"Applied Economics & Finance" – EN. 570.470 (W, Q, S)

Course Syllabus

Prof. Steve H. Hanke

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Syllabus for "Applied Economics & Finance" – EN.570.470 – Prof. Hanke

PURPOSE AND SHORT COURSE DESCRIPTION

This document presents an overview of Applied Economics and Finance, a course that has been taught at The Johns Hopkins University by Prof. Steve H. Hanke on a year-round basis for over twenty years. It has produced a distinguished group of alumni who are operating at the highest levels of finance. The course is widely recognized in banking, finance, and trading circles.[1][2][3]

This course focuses on company valuations, and does so in depth. (1) Students are taught the "ins" and "outs" of a proprietary Discounted Free Cash Flow Model (DCF). Students use the model and primary data from financial statements filed with the Securities and Exchange Commission to calculate the value of publically-traded companies. (2) Students use Monte Carlo simulations to generate forecast scenarios, project likely share-price ranges, and assess potential gains/losses. Emphasis is placed on using these simulations to diagnose the subjective market expectations contained in current objective market prices and the robustness of these expectations. (3) Students use long-term asset turns trends, in conjunction with DCF and Monte Carlo simulations, to gain unique insights into their analyses. (4) To evaluate trading strategies, students use proxy statements to determine the degree to which a company's management is incentivized to pursue policies that will generate free cash flow.

So, the four unique elements of a comprehensive system of valuation presented in this course are: 1) the construction of DCF models from scratch using primary data, 2) the application of Monte Carlo simulations, 3) an asset-turns diagnosis, and 4) proxy statement analysis.

During the weekly seminar, students' company valuations are reviewed and critiqued. A heavy emphasis is placed on research, writing, and craftsmanship. The course is a Hopkins Writing Intensive course (see Appendix A). High-quality craftsmanship requires a great deal of practice at detecting and correcting errors, and this course is designed to give students plenty of practice in doing just that (for more on this, see Appendix B "the check list.") Work products are expected to be of publishable quality at the Johns Hopkins University Institute for Applied Economics, Global Health, and the Study of Business Enterprise *Studies in Applied Finance*.

The course is taught by Prof. Hanke with contributions from an informal participant Dr. Hesam Motlagh (Fellow at The Johns Hopkins Institute for Applied Economics, Global Health, and the Study of Business Enterprise). It meets once a week on Fridays from 1:30PM-4:30PM.

Beyond the specifics of the modeling and so forth, Prof. Hanke challenges students to think and figure things out for themselves. To do this, they must learn the meaning of the 5 Ps: Prior Preparation Prevents Poor Performance. If the 5 Ps aren't followed, students quickly learn the meaning of Prof. Hanke's dictum: "you run the show, or the show runs you."

The 5 Ps should not only be followed for the duration of this course. For anyone in the finance profession, broadly defined, it's as Aristotle taught us: you need to know everything – and that's going to take a while.

OVERALL COURSE DESIGN

1. **Prerequisites for the course:**
    a. *Problems in Applied Economics* (EN.570.428) taught by Prof. Hanke is a pre-requisite. The prerequisites for *Problems* are Financial Accounting, Micro-, and Macroeconomics. The students should also be Bloomberg Certified. The students who are rusty on this material will be guided the first three weeks and can use the lectures as a launching pad to get up to speed on the material.
2. **What the students are expected to do:**
    a. Understand the importance and use of primary data. Specifically, they should be able to analyze financial statements from the Securities and Exchange Commission and to analyze company proxy statements.
    b. Build reproducible and high-quality DCF models, with a full understanding of the accounting underpinnings that make it unique. All models must be built from scratch – "by hand." Replication, citation, and documentation of work are "musts."
    c. Understand and employ re-sampling theory via Monte-Carlo Simulations and appreciate the difference between point estimates and probability distributions. This is towards the Hopkins "Q" (quantitative) requirement.
    d. Understand the importance of reproducibility and primary data. We do not allow the students to use private data providers for building their models.
    e. Provide high quality writing that reflects clarity of thought from the above concepts. This is towards the Hopkins "W" (Writing Intensive) requirement.
        i. Students are expected to write summaries of each model in addition to a final article that will be a cogent investment thesis. The final article is expected to be of publishable quality in the Johns Hopkins University Institute for Applied Economics, Global Health, and the Study of Business Enterprise *Studies in Applied Finance*.
    f. Discuss the companies, whether or not it is a worthwhile investment based on the information above, and the possible fundamental value ranges.
    g. Be prepared with a high-level background in modern finance and be ready for an interview with a unique selling proposition (U.S.P.) – i.e. know why the DCF and Monte-Carlo simulations are unique and how to discuss in probability distributions (not point estimates).
3. **Student assessment:**
    a. In the spirit of a Hopkins upper-level course (read: old school), the class consists of a mix of undergraduate, masters, and doctoral students. As a result, the course will be taught as a hybrid between a lecture and a seminar. Thus, students will be routinely called on to answer questions and contribute to discussions.
    b. Students will be tested by presenting their models and by submitting written summaries. There will be 12 students in the class. To go over every model in three weeks will require devoting ~20-30 minutes per model if each student presents a model. The companies are assigned on Friday, are delivered to a TA by the start of the business day on Tuesday, and polished by class time on Friday. During the week, when the write-up is due, the papers are to be sent to Dr. Hesam Motlagh by the time the U.S. Markets close on that Wednesday. The papers will then be

