

180.266 Financial Markets and Institutions

Answers to Problem Set 1

Spring 2010

Question 1

Q1.1: See Figure 1

Interpretation: This graph represents the evolution of the ROE for the American commercial banks from 1950 to 2009. Clearly, this ratio appears on average to be increasing with time. In particular, in the last recent years it achieved its peaks (see the period 1992-2006 for instance).

We know that ROE measures a firm's efficiency at generating profits from every dollar of shareholders' equity. Therefore, during the 1990s the shareholders had seen their returns be constantly higher than the historical average.

Two sudden declines are observed. The first one happened in late 1980s, primarily due to the saving and loan crisis. The second big decline is a recent story. As the subprime crisis started to show its effects on the stock markets, we can see a fall on ROE from 12.45% in 2006 to 8.54% in 2007 and 1.35% in 2008. Eventually, we now know very well what happened in the recent months to some of the largest bank of the country (like Citigroup), which had to be bailed out by the Government. Of course, it may be that the rise in ROE was associated with increased risk taking.

Q1.2: See Figure 2

Interpretation: This graph represents the evolution of the ratio of Total Non-interest Income over Net Interest Income for the American commercial banks from 1950 to 2008.

The interest income (for instance on loans and securities) represents the majority of the income, while the non-interest income is composed for instance by the service charges on deposit and it also includes off-balance sheet income. We also know that net operating income is an essential element when computing ROE and

ROA.

As we can see, this ratio had been around 20% until the late 1970s and therefore relatively constant. However, after that period, this ratio started to sharply climb until very high levels (relatively to the historical average) until reaching in 2003 a peak of 77.85%. The ratio has fallen off a bit in the last few years.

Q1.3: See Figure 3

Interpretation: This graph represents the evolution of the ratio of Interest bearing to Non-interest bearing deposits for the American commercial banks from 1950 to 2008. As we can see graphically, the interpretation is straightforward: the ratio is increasing in time (especially in late 70s and early 80s); and in 2007 it reached its historical peak.

Noninterest bearing deposits (mainly transactions balances) have been growing much more slowly than interest bearing deposits. Obviously, acquiring a given level of deposit liabilities in order to finance activities is more costly today than in the past.

Question 2

Q2.1: A Form 10-K is an annual report required by the U.S. Securities and Exchange Commission (SEC), that gives a comprehensive summary of a public company's performance. The 10-K includes information such as company history, organizational structure, executive compensation, equity, subsidiaries, and audited financial statements, among other information. Companies with more than \$10 million in assets whose securities are held by more than 500 owners must file annual and other periodic reports, regardless of whether the securities are publicly or privately traded (ref. Wikipedia).

Q2.3: Return on asset in 2008:

Net income (loss)	(\$27,684) Million USD
Total assets	\$1,938,470 Million USD
Return on assets in 2008	-1.43%

Q2.4: Sub-prime related direct exposures: **\$14.283** billion; sub-prime remaining direct exposure: **\$14.1** billion.

Q2.5: Credit derivatives (in million USDs):

Citigroup as Guarantor	1,443,280	Citigroup as Guarantor	1,590,212
Credit default swaps	1,441,117	Credit default swaps	1,560,087
Total return swaps	1,905	Total return swaps	29,990
Credit default options	258	Credit default options	135

Q2.6: Significant focus has been placed on fostering a risk culture based on a policy of **“Taking Intelligent Risk with Shared Responsibility, without forsaking Individual Accountability.”**

“Taking intelligent risk” means that Citi must carefully identify, measure and aggregate risks, and must fully understand downside risks; “Shared responsibility” means that individuals own and influence business outcomes, including risk controls; “Individual accountability” means individuals held ourselves accountable to actively manage risk.

