LUISS University

CIB — Instructor: John Teall

Corporate and Investment Banking — Spring Term 2020

Exam: Practice Version 1, Part 1, Closed-Book Part

2 hours for both parts

1. Market-based regulation can and does serve in the banking system as an alternative to regulation based on government authorities. In fact, one might argue, as has the CFA Institute (2007) that "the overarching purpose of any self-regulatory group is to keep industry interests aligned with the public interest so as to avoid government intervention and the possibility of more-restrictive regulation." What are the primary potential advantages of a market-based regulatory system for the banking system relative to regulation based on government authority?

2.a. In what activities do banks engage that enable them to obtain insider information on clients? What qualities do banks have that enable them to contribute to funding efficiency by undertaking activities that mitigate information problems?

b. What is *bank contagion*?

3.a. What activities do banks undertake to evaluate their prospective client borrowers?

b. Why might a bank have an advantage relative to public bondholders in monitoring borrowers?

4.a. Banks facilitate the channeling of funds from surplus to deficit agents by transforming assets (Gurley and Shaw [1960]) such that both deficit and surplus agents or bank clients receive their preferred terms. What are the typical contractual terms that financial institutions transform to facilitate the deposit and lending processes?

b. Full faith and credit instruments of certain national governments such as U.S. Treasury issues and U.K. sterling (gilt) issues of H.M. Treasury are considered to be (or be nearly) free of default risk. What makes the government bond risk for such countries to be perceived as being practically zero?

5. The initial public offering (IPO) has been characterized as the most costly transaction that public firms have ever undertaken. Why are IPOs so costly to firms?

6.a. Describe how an underwriter in an IPO setting might be able to lock in trading profits on a new stock issue if its price declines after the effective date.

b. Briefly discuss why *bitcoin* is (or is not) a *fiat* currency.

7. What were the major contributions of early goldsmith banking to banking in the modern era? That is, what were the new innovative practices incorporated into goldsmith bank business models that have lasted to the present time?

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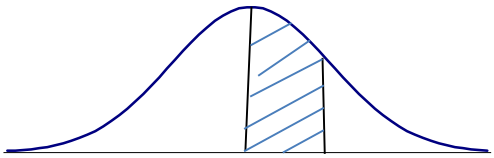
8. Suppose that a bank with $1 billion market value in assets is obliged to repay $900 million face value in debt (all deposits) in two years. The current riskless rate of return is 3% per annum and the standard deviation of annual returns on the bank's portfolio of assets is .2. Black-Scholes assumptions hold in this corporate securities framework. By how much would the value of the bank's equity increase if the standard deviation of the bank's asset returns increased to .3?

9. A bank with both risk neutral shareholders (shareholders are able to diversify all firm-specific risk) and limited liability has the opportunity to invest all of its assets in a 19 to 1 long shot (horse with a 1/20 chance of winning) in a horse race at the local track. If the horse should win, the payoff on the 200,000 investment would be 4,000,000. Bank management, whose risk preferences are identical to those of shareholders, estimate the probability that the horse will win is .04; the probability of the horse not winning is .96. Of the 200,000 in bank assets, 100,000 is financed through zero-interest depositor accounts. In the event of bank failure (value of remaining assets is less than the 100,000 in deposits), depositors will receive what remains of the bank's assets (nothing if the bank invests in the horse and the horse loses) and the current shareholders and managers will receive and owe nothing. The time value of money can be ignored, as interest rates are zero.

a. Based on managerial probability projections, what are the expected profits received by the bank if it invests all of its assets at the racetrack?

b. What is the expected profit received by shareholders if the bank invests all of its assets at the racetrack?

c. Yes or no: Should the bank, assuming that it seeks to maximize shareholder profits and wealth, invest its assets at the racetrack?



