d. 0.63

FRM Question 123.

Which of the following 'Greeks' contributes most to the risk of an option that is close to expiration and deep in the money?

- a. Vega
- b. Rho
- c. Gamma
- d. Delta

FRM Question 113.

An option portfolio exhibits high unfavorable sensitivity to increases in implied volatility and while experiencing significant daily losses with the passage of time. Which strategy would the trader most likely employ to hedge his portfolio?

- a. Sell short dated options and buy long dated options.
- b. Buy short dated options and sell long dated options.
- c. Sell short dated options and sell long dated options.
- d. Buy short dated options and buy long dated options.

FRM Question 107.

An operator has bought a short condor. His position is:

- a. Delta-negative, vega-negative
- b. Delta-negative, vega-positive
- c. Delta-neutral, vega-negative
- d. Delta-neutral, vega-positive

FRM Question 79.

A bank has sold USD 300,000 of call options on 100,000 equities. The equities trade at 50, the option strike price is 49, the maturity is in 3 months, volatility is 20%, and the interest rate is 5%. How does it the bank delta hedge? (round to the nearest thousand share)

- a. Buy 65,000 shares
- b. Buy 100,000 shares
- c. Buy 21,000 shares
- d. Sell 100,000 shares

FRM Question 80.

Which position is most risky?

- a. Gamma-negative, delta-neutral
- b. Gamma-positive, delta-positive

- c. Gamma-negative, delta-positive
- d. Gamma-positive, delta-neutral

FRM Question 92.

Under usually accepted rules of market behavior, the relationship between parametric delta-normal VaR and historical VaR will tend to be:

- a. Parametric VaR will be higher
- b. Parametric VaR will be lower
- c. It depends on the correlations
- d. None of the above

Answer to FRM Question 114-see Section 11.3.

a. We assume a normal distribution and i.i.d. returns, which lead to the square root of time rule and compute the daily standard deviation. E.g., for portfolio 1, $SD = 10 / [\text{SQRT}(5) * 2.33] = 1.922$. This gives, respectively, 1.922, 2.719, 1.359, 1.923, 1.110, 1.570. So, portfolio 5 has the lowest risk and so on.

Answer to FRM Question 100-see Section 11.5.

d. Stress testing does not replace VAR, which has a probability attached to it. So, (b) is wrong. It does not forecast the worst loss, which would not be useful anyway, nor a fixed confidence level. Rather, it evaluates the effect of extreme price changes, not within the usual VAR framework, on the portfolio.

Answer to FRM Question 101-see Section 11.5.

a. This information is taken from Table 2, p.25, in: Committee on the Global Financial System (April 2001), "A survey of stress tests and current practice at major financial institutions", on the BIS web site (paper cgfs18.pdf).

Answer to FRM Question 122-see Section 12.3.2 and 15.2.1.

b. Answer (c) is not correct since the correct market price can be set at expiration as a function of the underlying spot price. The main problem is that the delta changes very quickly close to expiration when the spot price hovers around the strike price. This high gamma feature makes it very difficult to implement dynamic hedging of options with discontinuous payoffs, such as binary options.

Answer to FRM Question 86-see Section 14.2.1.

b. Set x as the amount to invest in the second security, relative to that in the first (or the hedge ratio). The variance is then proportional to $1 + x^2 + 2x\rho$. Taking the derivative and setting to zero, we have $x = -\rho = 0.5$. Thus one security must have twice the amount in the other.

Answer to FRM Question 96-see Section 14.2.1.

d. According to Equation (14.6), the optimal hedge ratio is $N^* = -\rho \sigma_S / \sigma_F$, where S represents the volatility of the asset to be hedged and F the hedging instrument. Hence, $N^* = -0.79\% / 10\% = -0.63$.

Answer to FRM Question 123-see Section 6.1.3. and 15.2.6.

d. A short-dated in-the-money option behaves essentially like delta in the underlying asset. The gamma is low, vega is low. There is also high theta, but this is not mentioned.

