BANRISK III

A SEMINAR IN CURRENT BANKING ISSUES

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FOREWORD

The BanRisk educational materials are designed to be used with the Executive Edition of the Players' Manual for the Stanford Bank Game. The Reading Materials supplement and expand on content in the Manual. The Case Studies are the tools that your team will need to improve on the performance of your bank. The Introduction to the Case Studies provides information on how the cases can be organized and assigned to members of the team.

The Stanford Bank Game is used by diverse groups in a variety of presentational formats. In particular, the BanRisk course materials are designed so that the simulation can be used as a stand-alone educational program for commercial users. Consequently, parts of the course may cover content that is familiar to some participants.

The most powerful educational advantages of the simulation are the way it compresses time, and focuses on critical bank management issues. Events that would take two or more years to play out in the real world occur in eight decision periods. Unlike a flight simulator that is designed to be an exact duplicate of the real world, the bank game is designed to accelerate and condense real-world experience. As participants, you will see how your decisions play out over time. In general, your mistakes are the most valuable part of the experience.

You may feel overwhelmed at first by all the details, but after they become clear, you will discover the most exciting part of SBG: learning to manage and control your bank profitably.

BANRISK READINGS

MARKETING

The Changing Environment

In the mid-1960's, few banks in the U.S. had a marketing department. Although that situation has changed today, bankers are still uncertain about how to apply marketing theory to the banking industry. Marketing--knowing the customers in your market so that you can establish policies that attract their business--is so intermixed with what has been traditionally viewed as banking that it is difficult to separate the two concepts.

Historically, bankers based important profit decisions on their knowledge of the customer; bankers based even the fundamental decision to make a loan on their assessment of the customer's integrity as much as on hard financial information. Banks collected marketing data directly through the calling officers in their ongoing contact with their customer.

Today, as in the past, bankers still base many of the key decisions that influence profitability upon certain assumptions about the customer group. However, in recent years, bankers have had more difficulty knowing and serving their customers because changes in the industry have undermined traditional relationships:

1. Corporate lending--making loans to a legal entity rather than individuals--has grown.

2. Competition from nonbanking entities and banks in markets outside their traditional serving areas has increased.

3. More smaller banks are merging into larger banks, in which the senior management decision makers are removed from the customers. These large banks service broader markets, making it more difficult for management to know the characteristics of their market.

4. Banks are using more electronic equipment and machines to handle accounts, reducing contact with the customer.

5. The number and types of services offered to customers have greatly increased.

Small banks still consider their main strength to be their knowledge of, and long term relationship with, their customers. Even in the highly competitive California and New York marketplaces with their giant retail banks, small single-unit banks have usually been highly profitable when well-managed. These small banks are successful not just because they have low operating costs, but because they provide closer, more personalized customer service than larger banks.

Today's larger banks have increasingly turned to marketing specialists for information and assistance. Yet bankers have not been entirely comfortable relying upon such experts for critical decisions or information, especially if the specialists advise them to act counter to their personal experience. Traditional bankers often perceive much of the data produced by specialists to be of questionable value because the specialists fail to address the total posture of the bank in a market and, subsequently, the way the bank generates bottom line profits. Often marketing specialists in larger banks do not understand banking, and their recommendations reflect this. However, even when the specialists do understand the industry, they have a difficult time determining how to price products appropriately, usually a basic ingredient in marketing.

Pricing Problems

Basically, bankers must make two types of decisions: spread management and operating expense. Today most banks can easily determine the minimum spread needed to meet their profit objectives, but bankers still have difficulty making operating expense decisions (personnel, branches, marketing, and so on) because cost/benefit

analysis is highly complex and ambiguous.

Operating expenses are almost always related to the spread in some way; all of the operating expenses of a bank influence either the cost of funds or the price received for assets. However, with so many different prices, management can have trouble allocating costs properly and determining their effectiveness. Although they can measure some soft costs, management is still unclear on what a dollar spent on advertising, salary, training, or even branches really produces. These costs exist, but are seldom allocated. Also, bankers have long believed certain services that have at times been unprofitable have been essential to attract profitable business (i.e., trusts and free checking accounts).

Given the rapidly changing, competitive market, today's large banks believe they must reevaluate their understanding of the markets that they serve in order to maintain their profitability, growth, and market share. Perhaps more important, a significant percentage of smaller banks are utilizing the same assumptions and moving in the same directions today. Many bankers realize that they work with a high level of risk when they implement strategies developed to serve an evolving market, but feel that if they hang back, they could lose customers.

Historically, banking has been a low-risk business for a good reason. When banks engage in a high-risk strategy, not only banks but the whole country takes a risk. Banks are unlike other businesses in several critical areas. Although they are a private enterprise, they play a significant role in the national economy for which they need the public's trust and confidence. If banks fail to maintain their profits and market shares, not only the stockholder suffers (as is the case in a normal business) but also the uninsured depositor. As a result, depositors may lose confidence in the whole system. In the increasingly competitive environment, created in large part by deregulation, bankers are forced to take unprecedented risks. The question now is whether banks should be placed in a position where they must engage in the same types of risk activities that other businesses do.

The new products introduced by deregulation, which have changed customer expectations and behavior, have also created problems. Because of advertising, promotion, and general publicity about banking, customers are more aware and more able to transfer funds in response to changing opportunities with much greater ease. In this situation, marketing plays a critical role. In the future, marketing will become even more important, yet increasingly difficult because of the rapid industry changes.

Marketing within Banrisk

Marketing is critical within the bank simulation. For one thing, your team must define the characteristics of the customers for the major accounts in your bank. You want to determine, with some care, how big the customer group is (indicated to some extent by current account size) and how that customer group responds to the decision variables that are available to you as a team (price, salary, advertising, branches, and so on). To determine the effects of your decisions, you must run some experiments with your own bank and carefully study the results other banks achieve with their decisions.

Basically, all of the decision variables at your disposal are resources, and each one has an inherent cost. You can determine exactly or closely the profitability of each area of your bank. You can then change the profitability of the various accounts by changing how you employ your resources.

If you want to use your resources to maximize profits, you must know your customers. No bank in either the real world or the simulation can operate properly without knowing the customers in its service area. If you make inaccurate assumptions about your customers, which are represented by the computer model, you may use the wrong type of resource or decrease the profitability of a key area.

For example, in the simulation most of the retail customers are basically convenience shoppers; they consider service and price less important than facility convenience. You can attract such customers into your bank with advertising and multiple locations. But because advertising and branches add substantively to bank expenses, you

must recapture those higher costs through appropriate pricing. You must also determine if you can recover the additional expenses you have incurred through higher charges to your customer and still be competitive.

The commercial customer in the model is more concerned with price and service. If you change pricing or use additional officer effort to service commercial accounts, you will change profitability, just as you changed retail accounts by increasing branches or the advertising budget.

Perhaps the greatest single advantage to working within the simulation is that the market represented by the model will not change unexpectedly. In the real world, customers are always changing their expectations as a result of numerous forces. In the simulation, customers do not change as much because the computer program highlights the type and overall quality of information that management should use to make key decisions. Although we make no pretense that the marketplace represented by the model is real, it is designed to approximate reality. As in the real world, you should always try to test your theories in a limited fashion before you make a large commitment.

SECURITIES MANAGEMENT

The Basics

In its simplest form, a security can be defined as a debt or equity instrument, or a contractual obligation. One party provides money to another and receives a legal document (the security) which represents the right to receive prospective future benefits under stated conditions.

A debt security is different from other types of investments in that it represents a loan and requires the periodic payment of interest. Debt securities either have an interest rate that is fixed at a specified level for the duration of the transaction, or have floating rates, ie. rates that change periodically over the duration of the transaction.

Securities that are periodically traded, or that can be readily bought and sold, are graded for quality (repayment or default risk) by rating agencies such as Moody's or Standard and Poors. Essentially, the rating agencies evaluate the borrowers' ability to repay the debt, which affects the price that borrowers can offer on their securities.

Most investors who purchase low-risk debt securities have three objectives: 1) predictable cash flow from the investment 2) return of their original investment at a predictable time and, 3) the ability to liquidate their investment at an earlier date by selling the security to a third party.

The purchase and sale of securities by parties other than the original investor is called the "secondary market." Security prices in the secondary market are generally governed by changes in repayment risk, liquidity and market interest rates on securities of similar maturity.

Neither repayment risk nor liquidity affects prices too significantly. Generally, the ability of an issuer of debt securities to repay, and the supply and demand for particular categories of securities, change infrequently.

The price of a security changes primarily as a result of changes in interest rates. In fact, market experience shows that on average, 80% to 90% of the change in the price of a low-risk debt security is due to variations in market interest rates. The market price of a security moves inversely with market interest rates. The following examples illustrates this.

Assume you purchase two $1000 securities from the same issuer as follows:

$1000 for 2 years at 8%

$1000 for 10 years at 8%.

For simplicity and illustration, the yield curve is flat at 8%. (The yield curve shows the pattern of interest rates for securities of different maturities, but of equal issuer risk. The yield curve can be upward sloping, flat, or downward sloping. In other words, longer-term securities can have higher, equal, or lower yields than shorter-term securities).

One year after you purchase these securities, if interest rates rise by 1% to 9%, then you will not be able to sell the 8% securities for the original purchase price of $1000.

The 2-year security has one year remaining until maturity, and the 10-year security, nine years remaining until maturity. The issuer of the security still pays interest at only 8%, but because of the increase in interest rates by 1 percentage point, an investor can now buy a 1-year security and a 9-year security yielding 9% per year.

If the investor can now earn $90 (9%) on a 1-year investment of $1000, and you want to sell the security that

pays only $80 (8%), you will have to sell it for less than $1000, since equivalent securities are yielding a higher rate, namely 9%.

The $1,000 par value security that yields 8% will now be discounted and sold for $990.83. Whoever issued the security pays $80 a year in interest to whoever holds the security. If the original purchaser sells the security to someone for $990.83, the purchaser will be getting $80 in interest. But the new purchaser has invested less money, and the $80 in interest plus the reduced price represents a 9% return, which is the market interest rate for equivalent securities. Also, the 8%, $1000 par value, 9-year security will now sell for $953.04, in order to equalize its return value to yield 9%.

The following table illustrates the change in price of our $1000, 8% bonds when they are priced to yield 9% to maturity:

Time to Maturity	1 Year	9 Years
Current Price	$990.83	$953.04
Percent Change	.00917	.04696

The table illustrates the inverse relationship between the value of a debt security and market interest rates. It also illustrates another very important feature of debt securities: For any given change in market interest rates, the longer the time to maturity on debt securities with equal coupon rates, the greater the change in its market price. In the example, a 1 percentage point change in the market rates resulted in a changed value of $9.17 for the 1-year security, compared to $46.96 for the 9-year security. The longer the term to maturity of a security, the greater the interest risk.

Naturally, if interest rates fall, then the converse occurs. In other words, a drop in market rates increases the value of the $1000, 8% security in order to make its interest return equivalent to lower-yielding securities. Since all of the securities are “marked to market” in SBG, these price fluctuations are realized by increasing or decreasing the retained earnings account in the balance sheet of your bank.

Early Securities Management

Prior to December of 1983, banks in the U.S. reported securities net income first and then adjusted it for gains and losses. Today, the net income figure is reported after gains and losses. This difference is significant. In the earlier method, it was assumed that most of the securities a bank held were required by regulation. If a bank took a loss, it was reinvesting at higher yields; if it took a gain, it was reinvesting at lower yields. In either case, the new security would affect the bank's current net income; therefore, net income should not be adjusted by specific gains and losses from trading. The basic theory was that net income, exclusive of current trading activities, provided a more honest picture of what was really happening in the bank.

Numerous counter arguments eventually led to a change in 1983. Among the strongest was the fact that banks were the only business to utilize this rather unique accounting approach, and it was confusing to the average person who had some ability to read and understand income statements. Opponents also argued that many banks, especially those with low loan-to-deposit ratios, hold securities well above regulatory limits. Many of these banks trade securities for profits and consider their securities activities one of their principal sources of income. This type of bank would more appropriately show gains and losses as part of net income.

The market for bank stock has historically valued stability of earnings very highly. Banks that reported annual earnings that fluctuated, or even earnings that didn't improve at a modest pace, suffered in the market price of their shares. Especially in earlier years, most investors in bank stocks looked for a safe and reliable long-term

return on their investment at a very low risk. The marketplace seemed to believe that banks were supposed to be conservative, that if a bank had high profits, it was taking too many risks. Although deregulation and other events of the past few years may change these assumptions, they still influence the behavior of the stock price of most banks.

Banks have historically managed the securities portfolio to meet liquidity objectives, but in recent years they have changed their approach substantially. In the early days of banking, banks typically lent only a relatively small portion of their deposits (i.e., 60%), and the rest were invested in securities. Today, usually only the smaller banks do this. Also, in smaller banks, the percentage of deposits outstanding as loans tends to fluctuate quite a bit more and to be less predictable than for larger banks.

In the earlier days of banking, banks based their ability to raise money for unexpected loan demand on their ability to sell securities. Because banks did not want to take losses when they needed to sell securities, they managed their portfolios so that a large portion of the securities were always very close to maturity. (This process was generally referred to as liquidity management). However, banks cannot maximize investment profits by keeping a relatively large portion of a security portfolio in short-term instruments. Because most larger banks can easily access other sources of money to meet unexpected loan demand (i.e., CD's), they now emphasize profitability in most of their securities' decisions.

Until banks were required to mark most of their securities to market, bank management used gains and losses on securities as one of the primary mechanisms to "smooth" the earnings of the bank. If profits were high, low-yielding securities would be sold at a loss to lower earnings to a desirable level and vice versa. Some strong theoretical arguments were advanced that this was not in the long-term interest of the stockholder. But the strongest argument was that banks could hide large potential losses and liquidity problems by reporting the value of securities at the purchase price.

Since the value of securities fluctuates with market rates, banks today need to protect earnings from changes in interest rates and they use a variety of strategies to meet these objectives

Securities Management in SBG

In SBG, as in reality, when a bank manages a securities portfolio, it must take into account other considerations besides income. In SBG you can control the maturity structure of your portfolio and you can also use futures contracts to protect earnings. Gap analysis partially dictates securities management decisions in SBG. (See page 5 of the printout). If you make decisions on securities that put the bank's gap measurement outside the established limits, your P/E ratio, and stock price will suffer. You will have an extremely difficult time realizing enough profits to offset this negative effect. You can manipulate the overall asset/liability structure of the bank quite a bit and remain within gap limits. However, you may not immediately realize the long-range implications if you are not familiar with the gap mechanics or how gap changes each quarter.

Managing the Portfolio

Securities management in your bank can be divided into two areas: nondiscretionary and discretionary. The nondiscretionary part includes the securities you are required to purchase to meet government regulations. The discretionary part includes the securities that your bank may buy or sell as you choose. When you manage the nondiscretionary part of the securities portfolio, you simply want to maximize the earnings on investments that the bank must make because of regulation without taking excessive risk. You will find that the discretionary part of your securities portfolio is much more difficult to manage because you need to consider the current overall position of the bank and the management's goals and philosophies, as well as other non-security investment options.

NONDISCRETIONARY

Your bank is required to keep certain minimum amounts of securities in order to meet government regulatory requirements. To manage this area, project the regulatory requirements into the future and try to maximize the income from those forced investments.

1. Review the current regulatory requirements and forecast the increases or decreases that would occur over the next several quarters. (Base your forecast on the expected changes in those accounts that force the bank to purchase securities).

2. Review the maturity of existing securities, the economic forecast, and trading opportunities in order to improve the income from these required investments.

