

# HHIF Lecture Series: Discounted Cash Flow Model

Alexander Remorov

University of Toronto

November 19, 2010

# Background: Efficient Market Hypothesis

- Assumptions: market is efficient; many investors; no inside information
- Therefore any new information is immediately reflected in stock price via supply and demand
- At any point in time a stock trades at its fair value, i.e. only normal rate of return provided to investor
- Therefore can't beat the market and should just invest in an index fund
- Then how does one explain Warren Buffet's or Goldman Sachs prop trading success?
- If the market were "rational" we would not have the stock movement observed in the past 3 years

# Valuation

- Some stocks don't trade at their fair value
- Objective: determine the intrinsic value of a company and compare with market value
- If the two values significantly differ, this could be a signal to trade the stock
- How can we value a company? What aspects to consider?
  
- Extreme Case: Deep Value Investing - find extremely undervalued stocks (e.g. P/E below 7)
- This is how Warren Buffet started

# DCF Steps

1. Forecast revenue growth
  - ▶ Revenue determines all other financial statement items
  - ▶ However, company cost structure will probably change
2. Forecast Free Cash Flows (FCF)
  - ▶ How much cash does the company have left to pay to investors?
  - ▶ More cash means higher value
3. Determine discount rate
  - ▶ \$100 today is not the same as \$100 one year from now
4. Calculate intrinsic value of the company
  - ▶ Determine present value of all future FCFs

# Forecast Revenue Growth

## 1. Determine Forecast Period

- ▶ Slow growth: 1 year
- ▶ Relatively fast growth: 5 years (standard)
- ▶ High growth: 10 years

## 2. Forecast Revenue Growth Rate

- ▶ What aspects to consider?
- ▶ Historical growth, market share, economic situation, products, competition
- ▶ Not easy to estimate
- ▶ Could use analyst estimates

## 3. **The big picture: How does the company make money?**

- ▶ Will it be able to make money in the future
- ▶ If you can predict the firm's success (or failure) accurately, you win

# Forecast Revenue Growth - Example

## Wal-Mart Stores Inc.

- Take forecast period of 5 years
- Revenue growth 2009-2010: 0.9%; 2008-2009: 7.3%
- Yahoo Finance Analyst 5-year annual growth estimate: 10.35%
- Expect moderate growth in the near future; as US economy improves, revenue will grow faster
- Very mature market; hard to achieve very high growth (e.g. 14%)

Table: Projected Revenue Growth

Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
6.4%	8%	9%	10%	10%	10.5%
416.6B	449.9B	490.4B	539.5B	593.4B	655.7B

# Forecast Free Cash Flows

$FCF = NI - (CapEx - Dep) - \Delta WC + (ND - DR)$ , where:

$FCF$  = Levered Free Cash Flow (to Equity)

$NI$  = Net Income

$CapEx$  = Capital Expenditure,  $Dep$  = Depreciation

$\Delta WC$  = Change in Working Capital

$ND$  = New Debt,  $DR$  = Debt Repayment

- Unlevered Cash flow:  $FCF = EBITDA - CapEx - \Delta WC$
- Assume  $ND = DR$ , then formula becomes:

$FCF = (R - C - I)(1 - t) + Dep - CapEx - \Delta WC$ , where:

$R$  = Revenue,  $C$  = Operating Expenses,

$I$  = Interest paid,  $t$  = Tax Rate.

- Need to estimate future  $C, I, t, CapEx, \Delta WC$  based on projections for revenue. How?

## Forecast Free Cash Flows - Example

- Calculate as percentage of Revenue.

### Wal-Mart Stores Inc. - Historical

	2005	2006	2007	2008	2009	TTM
Revenue	315.7	348.7	378.8	405.6	408.2	416.6
1 - Op. Margin	94.1%	94.1%	94.2%	94.4%	94.1%	94.05%
Op. Costs	297.1	328.2	356.8	382.8	384.2	391.8
Interest (%)	0.54%	0.63%	0.66%	0.67%	0.64%	0.60%
Interest	1.7	2.2	2.5	2.7	2.6	2.5
Tax Rate	33.4%	33.6%	34.2%	34.1%	32.4%	32.6%
Depr. (%)	1.68%	2.09%	1.87%	1.95%	1.84%	1.87%
Depr.	5.3	7.3	7.1	7.9	7.5	7.8
CapEx (%)	4.62%	4.50%	3.93%	2.84%	3.14%	2.88%
CapEx	14.6	15.7	14.9	11.5	12.8	12.0
$\Delta$ WC	(1.2)	(1.4)	(0.6)	(1.3)	(4.3)	(4.0)
FCF	3.1	5.1	5.6	11.0	13.9	14.8



