

INVESTMENT PLANNING CONCEPTS & CALCULATIONS

I. INTERNAL RATE OF RETURN (IRR)

A. Introduction

The internal rate of return (IRR) is the earnings rate at which the present value of a series of cash flows will equal its cost or initial outflow. The formula below describes the basic present value model used for discounting cash flows. The formula states that the PV of a series of cash flows is equal to each cash flow divided by one plus the discount rate raised to a power equal to the period in which the cash flow occurs.

$$P_0 = \frac{CF_1}{(1+k)^1} + \frac{CF_2}{(1+k)^2} + \dots + \frac{CF_t}{(1+k)^t} \quad \text{where:}$$

P_0 = The value of the security or asset today.

CF_t = The cash flow for a particular period t .

k = The discount rate or IRR.

t = The number of cash flows to be evaluated.

The internal rate of return (k) is the discount rate that makes the discounted cash flows equal to the initial outflow. The underlying assumption inherent in the above equation is that the cash flows that occur during the investment period will be reinvested at the investment's internal rate of return. This is the same assumption in computing the yield to maturity. The IRR is equivalent to the YTM, the compound average rate of return, and the geometric average return. All of these methods have been developed to determine what earnings rate occurs over the life, or period, of the investment.

B. Example

Kristen owns 1 share of Casey, Inc. stock. She purchased this share three years ago for \$50.00. The current market value of the stock is \$40.00 per share. Since buying the stock, the following dividends have been paid:

Dividend year 1 (end) \$4.80 per share

Dividend year 2 (end) \$5.90 per share

Dividend year 3 (end) \$7.25 per share

What is the IRR that Kristen has earned on her investment?

HP 17BII		HP 12C		HP 10BII	
<i>Keystrokes</i>	<i>Display</i>	<i>Keystrokes</i>	<i>Display</i>	<i>Keystrokes</i>	<i>Display</i>
[FIN]	SELECT A MENU	[f] [REG]	0.0000	[■] [C ALL]	0.0000
[CFL0]	FLOW()=?	50 [CHS]	-50.	50 [+/-][CF _j]	-50.0000
[■][CLEAR DATA]	CLEAR THE LIST?	[g][CF ₀]	-50.0000	4.8 [CF _j]	4.8000
[YES]	FLOW(0)=?	4.8 [g][CF _j]	4.8000	5.9 [CF _j]	5.9000
50 [+/-][INPUT]	FLOW(1)=?	5.9 [g][CF _j]	5.9000	7.25 [+]	7.2500
4.8 [INPUT]	#TIMES(1)=1	7.25 [ENTER]	7.2500	40 [=][CF _j]	47.2500
	1.0000	40 [+][g][CF _j]	47.2500	[■][IRR/YR]	5.5695
[INPUT]	FLOW(2)=?	[f][IRR]	5.5695		
	1.0000				
5.9 [INPUT]	#TIMES(2)=1				
	1.0000				
[INPUT]	FLOW(3)=?				
	1.0000				
7.25[+]	#TIMES(3)=?				
	7.2500+				
40 [=] [INPUT]	#TIMES(3)=1				
	47.2500				
[INPUT]	FLOW(4)=?				
	1.0000				
[EXIT]	FLOW(4)=?				
[CALC]	NPV,NUS,NFV				
[IRR%]	IRR= 5.5695				
[EXIT][EXIT]					
[EXIT]					

TI BA II Plus		SHARP EL 733A		SHORTCUT	
<i>Keystrokes</i>	<i>Display</i>	<i>Keystrokes</i>	<i>Display</i>		
[CF]	CF ₀ =(Old Work)	[2 nd F] [CA]	0.0000 ^{FIN}	CF ₀	-50.0000
[2 nd][CLR Work]	CF ₀ =0.0000	50[+/-]	-50 ^{FIN}	CF ₁	4.8000
50 [+/-][ENTER]	CF ₀ =-50.0000	[CF _i]	-50.0000 ^{FIN}	CF ₂	5.9000
[↓] 4.8 [ENTER]	C01=4.8000	4.8 [CF _i]	4.8000 ^{FIN}	CF ₃	47.25 (7.25 + 40.00)
[↓][↓]		5.9 [CF _i]	5.9000 ^{FIN}	IRR	5.5695
5.9 [ENTER]	C02=5.9000	7.25 [+]	7.2500 ^{FIN}		
[↓][↓]		40 [=][CF _i]	47.2500 ^{FIN}		
7.25 [+]	C03=7.2500	[IRR]	5.5695^{FIN}		
40 [=][ENTER]	C03=47.2500				
[IRR][CPT]	IRR= 5.5695				