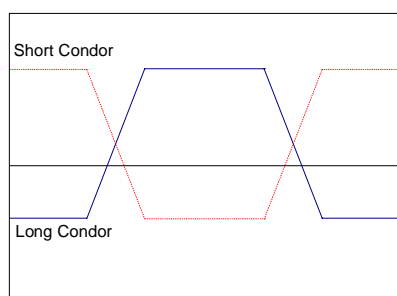
Answer to FRM Question 113-see Section 15.2.6.

b. Such a portfolio is short vega (volatility) and short theta (time). We need to implement a hedge that is delta-neutral and involves buying and selling options but with different maturities. Long positions in short-dated options have high negative theta and low positive vega. The target can be achieved by selling short-term options and buying long-term options.

	Theta	Vega
Short-dated:	-0.05	0.1
Long-dated:	-0.02	0.2
Target:	Positive	Positive
Combination (-1,1):	$0.05-0.02=0.03$	$-0.1+0.2=0.1$

Answer to FRM Question 107-see Section 6.1.3. and 15.2.6.

d. A “condor” position is akin to a “butterfly” but involves four options instead of three. The payoff pattern is described in Figure 1. A short condor involves, for instance, buying two options, a call and put each slightly out-of-the-money, and selling two other options that are much more out of the money. In the middle of the range, the position is dominated by the purchase of the two options, which gives a net delta-neutral and long volatility (vega positive) position.

Figure 1. Payoffs on Condor Positions**Answer to FRM Question 79-see Section 15.2.6.**

a. This is an at-the-money option with a delta of about 0.5. Table 15-1 shows a delta of 0.54. Since the bank sold calls, it needs to delta-hedge by buying the shares. With a delta of 0.54, it would need to buy 54,000 shares. Answer (a) is the closest.

Answer to FRM Question 80-see Section 15.2.1.

c. The worst combination involves some directional risk plus some negative gamma. Directional risk, delta-positive, could lead to a large loss if the underlying price falls.

Answer to FRM Question 92-see Section 17.2.1.

b. Parametric VAR usually assumes a normal distribution. Given that actual distributions of financial variables have fatter tails than the normal distribution, parametric VAR at high confidence levels will generally underestimate VAR.

Part IV: Credit Risk Management

FRM Question 5.

What is the approximate probability of exactly one default over the next year from a portfolio of 20 BBB-rated obligors? (Assume the 1-year probability of default for a BBB-rated counterparty to be 4% and obligor defaults to be independent from one another)

- a. 2%
- b. 4%
- c. 45%
- d. 96%

FRM Question 14.

To what sort of option on the counterparty's assets can the current exposure of a credit-risky position better be compared?

- a. A short call
- b. A short put
- c. A short knock-in call
- d. A binary option

FRM Question 2.

Which of the following is the best-rated country according to the most important ratings agencies:

- a. Argentina
- b. Brazil
- c. Mexico
- d. Peru

FRM Question 10.

Consider two bonds, one AA rated and the other B rated. Which of the following is true?

- a. The marginal default rate of the B rated bond declines over a long time period (say 10 years) compared with the AA rated bond
- b. The marginal default rate of the B rated bond increases over a long time period (say 10 years) compared with the AA rated bond
- c. The marginal rates of default stay roughly the same over all time scales
- d. The ratio of marginal default rate between the two bonds stays constant at all times

FRM Question 12.

A pool of high yield bonds is placed in an SPV and three tranches (including the equity tranche) of bonds are issued collateralized by the bonds to create a Collateralized Bond Obligation (CBO). Which of the following is true?

- a. At fair value the value of the issued bonds should be less than the collateral
- b. At fair value the total default probability, weighted by size of issue, of the issued bonds should equal the default probability of the collateral pool
- c. The equity tranche of the CBO has the least risk of default
- d. The yield on the low risk tranche must be greater than the yield on the collateral pool

FRM Question 26.

If the incremental annual default probability of an obligor is 10% in year one and 20% in year two, what is the survival rate at the end of year two assuming a recovery rate of zero?

- a. 72%
- b. 70%
- c. 80%
- d. 90%

FRM Question 28.

What element is not directly part of the CAMEL approach to determining country risk?

- a. Asset quality of the country's natural, human and economic resources
- b. Current account balance of payments
- c. Country's access to hard, convertible currency from reserves
- d. Legal framework for foreign companies doing business in that country

FRM Question 18.

