FOM 12

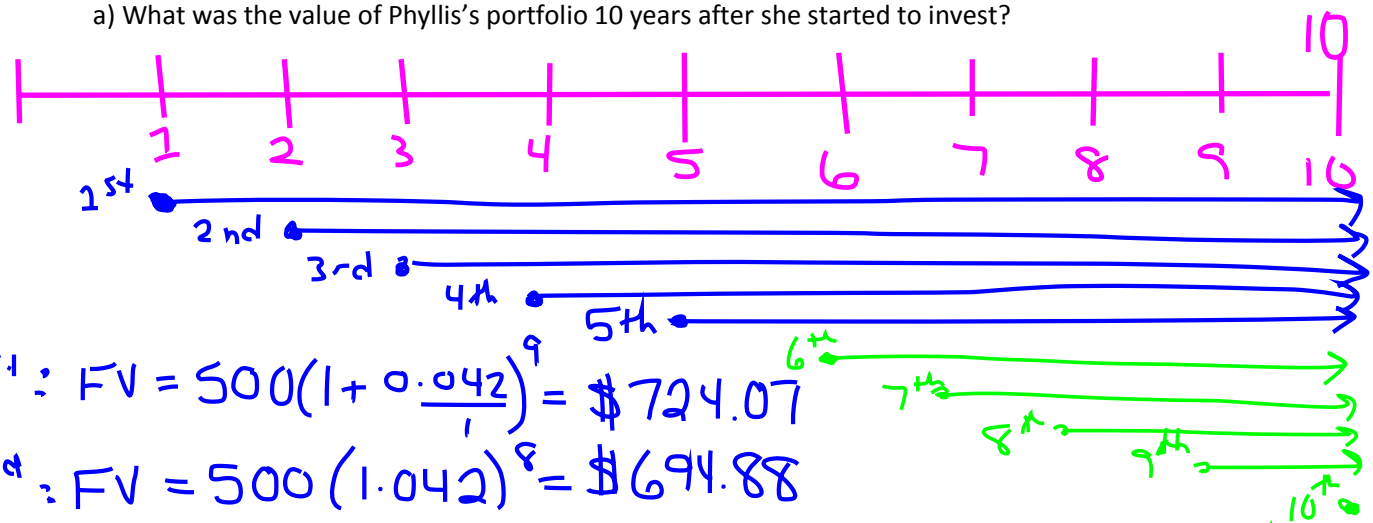
1.6 – Solving Investment Portfolio Problems

Portfolio – One or more investments held by an individual investor or by a financial organization

Example 1: Phyllis started to build an investment portfolio for her retirement.

- She purchased a $500 Canada Savings Bond (CSB) at the end of each year for 10 years. The first five CSBs earned a fixed rate of 4.2%, compounded annually. The next five CSBs earned a fixed rate of 4.6% compounded annually.
- Three years ago, she also purchased a $4000 GIC that earned 6%, compounded monthly.

a) What was the value of Phyllis's portfolio 10 years after she started to invest?



1^{st}: $FV = 500\left(1+\frac{0.042}{1}\right)^{9} = \$724.07$

2^{nd}: $FV = 500(1.042)^{8} = \$694.88$

3^{rd}: $FV = 500(1.042)^{7} = \$666.87$

4^{th}: $FV = 500(1.042)^{6} = \$639.99$

5^{th}: $FV = 500(1.042)^{5} = \$614.20$

GIC: $FV = 4000\left(1+\frac{0.06}{12}\right)^{(12\times 3)} = \$4786.72$

Add all for total: $\boxed{\$10867.56}$

TVM for 6^{th} – 10^{th}

N: 5
I: 4.6
PV: 0
PMT: -500
FV: ?
P/Y: 1
C/Y: 1

$\$2741.83$

b) Phyllis found a savings account that earned 4.9%, compounded semi-annually. She redeemed her portfolio and invested all the money in the savings account. About how long will it take her to double her money?

Rule of 72!

$72 \div 4.9 = 14.69$

The rule of 72 is most accurate for annual compounding. This investments doubling time will most likely be closer to 14.5 years.

Example 2: Jason and Malique are each hoping to buy a house in 10 years. They want their money to grow so they can make a substantial down payment.

Jason's Portfolio:

- A 10 year $2000 GIC that earns 4.2%, compounded semi-annually
- A savings account that earns 1.8%, compounded weekly, where he saves $55 every week
- A 5 year $4000 bond that earns 3.9%, compounded quarterly, which he will reinvest in another bond at an interest rate of 4.1%

Malique's Portfolio:

- A tax-free savings account (TFSA) that earns 2.2%, compounded monthly, and has a current balance of $5600
- The purchase, at the end of each year, of a 10 year $500 CSB that earns 3.6% compounded annually
- A savings account that earns 1.6%, compounded monthly, where she saves $200 every month

In 10 years, whose portfolio will have the greater rate of return on investment?

Jason:

GIC: $FV = 2000\left(1+\frac{0.042}{2}\right)^{(10\times2)}$

$= \$3030.71$

Savings:

$N = 52\times10 = 520$

$I = 1.8$

$PV = 0$

$PMT = -55$

$FV = ?$ $\$31329.72$

$P/Y = 52$

$C/Y = 52$

Bond: First 5 years:

$FV = 4000\left(1+\frac{0.039}{4}\right)^{(5\times4)}$

$FV = \$4856.65$

Next 5 Years:

$FV = 4856.65\left(1+\frac{0.041}{4}\right)^{(5\times4)}$

$= \$5955.45$

Malique

TFSA:

$FV = 5600\left(1+\frac{0.022}{12}\right)^{(10\times12)}$

$= \$6976.62$

CSB: $N = 10$, $I = 3.6$, $PV = 0$, $PMT = -500$, $FV = ?$ $\$5892.88$, $P/Y = 1$, $C/Y = 1$

Savings:

$N = 10\times12 = 120$

$I = 1.6$

$PV = 0$

$PMT = -200$

$FV = ?$ $\$26007.87$

$P/Y = 12$

$C/Y = 12$

Assignment: Pg. 64 #1b, 2, 4, 7, 9

Rate of Returns:

Jason Invested:

$2000 + (520 \times 55) + 4000 = \$34600$

FV of all Investments:

$3031.71 + 31329.72 + 5955.45$

$= \$40315.88$

Interest Earned:

$40315.88 - 34600 = \$5715.88$

Rate of Return $= \frac{\text{Interest}}{\text{Investment}}$

$= \frac{5715.88}{34600} = \boxed{16.5\%}$

Malique Invested:

$5600 + (10 \times 500) + (120 \times 200)$

$= \$34600$

FV of Malique's Investments:

$6976.62 + 5892.88 + 26007.87$

$= \$38877.37$

Interest Earned:

$38877.37 - 34600 = \$4277.37$

$$R.o.R = \frac{\text{Interest}}{\text{Invested}} = \frac{4277.37}{34600} = \boxed{12.4\%}$$

Jason has the better rate of return.