The Normal Density Function

z-Table

z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	.0000	.0040	.0080	.0120	.0159	.0199	.0239	.0279	.0319	.0358
0.1	.0398	.0438	.0478	.0517	.0557	.0596	.0636	.0675	.0714	.0753
0.2	.0793	.0832	.0871	.0909	.0948	.0987	.1026	.1064	.1103	.1141
0.3	.1179	.1217	.1255	.1293	.1331	.1368	.1406	.1443	.1480	.1517
0.4	.1554	.1591	.1628	.1664	.1700	.1736	.1772	.1808	.1844	.1879
0.5	.1915	.1950	.1985	.2019	.2054	.2088	.2123	.2157	.2190	.2224
0.6	.2257	.2291	.2324	.2356	.2389	.2421	.2454	.2486	.2517	.2549
0.7	.2580	.2611	.2642	.2673	.2703	.2734	.2764	.2793	.2823	.2852
0.8	.2881	.2910	.2939	.2967	.2995	.3023	.3051	.3078	.3106	.3133
0.9	.3159	.3186	.3212	.3238	.3264	.3289	.3315	.3340	.3365	.3389
1.0	.3413	.3437	.3461	.3485	.3508	.3531	.3554	.3577	.3599	.3621
1.1	.3643	.3665	.3686	.3708	.3729	.3749	.3770	.3790	.3810	.3830
1.2	.3849	.3869	.3888	.3906	.3925	.3943	.3962	.3980	.3997	.4015
1.3	.4032	.4049	.4066	.4082	.4099	.4115	.4131	.4147	.4162	.4177
1.4	.4192	.4207	.4222	.4236	.4251	.4265	.4279	.4292	.4306	.4319
1.5	.4332	.4345	.4357	.4370	.4382	.4394	.4406	.4418	.4429	.4441
1.6	.4452	.4463	.4474	.4484	.4495	.4505	.4515	.4525	.4535	.4545
1.7	.4554	.4564	.4573	.4582	.4591	.4599	.4608	.4616	.4625	.4633
1.8	.4641	.4649	.4656	.4664	.4671	.4678	.4686	.4693	.4699	.4706
1.9	.4713	.4719	.4726	.4732	.4738	.4744	.4750	.4756	.4761	.4767
2.0	.4772	.4778	.4783	.4788	.4793	.4798	.4803	.4808	.4812	.4817
2.1	.4821	.4826	.4830	.4834	.4838	.4842	.4846	.4850	.4854	.4857
2.2	.4861	.4864	.4868	.4871	.4875	.4878	.4881	.4884	.4887	.4890
2.3	.4893	.4896	.4898	.4901	.4904	.4906	.4909	.4911	.4913	.4916
2.4	.4918	.4920	.4922	.4925	.4927	.4929	.4931	.4932	.4934	.4936
2.5	.4938	.4940	.4941	.4943	.4945	.4946	.4948	.4949	.4951	.4952
2.6	.4953	.4955	.4956	.4957	.4959	.4960	.4961	.4962	.4963	.4964
2.7	.4965	.4966	.4967	.4968	.4969	.4970	.4971	.4972	.4973	.4974
2.8	.4974	.4975	.4976	.4977	.4977	.4978	.4979	.4979	.4980	.4981
2.9	.4981	.4982	.4982	.4983	.4984	.4984	.4985	.4985	.4986	.4986
3.0	.4986	.4987	.4987	.4988	.4988	.4989	.4989	.4989	.4990	.4990

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Exam Solutions: Practice Version

1. Major advantages to maintaining private regulatory bodies or self-regulation in financial markets might be as follows:

1. Market participants have the most intimate knowledge of the markets to be regulated.
2. Regulatory foci on developing best practices and effective monitoring and enforcement policies are based on economic and reputational self-interest.
3. Governmental regulatory costs are reduced as they are passed on to the regulated market.
4. Financial industries may have strong incentives to effectively self-regulate when the alternatives are either government regulation or market failure.
5. Market-based regulation has the potential to reduce the cost of capital to business, returning capital and businesses from foreign markets and enhancing economic growth.
6. Market-based regulation based on measures such as reputation, monitoring, branding, bonding, independent certification, and various signaling mechanisms has the potential to resolve banking problems related to information asymmetry.

2.a. Banks engage in information collection through loan application and loan screening processes, loan monitoring, provision of advice and consulting services, account deposits and securities issuance. Banks contribute to funding efficiency by engaging in activities that mitigate these information problems:

1. Banks enjoy scale economies that enable them to more efficiently obtain information and share that information among members of lending coalitions (loan syndicates; See Leland and Pyle [1977] concerning provision of information through signaling). Asset diversification is realized from the scale economies.
2. Banks monitor their borrowers
3. Banks that provide capital seek long-term financial relationships. Such long-term relationships (commitments) enable banks to execute contracts in the absence of complete contracts and markets.

b. Bank contagion (systemic risk) refers to financial difficulties at one bank that spill over to other banks, or to the banking system as a whole.

3.a. Banks screen bad loan applications from good, evaluate borrower creditworthiness and observe the extent to which borrowers adhere to the terms of their borrowing contracts.

b. Banks can access inside information in the loan application process and on an ongoing basis about their clients that need not be made public and made available to bank competitors. Banks are also single large lending entities, such that coordination of many lending entities (bondholders) is not necessary for effective monitoring.