distributed to all students to allow everyone an opportunity to familiarize themselves with the investment thesis.

c. Students will submit write-ups on each company. They will also write a final paper, which will be a stock pitch article for publication in addition to an explanation of why the DCF is unique.
d. Students will have weekly readings and will be called on to lead discussions. Many of these discussions will utilize articles written by Prof. Hanke or a book by Dr. David Ranson (Fellow at the Johns Hopkins Institute for Applied Economics, Global Health, and the Study of Business Enterprise):
    i. http://krieger.jhu.edu/iae/books/Reading_Ranson_Applied_SupplySide_Economics.pdf

4. Workload:

a. We expect the students, at a minimum, to spend 10 hours per week outside of class on their work. This course should be their top priority.
b. Students will learn, Prof. Hanke's dictum: the 5 Ps – Prior Preparation Prevents Poor Performance. If more than 10 hours are required to satisfy the 5Ps, so be it.

LECTURE FLOW OF THE COURSE

Every lecture will begin with a short discussion of recent events in the market. We will focus on questions that include, but are not limited to: What is the macro narrative? What news is dominating the conversation? How has the market performed? What were the big movers in the market? Do the big movers represent investment opportunities? What sectors or industries have out- or under-performed? What economic data were released this week? These discussions are intended to be short (10 to 15 minutes) and to ensure that students are in tune with the pulse of markets. The two highest quality publications to read regularly are the *Wall Street Journal* "Heard on the Street" and the *Financial Times* "Lex" columns. It is expected that students keep their nose in the news through a myriad of other sources including, but not limited to: Professor Hanke's blogs and articles, *Investor's Business Daily*, *Bloomberg*, *CNBC*, *Zero Hedge*, *Barron's*, the *New York Times*, etc… Students will be called on to provide insight and offer their opinions on the subject matter. These are critical skills to develop if one wishes to be a finance or economics professional.

The rest of the lecture will be devoted to teaching and discussing models. In the first three to four weeks the students will learn how to build DCF models from scratch (i.e. with primary data in empty spreadsheets), re-sampling theory via Monte-Carlo simulations, how to analyze a company's inventive structure as contained in proxy statements, and how to use the conceptual framework of value investing. After these initial lectures, the students will build a DCF every three weeks and present it to the class along with a write-up that expands on the proxy report. The written summaries will read as a hybrid between an investment pitch (e.g. sell-side research) and a technical report. This will force students to: (1) Write more and receive feedback on that writing, and (2) Think out their model and investment thesis more thoroughly. Additionally, the write-ups being presented will be distributed to students early in the week for reading. This will ensure that all students are familiar with the company and the model being presented. These discussions will be led in an interview question format to prepare the students for interviews and the professional workplace.

SELECTION OF COMPANIES

The first 4 weeks will mostly consist of teaching the students how to build their first model. Then every three weeks they will build their own model. Companies will be assigned on weeks 1, 5, and 8.