Question 3

Q3.1:

- expected price of asset B at t+1 is: \$20 ($=17 \times 0.25 + 20 \times 0.5 + 23 \times 0.25$)
- expected return from buying B at t and selling at t+1 is $(20-19)/19=$ **5.263%**

Q3.2: The covariance of the price of streams B and C at t+1 is **negative**. This is because, across the three possible outcomes, prices of streams B and those of streams C are moving in the opposite direction.

Q3.3: The required **real** rate of return is **0** because the car price and inflation increase by the same degree. (Car prices grow at 4.8%, hence the required *nominal* rate of return is 4.8%; then given the inflation rate at 4.8%, by Fisher's equation we have the required *real* rate of return is 0% (=required *nominal* rate of return minus the inflation rate).

Q3.4: Given the internal rate of return at 3.50%, the price of A is **\$75.33** ($=\frac{20}{1+3.5\%} + \frac{60}{(1+3.5\%)^2} + \frac{0}{(1+3.5\%)^3}$).

Q3.5: Stream **A** has a longer duration, because a higher weight of payment is due at t+2 for stream A, as compared to stream B.

Q3.6: Suppose the portfolio consists of x unit of B and y unit of D, then to match this with the stream C, we have

$$\begin{aligned}20x + y &= 7 \\40x + y &= 9 \\0x + y &= 5\end{aligned}$$

Solving this system of equations, we will end up with $\{x = 0.1, y = 5\}$, i.e. 0.1 unit of B and 5 unit of D.