Use the equations that create the pledge requirement which are shown in the "Glossary" at the end of "The Players' Manual." If you have a general idea of the change in your accounts over the next four quarters, you can easily determine the impact on your pledging requirement.

Review the maturity schedule in the securities portfolio and consider these questions: As securities mature in the future, will you be below your pledging requirement? If so, what actions, if any, should you take now?

To answer this last question, and to manage your portfolio, you will need to do some economic forecasting. For example, if the bank, in the future, will fall below pledge requirements, you will then be required to add some type of security. (If you don't have enough, the model automatically purchases 90-day Treasury bills to meet pledge requirements.) If your economic forecast shows that interest rates are falling, you might do better if you purchased securities now at higher yields rather than wait and later be forced to buy at low yields. Generally, if you are absolutely certain that interest rates are at a peak and will start heading downward, you should buy municipals and 5-year government bonds. The high yield and profits from these securities will protect the earnings of the bank as rates fall.

In a rising rate market, you want to have most of your money invested in short-term securities, so that, as the rates rise, the earnings from your investments will rise, rather than stay at a fixed rate. (The money is reinvested each quarter at a higher rate). Any time you are convinced that rates are at the low point in the rate cycle and are going to start upward, you should consider selling long-term securities, and reinvest in T-bills. When you sell the high-yield bonds and reinvest at a lower rate, you are gambling on your forecast that you will be able to reinvest at some future date at an even higher rate of interest.

DISCRETIONARY

Whenever you invest more than the regulatory minimums, you expose the earnings of the bank. SBG banks are structured in such a way that any securities above regulatory limits are essentially being funded with purchased money. The larger the dollar amount of such transactions, the greater the risk. In general terms, you base the amount of the transactions (i.e., the amount of risk) on your confidence in your forecast and especially on how such investments will affect the bank's gap and portfolio duration. You will need to make a long-range economic prediction if you intend to maximize the return from the securities portfolio. The old adage, "Buy at the top, sell at the bottom," is valid, provided you are reasonably sure that you are at the top (or bottom) of an interest rate cycle.

Taxes

Taxes are another critical aspect of managing the securities portfolio. Unlike larger modern commercial banks, your SBG bank has only one way to adjust its overall tax position: through the purchase of municipal securities.

For this reason, SBG banks have rather large municipal portfolios. However, because municipals are longer-term, fixed-rate investments (and so somewhat illiquid), this large investment in munis can create substantial interest rate risks. The SBG program measures risk through the gap analysis and the market value of the long-term assets compared to par value. The degree of risk affects the price/earnings ratio of the bank; a higher-risk bank has a lower stock price. Ideally, management might like to have a small municipal portfolio, but the trade-off is a high effective tax rate.

To see how you can use the muni portfolio to reduce taxes and increase profitability (assuming a 50% tax rate), let's look at three different banks with different gross revenue figures.

Bank	A	B	C
Taxable income	1000	600	200
Nontaxable income	---	300	600
Gross revenues	1000	900	800
Expenses	- 600	- 600	- 600
Net income	400	300	200
Taxes	- 200	---	---
After-tax income	200	300	200

In the above example, Bank B has the best after-tax income because it has an appropriate mix of taxable and nontaxable revenue. However, large investments in municipals are extremely difficult to manage because of their effect on gap and on earnings.

Arbitrage

Arbitrage (investing a specific amount for a specific term to take advantage of a specific rate differential in the marketplace) can be both profitable and dangerous. It can be profitable, because you take advantage of a unique rate dislocation in the marketplace. But if you have misjudged the movement and direction of interest rates, what may have looked like a profitable decision can rapidly become a loss. You also pay a penalty in the investors' assessment of the bank (the P/E ratio), because your assets are changing erratically. (Assets expanded when the funds were purchased to invest and contracted when the position was closed out).

As you progress through the program, you will find that securities management becomes increasingly critical to profitability and share price. Also, as you become more familiar with the interaction of variables of the bank, you will understand these issues more easily.

LOAN MANAGEMENT

Policies

As management, you must be aware that you can generate profits in numerous ways. Some of these you may have to study in depth before you properly understand them. After examining various market strategies and the workings of various aspects of your bank, you may need to revise certain policies or attempt to reposition the organization. In a way, SBG is a little bit like a complicated Erector Set with few directions. You begin to put together something that might work, but you must continually examine the parts to understand better how they function together in order to improve the overall design. While engaged in this process, you must also be careful not to get so engrossed with a single part that you neglect the total system.

However, as you explore the alternatives suggested by your goals, remember profitability is clearly most important. Since loans are such a large part of the bank's profitability, they deserve considerable attention.

To determine what constitutes a good loan policy, you must consider the costs involved, your growth and profitability goals, capital needs and the dynamics of the various loan markets.

You must carefully orchestrate growth and profitability well into the future by well-defined policies. In some situations, you may lower your rates, producing rapid growth at reduced or marginal profitability in order to create a more formidable overall position in a given market. However, you must be very skillful to make the lower rate profitable in the long-run; sooner or later, you will need to make changes in your policies to improve profits, changes which may drive away the customers you gained by lowering rates.

You may also develop a problem with equity capital if you grow too quickly. You may, for example, allow the margin of profitability on loans to erode as long as volume increases so that total earnings grow, but you need equity capital for this growth. You must have profits and profit retention high enough so that you are not forced to seek outside equity, or investors must have a sufficiently high opinion of the bank (based on your profit) so that they will supply additional equity at rates the bank can afford.

The Loan Market

You increase or decrease your bank's market share of loans by your actions in the loan market: your rates and your efforts (officer time, advertising, and so on). You can explore some aspects of the loan market with the following equation:

SPREAD* X LOANS BOOKED = ESTIMATED INCOME

*Spread should be the difference between the actual loan rate and some economic benchmark cost-of-funds rate like prime.

The amount of loans booked is determined by a variety of factors (rate, officer time, etc.) that were discussed at length in the Players' Manual. For each loan category, the factors that influence loans booked will operate differently. As your team discovers and understands how these factors interact, you can substantially improve profits.

The best information comes from the history of your bank. For instance, if you increase officer time devoted to prime loans when the economy is reasonably stable, *and you don't make other changes that might significantly affect the loan category*, you might note something like the following results. Assume that with 6% of the officer time devoted to prime loans, you find:

SPREAD	X	LOANS BOOKED	=	ESTIMATED INCOME
3%	x	$16,000,000	=	$480,000

However, with 12% of the officer time devoted to prime loans, you find:

SPREAD	X	LOANS BOOKED	=	ESTIMATED INCOME
3%	x	$24,000,000	=	$720,000

Therefore, you would know that officer time (up to a point) has a dramatic effect on the amount of prime loans and could be used as an effective tool. Although you now have some valuable information, it still does not tell you what you should do. You only know that under current economic conditions, you can successfully manipulate prime loans through the use of officer time.

You should also be careful about drawing conclusions from this type of data because the computer program has a diminishing return aspect. In other words, increases in effort (officer time, advertising, etc.) will only increase new business up to a certain point. Beyond the point of diminishing returns, increases in officer time produce progressively less and less new business.

Even if you had a great quantity of this type of information, you would not necessarily know how to manage your bank. In the real world, each bank is in a unique position created by its financial condition and competitive environment. After a couple of quarters, SBG banks are too. In the last example, management found it could improve prime loan bookings by increasing officer time, but we have not considered the equity position of the bank; perhaps the bank cannot grow further because it does not have adequate capital. Finally, we have not considered the profitability compared to other assets the bank might be able to acquire.

Loan Volume

You can use the same equation to explore the dynamics of profitability and loan volume. Let's say that the average rate for "All Banks in the Economy" was 11.0% in quarter 1.3. You priced at the market, and another bank priced at 10.5%.

SPREAD	X	LOANS BOOKED	=	ESTIMATED INCOME
2.5%	x	$20,000,000	=	$500,000
3.0%	x	$16,000,000	=	$480,000

Clearly, the bank that priced under the market increased bookings by $4 million. But it may not have been profitable after all. Management sacrificed .5% on 16 million in order to acquire the extra $4 million in loans. The additional $20,000 in estimated income may not have been enough to cover the operating expenses associated with the extra loans.

Market Elasticity

"Market elasticity" is an important characteristic of loan demand. A loan category is elastic if a change in rate above or below market averages produces a dramatic change in demand. Prime loans are very elastic because a

small change in rate will cause a large change in demand. Bank management should determine the elasticity of each loan category. For example, let's consider medium-grade loans.

SPREAD	X	LOANS BOOKED	=	ESTIMATED INCOME
3.0%	x	$16,000,000	=	$480,000
3.2%	x	$15,500,000	=	$496,000

In this case, you could collect an extra 20 basis points without significantly affecting the volume of loan s. Also, note when the volume is not reduced significantly by the price, the income of the bank improves.

You can use your knowledge of market elasticity to increase profitability. In some loan categories, you may be able to price significantly above or below the market before volume begins to change. If you are trying to achieve loan growth, you need to know how far below market you have to price in order to increase volume. In some instances, you may have to price 30 or 40 basis points below market to attract significant new business. If you do not know this and price 10 points below, you will not achieve your growth objective, and you will give up a substantial profit on millions of dollars of loans.

Return on Equity

As banks grow, they must maintain sufficient capital and continue to provide an adequate return on equity (ROE). To do this, management must understand how growth, pricing, and profits relate to capital. Because each loan category requires a different amount of equity, a bank may achieve higher earnings but a lower ROE on one type of loan compared to another. For example, assume a bank earns 9% on the prime loan and that management pays 8% for the funds.

USES	SOURCES	
$1,000.00 at 9.0%	$ 960.00	at 8.0%
	+40.00	equity required for prime-grade loan
$1,000.00	$1,000.00	

Bottom line results:

$ 90.00	Interest revenue
- 76.80	Interest expense
$ 13.20	Pre-tax earnings
- 6.60	Tax at 50%
$ 6.60	Earnings

Assume that the bank also books a medium-grade loan at 9.4%. The bank still has the 8% cost for the funds.

USES	SOURCES	
$1,000.00 at 9.4%	$ 940.00	at 8.0%
_____	+60.00	equity required for medium-grade loan
$1,000.00	$1,000.00	

Bottom line results:

$ 94.00	Interest revenue
- 75.20	Interest expense
$ 18.80	Pre-tax earnings
- 9.40	Tax at 50%
$ 9.40	Earnings

Management might conclude that the prime loans don't earn as much, but first they must also consider the ROE of both loans. According to the capital adequacy equation of the SBG program, $40 of equity is required for a $1,000 prime loan. So the earnings of $6.60 represent an ROE of 16.5% ($6.60/$40.00). The equity required for the $1000 medium-grade loan is $60, so ROE is 15.67% ($9.40/60). Although the actual dollar amount on the bottom line of the medium-grade loan was greater, the ROE is lower. Now look what happens if the equity of $60 used for the medium-grade loan had been used to support a prime loan of $1,500:

USES	SOURCES	
$1,500.00 at 9.0%	$ 1440.00	at 8.0%
_____	+60.00	equity required for prime-grade loan
$1,500.00	$1,500.00	

Bottom line results:

$ 135.00	Interest revenue
- 115.20	Interest expense
$ 19.80	Pre-tax earning
- 9.90	Tax at 50%
$ 9.90	Earnings

The bank should have priced the medium-grade loan at 9.50% rather than 9.40% to produce the same ROE. However, management may not have been able to make the dollar volume of loans they wanted at that higher rate.

When a bank's capital adequacy begins to sink, most teams immediately seek new equity. Rarely do they explore using their current equity differently.

Let's consider the previous example again. By now, you should realize that medium-grade loans are not very sensitive to price differentials from market. So if a bank does not want to lower capital adequacy, it could do the following:

1. Price medium-grade loans significantly above market;*

2. Price prime-grade loans significantly below market.*

* "Significantly" here would have different implications for each loan category and economic scenario.

The earnings from each new medium-grade loan would increase substantially, but the total of these loans would decrease. If the bank priced the loans carefully, the volume would not be reduced severely, and the bank would experience a net gain in earnings on medium-grade loans as a result of the higher rate. Because the prime market is sensitive to price, earnings on each loan would be slightly lower, but the amount of loans would increase. Overall, earnings on prime loans would also increase.

Now, the bank could also grow total assets; for every $100 reduction in medium-grade loans, the bank could add $150 in new prime loans using the current equity. Naturally, if everyone were to adopt this strategy, a competitor might raise new equity in order to exploit the medium-grade market at slightly lower rates.

Each quarter you should compare the ROE of each category of commercial loans for "All Banks in the Economy." (See Case Study #20). Even without adjusting for loan losses (which should be done), you will see that the ROE's for these average market prices are not equal. You can use these ROE's to help you set rates to maintain the maximum profitability of the loan portfolio.

To determine a ROE for "All Banks in the Economy," use the coming quarter's interest rate and any reasonable cost of funds figure. Because you always evaluate loan pricing relative to market, if you know the market ROE, you can watch for opportunities to lower your price, achieve good growth, and still maintain profitability. Without the ROE calculation for the overall market, you can easily inadvertently reduce prices in a market segment that already gives a low return.

LIABILITY MANAGEMENT

In order to highlight the major interrelationships in managing a modern commercial bank, we have simplified several management areas in the SBG program. Liability management, one of the most difficult areas to manage, has been highly simplified in the simulation so that a single error in judgment will not penalize a group for more than two or three quarters. However, because liability management is such a critical area and only a few members of senior management in most banks are fully aware of the process, we will review the major issues.

Twenty-five years ago, liability management was unheard of and essentially unnecessary because most banks had more deposits than loans. In its early forms, liability management meant relying on short-term purchased money or mismatched purchased funds for a profit.

Liability management, which began in the 1970's, was pioneered by Citibank. In the 1970's, banks used several indicators to assess their "liquidity strategy," or how a bank ensured it had sufficient cash to meet commitments under a variety of conditions. These indicators were *the loan-to-deposit ratio* that a bank maintained under different economic conditions, *the securities maturing in 1 year as a percentage of total loans*, and *the volatile liabilities (Fed funds, CD's and commercial paper) as a percentage of total liabilities.*

In 1975, when most banks were lowering their loan-to-deposit ratio, indicating that funds were being invested in other ways, Citibank actually increased theirs to over 80%. In addition, Citibank's securities maturing in 1 year were approximately 1.5% of total loans, while more conservative banks were anywhere from 15% to 20%. A high level of securities maturing in 1 year meant that the banks could meet unexpected credit demands from the cash supplied by the securities portfolio rather than seek purchased money. Finally, while other banks' volatile liabilities were at 10% or below, Citibank's volatile liabilities were over 18%, indicating Citibank used more purchased money to support loans.

Demand for loans in 1975 was decreasing. Citibank was pricing aggressively and funding loans through the mechanisms available in domestic money markets, thus maintaining a very high loan -to-deposit ratio. As a result of this strategy, Citibank raised net return on assets from a relatively normal .45% or .50% for a large bank to over .60%. Not surprisingly, other large banks began to adapt the same principals in the quest for profit.

However, in the volatile markets of the late 1970's, bankers found that if they relied on purchased money, they could have problems because they could no longer predict interest rate movements with any accuracy. Any time rates changed substantively, regardless of direction, the banker lost money on some mismatched position.

Bankers today feel that managing liabilities, independent of the assets, entails substantial risk. In addition, pure liability management was based on a number of assumptions about the asset side of the bank that proved to be incorrect during the 1970's. As a result, the process today is referred to as "asset and liability management."