The US Government Bond Zero Curve give a 1-year semi-annual yield of 4%, on the same basis a corporate security has a yield of 5%. What is the market implied 1-year default probability of the corporate security? The recovery rate is 88.6%.

- a. 0.974%
- b. 1.000%
- c. 9.000%
- d. 0.184%

FRM Question 31.

What is the main issue in modeling a credit spreads stochastic process like that of an equity?

- a. Dividends
- b. Influence of interest rates
- c. A credit-spread process shows jumps
- d. In case of equity split or other operations

FRM Question 8.

Which of the following 10-year swaps has the highest potential credit exposure?

- a. A cross-currency swap after 2 years
- b. A cross-currency swap after 9 years
- c. An interest rate swap after 2 years
- d. An interest rate swap after 9 years

FRM Question 74.

Options on the Nikkei 225 from Osaka Exchange are traded on a multiplier of 1000. Volatility of the index is expected to be less than 15%. The index is at 12,000.

Which of the following positions has the highest credit exposure?

- a. 400 call contracts at an 11,800 strike maturing in 1 month
- b. 400 put contracts at a 12,200 strike maturing in 1 month
- c. A FRN in JPY issued by an AAA corporate, for 100M JPY
- d. Not enough information to tell.

FRM Question 84.

If a counterparty defaults before maturity, which of the following situations will cause a credit loss?

- You are short EUR in a 1-year EUR/USD forward FX contract and the EUR has appreciated.
- You are short EUR in a 1-year EUR/USD forward FX contract and the EUR has depreciated.
- You sold a 1-year OTC EUR call option and the EUR has appreciated.
- You sold a 1-year OTC EUR call option and the EUR has depreciated.

FRM Question 29.

Which of the following models can least be used to price credit derivatives?

- Madan-Unal
- Heath-Jarrow-Morton
- Duffie-Singleton
- Jarrow-Turnbull

FRM Question 27.

What can be said about default correlations in CreditMetrics?

- Default correlations can be estimated by ratings changes
- Firm-specific aspects are more important than correlation
- Past history is insufficient to judge default correlations
- Default correlations can be estimated by equity valuation

Answer to FRM Question 5-see Section 18.3.3.

a. This question asks the probability that one particular bond will default and 19 others will not. Assuming independence, this is $p(1-p)^{19}=1.84\%$. Note that the probability that any bond will default and none others is 20 times this, or 36.8%

Answer to FRM Question 14-see Section 18.2.1.

b. The lender is short a put option, since exposure only exists if the value of assets falls below the amount lent.

Answer to FRM Question 2-see Table 19-10.

c. Mexico is the most highly rated country of this group. Below is a table with S&P's ratings as of May 2002. Note that since last year, Argentina is in Selective Default (SD).

Sovereign	Long-term rating	
	Local Currency	Foreign Currency
Argentina	SD	SD
Bolivia	BB	B+
Brazil	BB+	BB-
Chile	AA	A-
China		BBB
Colombia	BBB	BB
Czech Republic	AA-	A-
Hungary	A+	A-
India	BBB-	BB
Indonesia	B-	SD
Korea	A+	BBB+
Malaysia	A	BBB
Mexico	A-	BBB-

Pakistan	B+	B-
Peru	BB+	BB-
Philippines	BBB+	BB+
Poland	A+	BBB+
Russia	B+	B+
Senegal	B+	B+
South Africa	A-	BBB-
Taiwan	AA	AA
Thailand	A-	BBB-
Turkey	B-	B-
Venezuela		B

Source: S&P, as of May 9, 2002

www.standardandpoors.com/RatingsActions/RatingsLists/Sovereigns/SovereignsRatingsList.html

Answer to FRM Question 10-see Figure 19.3.

a. The marginal default rate increases for high credit ratings but decreases for low credit rating. The intuition is that for, a B-rated firm, there is a high probability of defaulting in the next year or so. Conditional on having survived this period, however, the probability of defaulting in a subsequent year is lower.

Answer to FRM Question 12-see Section 19.4.

b. The market values and weighted probability of default should be equal for the collateral and various tranches. So, (a) is wrong. The equity tranche has the highest risk of default, so (c) is wrong. The yield on the low risk tranche must be the lowest, so (d) is wrong.