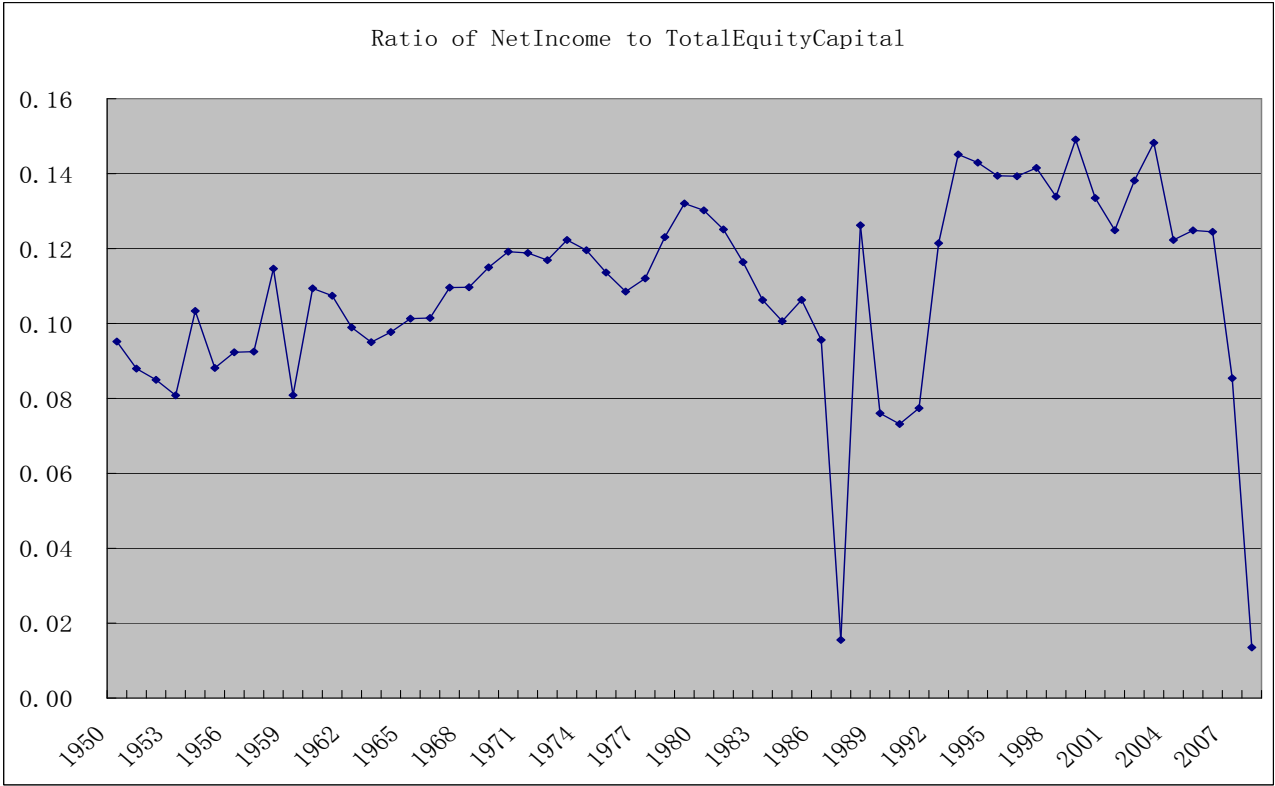


Figure 1: US Commercial Bank: NetIncome / TotalEquityCapital 1950-2008

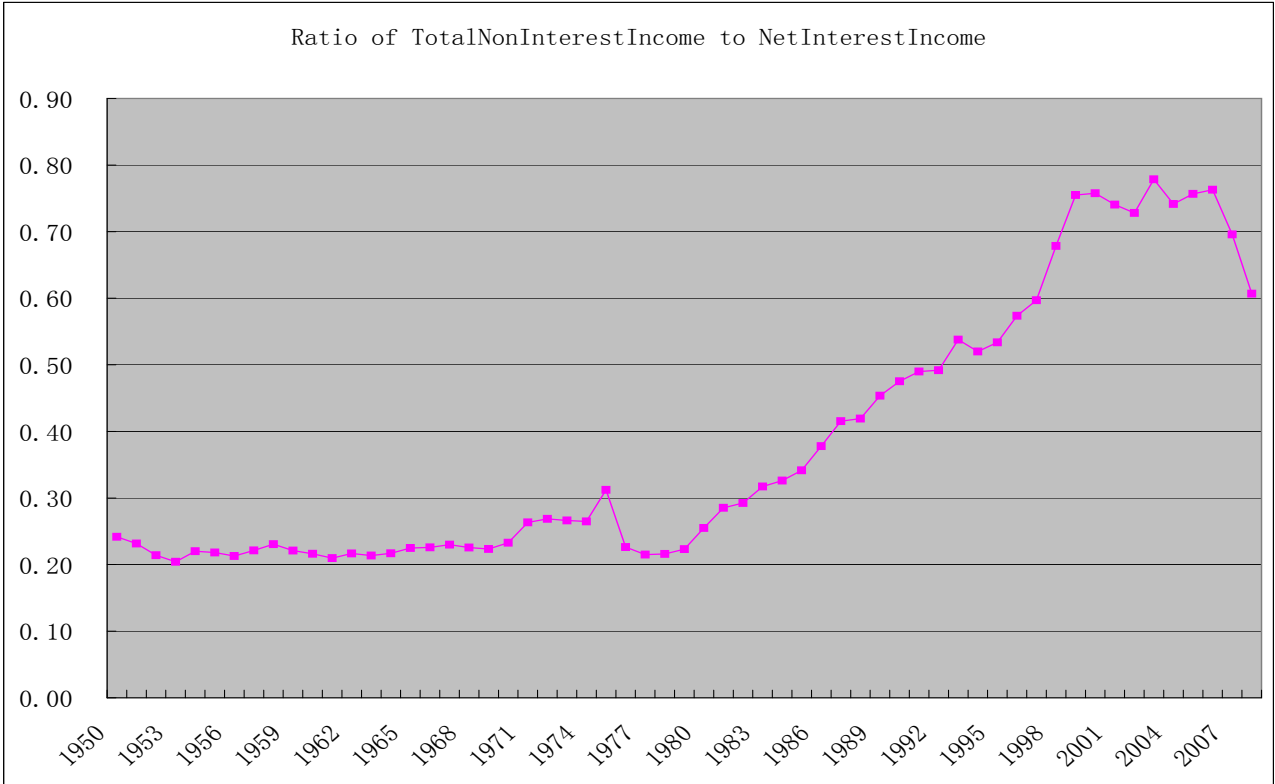


Figure 2: US Commercial Bank: TotalNonInterestIncome / NetInterestIncome 1950-2008