Before deregulation and the increased competition for funds that accompanied it, most banks relied on core deposits (i.e., savings and checking accounts) to fund their loan growth. But because today's consumers have more options and are more sophisticated, they do not usually put their money in low-yield liability accounts. Retail banks still promote these low-yield liability accounts aggressively; however, because of the operating expenses associated with these liabilities, the real cost of these funds may at times be higher than the price of purchased money. Modern commercial banks cannot support significant loan growth with these scarce funds.

In order to meet credit demands, commercial banks now obtain funds from a host of sources. Depending on its size, a bank may use a variety of markets including Eurodollars, correspondent banks, Fed funds, loans from subsidiaries (savings and loans), the commercial paper markets, and certificates of deposits.

The maturities and the quantities of funds available in these markets may vary substantially, depending on the

economic conditions at any given time. Because commercial banks always rely on these markets for a percentage of their total funds, when the banks need more funds, these markets become more volatile, thereby greatly increasing the risk for the banks.

A bank that relies heavily on purchased funds can have difficulty if profits decline or if the safety of the deposits is threatened in any way. The money markets are extremely sensitive to any sign of trouble; risk premiums rise rapidly at the first hint of difficulties. The old Continental Bank was a classic example of this market reaction. As soon as it experienced loan losses, its cost of purchased funds increased relative to other banks of similar size.

In theory, when a bank uses purchased money, it likes to match the maturity dates of the liability and asset sides of a transaction (e.g., to fund a 1-year loan with a 1-year CD), in order to ensure that the funds will be available and that the spread between the cost of funds and the interest rate on a loan will remain constant. In practice, banks often have difficulty matching the rate and the term of the funds available in the marketplace. To help reduce this mismatch, most banks make commercial loans at a floating rate; i.e., a designated spread over a specific cost-of-funds indicator, usually the bank's prime rate. However, because the prime rate is a composite indicator, the floating rate on the loan may not reflect the real cost of the funds that the bank is using.

Most bankers purposely mismatch liabilities and assets to some degree, because if their rate forecasts are correct, mismatching can work in their favor. But mismatching to produce profits is very risky. Because the marketplace is so volatile, if a bank makes a relatively small error in judgment, it can have long-term and substantially negative effects on the bank's income.

Managing the Bank

Most commercial banks have a series of interlocking decision-making groups; members of the senior management sit on several of the significant committees simultaneously. This organization ensures that the various operational senior committees are aware of each others' actions during their decision-making processes. The various managing committees continually review several rather large sets of information such as bank goals and policies, economic forecasts, and weekly changes in assets and liabilities.

First, most commercial banks in today's marketplace establish policies and set annual goals for all assets and liabilities. They take into consideration the long-term history of the bank, its overall market presence, market trends, and major competitors.

Second, the decision-making committees use economic forecasts, again taking into consideration the bank's history. Larger banks usually make three rate forecasts weekly: high, low, and "most likely." All the appropriate committees review these forecasts. If they reach a high level of consensus on the forecasts, management may extend the overall interest rate risk position of the bank. If the members of the committees disagree on the forecasts, management will generally reduce the risk of the bank.

In today's better managed bank, management usually sets predetermined limits on the level of risk that they will take under the most favorable conditions. Banks measure risk in several different ways. For example, they may put a maximum limit on the average time to maturity of the bank's total liabilities or on the amounts of funds that can be purchased to take advantage of temporary marketplace conditions; that is, they limit the maturity of long-term funds purchased for reselling in short-term money markets.

Third, management monitors all asset and liability categories. Each week, senior management reviews balance sheet changes in light of the bank's goals, determines the implications of current trends, and then decides on any changes in current policies.

(You will note that you go through the same process when you complete your sources and uses forecast on a quarterly basis).

Asset/Liability Management

As we mentioned, liability management actually includes monitoring the relationships between liabilities and the bank's assets.

To begin with, banks may have more demand for loans than they want. Banks make many of their commercial loans based upon loan commitments (agreements to loan money over a specified period of time at a specified rate or spread). If the demand for credit increases, banks must honor these commitments, even if the loans may be somewhat unprofitable because of market conditions.

Few commercial banks are in a position to slow demand for loans by charging excessive rates. (By "excessive" rates, we mean rates that the affected market segment would consider substantially over prevailing rates, although different customer groups will have different perceptions on this issue, depending somewhat on access to alternative sources of cash.) Banks may be especially reluctant to discourage long-standing customers through pricing, because these customers may be potentially profitable as long-term depositors or through the fees they pay for other services. In short, once a bank has established a market presence, it must be careful not to destroy this reputation. Senior management really cannot set the rate on assets anywhere it wants, but only impose slight variances from the marketplace at large.

A bank can restrict demand for loans by refusing to take on new customers and by ensuring that it makes loans only to its more creditworthy customers. The bank may lose some accounts, but presumably these will be customers that the bank believes it can afford to lose.

Banks that want more loans can also have problems. A bank which is pursuing very aggressive loan growth policies often begins to experience heavy loan losses. Usually, the bank has relaxed credit standards to increased growth; as a result, a large percentage of its new loans are higher risk.

Banks try to match rates and maturity dates in assets and liabilities so that spread is maintained regardless of interest rate fluctuation. When a bank cannot match rates, it constantly monitors the mismatched positions, or gaps, and evaluates the degree of interest rate risk in various segments of the bank through a process called gap management. Unless management has a relatively high level of confidence in the direction of interest rates, they will try to close the gaps by using swaps or other financial instruments. These transactions add a cost, (which is sometimes built into asset pricing). If the bank hedges in this fashion, it guarantees a level of profits regardless of interest rates movements.

Liability management in wholesale and retail banks presents slightly different problems. Banks are sometimes classified as wholesale or retail based on the mixture of their customer base (corporations versus the general public). Because large commercial customers are very careful about managing their money, wholesale banking does not attract a significant amount of inexpensive deposits. Instead these banks use money purchased from a wide variety of sources to make loans and investments. Because of the nature of assets and liabilities in wholesale banking, a wholesale bank often has mismatches that expose the bank to interest rate risk.

Problems in a predominantly wholesale bank can escalate rapidly. The bank uses large sums of purchased money that are not protected against loss; only the good name and profits of the bank serve as a guarantee to those willing to sell money. (For this reason, the cost and availability of CD's in SBG are partially a function of a bank's profitability and capital adequacy.)

Sellers of large amounts of money are sophisticated and wary; if they believe the bank is having any problems, they will demand a higher price for their funds--or no longer sell them--because they are taking a greater risk. *Because a large wholesale bank has little control over the asset pricing*, when the cost of the bank's funds increases, its profits decrease, compounding any other problem the bank might have. Continental Bank was a classic example of the risks inherent in wholesale banking and underlines the need for a conservative management approach.

By contrast, retail banks have more control over the prices on their consumer assets (although they tend to reprice less frequently) and rely on a large retail deposit base for a major percentage of their funds. Typically, such a bank uses only about 60% to 70% of its retail deposits for retail loans. It can then fund commercial loans with the remainder, or in the case of smaller banks, sell the remainder in the Fed funds market. Retail deposits are largely insensitive to minor problems the bank might encounter. To the extent that the bank does not rely on large sums of purchased money, it is not exposed if it encounters difficulty.

However, a retail bank usually has operating expenses that are quite high and rather inflexible, but are part of the bank's cost of funds. If interest rates fall to very low levels, or if other financial intermediaries become aggressive in the bank's market, the bank's cost of funds will increase (or, more properly, the spread will narrow), so that the bank will have profit problems.

Banks also have more difficulty matching assets and liabilities in the retail market. The mismatches are such that if interest rates move quickly by substantial amounts, a retail bank will usually have trouble, whether the rates are going up or down.

Summary

As you can see, a bank today can have major problems dealing with the dynamic interrelationship between assets and liabilities. What the bank may see as a low-risk, profitable venture may turn quickly into a situation in which the bank is truly in danger of failure.

In the last decade, large banks have relied more heavily on the purchased funds market, a market which has become more volatile every year. These banks have been successful primarily because they have increased their expertise in managing the liability portion of the bank and improved their management reporting systems. These systems have become increasingly important today; as events move at a rapid pace, senior management must have an up-to-date picture of the bank's total position at all times.

Today's retail banks are betting that they can substantially reduce their costs. If a bank can reduce its overhead or manage its work more efficiently and flexibly, it will make greater and more stable profits. For example, many banks have successfully reduced the real cost of funds by using computerized systems that can handle large volumes of small transactions at a very low cost per unit.

INTEREST RATE RISK AND GAP MANAGEMENT

The interest margin for a bank is the difference between all interest revenues on bank assets and all interest expenses on bank funds. The three common measures of a bank's overall interest margin are dollar interest margin, percent net interest margin, and spread. Using the information from page 1 of the printout for period 2.1, the three measures are calculated as follows:

Interest Margin Measures

Dollar Net Interest Margin = Interest Revenues - Interest Expense

(*before* loan loss provision)

$46.857 = $104.638 - $57.781

Dollar Net Interest Margin = Interest Revenues - (Interest Expense + Loan Loss Provision)
(*after* loan loss provision)

$39.592 = $104.638 - ($57.781 + $7.265)

Percent Net Interest Margin = (Interest Revenues - Interest Expense)/Earning Assets
(*before* loan loss provision)

.01083 or 1.083% = ($104.638 - $57.781)/$4,328.443*

Percent Net Interest Margin = (Interest Revs. - Int. Expense - Loan Loss Prov.)/Earning Assets
(*after* loan loss provision)

.00915 or 0.915% ($104.638 - $57.781 - &7.265)/$4,328.443

Interest Spread = Interest Revs./Earning Assets - Interest Exps./Interest Bearing Funds
.00409 or 0.409% = $104.638/$4,328.443 - $57.781/$2,877.167**

Notes:

- *Earning Assets* = Total Assets less ["Cash and Due from Banks" and "Bank Premises"].

** *Interest Bearing Funds* = Total Assets less["Demand Deposits" and "Dividends Payable" and "Accrued Taxes" and "Other Liabilities" and "All Equity Funds (but not Capital Notes)"].

The *Dollar Net Interest Margin* is helpful in ascertaining how well the bank can cover its other expenses. The *Percent Net Interest Margin* is helpful in measuring the changes and trends in interest margins and in comparing interest margins among banks (as shown in Case Study # 2). The *Spread* measures trends, swings, and relative margins as well as percentage net interest margin.

Variations in Interest Margins

Banks have little control over cyclical movements in savings or credit demands or fiscal and monetary policies. The typical economic or business cycle has profound implications for a bank. The acceleration in household and especially business borrowing *during economic expansion*, coupled with rising interest rates, should have an

abnormal effect on banks' interest margins. The sources of such an effect can be summarized in terms of volume, mix, and rate:

Volume effects—these occur since intense credit demands during rapid economic growth force a higher rate of bank credit production and, thus, higher levels of bank assets and liabilities.

Mix Effects—these usually stem from a shift in most bank portfolios toward high-yielding assets (such as loans) and away from lower-yielding assets (such as U.S. Treasury securities). Also, the mix of resources for most banks is toward relatively more purchased funds in the form of CDs or short-term borrowed funds.

Rate effects—during economic expansion, these effects tends to benefit the net interest margins as yields on assets rise, but this benefit is partially offset by negative rate effects as the marginal cost of funds also rise.

Managing Interest Rate Sensitivity—Traditional Funds GAP Management

The most widely used system in the early 1980s for banks to manage interest rate sensitivity was traditional Funds Gap Management. In this system, all items on each side of the bank's balance sheet are categorized into groups of items whose cash flows are sensitive and whose cash flows are not sensitive to changes in short-term interest rates. An asset or liability is identified as sensitive if cash flows from the asset or liability change as the short-term interest rate changes. The figure below provides an illustration of this system:

Interest-Sensitivity Funds GAP Analysis

<table>
<tr><th>Assets</th><th colspan="2">Liabilities + Equity</th></tr>
<tr><td rowspan="2">ISA</td><td>Sensitive Assets Financed by Sensitive Liabilities</td><td>ISL</td></tr>
<tr><td>ISA - ISL</td><td rowspan="2">+ GAP</td></tr>
<tr><td rowspan="2">NSA</td><td rowspan="2">Financed by Non-Sensitive Liabilities and Equity</td></tr>
<tr><td>NSL</td></tr>
</table>

It is important to note that it is interest sensitivity and not maturity that is the important distinction. For example, a 5-Year U.S. government security for which the rate changes continuously would be interest sensitive. There are three financing relationships illustrated in the diagram:

1. Interest Sensitive Assets (ISA) that are financed with Interest Sensitive Liabilities (ISL),
2. Non-Interest Sensitive Assets (NSA) that are financed with Non-Interest Sensitive Liabilities (NSL) and Equity, and
3. The funds gap (GAP) representing the difference between Interest Sensitive Assets and Interest Sensitive Liabilities.

The Funds Gap refers to the dollar amount by which ISA exceed ISL. The Gap is positive if ISA exceeds ISL and negative if ISL exceeds ISA. The ratio of ISA to ISL is another measure. A ratio above 1.0 indicates that ISA exceeds ISL. The reverse is true for a ratio below 1.0. A balanced interest sensitivity position is one for which the dollar Gap is $0.0 or the ratio is equal to 1.0.

The figure above illustrates a bank with a positive Funds Gap. Under rising short-term interest rates, wherein rates on assets and liabilities rise by about the same amount, this positive Gap would increase the interest margin. Declining short-term rates would exert downward pressure on the interest margin. If the Gap is negative (ISL are greater than ISA) then the interest margin would decline if rates rose and it would rise if rates declined.

The implication for bank management seems straightforward: If management expects rates to rise, then it would widen the Funds Gap and the reverse if rates are expected to fall. If used effectively, such Gap management decisions should lead to higher returns for a given interest rate risk level or should reduce interest rate risk for a given return level.

Achieving such lofty goals using Gap management decisions poses three major problems:

1. Which time period is appropriate to use in determining whether assets and liabilities are rate sensitive?

   This concern is an important one. A bank that uses six-month CDs extensively may have a large positive Gap if the time period is one month, and may have a negative Gap if the time period is six months. Page 5 of the printouts, period 2.1, illustrates an interest sensitivity worksheet. The "Balance Sheet Gap" is shown for each maturity bucket, i.e., in the 1-90 day maturity bucket, there is a positive Gap of $37.03 million; and in all other maturity buckets there is a positive Gap, save the "Over 3 Yrs." maturity bucket in which the bank has a negative Gap. This is not at all unusual for a bank. In other words, it is not unusual for a bank to be asset sensitive for some maturity buckets and liability sensitive for other maturity buckets.

   The interest rate risk of Gap management is the variability in the interest margin produced by the Gap. This view of risk, from the standpoint of choosing a time period to measure the GAP, is incomplete. If the time period chosen to measure the GAP is the next 90 days, then the GAP focuses on *current flows* from the funds Gap and ignores the present value of longer-term non-sensitive flows. It also ignores reinvestment risk. Yield curve movements that occur over the credit cycle can profoundly affect the latter. The point here is that current cash flows are emphasized rather than total value of the bank.

2. How capable is bank management in predicting the direction, magnitude, and timing of interest rate movements?

   The concern about the ability of anyone, including bankers, to *predict* interest rates (direction, magnitude, and timing) is a very real one. In effect, the use of Gap management argues that the user - the banker - can outguess the market on the future course of interest rates. This is a very questionable assertion. To the extent that Gap management is based solely on predictions of interest rates, then the typical bank is probably subjecting itself to higher risks.

3. Can bank management flexibly adjust assets and liabilities to obtain the desired Gap even if it can predict interest rates correctly?