- All models will be built individually. This is to ensure that each student can perform the analysis independently. We will try our best to have students "specialize" by sectors and accommodate interesting companies. That leads to a total of ~30 companies that will be covered throughout the course of the semester.
- The first few weeks will be simpler companies to ensure that students can properly construct the models. Later on, companies will be more difficult (i.e. more complicated financial statements and/or uncertainty in historical statistics) and advanced students can attempt to model exceptionally difficult companies (e.g. financials, pre-profit pharmaceuticals, or mergers/spin-offs of two companies).

WRITTEN SUMMARY OF EACH COMPANY

For each company, the students will have to present a write-up and a defense of their investment thesis in front of the class. This will be a great opportunity for students to learn to (1) write, and (2) think on the spot. These skills are critical for a successful analyst. An example summary will be distributed to students to demonstrate the quality expectations. Below are the current guidelines of what will be expected in a summary. These are just guidelines – feel free to change the format for however you see fit for your investment thesis. Part of the pleasure of being an analyst is presenting your intellectual property in creative ways. However, be warned: the final product must be well thought out. If not the student risks having an embarrassing experience in front of the rest of the classroom.

- **Cover Page**
  - Company Logo
  - Information on the company (share price, shares outstanding, cap, beta, P/E, etc…)
  - Table of contents.
    - Make sure each page is numbered and that there is a header as well that includes the company name, the date it was last updated, and the names of the students writing it.
- **Executive Summary** (1 paragraph)
- **Catalysts/Risks**
- **Company Description and Historical Performance** (approximately 5 paragraphs) – The order below will change for each company – it is up to the student to come up with the most cogent order of presentation.
  - Who are they and what do they do?
    - What industry/sector are they in? How has this industry/sector performed historically and how do you expect it to perform in the future? How much of the market share do they have? Who are the major players? Who has the competitive advantage (if any)?
      - *An organization chart of the company is desirable.*
    - This section will vary significantly. Students should make certain to focus on the company's investment strategy.
  - What *mechanistically* generates their revenue?

        - What are their major business segments? How have these segments historically contributed to their revenue over time?
        - As a corollary – how should they be modeled? How must their revenue projections be represented?
    - How has their stock performed? What are analyst recommendations?
        - *Must include figure of at least 5 years performance versus the proper index (most companies will be the S&P500, however, some small cap companies may require the Russell 2000 or another appropriate index.)*
    - What have their Long-term Asset Turns (LAT) and Useful Life looked like the past 10 years? Is there a systematic trend? What are the historical averages?
        - *May include figures*
- **Model of the company**
    - How was the model built?
        - Projected Revenue Growth discussion
        - Cash Flow/Margins discussion
        - Questions you should ask yourself:
            - What numbers stick out? e.g. did they recently see a huge decrease in LAT because they just purchased a company?
    - Discounted Cash Flow Model
- **Results and Discussion of the model**
    - What is the expected free cash flow per share given the Monte-Carlo simulation?
    - What assumptions significantly change the values?
- **Proxy report**
    - How is management incentivized? Does this comport with our model?
    - How would you expect this compensation to drive the company stock price?
- **Conclusions and investment decision**

Suggested data sources: 10-K, 10-Q, DEF-14A as primary data sources from the SEC EDGAR database. Shareholder reports, earnings transcripts (Seeking Alpha or from the Bloomberg), Bloomberg Terminal, and Yahoo Finance as potential secondary sources. Caution must be used for secondary data and private data vendors – make sure to cite your sources.

FINAL WRITING ASSIGNMENT

There will be a final writing assignment, which is to be written individually. There will be a cumulative list of companies we build models for as "Winners" – i.e. those that we think represent investment opportunities. The students can work together or individually to write a Seeking Alpha article surrounding one of these companies. The writing assignment will be the written in three parts: an outline, a rough draft, and a final draft. These will be due in week 11, week 13, and the last day of finals, respectively. The write-up will also have a separate component due with the final that is a case study of the DCF with the company of choice. The purpose of this separate component is for the students to explain why the DCF is unique, thus demonstrating a complete mastery of the material. Critical feedback will be provided along the way. A company may not be

pitched by more than one individual – i.e. there will only be one accepted "Winner" stock report written per semester.