## Forecast Free Cash Flows - Example

- $$FCF = (R - C - I)(1 - t) + Dep - CapEx - \Delta WC$$

### Wal-Mart Stores Inc. - Forecast

	TTM	Year 1	Year 2	Year 3	Year 4	Year 5
Revenue	416.6	449.9	490.5	539.5	593.4	655.7
1 - Op. Margin	94.05%	94.05%	94.05%	94.05%	94.1%	94.1%
Op. Costs	391.8	423.1	461.3	507.4	558.4	617.0
Interest (%)	0.60%	0.61%	0.62%	0.62%	0.61%	0.60%
Interest	2.5	2.7	3.0	3.3	3.6	3.9
Tax Rate	32.6%	32.6%	32.6%	32.6%	32.5%	32.5%
Depr. (%)	1.87%	1.89%	1.92%	1.95%	2.0%	2.05%
Depr.	7.8	8.5	9.4	10.5	11.9	13.4
CapEx (%)	2.88%	2.95%	3.00%	3.10%	3.20%	3.30%
CapEx	12.0	13.3	14.7	16.7	19.0	21.6
$\Delta WC$	(4.0)	(4.1)	(4.2)	(4.3)	(4.4)	(4.5)
FCF	14.8	15.5	16.6	17.5	18.5	19.8

## Determine Discount Rate

**WACC =  $W_d R_d (1 - t) + W_{pr} R_{pr} + W_e R_e$** , where:

$WACC$  = Weighted Average Cost of Capital;

$W_d$  = debt portion of financing,  $R_d$  = cost of debt;

$W_{pr}$  = preferred stock portion of financing,

$R_{pr}$  = cost of preferred stock;

$W_e$  = common stock portion of financing,

$R_e$  = cost of common stock.

- **WACC** - weighted cost of all capital in the firm (same as the return the company requires to pay off all its capital providers)
- Often companies don't have preferred shares, so the preferred share term is not used
- WACC will give the discount rate at which to discount FCFs

## WACC - Where to get information

$$WACC = W_d R_d (1 - t) + W_{pr} R_{pr} + W_e R_e$$

- Want to determine market value of debt, preferred stock, and common stock to get weights
- Value of common stock = market cap
  - ▶ Current share price  $\times$  # shares out
- Market value of preferred stock, debt - close to book value
  - ▶ Get the numbers from most recent balance sheet
  - ▶ Long Term Debt = Notes Payable +  
Current Portion of Long Term Debt + Long Term Debt
- Cost of debt = yield on company's corporate bonds
  - ▶ Can find bond yields on Morningstar
  - ▶ Can also use company credit rating listed on Standard & Poors
- Tax Rate - from past income statements
- Cost of equity - can use CAPM:  $R_e = R_f + \beta(R_m - R_f)$ 
  - ▶ Can find stock beta from any financial website
  - ▶  $R_f$  - return on 20-year US bonds

## Determine Discount Rate - Example

### Wal-Mart Stores Inc.

- Has no preferred shares
- For Q2 2010: LT Debt = \$45242 MM
- Market Cap (as of September 26, 2010): \$196850 MM
- Debt portion: 18.7%, Equity portion: 81.3%
- Coupon Rate on most recent WMT bonds: 6.50%
- Forecast tax rate: 32.6%
- Cost of Equity:  $R_e = 3.50 + 0.29(7.0 - 3.5) = 4.5\%$ 
  - ▶ Beta: 0.29
  - ▶ 20-year US bond rate: 3.50% (as of September 24, 2010)
  - ▶ S&P 500 Return (historical): 7%
- Bond coupon Rate is greater than expected stock return?!?

## Determine Discount Rate - Example

### Wal-Mart Stores Inc.

- Has no preferred shares
- For Q2 2010: LT Debt = \$45242 MM
- Market Cap (as of September 26, 2010): \$196850 MM
- Debt portion: 18.7%, Equity portion: 81.3%
- Coupon Rate on most recent WMT bonds: 6.50%
- Forecast tax rate: 32.6%
- Cost of Equity:  $R_e = 3.50 + 0.29(7.0 - 3.5) = 4.5\%$ 
  - ▶ Beta: 0.29
  - ▶ 20-year US bond rate: 3.50% (as of September 24, 2010)
  - ▶ S&P 500 Return (historical): 7%
- Bond coupon Rate is greater than expected stock return?!?
  - ▶ There is tax. But still, too close...
- Cost of Capital =  $0.187 \times 4.38 + .813 \times 4.5 = 4.48\%$
- This is too low

# Calculate Intrinsic Value

- Discount cash flows for the next 5 years using the WACC as discount rate

- ▶ 
$$PV(FCFs) = \frac{FCF_1}{(1+r)} + \frac{FCF_2}{(1+r)^2} + \dots + \frac{FCF_5}{(1+r)^5}$$

- Find terminal value of the company - value beyond 5 years

- ▶ Can use Perpetuity Growth Model:

- ▶ 
$$\text{Term. Value} = \frac{FCF_f(1+g)}{r-g}$$
, where:

$FCF_f$  = cash flow in final year,  $g$  = long term FCF growth rate.