4.a. Preferred terms can be affected by transformations to contractual terms such as maturity, risk or size:

1. *Maturity transformation*: convert short-term (long-term) liabilities to long-term (short-term) assets. Since short-term deposits are unlikely to be withdrawn all at once, banks can make longer-term loans as long as they can adequately predict or cover their depositors' liquidity needs.
2. *Risk transformation*: convert risky investments into safe investments. Banks and insurance companies engage in a variety of risk management techniques (introduced later) to manage these risks.
3. *Size transformation*: match small (large) deposits with large (small) loans. For example, the mortgage extended by a savings and loans institution to a borrower is likely to be larger than the typical deposit received by the institution.

Note that physical assets needed for the production of goods and services are risky, their useful lives can be of any duration, their acquisition imposes transaction costs on their purchasers and they tend to be indivisible. Thus, the asset transformation process is necessary, and financial intermediaries play the primary role in this process.

b. First, neither the U.S. government (excepting a several day delay on payments once in the late 1970s) nor the U.K. government has ever defaulted on one of its treasury instruments. Treasury issues are practically default risk-free because they are fully backed by the full faith and credit of the U.S. or U.K. government, which in addition to being quite wealthy, have substantial backup resources due to their abilities to tax their citizens, to create or "print" money and to borrow more money as needed.

5. Among the direct expenses incurred by the firm going public are the following:
1. IPOs generate substantial fees: The offering firm incurs significant legal, accounting and investment banking fees that frequently exceed 10% of the capital raised by the offering.
2. Tax and legal entity restructuring costs in anticipation of the IPO: The issuing company faces significant restructuring costs (e.g., articles of incorporation) to prepare for the IPO.
3. Increased auditing, legal and other fees incurred on an ongoing basis after the IPO.

In addition to these direct expenses, the newly public firm subjects to the following implied costs of going public:

1. Increased disclosure, scrutiny and regulation by the media, competitors, the general public, the S.E.C. and other regulators. In addition to potentially drawing unwanted attention, this regulation and accompanying media coverage may restrict the firm’s operating activities.
2. IPO underpricing: IPO investors enjoy substantial short-term returns on their investments, presumably at the expense of entrepreneurs. Underpricing might be the most costly to IPO issuers.

6.a. The key to this opportunity is the *greenshoe option*, which is implemented to support the aftermarket price stabilization process. Many underwriter agreements include an *overallotment option* (*Greenshoe*) whereby the underwriter retains an option from the issuing firm to purchase additional shares, up to 15% of the original issue. This greenshoe option normally supports the price stabilization process described above. The underwriter then oversells the issue by up to 15% (shortselling). If interest in the issue appears to weaken, the underwriter supports its price by purchasing oversold shares. By shorting the stock at its issue price, then repurchasing after the price drops, the underwriter earns a trading profit on the greenshoe option.

b. Bitcoin is a fiat currency because it is not backed by any hard asset or commodity.

7. In many respects, goldsmiths replaced merchants in many of the more important roles in banking. Goldsmiths broke into the banking business by starting as safe repositories for safekeeping of gold for depositors who no longer trusted the Royal Mint in the U.K. Among the new practices, goldsmiths issued receipts for the gold that they accepted on deposit, called acceptances, which evolved into banknotes and checks. Goldsmiths realized that they could loan both gold and receipts for gold as long as they were able to predict withdrawals. This latter innovation led to the development of modern fractional reserve banking. The rise of goldsmith banking led to the establishment of many of Britain's great banks of today.

8. Our first step is to obtain the bank's initial equity value, based on the assumption that the equity is a call option to purchase the firm's assets:

$$d_1 = \frac{\ln\left(\frac{1{,}000{,}000{,}000}{900{,}000{,}000}\right) + \left(.03 + \frac{1}{2} \times .2^2\right) \times 2}{.2\sqrt{2}} = 0.726; N(d_1) = .766$$

$$d_2 = 0.726 - .2\sqrt{2} = .443; N(d_2) = .671$$

$$Equity\ Value = c_0 = 1{,}000{,}000{,}000 \times .766 - \frac{900{,}000{,}000}{e^{.03 \times 2}} \times .671 = 197{,}201{,}500$$

Next, we work through the same formulas, with the new standard deviation = .3:

$$d_1 = \frac{\ln\left(\frac{1{,}000{,}000{,}000}{900{,}000{,}000}\right) + \left(.03 + \frac{1}{2} \times .3^2\right) \times 2}{.3\sqrt{2}} = 0.602; N(d_1) = .726$$

$$d_2 = 0.602 - .3\sqrt{2} = .178; N(d_2) = .570$$

$$Equity\ Value = c_0 = 1{,}000{,}000{,}000 \times .726 - \frac{900{,}000{,}000}{e^{.03 \times 2}} \times .570 = 242{,}834{,}400$$

We see that the value increase in the bank's equity is 242,834,400-197,201,500 = 45,633,900.