READING MATERIAL FOR THE COURSE

Reading will be assigned weekly and we will have a short discussion at the beginning or end of class on the material if necessary. Given the lively nature of the markets, readings will be assigned that are timely and discussions will focus on current developments. Many of these discussions will utilize articles written by Prof. Hanke or a book by Dr. David Ranson (Fellow at the Johns Hopkins Institute for Applied Economics, Global Health, and the Study of Business Enterprise). Here is the link to his book.

SUGGESTED READING MATERIAL

Below is a reading list of suggested books for students to obtain and read for preparation to be a financial professional. This reading list is by no means complete, but provides an exceptional starting point to develop general knowledge on the subject matters:

Standard high-quality general reference:

- **Aswath Damodaran. Damodaran on Valuation: Security Analysis for investment and Corporate Finance. Wiley Finance, 2nd Edition**. (This book does an excellent job of walking through discounted cash flow valuation and multiples analysis. The multiples analysis sections will help wrap your head around its relationship to fundamental value and why the vast majority of equity research uses this valuation methodology.)

Older classics:

- **Benjamin Graham. *The Intelligent Investor: The Definitive Book on Value Investing.* Revised edition. Collings Business Essentials.** (This is one of two classic Benjamin Graham books on value investing; the other being Security Analysis)
- **Kenneth L. Fisher. *Common Stocks and Uncommon Profits and Other Writings. Wiley, 2nd Edition.*** (Note – this classic extends Benjamin Graham by stressing the importance of a competitive moat)
- **Seth A. Klarman. *Margin of Safety: Risk-Averse Value Investing Strategies for the Thoughtful Investor*. HarperCollins, 1st Edition.** (Note: This book is a classic but costs >$1,000 due to it only being printed once; it is recommended you obtain an electronic copy online. It is considered a trophy among value investors to own a physical copy)

More current texts:

- **Bruce C. N. Greenwald, Judd Kahn, Paul D. Sonkin, and Michael van Biema. *Value Investing: From Graham to Buffett and Beyond*. Wiley Finance, 1st Edition.** (This is essentially the textbook used by Columbia Business School for teaching value investing; Bruce Greenwald teaches from this book and has updated Graham/Dodd value investing to reflect more modern times and sprinkles in new knowledge from the last century. It is edifying to read this book after the Intelligent Investor and Security Analysis to observe the evolution of value investing thinking).

- **Sam L. Savage.** ***The Flaw of Averages: Why We Underestimate Risk in the Face of Uncertainty.*** **Wiley, 1st Edition.** (An excellent read on why using point estimate means and not probability distributions can lead to misleading and sometimes false conclusions. This type of thinking is at the heart of why we use Monte Carlo simulations for our modeling class).
- **Joel Greenblatt.** ***You Can Be a Stock Market Genius: Uncover the Secret Hiding Places of Stock Market Profits.*** **Simon and Shuster.** (Joel Greenblatt is a renowned value investor and in this book he describes the basics of some of his investment strategies and then walks through "special situations" such as spin-offs and how one can achieve excellent returns.)
- **Nassim Nicholas Taleb.** ***Fooled by Randomness: The Hidden Role of Chance in Life and in the Markets.*** **Random House Trade Paperbacks.** (Nassim Taleb is another well-known investor who thinks about investment strategies in terms of probability distributions. This book reads more like a novel than a textbook [similar to Malcom Gladwell, except Nassim provides significant statistical support]. He was actually trained by a current Johns Hopkins professor during his Ph.D. [Professor Helyette Geman].)
- **McKinsey & Company Inc. Valuation: Measuring and Managing the Value of Companies. Wiley Finance, 6th Edition.** (This book is currently treated as "the book" on valuation by a number of consulting and investment firms. It is a long read, but it cites great literature and provides good examples for demonstrating concepts.)
- **Joshua Rosenbaum and Joshua Pearl.** ***Investment Banking: Valuation, Leveraged Buyouts, and Mergers & Acquisitions.*** **Wiley, 2nd Edition.** (For those interested in investment banking internships, this book is highly recommended before an interview. This was written by two analysts from the Street who claim that this book would have helped them significantly in their interviews and during their first year on the Street. It serves as a high-level introduction to most subjects encountered.)

