CH 26 – ASSET ALLOCATION

❑ Introduction

The time to start preparing for your financial future is NOW. But knowing where to invest your money – taking into account both profit and safety – is a difficult and confusing dilemma.

The term *asset* in the chapter title refers to the money you will invest (or the things that you buy with your money), and the word *allocation* describes the way you will distribute the money to the various investments. In short, asset allocation is how you divvy up your dough. To get us ready for the upcoming applications, let's first brush up on translating English expressions to algebra.

Homework

1. Translate each of the following English phrases into an algebraic expression:

a. 12 more than x
b. 8 more than y
c. twice n
d. 3 times Q
e. 1 more than z
f. 5 times m
g. twice $2a$
h. 3 times $4x$
i. 7 less than t
j. 13 less than B
k. 4 more than twice x
l. 20 less than three times a
m. 9 less than T
n. 8 less than 7 times R
o. the difference of X and Y
p. 8 times $3x$
q. 12 times $9a$
r. 20 times $8w$
s. 4 times the product of 3 and x.

t. 3 times the product of 13 and b.
u. 9 times the product of 5 and T.
v. twice the product of π and x.

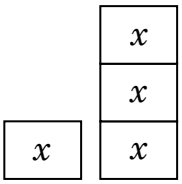
❑ Examples

EXAMPLE 1: **Ms. Zimmerman has $37,000 to invest in Coke and Microsoft stocks. She wants the amount invested in Microsoft to be 3 times the amount invested in Coke. How should the asset of $37,000 be allocated to the two investments? That is, how much money should she invest in each company?**

When you buy stock in a company, you own a piece of that company. If the company does well, and if the price of the stock goes up, and if you sell your shares at the right time, you can make a profit. If the reverse happens, you can lose money.

Solution: Since the Microsoft amount is based on the Coke amount, we'll let x represent the amount of money invested in Coke, which implies that $3x$ represents the amount invested in Microsoft:

x = Coke investment
$3x$ = Microsoft investment



Coke Microsoft

One investment is 3 times the other.

The sum of these amounts must equal the total investment of $37,000. This fact leads to the equation

$$x + 3x = 37{,}000$$
$$\Rightarrow \quad 4x = 37{,}000 \qquad \text{(combine like terms)}$$
$$\Rightarrow \quad x = 9250 \qquad \text{(divide each side by 4)}$$

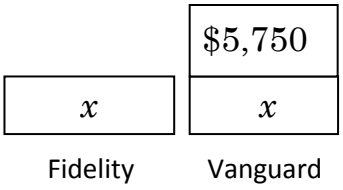
Since x = Coke investment, Ms. Zimmerman should invest \$9,250 in Coke. The Microsoft investment is $3x = 3(9250) = 27{,}750$. Her plan is therefore to

> Invest \$9,250 in Coke
> and \$27,750 in Microsoft

EXAMPLE 2: **\$42,750 is to be invested in two mutual funds, Vanguard and Fidelity. The Vanguard fund is to have \$5,750 more than the Fidelity fund (maybe because it's a little safer). How much will be invested in each mutual fund?**

A *mutual fund* is a basket of stocks. When you buy a mutual fund you're diversifying your investment across dozens or even thousands of companies. This way, if one company tanks big time, it will hurt your investment just a little bit.

Solution: Since the Vanguard fund amount is more than the Fidelity fund amount, we'll let x represent the smaller Fidelity amount. This implies that $x + 5750$ will be the larger Vanguard amount. Since the total investment is \$42,750, the relevant equation is



The Vanguard investment is \$5750 more than the Fidelity investment.

$$x + (x + 5750) = 42{,}750 \quad \text{(the 2 funds total \$42,750)}$$
$$\Rightarrow \quad x + x + 5750 = 42{,}750 \quad \text{(drop the parentheses)}$$
$$\Rightarrow \quad 2x + 5750 = 42{,}750 \quad \text{(combine like terms)}$$
$$\Rightarrow \quad 2x = 37{,}000 \quad \text{(subtract 5750)}$$
$$\Rightarrow \quad x = 18{,}500 \quad \text{(divide by 2)}$$

Therefore, the Fidelity amount should be \$18,500. And the Vanguard amount would be

$$x + 5750 = 18{,}500 + 5750 = 24{,}250$$

Thus, the \$42,750 should be split between the two mutual funds as follows

Fidelity: \$18,500
Vanguard: \$24,250

EXAMPLE 3: **The amount invested in stock A is to be \$3,600 less than the amount invested in stock B. If the total investment is \$17,300, determine the asset allocation.**

Solution: Since the amount for stock A is based on the amount for stock B, we'll let b represent the investment in stock B. The wording of the problem then implies that $b - 3600$ is the amount for stock A (because it's "\$3,600 less than . . . stock B"). In short,

b = amount invested in stock B

$b - 3600$ = amount invested in stock A

Since the total investment is \$17,300, we add the two investments to get the total:

$b + (b - 3600) = 17{,}300$ (total investment: \$17,300)

$\Rightarrow$ $b + b - 3600 = 17{,}300$ (drop the parentheses)

$\Rightarrow$ $2b - 3600 = 17{,}300$ (combine like terms)

$\Rightarrow$ $2b = 20{,}900$ (add 3600 to each side)

$\Rightarrow \quad b = 10{,}450$ (divide each side by 2)

That's the amount for stock B. To calculate the amount for stock A, we compute $b - 3600 =$ **10,450** $- 3600 = 6850$.