9. If the investment at the race track is undertaken, expected bank profits are:

.04(4,000,000-200,000) + .96(0-200,000) = -40,000

Investing all of the bank's assets at the race track diminishes overall bank value by an expected value of 40,000. However, if the investment at the race track is undertaken, expected shareholder profits are:

.04(4,000,000-100,000-100,000) + .96(0-100,000) = 56,000

Thus, if this bank seeks to maximize shareholder wealth, it should invest its assets at the race track since expected profits increases from zero to 56,000. **[YES]** The race track investment reduces depositor profits from 0 to -96,000 (.04(100,000-100,000)+.96(0-100,000)).

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Additional Sample Exam Questions

This is not exactly a 2nd sample exam, but rather an additional set of sample exam questions. The questions that follow are denoted (CB) for closed book exam style questions, (OB) for open book exam style questions or, in a few cases, both. All of these questions have been used in prior exams.

1. *Bills of Exchange* were developed in approximately 1290. One of their many uses was as a means to avoid charges of usury by political and religious authorities. What provisions were incorporated into bills of exchange in order to avoid accusations of usury while still enabling the recipient of the bill (the lender) to earn a lending profit from the issuer of the bill (the borrower)? (CB)

2. To what extent has been the Bank of England able to prevent or resolve English banking crises? (CB)

3. What are the most essential criticisms of the VaR methodology as an indicator of bank (or unit thereof) stress? (CB)

4. What are the major drawbacks to market-based prudential regulation in preventing banking crises? (OB)

5. What are the primary purposes of IPO "road shows," also known as "dog and pony shows?" (CB/OB)

6.a. What is a collateralized debt obligation (CDO)? (CB)
b. Describe the tranche structure of a typical CDO. (CB)

7. Most countries do not separate investment banking activities from commercial banking activities. The U.S. is an exception. After the Financial Crisis of 2008, numerous calls have been made to restore Glass Steagall (separation of investment banking from commercial banking) in the United States. The proposals to repeal the Gramm-Leach-Bliley Act (e.g., the Warren-McCain bill) would be intended to reduce bank risk-taking prevent a similar crisis caused by shadow banking. Such proposals have ultimately failed, with Dodd-Frank being passed instead.
a. What would be the drawbacks of repealing Gramm-Leach-Bliley? (OB)
b. What might be some of the "compromise" or "middle road" solutions to managing risks in the current system? (OB)

8. A bank trades exchange at its FX desk. The current value of assets being traded by this desk is $100,000,000. The FX portfolio's returns tend to be normally distributed with a 2% daily standard deviation and uncorrelated over time. The bank is required to prepare its *VaR* calculations on a daily basis. FX transactions result in a standard deviation of returns equal to the bank's other assets, totaling $100,000,000 without the FX assets, are completely hedged so that the FX is the only source of uncertainty to the bank's cash flows.

a. What is the maximum FX portfolio trading loss associated with a 99% VaR threshold? That is, what loss figure does the bank's FX portfolio expected to outperform with 99% probability?

b. Suppose that the bank can reduce its FX portfolio risk level tomorrow while it continues to trade its $100,000,000 FX assets. In order to ensure with 99% probability that the bank won't lose more than $1,000,000 tomorrow, how much should the risk of this portfolio be reduced?

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Additional Sample Exam Question Solutions

1. Bills of exchange could incorporate provisions such as credit insurance, currency exchange (at a rate favorable to the lender), gifts to the lender, overcharging for borrower purchases, etc.)

2. After experiencing many banking crises during the first half of the 19th century, and after an 1866 U.K. crisis, following the advice of Walter Bagehot, the Bank of England began lending to troubled correspondent banks based on collateral and penalty interest rates. The U.K. remained free of depositor banking panics from 1866 until 2007. Even the 2008 banking crisis did not involve a depositor run.

