



Forward Pricing

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IBM Stock



What will the price of IBM be in one year?

Who knows?

Your first thoughts might be to the price at which IBM is trading today (and you may even consider how the future price will be different from its current level).

Your second thoughts might be to global circumstances and the future (one-year) prospect for the economy.

You may then think about the relative strength of IBM, the state of its financial, industrial/sector, and economic conditions relative to its competitors, ...

You may even consider the attractiveness of other investment vehicles (gold, interest rates,...).

Selling Forward: To Be “Covered”

Who knows what the price of IBM will be in one year?

But there are people who have to “make markets”
in one-year IBM stock. Marketmakers.

Easier to think of it this way:

If you had to **sell** IBM in a year’s time, what
“forward price” would you need to lock-in today?

The good news: You don’t have to have an IBM crystal ball; you don’t have to take a stand on the economy (recovery or depression); you don’t even need to think of alternative assets (though you do need interest rates).

A Forward/Future is a Derivative

What is a derivative?

A well-known textbook says the following:

“A *derivative* can be defined as a financial instrument whose value depends on (or derives from) the values of other, more basic, underlying variables.” (page 1)

In the same book’s glossary, it defines “derivative” as:

“An instrument whose price depends on, or is derived from, the price of another asset.” (page 779)

A derivative is an instrument whose **value** is derived from the **price** of the underlying asset or security.

QUOTE

CHARTS

NEWS

IBM:US

International Business Machines Corp

Industry: Computers

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02/13 New York Currency: USD

Price 93.840	Change -1.230	% Change -1.294	Bid N.A.	Ask N.A.	Open 94.790
Volume N.A.	High 95.180	Low 93.570	52-Week High 130.93 (07/24/08)	52-Week Low 69.50 (11/21/08)	1-Yr Return -9.916%

EARNINGS

Earnings Past 12 Months 8.960	Quarter Est. EPS(03/09) 1.68	Quarter Est. EPS(06/09) 2.01	Year Est. EPS(12/09) 9.10
Price/Earnings (Trailing) 10.473	Relative P/E 0.454	Earnings Growth Rate 1.900	Estimated P/E 10.300

FUNDAMENTALS

Shares (Millions) 1,340.000	Market Cap (Millions) 125,745.600	Float (Millions) 1,338.420	Return on Equity 58.826
Short Interest 15,472,630.000	Last Dividend Reported 0.500 Regular Cash	Dividend Yield (Trailing 12mo.) 2.133	Relative Dividend Yield 0.623

Forward Pricing

If you're going to sell one-year IBM,
you had better have it to deliver:

$$S = 93.84$$

$$t = 1 \text{ year}$$

$$r = 4.00\%$$

$$\text{Div}(s) = 2.00 \text{ (} = .50 \times 4 \text{)}$$

$$F = S (1 + r \times t) - \text{Div}s = \$93.84(1.04) - \$2.00$$

$$F = \$95.59^+ \quad \text{so} \quad F_{\text{OFFER}} = 95.65$$

Marketmaking

Where would you agree to buy stock in one year?

May look symmetric, but there are “issues.”

If you can sell IBM short:

$$S = 93.84 \quad t = 1 \text{ year} \quad r = 3.00\% \quad \text{Divs} = 2.00$$

$$F = S(1+rt) - \text{Divs} = 93.84(1.03) - 2.00 = 94.65$$

so maybe $F_{\text{BID}} = 94.55$.

Issues

Didn't take any IBM bid-ask spread into account.

Ignored transaction costs, exchange fees, . . .

Have other risks.

Interest rate risk (unless you lock them in).

Dividend risk (though there are “div swaps”).

Stock may be “called back” at any time.

Counterparty risk.

Say you agree to sell IBM at our $F_{\text{OFFER}} = \$95.65$.

Counterparty risk if price in 1 year $S = 80$ or 125 ?

Forward Pricing

In general,

$$F = S + \text{Costs} - \text{Benefits}$$

Stock: $F = S + S r t - \text{Div}(s)$

Stock Indexes: $F = S + S r t - S r_{\text{DIV}} t$

Bonds: $F = S + S r_{\text{REPO}} t - 100 C_{(\text{coupon})} t^*$

Foreign Exchange: $F = S + S r_1 t - S r_2 t$
 $F = S (1 + r_1 t)/(1 + r_2 t)$

Gold: $F = S + S r t$

Commodities: $F = ?$

Forwards/Futures: $F = F$

Off-Market Forwards

$S = 93.84$ $t = 1 \text{ year}$ $r = 4.00\%$ $\text{Divs} = 2.00$

$F = 95.59$

Your best customer:

“I want to buy IBM in a year at $F = 90.00$.”

You would agree to sell IBM stock in one year
at a price of $F = 90.00$ if . . .

they pay you (today) . . .

the present value of $\$5.59 = 5.59/1.04 = \5.375 .

If you understand Forward Pricing, ...

$$S = 93.84 \quad t = 1 \text{ year} \quad r = 4.00\% \quad \text{Divs} = 2.00$$

$$F = 95.59$$

What will the Call option to buy IBM stock
at a (strike or exercise) price of $X = K = 90.00$
in exactly one-year (a “European” Call) cost?

Who knows? But we can say this :

The IBM 90 Call will cost at least . . . \$5.375!

Option Value

Option Value = Intrinsic Value + Time Value

Using our previous example:

$$S = 93.84 \quad F = 95.59$$

Does the 95 Call option have “intrinsic value”?

Equities: “No.”

Foreign Exchange: “Yes.”

Either way, it figures into the option valuation.

Relationship to Options

$$S = 93.84 \quad t = 1 \text{ year} \quad r = 4.00\% \quad \text{Divs} = 2.00$$

$$F = 95.59$$

If you understand forward pricing,
you're halfway to understanding options.

(European) Option Value (at least) = ?

80 Call ? **PV(15.59)** 80 Put ?

100 Call ? 100 Put ? **PV(4.41)**

120 Call ? 120 Put ? **PV(24.41)**

To Fully Understand Option Valuation

Also need to understand the “time value.”

A big part of time value depends on volatility.

That is what Shelly is going to talk about next.

Questions ?