The asset allocation should therefore be

stock A: \$6850 stock B: \$10,450

EXAMPLE 4: **Marvyn has \$22,400 to invest in his three favorite companies: Reebok, MTV, and Dell Computers. He wants to allocate his assets so that the amount invested in MTV is three times the amount invested in Reebok, and he also desires the amount invested in Dell to be four times the amount invested in MTV. How much should Marvyn invest in each company?**

Solution: Letting R = Reebok, M = MTV, and D = Dell, we translate the info in the problem like this:

"the amount invested in MTV is three times the amount invested in Reebok" becomes the equation

$$M = 3R$$

"the amount invested in Dell [is] to be four times the amount invested in MTV" becomes the equation

$$D = 4M$$

Since the total investment, \$22,400, is to be allocated to the three investments, the sum of the three investments must be \$22,400:

$R + M + D = 22{,}400$

$\Rightarrow \quad R + 3R + 4M = 22{,}400$ (since $M = 3R$ and $D = 4M$)

$\Rightarrow \quad R + 3R + 4(3R) = 22{,}400$ (since $M = 3R$)

$\Rightarrow$ $R + 3R + 12R = 22{,}400$ (associate the 4 and the 3)

$\Rightarrow$ $16R = 22{,}400$ (combine like terms)

$\Rightarrow$ $R = 1400$ (Reebok)

$\Rightarrow$ $M = 3R = 3(1400) = 4200$ (MTV)

$\Rightarrow$ $D = 4M = 4(4200) = 16{,}800$ (Dell)

The investments should be allocated as follows:

\$1400 to Reebok
\$4200 to MTV
\$16,800 to Dell

Notice that the total investment is \$22,400.

EXAMPLE 5: **You are in charge of investing \$50,000 according to the following allocation plan: equal amounts of money in each of three stocks, a fixed amount of \$5000 for a CD, and an amount in a mutual fund that is twice the amount invested in any of the three stocks. How much will you invest in each of the five investments?**

Whereas the stock market fluctuates (wildly in the past 7 years), and you can make (or lose) a fortune, a CD (*certificate of deposit*) is more like a savings account. It has a set interest rate (say, 3%) for a fixed term (say, 1 year). At the end of the year you are guaranteed a 3% return on your investment – no more, but no less.

Solution: Since the three stocks all get the same amount, we'll let x represent that amount; i.e.,

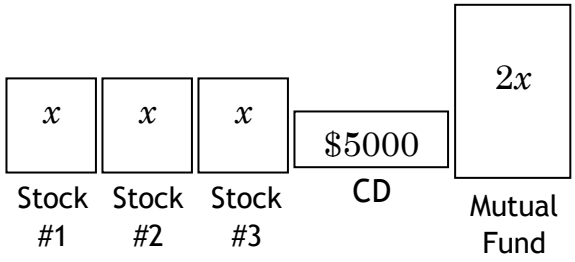
x = the amount invested in Stock #1
x = the amount invested in Stock #2
x = the amount invested in Stock #3

The CD investment is exactly \$5000, so

$5000 = the amount invested in the CD

The mutual fund gets twice the amount as any of the three stocks:

$2x$ = the amount invested in the mutual fund



Adding up all these amounts gives the equation

$$x + x + x + 5000 + 2x = 50{,}000$$

$\Rightarrow$ $5x + 5000 = 50{,}000$ (combine like terms)

$\Rightarrow$ $5x = 45{,}000$ (subtract 5000 from each side)

$\Rightarrow$ $x = 9000$ (divide each side by 5)

Therefore, the \$50,000 should be allocated as follows:

\$9000 = amount invested in Stock #1
\$9000 = amount invested in Stock #2
\$9000 = amount invested in Stock #3
\$5000 = amount invested in the CD
\$18,000 = amount invested in the mutual fund

Homework

2. One part of a $41,500 investment is designed to be four times the other part of the investment. How will the money be allocated? That is, find the two parts of the investment.

3. Sarah wants to invest a total of $22,500. Some will be in a stock and some will be in a municipal bond. The amount in the bond will be $10,500 more than the amount in the stock. Find the amount of each investment.

4. An investment of $9,500 is to be split among two stocks, each with equal amounts, a CD containing $2,000, and an index fund containing three times the amount in either of the two stocks. Determine the asset allocation.

5. Joseph has $5,950 to invest in his three favorite companies, Coke, Starbucks, and Nike. He wants to allocate his assets so that the amount invested in Starbucks is twice the amount invested in Coke, and he also desires the amount invested in Nike to be twice the amount invested in Starbucks. How much should Joseph invest in each company?

6. One part of an $88,025 investment is designed to be six times the other part of the investment. Find the asset allocation.