   A bank's flexibility and ability to adjust assets and liabilities to achieve a desired Gap position is also questionable. Also, there is the question of the effects on the bank's customers. Successful gap management by a bank means that the bank's customers (as a whole) have positioned themselves incorrectly for interest rate movements. For this reason, it is often important to understand and utilize artificial hedges, such as financial futures, options , and interest-rate swaps.

The meaning of these and other defects is that Gap management as a tool is not solely adequate for an effective interest sensitivity program. Even a situation in which interest sensitive assets are equal to interest-sensitive liabilities does not insulate a bank from interest rate variations. For example, it is possible that as interest rates rise, asset yields may rise on average by only 100 basis points while liability yields rise by 200 basis points. Thus, it is not sufficient to be matched.

Duration Weighting

The duration weighted value of the portfolio accounts for parallel shifts in the yield curve. The duration of security in each period is calculated as the sum of the present values of the weighted average of the cash flows to

the security, CFi's, each CF weighted by the time, t, at which cash flow occurs, divided by the present value of the security:

$$di = \sum ti \times PV(CFi)/\sum PV(CFi).$$

The duration weighted value of the portfolio, D, is calculated by summing the weighted value of the duration of securities in each time period, di, with weights given by the proportional value of securities in each time period, Vi:

$$D = \sum diVi.$$

As such, the portfolio's duration assumes parallel shifts in the yield curve (term structure) in order to estimate the sensitivity of prices of fixed income claims to changes in interest rates. In other words, the percentage change in the value of the portfolio from, say, quarter 1 to quarter 2, $(P_2 - P_1)/P_1$, to a change in interest rates from quarter 1 to quarter 2, is assumed to be equal to minus the portfolio's duration times the percentage change in the market interest rate:

$$(P_2 - P_1)/P_1 = -D \times (r_2-r_1)/ r_1$$

Clearly, this model assumes that the sensitivity of the portfolio's value to a change in interest rates is dependent upon a single representative interest rate, in this case, r_1. If there is a relatively *small* parallel shift in the yield curve, then all rates will change by the same amount and the assumption of the percentage change in interest rates, $(r_2-r_1)/r_1$, is a valid one. However, if there is a non-parallel shift in the yield curve, then the interest rates for securities with higher and lower d's than the assumed portfolio D, will change by more or less than that assumed by the model. In this case, the percentage change in the value of the portfolio will be over- or under-estimated.

The Portfolio Net Worth Concept of Duration

Interest rate risk can be defined as the effect of changes in interest rates on the value of a single asset, the value of a portfolio of assets, or the values of a portfolio of assets and a portfolio of liabilities that fund the assets. This latter or last value is the net worth of the asset owners' balance sheet.

The duration of an entire portfolio of assets or of liabilities can be derived from information on the portfolio's future cash flows and market discount rates. Matching the duration of the portfolio of assets with that of the portfolio of liabilities controls a bank's interest rate exposure of its net worth. If assets and liability durations are matched, general interest-rate movements should have roughly the same effect on the values of the bank's assets and liabilities, thereby protecting portfolio net worth.

The expression for the impact of interest-rate changes on portfolio net worth as a percentage of assets is

$$\Delta PNW/A = -DG[\Delta r/(1 + r)].$$

where

ΔPNW	= Change in Portfolio Net Worth,
A	= Market Value of Assets,
DG	= Duration Gap,
Δr	= Change in Interest Rates, and
r	= Current Interest Rate.

The DG (Duration Gap) is calculated as

$$\mathbf{DG = D_A - (L/A)\, D_L}$$

where

D_A	= Duration of Assets,
D_L	= Duration of Liabilities,

L = Book Value of Liabilities, and
A = Book Value of Assets.

For example, suppose a bank has a dollar weighted D_A equal to 1.125 and a dollar weighted D_L equal to .572. It also has Total Assets (A) of $2,000 million and Total Liabilities of $1,750 million. The duration gap for the bank is .625, calculated as follows:

DG = 1.125 - (1,750/2,000) x .572 = .625.

Assuming an initial discount rate of 10%, then the percentage change in the ratio of portfolio net worth to as sets for a 2% uniform increase in interest rates is -11.36%, calculated as follows:

ΔPNW/$2,000,000,000 = -.625 x .02/1.10 = -11.36%.

Then the change in the value of the portfolio's net worth (PNW) is as follows:

ΔPNW = $2,000,000,000 x -.1136 = -$227.2 million.

Duration: The Measure of Interest Sensitivity for a Bank

For a commercial bank, we are interested in the sensitivity of two present values simultaneously—total assets and total liabilities. It is convenient to think in terms of their comparative d urations, i.e., total interest sensitivity can be couched in terms of a Duration Gap—the difference in the durations of assets and liabilities. The interest rate risk of a bank's whole portfolio of earning assets is derived from cash-flow mismatches between that portfolio and the liability portfolio that funds it. Thus, the relevant determinant of interest rate risk for a bank is the way the duration of its assets line up with the duration of its liabilities. If duration is larger for the bank's portfoli o of assets than it is for the duration of its portfolio of liabilities, then the bank is exposed to rising interest rate risk. If the duration of assets and liabilities are matched, the bank's balance sheet is immunized against changes in interest rates.

The true value of duration analysis is that it gives bank management a more balanced focus. In other words, it allows bank management to view interest rate risk in two dimensions—income risk (changes in reinvestment cash flows) and price risk (changes in portfolio value). Income risk occurs when there are more or fewer assets being re-priced currently than liabilities. Price risk occurs when the value (prices) of assets either fall faster, or rise more slowly, than the values of liabilities. Both income and price risks are captured readily by duration.

Price risk usually receives less attention than income risk because the economic values of some assets and liabilities go unrecognized in an accounting sense. Price risk is , however, readily visible if, for example, the market price of mortgages is realized when a bank sells mortgages. Also and generally, prices of actively traded bank stocks are negatively affected by the perception of Duration Gaps in the banks' balance sheets. Price risk cannot be avoided just because accounting principles fail to account for changing market values of all assets and liabilities.

Duration and Gap Management

In contrast to the duration matching approach, Gap management addresses matching of the near term repricing volumes of assets and liabilities; it tends to ignore the interest sensitivity of long term assets and liabilities. Gap management attempts to stabilize earnings while duration matching attempts to stabilize the portfolio's net worth value. Bankers have a tendency to adhere to Gap management as opposed to duration matching because they are oriented toward short-term earnings objectives, not toward portfolio net worth values. This bias toward earnings would not hold up if banks adhered to market value accounting principles. If they did so, the impact of interest-rate movements on the values of loans, securities, and various funding sources would immediately be clear.

In any event, the practicality of duration appears to be limited. Duration values are very unstable with the passage of time. Contractual cash flows change, defaults occur, reinvestment opportunities vary, and assumptions about future business fail to hold. As a result, to be correctly matched, the asset and liability durations would have to be continually rebalanced and readjusted.

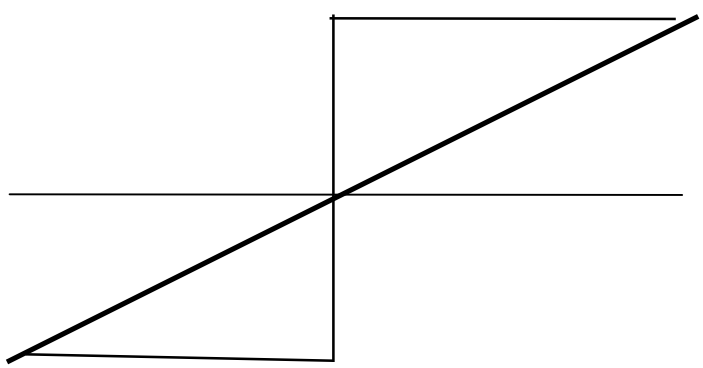
Immunization

Immunization is the key to managing interest rate sensitivity. There are two main classifications of interest rate risk: changing reinvestment rates and changing market prices. Gap management emphasizes cash flows—the changing reinvestment rate—and ignores changing security prices. Immunization describes the design of portfolios that can achieve a target level of return for a specific future period in the face of changing reinvestment rates and security price levels.

For example, a bank has $300 million in floating rate loans with a time-to maturity equaling 1.25 years, but with a calculated duration of 1.0 year. The promised yield to maturity on this portfolio of floating rate loans is, say, 10%. An increase in interest rates will reduce the market value of the portfolio; however, the reinvesting cash flows from the portfolio will increase. The significance of the 1 year duration is as follows: A one time change in interest rate over the course of 1 year ensures that the 10% promised yield will be achieved by the end of that 1 year period. This is so since over the course of the year, the 1-year duration of the portfolio ensures the bank that the decline in the value of the portfolio will be offset by the increased reinvestment cash flows.

The teeter-totter diagrams below demonstrate the fundamental principle of immunization. A positive change in interest rates insures that the 10% promised yield-to-maturity of the portfolio will be earned over a period of time equal to the duration of the portfolio, but not the time-to-maturity of the portfolio. In other words, over the course of one year (equal to the duration of the portfolio) the loss in the value of the portfolio (the area of the triangle below the horizontal dashed line through the fulcrum of the teeter-totter) is offset by the gains in reinvestment cash flows (the area of the triangle above the horizontal dashed line through the fulcrum).

IMPACT OF A *POSITIVE* CHANGE IN INTEREST RATES
ON A $300 MILLION FLOATING RATE PORTFOLIO
with
Time to Maturity Equals 1.25 Years and
Promised Yield-to-Maturity Equals 10%
Portfolio Duration Equals 1.0 Years

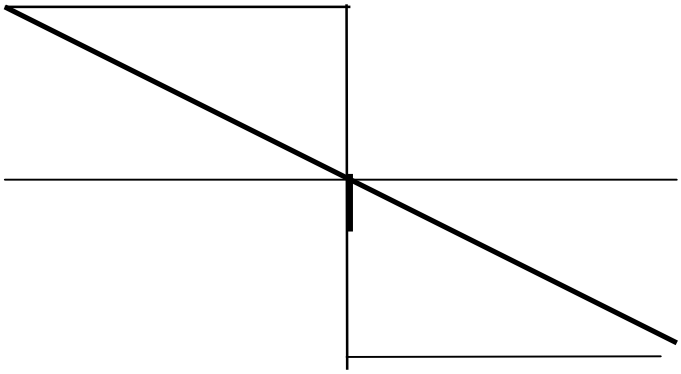


Negative Change in Portfolio Value = Positive Change in Reinvestment Cash Flows,

insuring that the 10% promised yield-to-maturity will be earned over the one-year period (the duration of the portfolio) for a one-time *increase* in interest rates.

If interest rates decline, rather than increase, the 10% promised yield-to-maturity is still earned over the course of one year (equal to the duration of the portfolio). In this case, the teeter-totter balances so that there is a gain in portfolio value (as opposed to a loss in value) which is offset by an equally valued loss in reinvestment cash flows (rather than a gain in cash flows).

IMPACT OF A *NEGATIVE* CHANGE IN INTEREST RATES
ON A $300 MILLION FLOATING RATE PORTFOLIO
with
Time to Maturity Equals 1.25 Years and
Promised Yield-to-Maturity Equals 10%
Portfolio Duration Equals 1.0 Years



Positive Change in Portfolio Value	**=**	**Negative Change in Reinvestment Cash Flows,**

insuring that the 10% promised yield-to-maturity will be earned over the one-year period (the duration of the portfolio) for a one-time *decrease* in interest rates.

The two illustrations demonstrate that a portfolio is immunized if its value at a specific future period, regardless of the course of interest rates, is at least as large as it would have been if interest rates had not changed. Under the assumption that changes in interest rates will be the same for all future rates on securities held in the portfolio—there is a parallel shift in the yield curve—duration is the investment horizon for which the reinvestment risk and price risk of a portfolio should be immunized from interest rate risk.

Alternatives for Measuring and Managing Interest Rate Risk in the SBG

The goal of most bankers is to assume risk and control it while making an acceptable profit (a profit that compensates investors with a risk-adjusted return commensurate with one that could be earned on alternative investments of similar risk). This goal is extremely relevant when considering a bank's asset/liability management efforts. Generally, bankers must manage and not necessarily eliminate interest rate risk. In other words, the process of managing interest rate risk should generate returns that are at least commensurate with the interest rate risk or funding risk taken by the bank.

GAP MANAGEMENT—Despite the above objections about GAP management, it still appears to be a helpful tool. Funds Gap measures are good indicators of the direction and possibly the size of interest margins for a given increase or decrease in interest rates. With this in mind, there are four strategies that utilize Gap management:

1. **Accept margin fluctuations:**

   This strategy accepts fluctuations in interest margins as one of the risks of banking. A bank goes about the business of banking—meeting depositors' and borrowers' needs—and ignores its Gap position. This strategy implies that a bank's market should control the destiny of the bank's interest sensitivity. However, with such a strategy, a bank is forced to hope that interest rates move in a certain direction, either up or down. A movement in rates opposite to that hoped for would be the bank's interest-rate risk. Increased volatility in rates makes this strategy highly questionable. In other words, most banks cannot afford the sizable rate risk inherent in the strategy of letting the market determine the bank's interest sensitivity position.

2. **Manage the Gap over interest rate cycles:**

   This strategy emphasizes managing the bank's Gap position over the course of the interest rate cycle. This strategy would require positive movement in the Gap—a higher amount of sensitive assets or a smaller amount of sensitive liabilities or both—when rates are expected to increase and the reverse when rates are expected to decrease. There are two major problems with implementing this strategy—one is the questionable ability of anyone to outguess the market on changes in interest rates and the other is the desirability of managing borrowers and depositors to achieve the bank's objectives at the borrowers' or depositors' expense. One way some banks try to control the risks of Gap strategies is to maintain Gaps for short periods and then shut down the Gaps if interest rates do not work out as anticipated. Another way is to limit cyclical Gap management to shorter maturities while balancing the Gap for longer-term periods.

3. **Achieve a long-term Gap Target:**

   This strategy attempts to achieve a target Gap level over a longer period of time (and over the course of the interest rate cycle) while managing the near term Gap with artificial hedges (see Duration Management section below). This strategy would require positive movements in the Gap when rates are expected to increase over the long term and the reverse when rates are expected to decrease over the long term.

   The most obvious means of achieving a target Gap is to make direct changes in the repricing or cash flow characteristics of conventional (cash) asset and liability instruments. For example, a bank can

   1. Replace quarterly turnover of Federal funds sales with sales placed directly for longer-terms,
   2. Replace fixed-rate loan programs with floating rate loans,
   3. Bid up term deposit rates to replace short-term deposits with longer-term deposits, and
   4. Longer-term securities can be effectively shortened by using them in repurchase agreements.

As with any tool of financial management, the first task is to have a dependable measurement upon which to use the tool. In the SBG, the measurement available for conducting GAP management and implementing controls is the *Bank Gap Analysis* report presented on page 5 of the printout. The report classifies interest sensitive assets and liabilities according to time periods called maturity buckets. Within each maturity bucket are the assets and liabilities that are expected to be repriced or to experience a change in cash flows as a result of a change in interest rates. Assets and liabilities are repriced at a new market rate of interest when (1) they mature, (2) they contractually repay a portion of their principal, (3) their interest rate is contractually reset according to a market index (which could be a market rate), and (4) they are paid or withdrawn in advance of maturity or expectations.

The "Balance Sheet Gaps" between expected asset repricings and liability repricings for each maturity bucket are indicators of the bank's earnings that are exposed to movements in interest rates. For period 2.1, the bank's interest sensitive assets exceed its interest sensitive liabilities by $37.03 million in the 1-90 day maturity bucket. Thus, the bank has a net exposure to *reinvestment risk* during that time-frame. *Net reinvestment risk* causes the net interest margin to depend on future interest rates at which assets are repriced. *Net refinancing risk* (i.e.,

negative reinvestment risk) causes the net interest margin to depend on future interest rates at which liabilities are repriced.