Answer to FRM Question 26-see Equation (19.3).

a. The obligor needs to survive year one and year two, which gives a survival rate of $S_2 = (1-d_1)(1-d_2) = (1-0.1)(1-0.2) = 0.9 \times 0.8 = 72\%$

Answer to FRM Question 28-see Section 19.5.2. (See also Altman et al. (1998), *Managing Credit Risk : The Next Great Financial Challenge*, p.352.)

d. The CAMEL acronym (Current earnings, Asset Quality, Management Quality, Earnings potential, and Liquidity) refers to the criteria used by bank regulators to judge bank credit quality. In the context of country risk, current earnings includes balance of payment flows, management is government, and liquidity consists of reserves. By itself, the legal framework for foreign companies is not directly related to the probability of a country default.

Answer to FRM Question 18-see Equation (20.3).

c. The approximation gives $(y^*-y)/(1-f) = (0.05-0.04)/(1-0.886) = 8.8\%$, which is closest to 9%.

Answer to FRM Question 31-see Section 20.1.4.

c. Credit spreads cannot be modeled using a lognormal process since they exhibit jumps when there is default. The other factors listed here are less important.

Answer to FRM Question 8-see Figures 21-7 and 21-10.

a. The question asks about potential exposure for various swaps during their life. Interest rate swaps generally have lower exposure than currency swaps because there is no market risk on the principals. Currency swaps with longer remaining maturities have greater potential exposure. This is the case for the 10-year currency swap, which after 2 years has 8 years remaining to maturity.

Answer to FRM Question 74-see Section 21.1.

c. The options are each slightly in the money by 200 (for the call, $S-K=12,000-11,800=200$) . The current exposure is then $200 \times Y1,000 \times 400 = 80,000,000$. This is less than the exposure of 100M for the FRN.

Answer to FRM Question 84-see Section 21.1.

b. Being short an option creates no credit exposure, so answers (c) and (d) are false. With the short forward contract, a gain will be realized if the EUR has depreciated.

Answer to FRM Question 29-see Section 4.1.3.

b. The HJM model is a pure term structure model and does not involve credit risk, like the Vasicek or CIR models. The other approaches are reduced-form, or intensity-based default models. The Duffie-Singleton model treats default as a stopping time with a hazard rate process. Jarrow-Turnbull allow the default intensity to depend on the state of the economy. Madan-Unal model the intensity as a function of the excess return on the issuer's equity.

Answer to FRM Question 27-see Section 23.4.2.

a. Correlations are important drivers of portfolio risk, so (b) is wrong. In CreditMetrics, correlations in asset values drive correlations in ratings change, which drive default correlations. Answer (d) is not correct as it refers to the Merton model, where default probabilities are inferred from equity valuation, liabilities, and volatilities.

Part V. Operational and Integrated Risk Management

FRM Question 48.

Which of the following most reflect an operational risk faced by a bank

- a. A counterparty invokes force majeure on a swap contract.
- b. The Federal Reserve unexpectedly cuts interest rates by 100 bps.
- c. A power outage shuts down the trading floor indefinitely with no back-up facility.
- d. The rating agencies downgrade the sovereign debt of the bank' sovereign counterparty.

FRM Question 49.

Which of the below is the term used within the insurance industry to refer to the effect of a reduction in control of losses by an individual insured due to the protection provided by insurance?

- a. Control trap
- b. Moral hazard
- c. Adverse selection
- d. Control hazard

FRM Question 51.

Which of the terms below refers to the situation where the various buyers of insurance have different expected losses, however, the insurer (or the capital market, as the seller of insurance) is unable to distinguish between the different types of hedge buyer and is therefore unable to charge differentiated premiums?

- a. Moral hazard
- b. Average insurance
- c. Adverse selection
- d. Control hazard

FRM Question 50.

The MAIN challenge of banks (as of fall 2001) in operational risk is to:

- a. Comply with BIS requirements.
- b. Recruit enough competent people for this function.
- c. Use the best quantitative model for operational risk.
- d. Define an operational risk framework.

FRM Question 54.

What can be used to manage reputational risk?