A Useful Font of Wisdom:

- **Charles T. Munger.** ***Poor Charlie's Almanack.*** **The Donning Company, Expanded 3rd Edition.**

WEEK BY WEEK BREAK-DOWN OF LECTURES

Week 1 - Friday, June 3rd

- **Lecture Topics**
  - Introduction to the course and general housekeeping – what makes this class a "Q" and a "W"
    - Determine which students have (1) taken the course before, (2) know financial accounting, and (3) know how to use a Bloomberg terminal.
  - How do we value companies?
  - The concept of value investing – what is a "value" stock versus a "growth" stock?
    - How do we want to invest in companies?
    - What is "mean-reversion" and how does it apply to value investing?
  - Revenue, margins, asset-turns, and free cash flow
  - DCF Model: Cover Page, Balance Sheet, Income Statement, Revenue Growth, and Value Drivers
- **Assigned Work**
  - Start building your first models up to the Value Drivers tab
  - Brush up on financial accounting

Week 2 - Friday, June 10th

- **Lecture Topics**
  - How to value a company or asset
  - Time value of money and discounted cash flow methodology
  - What is a Monte Carlo simulation?
  - DCF Model: DCF and Monte Carlo
  - How do we start forming an investment opinion? "Homeostatic Balance Sheet" and "Asset Turns" discussion.
- **Assigned Work**
  - Finish your first DCF and try to get to the MC if you are confident with your DCF.

Friday, June 17th – No lecture

Week 3 - Friday, June 24th

- **Lecture Topics**
  - How to read proxy statements – how is management tied to revenues, margins, and asset turnovers?
  - Walk through an example of a proxy and tie it all together
  - Start going through some of the models (if time permits)
- **Assigned Work**
  - Read the proxies
  - Finish your proxy write-ups and MC simulations

Week 4 - Friday, July 1st

- **Lecture Topics**
  - Common mistakes in DCFs
  - How to error-check your DCFs
  - Have the advanced students present their investment theses
- **Assigned Work**
  - Finalize models and write-ups. Prepare to present starting next week.

Week 5 - Friday, July 8th

- **Lecture Topics**
  - Begin new student presentations, students will be randomly chosen at the beginning of class.
- **Assigned Work**
  - Second models will be assigned to individual students. Build up to the DCF tab

Week 6 - Friday, July 15th

- **Lecture Topics**
  - Go over models and hear investment pitches
- **Assigned Work**
  - Make sure DCF is polished, start performing MC simulations, do proxy write-up.

Week 7 - Friday, July 22nd

- **Lecture Topics**
  - Finish first round of models and investment pitches
  - Begin to discuss financial model (if time permits)
- **Assigned Work**
  - Finish second models and write-up.

Week 8 - Friday, July 29th

- **Lecture Topics**
  - Start going over second models and investment pitches.
- **Assigned Work**
  - Assign third models
  - Recommended – start working on write-up as workload decreases

Week 9 - Friday, August 5th

- **Lecture Topics**
  - Continue model presentations.
- **Assigned Work**
  - Make sure DCF is polished, start performing MC simulations, and complete a proxy write-up.
  - Recommended – start working on final write-up as workload decreases

Week 10 - Friday, August 12th

- **Lecture Topics**
  - Continue model presentations
- **Assigned Work**
  - Finish third models and write-up and/or start writing rough draft of final paper
  - Outline for final investment pitch.

Week 11 - Friday, August 19th

- **Lecture Topics**
  - Final presentations (if any remain)
- **Assigned Work**
  - Final paper

Final writing assignment is due Tuesday, August 23rd by 5PM EST

All final-write ups are expected to be of publication quality.

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The Writing Requirement

Prof. Steve H. Hanke

To think, one must be able to write. I stress high-quality writing in each of the three courses listed above. The primary objective in all three courses is to produce publishable work. Exceptional papers will be published in the Studies in Applied Economics or Studies in Applied Finance working paper series. I developed this series, in part, for Hopkins students and Fellows at the Johns Hopkins Institute for Applied Economics, Global Health and the Study of Business Enterprise (http://krieger.jhu.edu/iae/economics/ or http://krieger.jhu.edu/iae/finance).

I require my students to read Prof. McCloskey's edifying little book to assist them in reaching a university level of writing and thinking.