It should be noted the Gap report is not a sufficient basis for implementing an effective interest sensitivity policy. The Gap report alone does not provide enough meaningful answers. Gap reports alone do not directly report about potential earnings volatility. Assets and liabilities are not equally sensitive to interest rate movements. Therefore, the negative Gap in the 91-180 day maturity bucket seems to imply that a negative change in rates will result in an improvement in the spread. However, the spread could decline even in a falling rate environment if there is a non-parallel shift in the yield curve—expiring low rate term deposits roll over at higher rates than those at which they were previously booked.

Duration Management—Interest Rate Futures

On page 5 of the printouts are two reports -- the "Current Securities Data" and "Futures Policy- Hedging Data and Hedge Ratio -- that provide data for duration management. All securities in the SBG are marked to market (repriced every quarter) and therefore are subject to easier duration analysis and management.

Duration matching can be achieved in the SBG over the coming period by using hedges—financial futures.—to achieve a funds Gap target. This strategy attempts to achieve a target GAP by buying (selling) financial futures. The hedge effectively alters the size of the GAP for the duration of the hedge which is effectively one period hence in the SBG.

Interest rate futures contracts offer a vehicle through which banks can shift interest rate risk for one period to the market for financial futures. Through financial futures contracts, a bank can commit to a price to sell or buy a security at some future date, i.e., the bank locks in a future price on a security. Before the futures delivery date arrives, the bank will execute an offsetting contract.

For banks there are two kinds of balance sheet hedges—asset hedges and liability hedges—that can be implemented using futures contracts. An asset hedge is designed to transform the effective interest rate maturity of an asset. To extend the maturity of an asset, futures contracts are bought; to reduce the maturity of an asset, futures contracts are sold. A liability hedge is designed to transform the effective interest maturity of a liability. To extend the effective maturity of a liability, futures contracts are sold; to reduce the effective maturity of a liability, futures contracts are bought. Basically, hedges using financial futures are designed either to maintain the market value of the asset or liability, or to reduce net interest income risk.

Costs Associated With the Duration Model and Using Futures Contracts

There is another cost to hedging: the fact that the hedge will not likely be a perfect hedge. With a perfect hedge, the profits or losses on the portfolio will be exactly offset with losses or profits on the hedge, i.e., there are no excess profits or losses. However, in the SBG, as is true in the real world, there are risks associated with the hedge, risks that could result in a less than perfect hedge, i.e., a hedge that could result in excess losses or profits. These risks are as follows:

1. Defaults are not re-priced when interest rates change, but do nevertheless impact the market value of the portfolio in the up-coming quarter. More specifically, the Duration Weighted Value of defaults in the up-coming quarter cannot be estimated since such defaults are not known in the current quarter. To the extent that there are defaults, then the Duration Weighted Value of Securities subject to repricing will be overstated. If a hedge is in place equal to the total Duration Weighted Value of Securities, then the profit (loss) on the hedge will not offset the loss (profit) on the securities portfolio.

2. The duration weighted value of the portfolio accounts for parallel shifts in the yield curve, but it does not account for non-parallel shifts. The duration of securities in each period is calculated as the sum of the present values of the weighted average of the cash flows, CFi's, each CF weighted by the time, t, at which cash flow occurs, divided by the present value of the security:

$$di = \sum ti \times PV(CFi)/\sum PV(CFi).$$

The duration weighted value of the portfolio, D, is calculated by summing the weighted value of the duration of securities in each time period, di, with weights given by the proportional value of securities in each time period, Vi:

$$D = \sum diVi.$$

As such, the portfolio's duration assumes small parallel shifts in the yield curve (term structure) in order to estimate the sensitivity of prices of fixed income claims to changes in interest rates. In other words, the percentage change in the value of the portfolio from quarter 1 to quarter 2, $(P_2 - P_1)/P_1$, to a change in interest rates from quarter 1 to quarter 2, is assumed to be equal to minus the portfolio's duration times the percentage change in the market interest rate:

$$(P_2 - P_1)/P_1 = -D \times (r_2 - r_1)/ r_1$$

Clearly, this model assumes that the sensitivity of the portfolio's value to a change in interest rates is dependent upon a single representative interest rate, in this case, r_1. If there is a parallel shift in the yield curve, then all rates will change by the same amount and the assumption of the percentage change in interest rates, $(r_2-r_1)/r_1$, is a valid one. However, if there is a non-parallel shift in the yield curve, then the interest rates for securities with higher and lower d's than the assumed portfolio D, will change by more or less than that assumed by the model. In this case, the percentage change in the value of the portfolio will be over- or under-estimated.

3. The duration model assumes that the relationship between duration and the value of the securities is a linear one; however, the true relationship is non-linear. For any given duration, the model will always underestimate the value of securities with higher or lower durations than the given duration. Therefore, for a negative change in rates, the model will underestimate the positive change in the value of the securities; and, for a positive change in rates, the model will overestimate the negative change in the value of the securities.

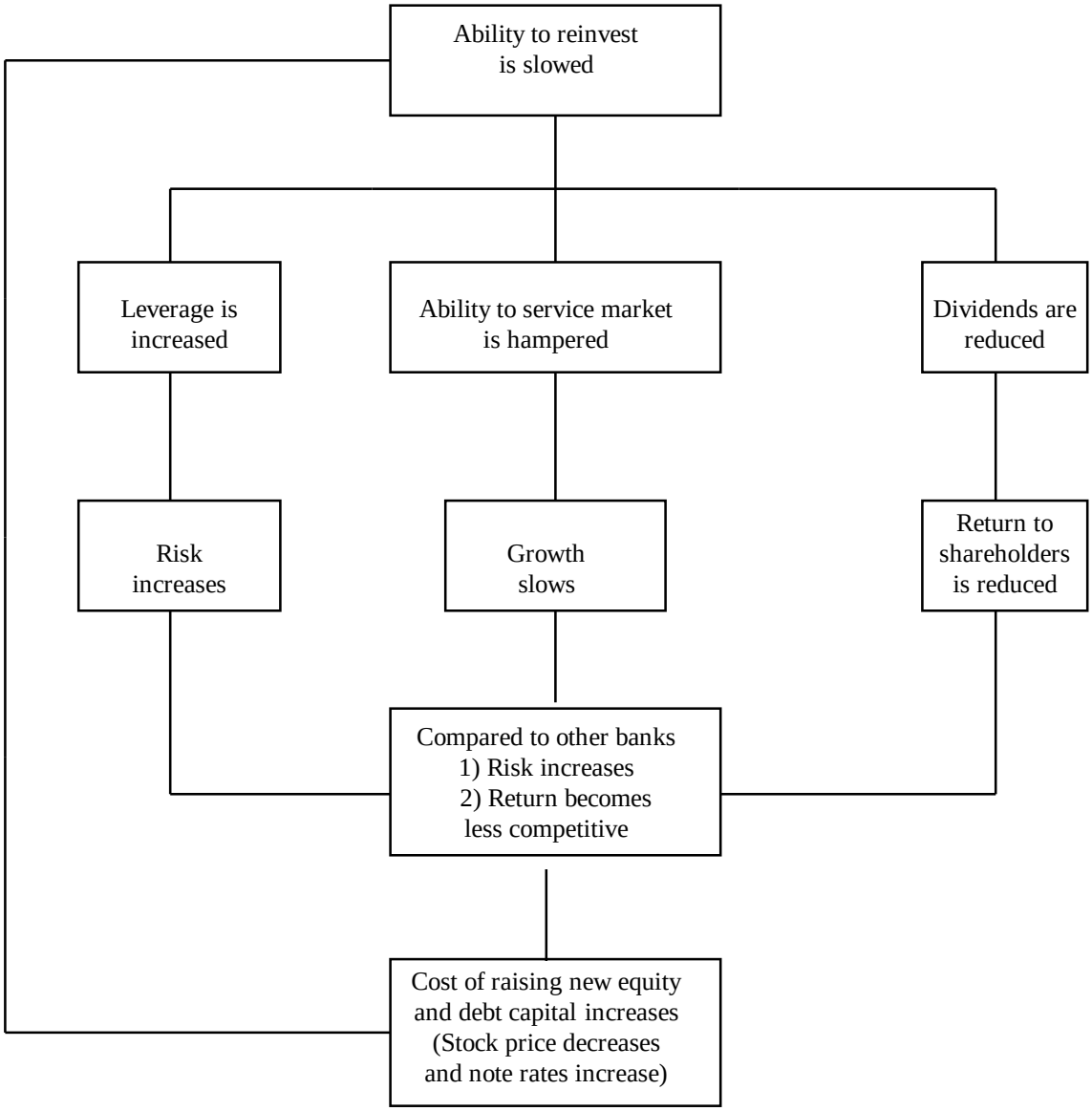
4. Finally, the futures contract is being priced on the basis of a five-year market yield whereas the securities portfolio is being priced on the basis of the yield curve. As long as the change in actual market rates is small and approximated by the actual change in the five year market yield, then there will not be an additional excess profit or loss generated when using futures contracts to hedge. However, if the actual rates change by more or less than the five year rate, then the change in the value of the futures contract will not parallel the change in the value of the portfolio and the hedge will be less than perfect. In this case, the profit (or loss) on the futures contract will not offset exactly the loss (or profit) on the securities portfolio. The risk of this occurring is called basis risk.

   This risk is further enhanced because the prices of the futures contracts being used to hedge a position are based on an underlying asset that is not identical to the assets being hedged. Thus, the assets are subject to different market pricing mechanisms than the futures contracts. As such, the pricing spread between the value of the futures contract's underlying securities and those actually held can change over the course of the hedge. This change in spread will result in profits (or losses) on the futures contract that are not identical to the loss (or profit) on the asset position.

CAPITAL MANAGEMENT

Stock price, which is the best measurement of your bank's overall performance, is primarily determined by earnings and growth in earnings. If earnings don't grow, investors become dissatisfied because the return on their investment begins to erode with inflation. In SBG, as in the real world, a reduction in earnings can quickly initiate a vicious cycle of slowed asset growth, more reductions in earnings, and a lower stock price, as the following diagram shows:

WHEN EARNINGS DECREASE



In SBG, although stock price is determined primarily by earnings, it is also affected by factors which measure financial risk: capital adequacy, capital structure, asset growth, liquidity in loans and investments (the mix), percentage of total loans which are non-accruing, dividend and its growth compared to the earnings growth of the bank, gap, and current market value compared to book value of the security and real estate loan portfolios. When banks grow assets and increase earnings, they must often assume more financial risk in one of these areas than they would if they did not grow or if they grew only slowly. Usually, higher earnings require greater risks, so banks with higher earnings often have lower P/E ratios. These banks must offset increased risk by increased earnings.

Growth

Over any significant time period, a bank must increase assets in order to increase earnings. A bank can increase earnings if it expands services that create fees or if the spread changes, but additional net fee income is usually insufficient, and the spread between the cost and use of funds is kept relatively stable by market forces.

In SBG you generally manage your bank for only about two simulated years. Because of the short time period, you do not need to grow total assets to realize increases in earnings. However, if you choose not to grow (or to shrink assets), you need to realize higher profit margins in order to compete successfully with the banks that grow assets; you need a better spread and/or lower expenses.

If your bank does grow assets, you need good capital management; you need to match carefully the asset growth rates to qualifying capital.

Capital Adequacy

Today, bank regulators from the major industrial countries agree on the minimum capital standards that will be applied. There are a few minor differences between countries and the regulators do change the standards from time to time, but most of the larger banks in the world are measured by the same risk-based set of measurements.

SBG also uses a risk-based system but a few of the requirements are slightly different and the actual calculations are simplified. On average, the actual total capital required by the simulation is very close to what would be required by a real-world bank.

The SBG capital adequacy ratio compares qualifying capital to both the size of the various assets categories and the risk the bank is taking; the ratio is expressed as a decimal. It is the product of the account balances and the different levels of required capital for each type of account based on risk as indicated by the SBG capital adequacy equation.

If you examine the capital adequacy equation (in Case Study #17), you will see that different types of assets require different amounts of capital. This equation represents a risk-related approach to capital. In the near future, bank regulators will probably implement this approach again. In the past, the regulators did not assign different levels of capital to specific types of assets; all assets required the same level of capital.

In SBG you control the capital adequacy ratio by controlling growth in the various accounts of the bank through the decisions you make each quarter. For example, if you don't want loans to grow, you price them accordingly.

The capital adequacy ratio has an immediate effect on the bank's stock price. But stock price generally is not important until the last few quarters of the program when you want to maximize the stock price of your bank compared to your competition.

Capital adequacy also affects the funding costs of capital notes and CD's; funding costs are very important at all

times during the program. If the capital adequacy ratio rises above 1.0, the bank's CD price will decrease compared to market rates. On the other hand, if a bank's ratio drops below 1.0, the bank's CD prices will increase. This effect becomes progressively more severe as the ratio decreases. As the bank pays a higher cost of CD's, its earnings per share will decrease. In turn, retained earnings, sustainable internal growth rates, and ultimately share price will be hurt. In other words, you will find your bank in the type of downward spiral diagrammed earlier. You should keep the ratio above .95 and certainly never allow it to go below .90. Obviously, you need to manage your bank's capital well to remain profitable.

Asset Mix

In SBG, you can increase total assets or improve capital adequacy, without adding to capital, by changing the bank's asset mix. If you reduce items such as branches or retail loans which have high capital requirements, you can expand other earning assets at a higher rate without affecting the capital adequacy ratio. For example, if a bank decreases its medium loans by $20 million, it "frees up" $1.2 million in capital. The bank could use this capital to support $30 million of prime loans, an increase of $10 million in total assets. (Required capital for medium loans is 6% and for prime loans is 4%). Or the bank could use the capital to simply improve the capital adequacy ratio. If you are contemplating issuing capital but don't believe the timing is right, you can change the asset mix as you continue to grow assets without damaging your capital ratio.

Retained Earnings

Retained earnings are the cheapest source of capital available to the bank. The growth in retained earnings depends on the overall profit of the bank and the dividend payout ratio.

Within the context of the simulation, a bank is expected to pay out at least 25% of its average quarterly operating earnings from the last 4 quarters, (i.e., the current quarter and the previous 3 quarters). The lower the bank keeps the dividend within this range, the greater potential it will have for growth in profits and stock price. A bank enjoys no advantages for paying out more than 25% - 35% of these earnings as dividends.

Also, you should be sure you can sustain your earnings before you increase the dividend. SBG shareholders expect that the bank will *never* reduce the *absolute* dividend per share. If a bank ever reduces the dividend, investors will not forget it for a long time.

If your team uses Case Study #17, you should not have much trouble matching the changes in assets to the changes in qualifying capital.

Notes and Stock

Raising external capital is considerably less complex in the bank game than it is in the real world. While the real-world banker has numerous financial vehicles available (i.e., adjustable-rate, perpetual preferred stock, equity notes, equity-commitment notes, debt/equity swaps, etc.), the teams in the simulation are limited to either capital notes or common stock.

In SBG, you can issue or recall capital notes and stock. Although the computer model simplifies this process, the issues you must consider are still rather complex. You may find a couple of simple guidelines helpful. If you want to raise capital, *it is considerably easier to issue notes than to issue stock*. If you make a mistake with notes, you can usually correct them without too much expense. If you issue or recall stock without understanding all the issues and implications, you can really damage you bank. If you decide to issue either notes or stock, use Case Study #17 and the following calculation to determine the correct amount.