- I. Elimination of external communication by employees
 - II. Strong ethical values at all levels of hierarchy
 - III. As much transparency as possible
 - IV. An efficient public relations department
- a. I only
 - b. II and IV
 - c. II and III
 - d. I and IV

FRM Question 61.

How is the risk of so-called catastrophic losses dealt with?

- a. Through Raroc models.
- b. Only insurance companies can offer a partial cover.
- c. Through VaR, preferably delta-gamma approach.
- d. By mitigation, with reserves in capital.

FRM Question 64.

The operational VaR is generated through the aggregation of the following general stochastic processes:

- a. Region and severity
- b. Brownian motion and frequency
- c. Poisson and frequency
- d. Severity and frequency

Answer to FRM Question 48-see Section 24.2.1.

c. A power outage is an example of system failure, which is part of the operational risk definition. Answer (d) is a case of credit risk. Answer (b) is a case of market risk. Answer (a) is a mix of credit and legal risk.

Answer to FRM Question 49-see Section 24.6.3.

b. Moral hazard arises when insured individuals have no incentive to control their losses because they are insured. Adverse selection refers to the fact that individuals buy insurance knowing that they have greater risk than the average, but that the insurer charges the same premium to all.

Answer to FRM Question 51-see Section 24.6.3.

b. As a follow-up, this is adverse selection.

Answer to FRM Question 50-see Section 24.2.1.

b. As of Fall 2001, there was no BIS requirement for operational risk, so answer (a) is wrong. There are no established and widely accepted models for operational risk, so (c) is wrong. The problem is much more basic, which is to establish a common framework.

Answer to FRM Question 54-see Section 26.2.

c. Reputational risk can be controlled by (1) avoiding problems such as rogue traders in the first place and (2) effectively communicating with the public when problems occur. This requires (ii) ethical values among employees and (iv) an efficient public relations department. There is no practical way to eliminate all external communication by employees, so (i) is wrong. Transparency can be helpful to control risks but limits the ability to communicate with the public.

Answer to FRM Question 64-see Section 24.5.

d. The distribution of losses is obtained through convolution of frequency of losses as well as severity when losses occur.

Part VI. Legal, Accounting, and Tax Risk Management

FRM Question 57.

Unlike credit risk, when the calculated expected credit losses might be covered by general and/or specific provisions in the balance sheet, in operational risk, due to its multidimensional nature, the treatment of expected losses is more complex and restrictive. Recently, with the issuing of IAS37 by the International Accounting Standards Board, the rules have become clearer as to what can (or cannot) be subject to provisions. Which of the operational risk types below can clearly be provisioned (given that a figure can be reasonably estimated)?

- a. Transaction processing risk
- b. Legal risk
- c. Systems risk
- d. Interest expenses

FRM Question 124.

Most credit derivatives contracts:

- a. Are based upon English law
- b. Are written on a one-off basis
- c. Have a clause about restructuring
- d. Are based upon ISDA agreement

FRM Question 128.

Compared to traditional ways to invest, hedge funds generally are, as a vehicle for investment:

- a. More risky, because they are smaller and less diversified.
- b. Less risky, because they are managed by small, more efficient teams.
- c. More risky, because they are more leveraged.
- d. Less risky, because they hedge their positions.

FRM Question 129.

FASB's latest decision about banks' losses related to the events of 11th September 2001 is that these:

- a. Losses must appear as capital losses.
- b. Are an extraordinary item.
- c. Must be shown as a separate item within extraordinary items.
- d. Must appear in the relevant places in the P&L, according to their nature.

FRM Question 130.

Liquidity risk is the risk that:

- I. The markets get less active, making it difficult to exit
 - II. The offices get flooded
 - III. It becomes difficult to borrow money
 - IV. The process for settlement becomes less smooth
- a. I and II
 - b. II and III
 - c. I and III
 - d. I and IV

Answer to FRM Question 57-see Section 29.2.2.

b. See part one of this update. Interest expenses are not an obligating event, so (d) is wrong. Systems risk and transaction processing risk are not past events. Legal risk can be provisioned as a result of a past event that is likely to lead to a lawsuit and settlement.

Answer to FRM Question 124-see Section 28.3.

d. Most derivatives contracts are based on the standard form provided by the ISDA, which provides uniformity in contracts and reduces legal uncertainty.

