1)

a) Duration Gap = DA – DL * (Liabilities/Assets) = 2.5 yrs. – 3.0 yrs. ($467/$560)million
= 2.5 years – 2.5018 years
= -0.018 years
This bank has a very slight negative duration gap; so small in fact that we could consider it insignificant. If interest rates rise, the bank's liabilities will fall slightly more in value than its assets, resulting in a small increase in net worth.

b)

First, we need an estimate of Stilwater's duration gap. This is:

$$\text{Duration Gap} = 3.25 \text{ yrs.} - 1.75 \text{ yrs} * \frac{\$485 \text{ mill.}}{\$512 \text{ mill.}} = +1.5923 \text{ years}$$

Then, the change in net worth if interest rates rise from 7 percent to 8 percent will be:

$$\text{Change in NW} = \left[-3.25 \text{ yrs.} \times \frac{+.01}{(1+.07)} \times \$512 \text{ mill}\right] - \left[-1.75 \text{ yrs.} \times \frac{+.01}{(1+.07)} \times \$485 \text{ mill.}\right]$$

$$= \$7.62 \text{ million.}$$

2)

a)

The relevant formula is:

$$\text{Net Interest Margin} = .0325 = \frac{\$88 \text{ mill.} - \$72 \text{ mil.}}{\text{Earning Assets}}$$

Then Earning Assets = $492.31 million.

Suppose the bank's interest revenues rise by 8 percent and its interest costs and earning assets increase 10 percent. What will happen to Ash Fork's net interest margin?

Substituting in the correct formula we have:

$$\text{New Net Interest Margin} = \frac{\$88 \text{ million}(1+.08) - \$72 \text{ million}(1+.10)}{\$492.3 \text{ million}(1+.10)}$$

$$= \frac{\$95.04 \text{ million} - \$79.20 \text{ million}}{\$541.53 \text{ million}}$$

$$= 0.0293 \text{ or } 2.93 \text{ percent.}$$

The correct formula is:

$$.0285 * 2 = \frac{\text{Net Interest Income}}{\$545 \text{ million} * (1+.4)}$$

or Net Interest Income = 0.057 * $763 million
= $43.49 million.

b)

Dollar IS Gap = ISA - ISL = ($65 + $42 + $230) - ($185 + $78) = $337 - $263 = $74

Weighted IS Gap = [(1)($65) + (1.15)(42) + (1.35)(230)] - [(.79)($185) + (.98)($78)]
= $65 + $48.3 + $310.5 - $146.15 + $76.44
= $423.8 - $222.59
= $201.21

a.) Change in Bank's Income = IS Gap * Change in interest rates

= ($74) (.01) = $.74 million

Using the regular IS Gap; net income will change by plus or minus $740,000

b.) Change in Bank's Income = Weighted IS Gap * Change in interest rates

= ($201.21) (.01) = $2.012

Using the weighted IS Gap; net income will change by plus or minus $2,012,000

3)

a)

The key formula is:

Change in net worth = $[-D_A * \frac{\Delta r}{(1+r)} * A] - [- D_L * \frac{Dr}{(1+r)} * L]$

For the change in interest rates from 7 to 9 percent, Leland's net worth will change to:

Change in Net Worth =

$$\left[-4.5 \text{ years} \times \frac{(+.02)}{(1+.07)} \times \$1800 \text{ mill.}\right] - \left[-3.25 \text{ years} \times \frac{(+.02)}{(1+.07)} \times \$1500 \text{ mill.}\right]$$

= -$151.40 million + $91.12 million

= -$60.28 million

On the other hand, if interest rates decline from 7 to 5 percent we have:

Change in Net Worth =

$$\left[-4.5 \text{ yrs} \times \frac{(-.02)}{(1+.07)} \times \$1800 \text{ mill.}\right] - \left[-3.25 \text{ yrs} \times \frac{(-.02)}{(1+.07)} \times \$1500 \text{ mill.}\right]$$

= + $151.40 mill. - $91.12 mill.

= + $60.28 million.

b)

Casio has asset duration of:

$$\frac{\$1,385.421 * 1}{(1+0.08)^1} + \frac{\$746.872 * 2}{(1+0.08)^2} + \frac{\$341.555 * 3}{(1+0.08)^3} + \frac{\$62.482 * 4}{(1+0.O8)^4} + \frac{\$9.871 * 5}{(1+0.O8)^5}$$

$$D_A = \frac{\$1,385,421}{(1+0.08)^1} + \frac{\$746,872}{(1+0.08)^2} + \frac{\$341,555}{(1+0.08)^3} + \frac{\$62,482}{(1+0.08)^4} + \frac{\$9,871}{(1+0.08)^5}$$

$$= \$3,594,1481 / \$2,246,912 = 1.5996 \text{ years}$$

Casio has a liability duration of:

$$D_L = \frac{\frac{\$1,427,886 * 1}{(1+0.08)^1} + \frac{\$831,454 * 2}{(1+0.08)^2} + \frac{\$123,897 * 3}{(1+0.08)^3} + \frac{\$1,005 * 4}{(1+0.08)^4}}{\frac{\$1,427,886}{(1+0.08)^1} + \frac{\$831,454}{(1+0.08)^2} + \frac{\$123,897}{(1+0.08)^3} + \frac{\$1,005}{(1+0.08)^4}}$$

$$= \$3,045,808 / \$2,134,047 = 1.4272 \text{ years}$$

Casio's Duration Gap = Asset Duration - Liability Duration = 1.5996 - 1.4272 = 0.1724 years.

Because Casio's Asset Duration is greater than its Liability Duration, the bank has a positive duration gap, which means that the bank's total returns will decrease if interest rates rise because the value of the liabilities will decline by less than the value of the assets. On the other hand, if interest rates were to fall, this positive duration gap will result in the bank's total returns increasing. In this case, the value of the assets will rise by a greater amount than the value of the liabilities.

Given the magnitude of the duration gap, the management of Casio Merchants and Trust Bank needs to do a combination of things to close its duration gap between assets and liabilities. It probably needs to try to shorten asset duration, lengthen liability duration, and use financial futures or options to deal with whatever asset-liability gap exists at the moment. The bank may want to consider securitization or selling some of its assets, reinvesting the cash flows in maturities that will more closely match its liabilities' maturities. The bank may also consider negotiating some interest-rate swaps to change the cash flow patterns of its liabilities to more closely match its asset maturities.

4)

a)

The formula for dollar portfolio VAR to compute the annual VAR(5%) for the bond position:

VAR2portfolio = VAR2Stocks + VAR2Bonds + 2VARStocksVARBonds ρStocks, Bonds

(1,367,000)2 = (1,153,000)2 + VAR2Bonds + 2(1,153,000)VARBonds(0)

VARBonds = [(1,367,000)2 – (1,153,000)2]0.5 = 734,357

Next convert the annual $VARBonds to daily $VARBonds:

734,357 / (250)0.5 = 46,445.

b)