How Much Capital to Use

To establish the quantity of notes to issue, you need to determine how much capital you will need for your desired

growth and capital adequacy ratio and then subtract the amount of capital you will have. Follow these steps:

1. Establish your bank's objectives for asset growth over a specific period.

2. Using the capital adequacy equation, calculate the amount of capital required for the increased assets at the end of the time period.

3. Forecast the income and dividend payout for each quarter in the period; then calculate the retained earnings accumulated by the end of the time frame.

4. Calculate the total capital at the end of the period by adding the capital you had initially to the earnings retained through the period.

5. Establish your desired capital adequacy ratio. (This should usually be approximately 1.0).

6. Determine the amount of capital you need to issue, using this equation:

NEW CAPITAL = (REQUIRED CAP. X CAP. ADEQUACY RATIO) - PROJECTED CAP.

In the simulation, new stock issued in any single quarter cannot exceed either 20% of the outstanding equity or 33% of retained earnings (i.e., undivided profits). Capital notes outstanding cannot exceed 30% of total equity in any given quarter.

Equity Capital: Common Stock

The best time for a bank to issue additional stock is when both the bank's and industry's P/E ratios are at historically high levels. But because you have limited market and historical data, and the game covers only a few years, you may sometimes have difficulty timing the issue properly. The best you can do is study the previous quarters' P/E levels and economic data, and any forecast which you can generate from these.

Price

First, you must determine if you can sell your stock at a good price. The computer program will set your new stock price at your present stock price discounted by 5% to 10%. When you issue new stock, your new share price should generally be at least equal to your current stock's book value. The book value is simply the equity (common + surplus + retained earnings) divided by the number of common shares outstanding. If you sell additional common stock below this amount, you will lower the value of the previous owners' holdings because the new shareholders will have been given a claim on this equity for less than its accounting value. Likewise, if you sell new shares while your stock is trading for one-and-one-half to two times book value, you will increase the previous shareholders' wealth for precisely the converse reason; the new shareholders will contribute $1.50 to $2.00 for each $1.00 of equity.

The book value and the stock price vary because the book value--the accounting valuation--is determined (and manipulated to a certain extent) by management while the stock price--the market valuation--is determined by market factors and the bank's earnings potential.

Internal Cost of Equity

The internal cost of equity is dividend as a percentage of the equity; i.e., the total dividend divided by equity (times four to annualize.)

$$\text{Cost of Equity} = \frac{\text{Dividend}}{\text{Equity}} \times 4$$

For example, in Period 2.1, your bank paid out a total dividend of 3.3 million ($1.10 on 3 million shares). With equity of $249.865 million, the cost of equity was 5.3%.

Because of stockholder expectations, a bank attempts to maintain an appropriate payout ratio (usually 25% to 35% of earnings) and the absolute level of dividend per share. But the bank's earnings may fluctuate due to the economy. As a result, the internal cost of equity will increase with increases in earnings. But it is extremely difficult to lower the cost of equity when earnings decline.

If you raise the dividend as earnings increase (that is, if you keep the payout ratio the same), the cost of internal equity will increase. But if you do not raise the dividend as earnings increase (if you lower the payout ratio), the cost of equity will remain constant; however, your stockholders may be displeased because they expect a payout ratio of about 25%.

You cannot lower the dividend when earnings decrease because stockholders react negatively to dividend reductions. In this situation, the cost of internal equity will remain the same, but the payout ratio will be higher. A high payout ratio usually leads to a lower valuation of the bank's stock. With a high payout ratio, the bank has lower levels of retained earnings which decreases its ability to grow, since fewer dollars are available to releverage.

If you lower the dividend when earnings decrease, the internal cost of equity will decrease; however, again your stock holders will be displeased (for several quarters) because their absolute dividend was decreased. The following charts summarize these relationships.

Earnings Increase

Earnings:	Higher	Earnings:	Higher
Dividend:	Higher	Dividend:	Constant
Payout Ratio:	Constant	Payout Ratio:	Lower
Cost of Equity:	Higher	Cost of Equity:	Constant
Stockholders:	Happy	Stockholders:	Unhappy

Earnings Decrease

Earnings:	Lower	Earnings:	Lower
Dividend:	Constant	Dividend:	Lower
Payout Ratio:	Higher	Payout Ratio:	Constant
Cost of Equity:	Constant	Cost of Equity:	Lower
Stockholders:	Unhappy	Stockholders:	Very Unhappy

Opening Position
(A Hypothetical Bank)

_ Earnings:	$12.862 (ROE = 18.48%)
_ Dividend:	$3.30 ($1.10 per share)
_ Payout Ratio:	25.65%
_ Cost of Equity:	5.3%
_ Equity:	$249.865 (Remains constant)
_ Stockholders:	Happy

(All dollar amounts in millions.)

Earnings Increase

Earnings:	$12.925 (ROE = 20%)	Earnings:	$12.925 (ROE = 20%)
Dividend:	$3.33 ($1.11 per share)	Dividend:	$2.84 ($.95 per share)
Payout Ratio:	25.65%	Payout Ratio:	22%
Cost of Equity:	5.3%	Cost of Equity:	4.6%
Stockholders:	Happy	Stockholders:	Unhappy

Earnings Decrease

Earnings:	$9.048 (ROE = 14%)	Earnings:	$9.048 (ROE = 14%)
Dividend:	$2.44 ($.81 per share)	Dividend:	$2.26 ($.75 per share)
Payout Ratio:	27%	Payout Ratio:	25%
Cost of Equity:	3.8%	Cost of Equity:	3.5%
Stockholders:	Unhappy	Stockholders:	Very Unhappy

As you may notice, you can also determine the cost of dividend equity by multiplying the ROE times the payout ratio.

ROE X Payout Ratio = Cost of Equity

Dilution Effect

When deciding whether to issue new stock, you must also consider the long-term earnings dilution effect; that is, how more shares outstanding will affect your current stockholders' earnings in the future.[1] Because your bank will have more shares outstanding, the profit will be divided between more shareholders; the original shareholders' stock will be "diluted."

Although your immediate EPS will be lower after a stock issue, the long-term EPS and stock price will be affected by a number of other factors, such as debt leverage (capital notes/total equity), capital adequacy (total capital/required capital), and the time frame for profitably leveraging the additional capital.

1. On the decision form, you indicate the dollar amount of stock you want to issue the next quarter, not the number of shares, so you will not know exactly how many new shares you have issued until after the sale. Still you can forecast with some accuracy an estimated number of common shares outstanding.

The more quickly the bank is able to increase its assets (which depends, to a large extent, on the individual bank's resource allocation and the loan demand in the economy), the more quickly it can improve its EPS. As income increases, retained earnings can, in turn, be releveraged.

Profitability

The additional assets, supported by the new equity, affect your profitability in an even more complex way, contingent on several key factors:

- after-tax ROA;
- asset leverage ratio (assets/total capital);
- additional equity leverage (additional assets/additional retained earnings);
- time to fully leverage additional capital;
- dividend payout ratio;
- dilution of earnings per share;
- price per share obtained for the new stock;

The following chart shows when the new equity will become profitable based on these factors. To illustrate the analysis, we have applied it to the initial position of a typical SBG bank and computed through 10 quarters, the duration of the game. We are assuming that this bank has a constant ROA, so if it increases equity, it should be able to grow assets and eventually increase the absolute level of earnings.

Equity Earn-Back Analysis: Factors and Assumptions

Factor	Assumption
After-tax ROA	.98%
Asset Leverage Ratio	Assets/Equity = .98
Additional Equity Leverage Ratio	$\frac{\text{Additional Assets}}{\text{Additional Retained Earnings}} = 18.8$
Time to Leverage Additional Capital	3 Quarters
Dividend Payout Ratio	25%
Amount, Number, and Price of New Shares	$10M: 94,607 shares @ $105.70 per share
Dilution of Earnings	Prior to Stock Issue: Earnings of $12.86 million. EPS of $4.29 per share and 3,000,000 shares outstanding.

We assume an 98 basis point after-tax return on assets. For the leverage ratio, we have assumed a 5.32% capital-

to-total-assets ratio, or a leverage factor of 18.8. In this instance, $5.32 of new debt combined with $94.68 of new deposits will support $100 of additional assets.

The third factor is the equity leverage ratio, or how heavily the bank levers retained earnings generated from these assets. Both the regulators in the real world and the simulation's stock valuation model treat primary (equity) capital and secondary (debt) capital identically for asset leverage purposes. Here, we assume a leverage ratio of 18.8.

For the purpose of this analysis, we have assumed that it takes three quarters to lever fully the additional debt based on both the quantity of notes issued and the projected growth rate of the economy. Finally, because we are concerned with retained earnings, we assume that the bank pays out 25% of earnings and retains 75%.

Equity Earn-Back Analysis: Results

Quarter	Equity	Assets Supported by New Equity	Assets Supported by New Retained Earnings	Add. Earnings	Add. Dividends	Additional Retained Earnings Quarterly	Additional Retained Earnings Cumulatively	Change in EPS
1	$10.0M	$ 62.67M	$ -0.0-M	$ .15M	$ .038M	$ .112M	$ .112M	-9. Cents
2	10.0	125.3	2.106	.312	.078	.234	.346	-4.
3	10.0	188.00	6.505	.477	.119	.358	.704	+2.0
4	10.0	188.00	13.235	.493	.123	.37	1.074	+2.6
5	10.0	188.00	20.191	.510	.128	.382	1.456	+3.1
6	10.0	188.00	27.373	.528	.132	.396	1.852	+3.7
7	10.0	188.00	34.818	.546	.136	.410	2.262	+4.3
8	10.0	188.00	42.526	.565	.141	.424	2.686	+4.9.
9	10.0	188.00	50.497	.584	.146	.438	3.124	+5.5
10	10.0	188.00	58.731	.604	.151	.453	3.577	+6.1

The bank has acquired $10 million in additional equity; 94607 shares of new common stock. To determine the maximum leverage the bank can get from this new equity, we multiply the additional equity ($10 mill ion) by the asset leverage ratio of 8.8 to get $188 million.

We are assuming that the new equity will be fully levered in 3 quarters, so we have arbitrarily divided the growth among those quarters (column 3, rows 1, 2, 3).

In the first quarter, with an after-tax ROA on the new assets of 24.5 basis points (98 basis points annually), new additional earnings (column 5) amount to $.15 million. With a 25% payout, the dividends are $.038 million (column 6), and $.077 million is retained (column 7).

The change in the EPS is, of course, based on the bank's total earnings, not just the additional earnings from the new equity. Before the issue, the bank had earnings of $12.862 million divided among 3 million shares for an

EPS of $4.29. In the first quarter after the issue, the bank has an additional $.15 million in earnings from the new equity for total earnings of $13.012 million (assuming all else remains the same). With 3,094,607 shares outstanding, the EPS is now $4.20, down $.09.

In the second quarter, the retained earnings are releveraged at 18.8 to produce $2.106 million of earning assets supported by retained earnings (column 4). With the constant ROA of 24.5 basis points, in the second quarter the bank earns an additional $.312 million. With a 25% payout, the additional dividends are $.078 million (column 6), and $.234 million is retained (column 7). This quarter the bank had total earnings of $13.174 ($12.862 million plus $.312 million) for an EPS of $4.25, now down $.04 from before the issue.

Although initially the EPS was lower due to dilution, by the end of the first year the EPS has begun to increase. Retained earnings accumulate on a quarter-by-quarter basis, and the bank builds assets which are supported by those retained earnings. The absolute level of earnings increases steadily throughout the 10-quarter period.

You can do the same analysis of a capital note issue and compare the two to evaluate the relative profitability of the different equity issues.

Capital Notes

When you consider raising capital through capital notes rather than common stock, you must take several slightly different cost factors into account. Besides the cost differences (interest and sinking fund payments vs. dividend yield), the other important difference between stock and notes is that notes do not dilute EPS. The EPS is still affected by a note issue, but the new cost is a fixed, pre-tax interest payment on the long-term debt, rather than a potentially fluctuating equity payout.

Remember that the interest expense on capital notes is a pretax expense while the expense on stock is an after-tax expense. In SBG, the tax rate is 48%, so an interest expense of 10% on notes is roughly equivalent to a cost of equity (stock) of 5%. (Internal cost of equity is based on the dividend which is paid on the internal after tax income).

When you issue capital notes, you also need to consider the debt leverage (debt to equity) ratio. When a bank issues notes, it should have a debt-to-equity ratio of somewhere between 15% and 30% in order to balance financial risk with additional earnings possibilities. Generally, capital notes should not exceed 25% of total equity because this increases the bank's financial risk and, therefore, lowers the stock price. A capital note issue that pushed the bank over this 25% limit might still be justified if the bank is able to continue generating retained earnings adequate to reduce this ratio.

Capital notes outstanding in any given quarter cannot exceed 30% of total equity, as defined by the regulators in the simulation. When a bank issues capital notes, it moves closer to this limit, but the bank should not have a problem with this unless it has a capital loss at a later time.

A capital note issue is limited to the difference between 30% of equity and the capital notes outstanding. In SBG, when the bank has a low capital notes/equity ratio, the bank can raise more capital by issuing notes than by issuing stock. When the ratio is high, the bank can raise more capital by issuing stock.

However, a capital notes issue is generally preferable to new stock. Because the cost of issuing new stock is higher than for capital notes, a bank has a greater potential for internal growth from notes than from stock. In addition, because the stock price fluctuates depending on market forces and earnings, correcting a stock error may be expensive. Correcting an error on issuing notes is less expensive because the cost is contingent on interest expense.

Now consider what would happen in the bank using the stock example above, if it issued notes instead; how would a capital issue affect the bank's ability to generate additional retained earnings, increase ROE, and repay

the sinking fund requirements? We begin with the same assumptions.

Debt Earn-Back Analysis: Factors and Assumptions

Factor	Assumption
_ After-tax ROA	_ .98%
_ Asset Leverage Ratio	_ Assets/Equity = 18.8
_ Additional Equity Leverage Ratio	_ $\frac{\text{Additional Assets}}{\text{Additional Retained Earnings}} = 18.8$
_ Time to Leverage Additional Capital	_ 3 Quarters
_ Dividend Payout Ratio	_ 25%

Equity Earn-Back Analysis: Results

Quarter	Equity	Assets Supported by New Equity	Assets Supported by New Retained Earnings	Add. Earnings	Add. Dividends	Additional Retained Earnings Quarterly	Additional Retained Earnings Cumulatively	Change in EPS
1	$10.0M	$ 62.67M	$ -0.0-M	$ .15M	$ .038M	$ .112M	$ .077M	+4.7 Cents
2	9.87	123.77	2.160	.308	.077	.231	.343	+10.
3	9.75	183.3	6.448	.456	.116	.349	.692	+15.
4	9.62	180.95	13.010	.475	.119	.356	1.048	+15.6
5	9.50	178.6	19.702	.486	.121	.364	1.412	+15.9
6	9.37	176.25	26.546	.497	.124	.373	1.785	+16.3
7	9.25	173.9	33.558	.508	.127	.381	2.166	+16.7
8	9.12	171.55	40.721	.520	.130	.390	2.556	+17.1
9	9.00	169.2	48.053	.532	.133	.399	2.955	+17.5
10	8.87	166.85	55.554	.545	.136	.409	3.364	+17.9

This time the bank issues capital notes instead of stock in a debt issue typical of a SBG bank: a $10 million, 20-year debt with quarterly sinking fund payments of $.125 million starting in the second quarter.