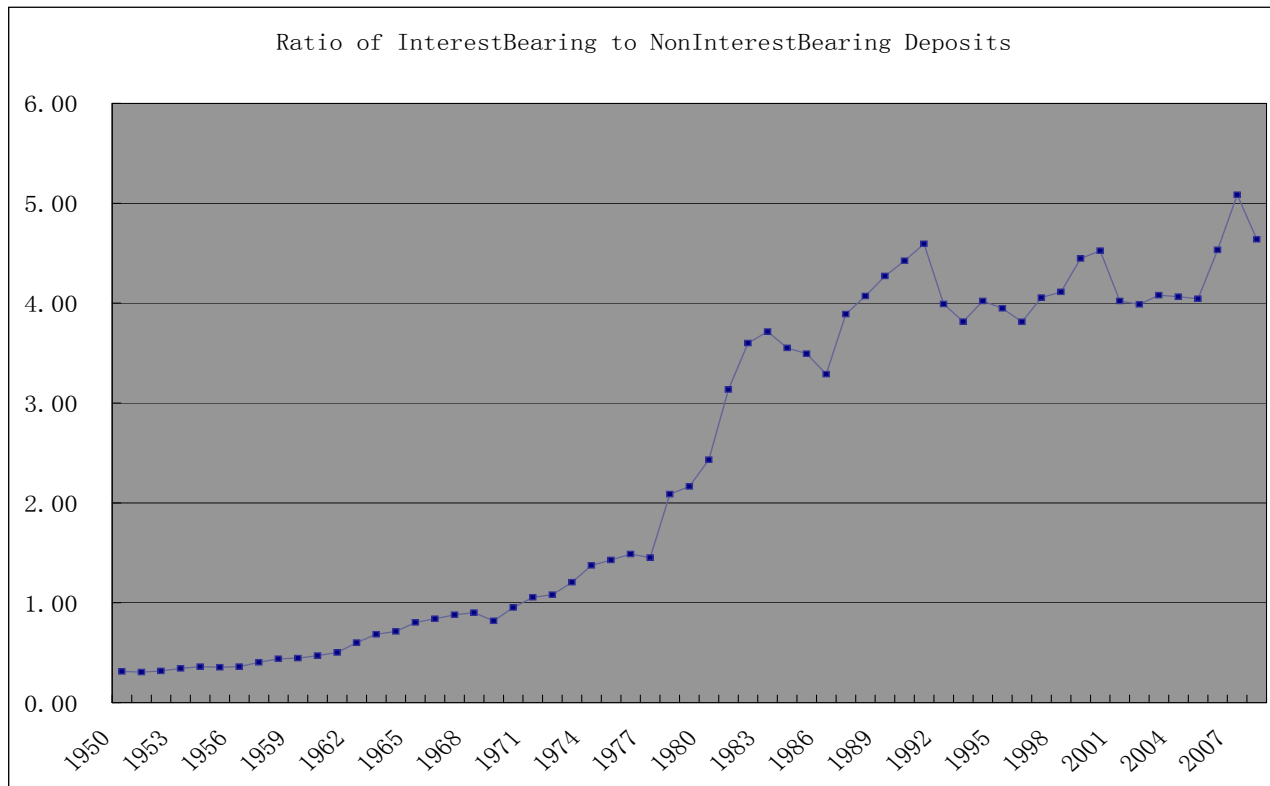


Figure 3: US Commercial Bank: InterestBearing Deposit / NonInterestBearing Deposits 1950-2008