- ▶ Exit Multiple Model - assume business will be sold;

- ▶ 
$$\text{Term. Value} = FCF_f \times \text{FCF multiple}$$
, where:

$$\text{FCF multiple} = \frac{\text{Market Cap}}{FCF}$$

- Discount Terminal Value (divide by  $(1+r)^5$ )

- $$\text{Fair Value} = PV(FCFs) + \frac{\text{Term. Value}}{(1+r)^5}$$

# Calculate Intrinsic Value - Example

## Wal-Mart Stores Inc.

- WACC = 4.48%; assume it is 6.5%
- $PV(FCFs) = \frac{15.5}{1.065} + \frac{16.6}{1.065^2} + \frac{17.5}{1.065^3} + \frac{18.5}{1.065^4} + \frac{19.8}{1.065^5} = \$72.5 \text{ B}$
- Using Perpetuity Growth Model
  - ▶ Assume  $g = 3\%$  (already low), then:
  - ▶ Term. Value =  $\frac{19.8 \times 1.065}{.065 - .03} = \$602.4 \text{ B}$
  - ▶ Discounted: \$439.7 B. Way too high.
  - ▶ Perpetuity Growth Model does not work here. Why?
- Using FCF multiplier (even though WMT is very unlikely to be sold soon)
  - ▶ Current FCF multiplier:  $\frac{196.6}{14.8} = 13.3$
  - ▶ Term. Value =  $19.8 \times 13.3 = \$263.3 \text{ B}$
  - ▶ Discounted:  $\frac{263.3}{1.065^5} = \$192.2 \text{ B}$
- Fair Value =  $72.5 + 192.2 = \$264.7 \text{ B}$
- Fair Price =  $\frac{\text{Fair Value}}{\# \text{ Shares Outstanding}} = \frac{264.7}{3.64} = \$72.7$

# Advantages and Disadvantages

## Advantages

- The concept of intrinsic value seems valid
- A reasonable way to estimate *long-term* value
- Cash is a better estimate of value than earnings
- Gives an idea of what effect certain numbers in financial statements will have on company value



# Advantages and Disadvantages

## Advantages

- The concept of intrinsic value seems valid
- A reasonable way to estimate *long-term* value
- Cash is a better estimate of value than earnings
- Gives an idea of what effect certain numbers in financial statements will have on company value

## Disadvantages

- Estimating too many numbers
- Sometimes hard to predict the values
  - ▶ e.g. growth companies, recession
- Firms cook the books
- Model is very sensitive to discount and growth rates
  - ▶ These are hard to estimate in current market
  - ▶ Interest rate is low

# Concluding Remarks

## The steps:

1. Forecast revenue growth
2. Forecast Free Cash Flows (FCF)
3. Determine discount rate
4. Calculate intrinsic value of the company

# Concluding Remarks

## The steps:

1. Forecast revenue growth
2. Forecast Free Cash Flows (FCF)
3. Determine discount rate
4. Calculate intrinsic value of the company

## In the end:

- Every model has its own pros and cons
- It comes down to your own judgement of if the model is appropriate or not
- Pick a company and perform DCF on it yourself

# Any Questions?

## Upcoming Events:

- Speaker Event: John Proper - Top Five Principles of Investing
  - ▶ Monday, November 22, 7:00-10:00 p.m., South Dining Room, Hart House
- HHIF First Quarterly Meeting
  - ▶ Tuesday, November 23, 8:00-10:00 p.m., Debates Room, Hart House

# References

1. Investopedia DCF Analysis  
<http://www.investopedia.com/university/dcf/default.asp>
2. Wikiwealth - WACC Cost of Capital Portal  
<http://www.wikiwealth.com/wacc#wacc>
3. Wikipedia - DCF, WACC articles  
[http://en.wikipedia.org/wiki/Discounted\\_cash\\_flow](http://en.wikipedia.org/wiki/Discounted_cash_flow)  
[http://en.wikipedia.org/wiki/Weighted\\_average\\_cost\\_of\\_capital](http://en.wikipedia.org/wiki/Weighted_average_cost_of_capital)
5. Morningstar WMT Financial Information  
<http://quote.morningstar.com/stock/s.aspx?t=WMT&region=USA>
5. Google Finance WMT Financial Information  
<http://www.google.com/finance?q=NYSE:WMT>