We assume the $10 million will be fully levered in 3 quarters (row 3, column 3). To determine the maximum leverage in the third quarter, we multiply the equity ($9.75 million) by 18.8 to get $183.3 million.

In the first quarter, with an after-tax ROA on the new assets of 24.5 basis points (998 basis points annually), new earnings amount to $.15 million (column 5). This includes the additional interest expense associated with the

new capital notes. We assume that this expense will be offset by the new opportunities in the lending markets. With a 25% payout, the dividends are $.038 million (column 6), and $.112 million is retained (column 7). The retained earnings are multiplied by the additional equity leverage ratio (18.8) to arrive at the $1.278 of earning assets in the second quarter (column 4). Quarter by quarter, the cumulative retained earnings (column 8) increase, and we build assets which are supported by those retained earnings (column 4).

The change in the EPS is, of course, based on the bank's total earnings, not just the additional earnings that result from the notes issue. Before the issue, the bank had earnings of $12.862 million, divided by 3 million shares for an EPS of $4.29. In the first quarter after the issue, the bank has an additional $.15 million in earnings from the new equity for total earnings of $13.012 million (assuming all else remains the same) with an EPS of $4.33, up $.047.

By the end of the game (quarter 10), the bank has added $3.364 million to retained earnings (column 8), which exceeds the sinking fund payments of $1.125 million by $2.239 million.

The bank can pay off the debt and still have substantial permanent capital left over. In the real world, the bank would have even more growth because this analysis would be done over a time period of 10 to 15 years, as opposed to 2.5 years (or 10 quarters).

We can also see one other feature from this analysis: the bank would never have to liquidate assets or stop lending as a result of amortizing the debt, assuming the level of new retained earnings can repay the interest and principal on the debt.

Each factor we have considered in the analysis of stock and of notes affects a bank's performance to a varying degree. To understand how these factors affect your bank, your team should compute earnings and growth values under different operating scenarios. For example, consider how an ROA of .30% (annualized) or a payout ratio of 50% would affect cumulative retained earnings.

Bank Reputation

Because depositors want to place their money with an institution they can trust, a bank's ability to raise funds and stay in business depends on its reputation. A bank's reputation is based, in part, on its perceived professionalism, its level of capital (if there are large differences between banks), and its size; the bigger a bank is, the safer it is generally perceived to be. As a result, larger banks have a lower cost of funds, which gives them a competitive advantage over the smaller ones. However, over time, a bank's market reputation is most strongly affected by its earnings record.

A bank's earnings and its market reputation affect each other substantially. If the market has great confidence in a bank because of its strong earnings, that bank can borrow funds as cheaply or cheaper than its competitors. With a lower cost of funds, the bank has higher earnings and so reinforces its ability to borrow at the best rates available. The more a bank earns, the more it is capable of earning.

Good management, especially of capital, is a key to developing strong earnings. At most banks, the management performance is evaluated based on the corporate goal for return on assets. ROA is computed based on bank capital (see "Managing Your Bank" in "Introduction to SBG"), and thus capital becomes key in the overall management process.

From a purely financial perspective, management must consider not one, but three, related, yet independent questions about adequate capital.

1. What constitutes capital? What is included and excluded?

2. What should the level of capital be based on risk assets, total assets, total loans, and nonperforming assets?

3. What is the proper relationship between capital and what is it based on?

Although in some areas regulatory guidelines are vague, guidelines on maximum leverage are clear cut: leverage is based on total assets. The regulatory authorities are willing to examine almost any reasonable proposal a bank might make for adding capital, either primary or secondary. Primary capital is differentiated from secondary capital by the fact that primary capital does not carry a specified or implied promise to repay. Secondary capital may not exceed a given percentage of primary capital, and most major banks choose to stay substantially below that regulatory limit in order to give themselves flexibility. For leverage purposes, primary and secondary capital are identical.

Summary

Capital is regarded by bankers as the base to which shorter-term liabilities are added to allow the bank to develop a portfolio of assets. Because they expect to be in business for a long time, banks look at everything, including capital, as a long-term concern. Banking regulators take a more short-term view; they are concerned about how adequate the capital of an individual bank and of the entire U.S. banking system is to withstand the next financial crisis.

In the real world, the capital measures are considerably less well defined than in the simulation. There is no single way to view the multitude of different banks with different equity, funding, debt, and earning characteristics. However, the earlier analysis may still be helpful, once bankers, regulators, and investors agree on the appropriate measures of capital.

THE ROE MODEL: ANALYZING BANK PERFORMANCE AND SETTING OBJECTIVES

Analyzing Bank Performance

Profitability, asset quality, capitalization, operating efficiency, liquidity, and interest rate sensitivity are the most critical areas of the bank. Although a wide variety of performance measures can be used to assess a bank's performance, we will explain six return measures and four risk ratios that can be used to provide a broad evaluation of operating and financial performance.

These are developed in terms of a model of return and risk. The model's ratios should be used in three ways: (1) to track your bank's risk and return performance over time, (2) to compare your bank's performance with both the current and historical performance of peer group banks, and (3) to help establish goal oriented policy decisions that are reasonable in terms of your bank's performance relative to the competitive environment.

KEY Return Measures

The six basic return measures are: 1] Return on Equity (ROE), 2] Return on Assets (ROA), 3]Leverage or the Equity Multiplier (EM), 4] Profit Margin (PM), 5] Asset Utilization (AU), and 6] Net Interest Margin (NIM). Previously, we saw that ROE was defined as

ROE = Adjusted Net Income/Equity

This clearly shows that the bank's ROE depends on its Adjusted Net Income and Equity. An increase in Equity, holding Adjusted Net Income constant, reduces ROE. An increase in Adjusted Net Income, holding Equity constant, increases ROE.
A bank's return on equity (ROE) can also be expressed as a product of its leverage or equity multiplier (EM) and return on assets (ROA):

Return on Equity (ROE) = Leverage or Equity Multiplier (EM) **x** Return on Assets (ROA)

If we break this down a bit further

ROE (Adjusted Net Income/Equity) = EM (Assets/Equity) **x** ROA (Adjusted Net Income/Assets).

ROA reflects management's ability to utilize the bank's financial and real resources to generate adjusted net income. Since ROA is typically low for banks as compared to most non-financial businesses, most banks must heavily utilize leverage to increase ROE to a competitive capital market level, i.e., a risk-adjusted level that is competitive with all other companies seeking financial capital in the capital markets. Leverage (EM) reflects the degree to which a bank is using equity (or conversely, debt) to finance income and non-income generating assets. As explained above, the ratio is typically high for commercial banks as compared with non-financial companies.
We can also express ROA in a slightly different fashion:

Return on Assets (ROA) = Profit Margin (PM or Net Margin) **x** Asset Utilization (AU or Yield) or

ROA (Adjusted Net Income/Assets) = PM (Adjusted Net Income/GOI) **x** AU (GOI /Assets).

SBG uses the term Gross Operating Income (GOI above) for what many would call revenue.

Asset Utilization (AU) reflects how many assets are employed as earning assets and the yields (both interest and non-interest income) earned on those assets. In other words, it reflects management's ability to utilize assets

effectively to generate operating income. The Net or Profit Margin (PM) reflects the proportion of Gross Operating Income that eventually drops down to the Adjusted Net Income of the bank (after taxes, capital gains/losses, and marking securities to market in the balance sheet). It reflects management's ability to control all expenses, given some level of operating income.
The basic ROE model with a few different components is now as follows:

ROE = EM x ROA **= EM x PM x AU**,

The bank's Profit Margin is affected by another key profitability measure, the Net Interest Margin (NIM). NIM is very important since interest income and expenses make up the bulk of a bank's total operating income and expenses.

NIM = (Interest Income - Interest Expense)/Earning Assets

If we expand the profit margin(PM) calculation a little it allows us to see two of the more important income components:

PM = Net Interest Income/GOI + Net Non-Interest Income/GOI

The advantage to this is that it lets us easily see what portions (or percentage) of the Profit Margin is made up of net interest income (interest income less interest expense) versus the portion of the Profit Margin that is made up of other income (non-interest income) and other expenses (non-interest expenses). The first measure is well worth calculating since interest income and expenses make up the bulk of a bank's total operating income and expenses. The second measure reflects the difference between non-interest income and non-interest expenses. While net non-interest income is relatively small for most banks, it is a deceptive number. Fundamentally all of the banks' expenses except interest (such as salary, premises, advertising, etc.) are deducted from non-interest income to get the Net figure. Clearly many of these expenses are in fact associated with the banks ability to generate loans and deposits at rates that presumably create an acceptable NIM and Case study #20 is devoted to the complexities of this problem. In recent years non-interest income has been a growing contributor to most banks' total returns.

More in-depth profitability analysis is necessary to fully evaluate the bank's returns. Risk measures should be calculated. The bank's return and risk measures should then be compared with its own history and with other banks. Players should keep such parallel measures in mind when analyzing the bank's results.

Key Financial Risk Measures

Risk measures are related to the return measures because a bank must take risks in order to earn adequate returns. Four categories of financial risk measurement are important:

1) **Liquidity Risk** is defined as the extent to which a bank has funds available to meet expected and unexpected cash demands for new loans and deposit withdrawals. The problem in measuring liquidity risk is that liability management has supplemented asset management at many banks as a way to fund liquidity. In other words, banks have decreased the proportion of highly liquid assets (asset management) and increased the proportion of purchased funds (liability management) -- sources of funds paying market interest rates -- for purposes of meeting expected and unexpected loan demands and deposit withdrawals. Thus, at a minimum, two ratios are needed to measure liquidity risk: one reflecting asset management and one reflecting liability management.

   Asset Management: *Asset Liquidity Ratio* = Highly Liquid Assets/Total Assets, and

Liability Management: *Liability Liquidity Ratio* = Net Volatile Liabilities/Total Assets.

A bank's liquidity risk compares its liquidity needs for expected and unexpected deposit outflows and loan increases with its actual or potential sources of liquidity, from either selling an asset it holds or acquiring an additional liability. This risk is partially approximated by comparing a proxy of the bank's liquidity needs (its highly liquid assets) with its total assets (resources). Highly liquid assets consist of LIBOR Funds Sold, 90 Day Government Securities, and Cash and Due from Banks. The higher the ratio the greater is the bank's liquidity and the smaller is the bank's liquidity risk. The risk is demonstrated by realizing that a shift from highly liquid, short-term assets into longer-term securities or loans would raise a bank's returns but would also increase its liquidity risk. Thus, a higher asset liquidity ratio for a bank would indicate a less risky, but less profitable bank.

A bank's liquidity risk is also partially approximated by comparing its *net* volatile liabilities with its total assets. Net Volatile Liabilities consist of 10% of Demand Deposits, CD's (private) maturing in the next 90 days, LIBOR Funds Purchased, CB Funds Borrowed, all less Highly Liquid Assets. The ratio considers the degree to which the bank's non-liquid assets are being funded by relatively unstable money -- money that can disappear from the bank in a short period of time. The higher this ratio, the less liquid the bank and the higher the liquidity risk. This risk is demonstrated by realizing that a shift from highly liquid assets into volatile liabilities would reflect the fact that a higher portion of the bank's non-liquid assets (longer term assets) are being funded with volatile liabilities. This would tend to raise a bank's return, but would also raise its liquidity risk. Again, a higher net volatile liability ratio would tend to raise a bank's return, but also its liquidity risk.

2) Interest Rate Risk = Rate Sensitive Assets/Rate Sensitive Liabilities

The bank's interest rate risk is related to the changes in asset and liability returns, and changes in asset and liability values caused by changes in interest rates. A beginning measurement of this risk is the ratio of rate sensitive assets to Rate sensitive liabilities. This interest rate risk ratio reflects the risk that the bank is willing to take in predicting the future direction of interest rates. If a bank has a ratio of 1.0, then changes in interest rates will have a minimal effect on returns. If the ratio is above 1.0, the bank's returns will be lower if interest rates decline and higher if they increase. To minimize interest rate risk the interest sensitivity ratio should be close to 1.0. Such a ratio may be hard for some banks to achieve and often may be achieved only at the cost of lower returns on assets.

The ratio also reflects potential re-pricing of rate sensitive assets and liabilities. Recognizing that a rise (fall) in rates will reduce (increase) the market values of rate sensitive assets less liabilities, a ratio of 1.0 would result in an approximate equal change in value for assets less liabilities when interest rates change. If a bank has a ratio greater (less) than 1.0, then a fall (rise) in market interest rates will result in a net positive (negative) change in the market value of rate sensitive assets less rate sensitive liabilities.

It should be noted that when market interest rates change, the change in net market value (of rate sensitive assets less rate sensitive liabilities) is opposite to the change in returns. For example, if there is a decline in market interest rates and a bank has a ratio above 1.0, then net market value will increase while returns will decrease. Thus, interest rate risk is a two edged sword -- one edge affects returns while the other edge changes the net market value of rate sensitive assets and liabilities in the opposite direction from returns when market interest rates change. The management of this problem involves making short-run return decisions versus longer-term value decisions. This problem and solutions to the problem are discussed at length in the "Interest Sensitivity Analysis" Case study.

3) Credit Risk = Loan Loss Reserves/Gross Loans and Mortgages

The credit risk of a bank is defined as the risk that the interest or principal, or both, on securities and loans will not be paid as promised. This risk is approximated by comparing a proxy of the bank's potential non-payments (Loan Loss Reserves) with a proxy for the bank's Earning Assets (Gross Loans and Mortgages). This measure can be supplemented by also measuring the proportion of assets that are medium and low quality loans and looking at the relative amount of past-due loans. The credit risk is higher if a bank has more medium and low quality loans, but returns are usually higher too. Returns tend to be lower if the bank chooses to lower its credit risk by having a smaller proportion of its assets in medium and low quality loans.

4) Capital Risk = Total Equity/Total Assets

The capital risk of a bank indicates how much asset values may decline before the position of its depositors and other creditors is jeopardized. This risk is approximated by comparing total equity to total assets. A bank with a 10% equity to assets ratio can withstand greater declines in asset values than a bank with a 6% capital to assets ratio. The capital risk is inversely related to the equity multiplier and therefore to the ROE. When a bank chooses to take more capital risk (i.e., a lower ratio), its leverage multiplier and ROE will be higher, if all other factors remain constant. If a bank chooses to lower capital risk, its equity multiplier and ROE will be lower.

The table below summarizes the four financial risk measures and their relationships to return. It should be noted that the Degree of Riskiness and the Potential Impact on return of a change in the risk ratio is a direct

Financial Risk Measures Summarized

Risk Measure	**Change in Ratio**	**Degree of Risk**	**Potential Impact on ROE**
Liquidity:			
Asset Liquidity Ratio	*Lower*	Greater Risk	Higher Return
Liability Liquidity Ratio	Higher	Greater Risk	Higher Return
Interest Rate Risk	Greater than or less than 1.0	Greater Risk	Higher Return
Credit Risk	Higher	Greater Risk	Higher Return
Capital Risk	*Lower*	Greater Risk	Higher Return

relationship -- there is a direct tradeoff between return and risk. In other words, policy decisions designed to enhance returns will generally also result in an increase in at least one or more of the risks associated with generating returns. However, a higher risk ratio measure does not always indicate a higher degree of risk, as in the case of the Asset Liquidity and Capital Risk ratios. For these risk measures, a lower ratio measure entails a higher degree of risk.