Answer to FRM Question 128-see explanation of LTCM.

c. Hedge funds are more risky than traditional investments due to their use of leverage. Hedge funds regularly go out of business because accumulating losses lead to liquidation. They can be very large, so (a) is wrong.

Answer to FRM Question 129.

d. FASB ruled that losses related to September 11 could not be classified as “extraordinary, on the grounds that “the economic effects of the events were so extensive and pervasive that it would be impossible to capture them in any one financial statement line item.”

See www.fasb.org/eitf/eitf91101.shtml

Answer to FRM Question 130-see Section 27.1.

c. Liquidity risk arises as asset liquidity risk, when transactions cannot be conducted at prevailing market prices (exiting positions is difficult, i.e. costly, to liquidate) and as funding liquidity risk, when losses cannot be funded easily by borrowing.

Part VII. Regulation and Compliance

FRM Question 36.

Which of the following most reflects the Basle Committee on Banking Supervision's approach to calculating regulatory capital for operational risk?

- Operational risk capital charge would be linked to fixed percentage of a single risk indicator.
- Operational risk capital charge would be determined from a decomposition of business into standardized lines associated with broadly defined risk exposure weighted by a beta factor.
- Operational risk capital charge would be determined from a decomposition of business into standardized lines associated with risk exposures and a gamma term taking into account the operational loss of the institution.
- All of the above.

FRM Question 38.

A Bank subject to the Basel Accord makes a loan of \$100m to a firm with a risk weighting of 50%. What is the basic on balance credit risk charge?

- \$8m
- \$4m
- \$2m
- \$1m

FRM Question 45.

The Basel Accord computes the credit exposure of derivatives using both replacement cost and an "add-on" to cover potential future exposure, which of the following is the correct credit risk charge for a purchased 7 y OTC equity index option of \$50m notional with a current mark to market of \$15m with no netting and a counterparty weighting of 100%?

- \$1.6m
- \$1.2m
- \$150,000
- \$1m

FRM Question 33.

Which of the following types of financial contracts do the BIS require a specific risk charge

- Forward Foreign exchange contract
- Interest rate swap contract
- FRA contract
- Debt security future contract

FRM Question 34.

Which of the following proposals was implemented in the New Basle Capital Accord.

- The use of advanced credit portfolio models for setting capital requirements
- The use of mark-to-model/market accounting in the determination of minimum capital requirements
- Introduction of risk bucketing approaches, with differentiated capital charges tied to ratings
- Increased weights for cross border lending to private companies

FRM Question 58.

What is the percentage of minimum regulatory capital that, according to the Basel Committee on Banking Supervision September 2001 paper, “would provide a reasonable cushion and produce required capital amounts in line with the risks faced by large, complex organizations”?

- a. 10%
- b. 12%
- c. 15%
- d. 20%

Answer to FRM Question 36-see Section 31.4.4.

d. (a) refers to the Basic Indicator Approach, (b) to the Standardized Approach, (c) to the Internal Measurement Approach. Hence, all answers are correct.

Answer to FRM Question 38-see Section 31.2.2.

b. Under current rules, the charge is $\$100\text{m} \times 50\% \times 8\% = \4m .

Answer to FRM Question 45-see Section 31.2.3.

a. From Table 31-3, the add-on factor is 10%. This gives a Credit Exposure of $\$15\text{m} + \$50\text{m} \times 0.10 = \20m , and a credit risk charge of $\$20\text{m} \times 8\% = \1.6m

Answer to FRM Question 33-see Section 32.2.2.

d. Items (a), (b), and (c) involve general market risk factors, currencies and risk-free interest rates. A debt security has issuer-specific risk, for which there is an additional risk charge.

Answer to FRM Question 34-see Section 31.4.2.

c. The January 2001 proposals did not allow internal portfolio credit models, so (a) is wrong. Answer (b) is also wrong since all marking-to-market does not measure prospective risks. Answer (c) is correct, as it refers to the standardized approach

Answer to FRM Question 58-see Section 31.4.4.

b. In the January 2001 paper, the original proposal was to have an operational risk charge account for 20% of the total. Later, this was reduced to 12%.