3. First, perhaps the most important criticism of VaR methodology concerns the assumption of normally distributed returns, suggesting that the most disastrous outcomes (sometimes referred to in a risk measurement context as black swans) are very unlikely. If worst case or near-worst case scenarios are not actually rare, those situations may be parts of "fat tails," and their probabilities might be underestimated by the thin tails consistent with a normal distribution. Remodel with another distribution if necessary. Second, if standard deviation is not the best or most complete measure of variability of returns, or if variability of returns does not provide a good indicator of risk, then adapt the VaR methodology to a more appropriate measure of risk, and/or rely on other risk measurement methodologies.

4. Government authorities have more power than do market-based regulators. While government-based regulators and authorities can fine, imprison, shut down and otherwise sanction financial rule breakers, market-based regulators lack the power to exact most of these penalties. Historically, market-based regulators in the banking system have been largely confined to limiting or withdrawing their aid from rule breakers only after the offending bank is distressed or fails. For example, J.P. Morgan did not have the power to prevent Knickerbocker from engaging in the high-risk behavior that led to the Financial crisis of 1907, though he was able to deny aid to the bank, leaving it to collapse. Nevertheless, the failure did not prevent the crisis, it triggered the crisis. It was clear that Morgan could pick and choose which banks would be left to fail, perhaps arbitrarily or based on his own personal preferences if Morgan so chose. On the other hand, the failure of Knickerbocker did bankers reason to pause before engaging in the same behavior afterwards. Morgan's ultimate success in tamping down the crisis at the prodding of President Roosevelt did provide the impetus to establish an effective central bank, an authority with the power to head off future crises.

Market-based insurers are not likely to be as effective at maintaining confidence in the banking system as is a government insurer with its unlimited ability to print money and tax its citizens. With a government insurer, a government regulator is needed to protect the interests of the government and taxpayers.

What is in the best interests of banks and bank affiliates is not necessarily in the best interests of

the general public. For example, many banks and bank affiliate groups realize that proprietary trading is very profitable to banks and the banking industry as a whole, and would be unlikely to bank proprietary trading unless forced by the government to do so.

5. Consider the following:
   1. The investment bank will present the new issue to prospective purchasers in "dog and pony shows" or “road shows” in its efforts to market and create interest in the issue.
   2. The underwriter will canvas its clientele to solicit bids from institutional or "cornerstone investors" to purchase shares in the new issue within a price range. This is the bookbuilding process. Although these preliminary bids are not binding, they do indicate the strength of the interest in the new issue. Thus, preliminary bids are very useful in the IPO price-setting process. If the new issue is oversubscribed, the offer price may be set at a level that exceeds the high end of the preliminary range. If interest in the new issue seems week, the offer price may be reduced below the range or the offering may be withdrawn altogether.

6.a. A collateralized debt obligation (CDO) is a security by which specified events determine the payouts associated with multiple classes of holders of debt-backed assets.

b. A series of debt- or mortgage-backed securities is placed into an SPV, the sponsor of which then repackages the series into tranches, each offering a series of payments that depend on conditions, usually defined by payment priority. A 3-tranche structure might include Tranche 1: the senior tranche, Tranche 2: the mezzanine tranche and Tranche 3: the subordinate tranche.

7.a. The banking industry would need to undertake a massive and painful restructuring and downsizing in order to separate commercial banking from investment banking. Customers would be forced to abandon comfortable banking relationships with existing banks to establish new relationships with restructured financial institutions. Investment banking activities are important sources of profitability to affiliated institutions, reduce government insurer and taxpayer risk and provide opportunities for commercial banks to diversify their income away from interest rate spreads. These issues would increase the costs of banking services, particularly as banks lose economies of scale and scope.

b. The Volker Rule, if maintained, might be viewed as a sort of compromise, serving to prohibit securities market and FX speculation by commercial banks while allowing them to affiliate. Chinese walls, if effective, can prevent some of the conflicts that exist between commercial and investment banking units.

8. First, remember that normal curve area (z-value) consistent with .99 is 2.326.

a. VaR = Relevant Assets $\times \sigma \times z \times \sqrt{t}$

$VaR = \$100{,}000{,}000 \times .02 \times 2.326 \times \sqrt{1} = \$4{,}652{,}000$

b. $VaR = \$100{,}000{,}000 \times \sigma \times 2.326 \times \sqrt{1} = \$1{,}000{,}000$

σ = Var/(Relevant Assets $\times z \times \sqrt{t}$)

$\sigma = \$1{,}000{,}000/(\$100{,}000{,}000 \times 2.236 \times \sqrt{1}) = .004472$

The bank would need to reduce the standard deviation of its FX portfolio returns by .015528 to .004472 in order to ensure that it will not lose more than $1,000,000 tomorrow.