Key Return and Risk Measures

As discussed above, the basic *Return on Equity (ROE) model* breaks apart ROE into its basic components, which can be analyzed to identify areas in which a bank is being successful and may want to improve. Schematically, the basic decomposed ROE model is as follows:

BASIC RETURN MODEL---------- -**BASIC MODEL EXTENDED**---

ROE (Return on Equity) =
- EM (Equity Multiplier)
  - Times
- ROA (Return on Assets) =
  - PM (Profit Margin)
    - Times
  - AU (Asset Utilization)

A basic Risk model desegregates financial risk into four basic components **-- Equity Multiplier, Return on Assets, Profit Margin, and Asset Utilization** -- which can be analyzed to identify areas in which a bank is taking excessive risks or unnecessary risks for the returns achieved. The basic *Financial Risk Model* is superimposed on the Basic Return Model as follows:

----------***BASIC RISK MODEL***----------

ROE (Return on Equity) = ***Financial Risk***
- EM ***(Capital Risk)*** ***(Liquidity Risk)*** ***(Interest Rate Risk)***
- ROA =
  - PM ***(Credit Risk)*** ***(Interest Rate Risk)*** ***(Capital Risk)*** ***(Liquidity Risk***
  - AU ***(Credit Risk)*** ***(Interest Rate Risk)*** ***(Capital Risk)*** ***(Liquidity Risk)***

Four basic financial risk measures are shown in the diagram***: Liquidity, Interest Rate, Credit, and Capital Risk***. Each risk measure is placed adjacent to the return measure for which the risk measure is primarily derived. In other words, the diagram demonstrates the primary impact on specific risk(s) of changes in the return measures.

The Relationship between Changes in Return Measures and Changes in Risk Measures

The diagrams above seem to imply that an analysis of return and risk is a simple matter. However, such analysis is very complex and requires an in-depth comparative analysis of other components. In particular, a return measure cannot change unless there is a change in price, volume, or mix. Furthermore, any change in price, volume or mix also creates a change in one or more of the risk factors.

In analyzing financial results and setting objectives in terms of the return and risk measures, it is important to recognize the potential impact of all three effects.

Volume Effect: A change in any one of the return measures automatically entails a change in either one or both of the financial amounts in the numerator and denominator of the relevant return ratio. *This change in the level(s) of the financial amount(s) in the return measure's denominator and/or numerator is called a Volume Effect*. The volume effect of changing a return measure has an impact on at least one risk measure. For example, an increase in EM means that the level of assets (and liabilities) relative to the level of equity has increased. This increase in EM has a *twofold volume effect*: the increase in EM will *increase ROE*, holding all

else constant, and the increase in EM will also lower the capital risk ratio and thereby *increase capital risk*, holding all else constant. However, all else may not be constant.

Mix Effect: The change in EM could also entail a change in the structure of assets and liabilities, i.e., a change in the relative amounts of particular categories of assets and liabilities. *The effect of a potential change in the relative amounts of categories of assets and liabilities on return and risk measures is called the Mix Effect*. The mix effect has an impact on both return and risk. Using the prior example of a change in EM, the increase in EM means that because the level of assets and liabilities has changed, it is also possible that the mix of assets and the mix of liabilities have also changed. If the mix of one or both did change, then there is an additional *twofold mix effect*: (1) the change in the mix of assets will also entail a change in income and expenses (particularly interest income and expenses), thereby affecting both PM and AU, and (2) it will entail a change in any risk measure affected by a change in the mix of assets and liabilities, most importantly, liquidity risk.

The direct relationship between return and risk is still preserved with the mix effect. In other words, if the increase in EM is accomplished by increasing longer-term, less liquid assets relative to highly liquid assets, then AU will increase. AU increases since the higher proportion of longer term assets will presumably earn higher income relative to their proportion before the change in EM. Holding all else constant, the increase in AU will increase ROA and thus ROE. But Asset Liquidity Risk will also increase since the proportion of highly liquid assets relative to total assets has diminished. Again, all else may not be constant, and there could be a further mix effect.

The increase in EM, together with the increase in longer-term assets relative to highly liquid assets, means that more liabilities, relative to equity, are required to fund the growth in assets. There is therefore a potential impact on PM. Whether PM increases or decreases depends on the increase in asset income relative to the increase in liability expenses, due solely to a change in mix (i.e., holding interest rates constant). Suppose PM increases. This increase in PM will increase ROA and thus ROE. However, it will also increase Liability Liquidity Risk. The increase in PM presumably reflects an increase in highly volatile liabilities, but lower interest rate liabilities relative to other liabilities. Since the proportion of volatile liabilities has proportionately increased, liability liquidity risk has also increased.

Price Effect: The mix effect presumes that interest rates did not change. However, this is highly unlikely. The change in EM entailed a change in the volume and a potential change in the mix of assets and liabilities, thereby subjecting the bank to potential changes in return and risk measures other then EM and capital risk. *If interest rates also change, then there is a potential Price Effect*. As was true for the volume and mix effects, the price effect can also have a potential impact on return and risk measures. Suppose the bank's assets are more rate sensitive than its liabilities and that interest rates change favorably for the bank, i.e., interest rates rise and rates on assets increase relative to liabilities. The profit margin will again increase, thereby again increasing ROA and ROE. However. the favorably increase in net interest income was presumably accomplished by proportionately increasing Rate sensitive longer-term assets by at least as much and likely more than the increase in Rate sensitive shorter-term liabilities. Thus, the increase in ROA due to the price effect also subjects the bank to a higher interest rate risk.

There is another element to the price effect. By virtue of increasing EM, the capital markets could perceive that the bank's financial risk has increased to a point that requires higher risk-adjusted returns then was previously the case. If so, then providers of both debt and equity capital would require higher yields for funds lent and/or provided through equity. Obviously, this would have the impact of increasing the cost of liabilities and reducing adjusted net income.

Thus far, we have ignored credit risk. This risk is an element of the mix effect. The mix effect of this risk is not merely related to changing the mix of assets, but rather changing the mix in such a way that the bank incurs a greater probability of default on its loans and securities -- the increased likelihood that principal and interest payments will not be paid or will be paid with a delay. The increased risk is assumed by the bank in order to

increase interest income -- higher risk loans require higher interest charges. The increase in adjusted net income will increase PM, and therefore both ROA and ROE, but will also increase credit risk.

The important point to recognize is that a change in any one return measure has three effects -- a volume, mix, and price effect. At least one of these effects is assured for both return and risk -- the volume effect. As described above, the two other effects are possible for both the directly impacted return and risk measures and for other return and risk measures. In an efficiently managed bank operating in an efficient market, there is a direct tradeoff between return and risk. In other words, policy decisions designed to enhance one aspect of return will also increase at least one aspect of risk. Also, these same policy decisions could result in changes in other return and risk measures. These other changes can be partially or fully offsetting. Nevertheless, and irrespective of how the increase in EM is accomplished, by way of example, the increase in EM will result in a net increase in risk if there is also an increase in ROE.

The operative words are "in an efficiently managed bank operating in an efficient market." To the extent that one or both of these assumptions is not true, then it would be possible for a bank's management to make policy decisions that increase return without increasing risk or reduce risk without reducing return. Naturally, bank management would continue to seek out such policy decisions until there is a direct tradeoff between risk and return. Then and only then does bank management achieve the highest return possible for the level of risk assumed.

SBG is designed to reward efficiency. At an absolute minimum, the economy, markets, and regulations are designed to adjust and/or penalize a bank's financial measures for decisions that lead to unreasonable changes in return, given risk, or unreasonable changes in risk, given return. Further, if banks are also affected by the decisions of competing banks, then market competition will affect the financial results of a bank's decisions. On a competitive basis, the market will reward banks for making decisions that result in reasonable direct tradeoffs between return and risk or decisions designed to protect return, while neutralizing risk.

Measuring Returns and Risks

The first step in analyzing the bank's performance is to calculate the relevant measures. In the SBG, the calculations are provided on page 7 of the printouts. These calculations are based on the following definitions of the return and risk measures:

Return and Risk Measures Defined

1. Net Interest margin = [(Interest Revenues less Interest Expense) times four] all divided by LIBOR Funds Sold plus Total Securities plus Gross Loans and Mortgages less Provision for Loan Losses times four).

2. Profit margin = Adjusted Net Income/Gross Operating Income. Adjusted Net Income = Net Income (after tax) + Adjustment to Retained Earnings (after tax).

3. Asset Utilization = (Gross Operating Income x 4)/Total Resources (Assets).

4. Return on Assets = (Adjusted Net Income x 4)/Total Resources (Assets).

5. Equity Multiplier = Total Resources (Assets)/Total Equity.

6. Return on Equity = (Adjusted Net Income x 4)/Total Equity.

7. Highly Liquid Assets/Total Assets = (Cash and Due from Banks + LIBOR Funds Sold + + 90 Day Government Securities) divided by Total Assets (Resources) .

Net Volatile Assets/Total Assets = [(10% of Demand Deposits + Private CD's maturing in the next 90 days + LIBOR Funds Purchased + CB Borrowings) less highly Liquid Assets] divided by Total Assets (Resources).

8. Interest Rate Risk = Rate Sensitive Assets maturing within one year/Rate Sensitive Liabilities Maturing within one year. From the Static GAP Analysis report on page 5 of the printout, sum Total RSAs and Total RSLs for the 1-90, 91-180, 181-270, and 271-1yr. maturity buckets to obtain rate sensitive assets and rate sensitive liabilities, respectively.

9. Credit Risk = Loan Loss Reserves/Gross Loans and Mortgages.

Analysis of Key Return and Risk Ratios

How well has the bank performed? Did it earn acceptable returns? What risks has it taken to achieve these returns?

Interpreting the calculated return and risk measures is the next step. Such interpretation involves analyzing two comparisons: Trends in your bank's own return and risk measures over time and a comparison of your bank's measures with the same measures for similar banks.

The following table was filled in using hypothetical data from page 7 for periods 1.4 and 2.1. This table should be filled in using the blank forms provided at the end of study #18. This table will help you to monitor your overall performance, evaluate the results of your decisions, compare your results with peer banks, and provide a basis for setting objectives in Case study # 2.

ROE (net income divided by equity capital) is the most important measure of banking returns because it is influenced by how well the bank has performed on all other return categories. Bank X's ROE fell from 20.64% in period 1.4 to 18.48% in period 2.1. This compares to a similar trend for the Peer Banks; *however, the Peer Banks' ROE in period 2.1 was higher*.

The bank's Net Interest Margin fell from 4.19% to 4.15% and was below that of peer banks. Further, the peer banks managed to increase their Net Interest Margin from period 1.4 to 2.1. This may be of concern, but not of significant concern depending on what happened to Net Interest Income as a percent of Gross Operating Income. Given that the peer banks maintained their Net Interest Margin, the decline in the spread between interest income and interest expense should be of major concern.

The Profit Margin also declined from 9.784% to 8.94% , while the Profit Margin of peer banks also declined, but by less. This would seem to confirm that the decline in the Net Inerest Margin is of concern. In other words, non-interest income and expenses could also have contributed to the relative decline, but the major problem seems to be one of spread between interest income and interest expenses.

Also, the return analysis shows that the bank's asset utilization ratio fell and was ever so slightly greater than that of the Peer Banks. Again, this would tend to confirm that the Bank's problem is one of net interest income since all banks experienced a similar decline in Gross Operating Income as a percent of Total Assets. The ROA that resulted from the low profit margin and the declining asset utilization ratio declined from the previous period and was slightly below that of the peer Banks. The peer banks maintained a higher Profit Margin and therefore a higher ROA.

A below-average multiplier further impacted negatively Bank X's ROE. The multiplicative effects of a slightly lower ROA and EM resulted in magnified impact on ROE, reducing ROE to three quarters of a percentage point below the ROE of the Peer Banks.

ILLUSTRATION ONLY: BANK 1
COMPARATIVE ANALYSIS OF RESULTS:
KEY RETURN AND RISK MEASURES

Category	Period 1.4	Period 2.1	--------Peer Banks------- Period 1.4	Period 2.1
Return Measures:				
Net Interest Margin	4.19%	4.15%	4.18%	4.18%
Profit Margin	9.78%	8.94%	9.89%	9.28%
x Asset Utilization	0.1077	0.1100	.1086	.109
= Return on Assets	1.05%	.98%	1.07%	1.01%
x Equity Multiplier	19.6x	18.79x	19.34x	19.05x
= Return on Equity	20.64%	18.48%	20.69%	19.24%
Risk Measures:				
Liquidity Risk:				
Asset Liquidity Risk	20.50%	18.67%	21.06%	18.62%
Liability Liquidity Risk	-7.95%	-3.34%	-6.83%	-4.39%
Interest Rate Risk	1.29	1.29	1.29	1.23
Credit Risk	0.66%	0.66%	.74%	0.73%
Capital Risk	5.10%	5.32%	5.17%	5.25%

* Derived numbers may differ from actual calculation due to rounding error.

ANALYSIS OF RESULTS

Primary Return Variances:

1. *Variance: Lower Net Interest Margin* Analysis of Variance: *Due to Interest Spread*
2. Variance: *Lower Profit Margin* Analysis of Variance: *Due to Interest Spread*
3. Variance: *Lower Equity Multiplier* Analysis of Variance: *Due to Higher Equity Financing*

Primary Risk Variances:

1. Variance *Lower Liability Risk* Analysis of Variance: *Greater Funding w/ Liquid Assets*
2. Variance: *Lower Credit Risk* Analysis of Variance: *Due to Higher Mix of Lower Yielding Assets with less Default Risk*
3. Variance_____Analysis of Variance:_____

The risk analysis demonstrates the risk associated with managing the primary components of ROE -- PM, AU, and EM. Fundamentally, returns are increased by adding risk to one or more of the four primary risk measures and returns are diminished by subtracting risk from the risk measures. Therefore, because of Bank X's lower-than-average returns, as measured by ROE, it would seem logical to expect that they are taking lower risks than the Peer Banks. This is confirmed by the risk measures.

All risk measures exhibited the same trends and were similar to the levels of peer banks with the exception of three measures -- Asset Liquidity, Credit Risk, and Capital Risk. The peer banks lowered the asset liquidity ratio, thereby reducing asset liquidity (increasing risk), presumably changing their asset mix to higher interest earning assets. The slightly higher liquidity risk ratio demonstrates that part of the reduction in asset liquidity was financed with volatile liabilities. Further, the peer banks maintained a higher Credit risk, possibly indicating a higher proportion of riskier interest-earning assets. This seems to confirm the peer bank's higher Net Interest and Profit Margins. Further, the peer banks maintained a slightly lower Capital Risk Ratio. This slightly higher capital risk further contributed to a higher ROE.

It should be noted that the interest rate risk for all banks is significantly above one. Thus, the banks are gambling that market interest rates will rise over the course of the next four periods. Some attention should be directed to the size of this interest sensitive Gap.

The analysis of the key risk-return ratios for Bank 1 indicate that the bank's lower than average ROE is *primarily* caused by two situations:

1. A lower-than-average interest rate spread due apparently to the fact that the bank is taking a lower than average liability liquidity and credit risk, and

2. a lower-than-average credit risk thereby resulting in a lower-than-average Equity Multiplier.

Once the return-risk ratios have been used to spot the areas of key concern, supplemental studies and measures of bank performance can be used to identify specific strengths and weaknesses. In other words, it is necessary to conduct a more detailed investigation before establishing objectives. In particular, the other Case studies should be used for a detailed understanding of the factors underlying the bank's profit margin, ROA, non-interest sources of funds, the interest costs of the bank's sources of funds, the cost efficiency in overhead costs (such as salaries), the composition of assets and liabilities, the composition of assets and liabilities in conjunction with yields on assets and liabilities, and the growth of assets and liabilities. These other investigations together with case study will provide the foundation for setting objectives and therefore making the appropriate policy decisions.