7. Mark wants to invest a total of $40,000. Some will be in a stock and some will be in a municipal bond. The amount in the bond will be $7,500 less than the amount in the stock. Find the amount of each investment.

8. An investment of $22,500 is to be split among three stocks, each with equal amounts, a CD containing $5,000, and an index fund containing four times the amount in any of the three stocks. Determine the asset allocation.

9. Melanie has $39,200 to invest in her three favorite companies, Coke, Starbucks, and Nike. She wants to allocate her assets so that the amount invested in Starbucks is $2000 more than the amount invested in Coke, and she also desires the amount invested in Nike to be equal to the total invested in Coke and Starbucks. How much should Melanie invest in each company?

10. The amount invested in stock A is to be $494 less than the investment in stock B. If the total investment is $7,528, how much should be invested in each stock?

11. The amount invested in stock A is to be $2,183 less than the investment in stock B. If the total investment is $4,517, how much should be invested in each stock?

12. The amount invested in stock A is to be $274 more than the investment in stock B. If the total investment is $14,452, how much should be invested in each stock?

13. The total investment in three stocks is $27,568. The amount spent on stock A must be 5 times the amount spent on stock C, while the amount spent on stock B is to be 2 times the amount spent on stock C. Determine the asset allocation.

14. The total investment in three stocks is $19,716. The amount spent on stock A must be 2 times the amount spent on stock C, while the amount spent on stock B is to be 3 times the amount spent on stock C. Determine the asset allocation.

15. The total investment in three stocks is $16,856. The amount spent on stock A must be 2 times the amount spent on stock C, while the amount spent on stock B is to be 4 times the amount spent on stock C. Determine the asset allocation.

16. The total investment in three stocks is $45,695. The amount spent on stock C must be 3 times the amount spent on stock B,

while the amount spent on stock B is to be 3 times the amount spent on stock A. How much should be invested in each stock?

17. The total investment in three stocks is $52,949. The amount spent on stock C must be 2 times the amount spent on stock B, while the amount spent on stock B is to be 4 times the amount spent on stock A. How much should be invested in each stock?

Review Problems

18. The total investment in three stocks is $21,824. The amount spent on stock A must be 4 times the amount spent on stock C, while the amount spent on stock B is to be 3 times the amount spent on stock C. Determine the asset allocation.
19. An investment of $37,442 is to be split among 3 stocks, each with equal amounts, a CD containing $4,602, and an index fund containing 5 times the amount in one of the stocks. Determine the asset allocation.
20. The amount invested in stock A is to be $441 more than the investment in stock B. If the total investment is $14,779, how much should be invested in each stock?
21. The total investment in three stocks is $43,670. The amount spent on stock C must be 4 times the amount spent on stock B, while the amount spent on stock B is to be 2 times the amount spent on stock A. How much should be invested in each stock?
22. The amount invested in stock A is to be $1,154 less than the investment in stock B. If the total investment is $8,032, how much should be invested in each stock?

Solutions

1.

a.	$x + 12$	b.	$y + 8$	c.	$2n$	d.	$3Q$
e.	$z + 1$	f.	$5m$	g.	$2(2a)$, or $4a$	h.	$3(4x)$, or $12x$
i.	$t - 7$	j.	$B - 13$	k.	$2x + 4$	l.	$3a - 20$
m.	$T - 9$	n.	$7R - 8$	o.	$X - Y$	p.	$8(3x) = 24x$
q.	$108a$	r.	$160w$	s.	$12x$	t.	$39b$
u.	$45T$	v.	$2\pi x$				

2. $8,300 and $33,200

3. $6,000 in the stock and $16,500 in the bond

4. $1500 in each of the two stocks, $2000 in the CD, and $4500 in the index fund

5. $850 in Coke, $1700 in Starbucks, and $3400 in Nike

6. $12,575 and $75,450

7. $23,750 in the stock and $16,250 in the bond

8. $2,500 in each of the three stocks, $5,000 in the CD, and $10,000 in the index fund.

9. $8,800 in Coke, $10,800 in Starbucks, and $19,600 in Nike

10. $3,517 in Stock A and $4,011 in stock B

11. $1,167 in Stock A and $3,350 in stock B

12. $7,363 in Stock A and $7,089 in stock B

13. $17,230 in Stock A; $6,892 in stock B; $3,446 in Stock C

14. $6,572 in Stock A; $9,858 in stock B; $3,286 in Stock C

15. $4,816 in Stock A; $9,632 in stock B; $2,408 in Stock C

16. $3,515 in Stock A; $10,545 in stock B; $31,635 in Stock C

17. $4,073 in Stock A; $16,292 in stock B; $32,584 in Stock C

18. $10,912 in Stock A; $8,184 in stock B; $2,728 in Stock C

19. $4,105 in each stock; $4,602 in the CD; $20,525 in the index fund

20. $7,610 in Stock A and $7,169 in stock B

21. $3,970 in Stock A; $7,940 in stock B; $31,760 in Stock C

22. $3,439 in Stock A and $4,593 in stock B

"Whether you think
that you can,
or that you can't,
you are usually
right."

Henry Ford (1863-1947)