I recommend a most interesting and useful book by Prof. David Crystal. He is an expert on rhetoric and oratory. Crystal has written over a hundred books on these topics, and his new one is important. If you master its content, you will be able to leverage off your other skills and go somewhere. If not, the likelihood of a successful professional career will be limited no matter how "smart" you are and how much you might "know".

In addition, the Hopkins requirements associated with the writing-intensive (W) designation are listed below, and will be adhered to.

Required reading: Deirdre N. McCloskey. *The Writing of Economics.* New York: Macmillan Publishing Company, 1987. 2nd Edition.

Recommended reading: David Crystal. *The Gift of the Gab: How Eloquence Works*. New Haven: Yale University Press, 2016.

In order to satisfy the requirements for this class, the student must fulfill the requirements below.
The university defines a writing-intensive (W) course as one in which students write at least 20 pages of *finished writing* over multiple assignments, *usually 3 or 4 papers* of varying length; instructors respond to students' work in *written comments or in conference*, or both; and students have *at least one*

opportunity to receive their instructor's response on a draft and then revise before submitting the revised version for a grade. In other words, a writing-intensive course does more than assign writing; it guides students' practice in writing and makes writing an integral part of the course.

• *Finished writing.* "Finished writing" describes papers written outside of class and submitted for a grade. Ungraded pre-draft writing assignments or drafts, in-class writing, journals, and exams do not fulfill this criterion.

• *Usually 3 or 4 papers.* Expertise in writing is gained through the guided practice of writing, as the writer gradually takes on greater challenges. A typical writing-intensive course will therefore assign 3 or 4 papers, starting with shorter assignments and building to longer ones. In writing, as in other complex practices, expertise builds with repetition over time. It's logical, then, that lower-level W courses (100 and 200) designed to introduce students to writing in a discipline would follow this pattern of assigning 3 to 4 papers. On the other hand, upper-level W courses (300 and 400) designed for majors in the discipline may require only 2 longer papers; and, in some cases, a course may be designed to teach students how to produce a single research essay or article in the discipline. Juniors and seniors, for instance, taking an Independent Study or writing a Senior Essay in the major may work on one 30-page paper for the entire semester.

• *Instructors respond to students' work in written comments or in conference, or both.* The teaching and learning of writing requires that instructors respond to students' writing, providing an explanation of both strengths and weaknesses. This responding to students' writing can take the form of notes written on papers or posted on a course web site, of in-person discussions in conference, or of some combination of these.

• *At least one opportunity to revise.* The opportunity to receive the instructor's response on a draft and then revise is a key criterion of a writing-intensive course. The instructor's response to a student's draft and the student's revision of the draft, in response, comprise the dialogue of writing instruction. A strong writing-intensive course will offer more than one opportunity to engage in this indispensable dialogue.

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The Check List

Prof. Steve H. Hanke

Introduction

In Applied Economics and Finance, a complex system is developed for the purpose of valuing companies traded on exchanges. Execution errors are the Achilles' heel of all complex systems that integrate multiple models and require many calculations. As John Kay put it in his 29 August 2012 *Financial Times* column, "You can buy tanning lotion on the beach but delivery of sugar to a cruise line needs a helicopter." Small errors in execution can be costly. Indeed, a small error in a company valuation can cost an investor a bundle.

This checklist, which has been compiled by students over the years, is designed to reduce errors. Ignorance, ineptitude, and clerical errors are the bane of high quality work products.

Recommended Reading: Gawande, Atul. "A Checklist Manifesto". New York: *Metropolitan Books*, Henry Holt and Company, 2009.

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Purpose

In building Professor Hanke's valuation system, certain mechanical steps must be followed. Mistakes can be avoided and corrected by referencing this checklist. Rationalization for

differing definitions and information surrounding analysis of the model's output can be found subsequent to the mechanical steps.

Pre-Model Requirements and Conditions

Examine the Stock Price and Industry

Questions the analyst should ask:

1. What is the current price? Why is the price low or high? How has it performed in the past 5 years versus the market or its industry as a whole?
2. What is not being discounted in the stock price? Something must be changing in the business to determine that what is currently being discounted is not an accurate reflection of ongoing operations.
3. Does the company operate in a well-defined market?
4. Is the industry heavily regulated? Does it have any dominant players? Is it vulnerable to the emergence of disruptive technologies?

Model Mechanics:

Balance Sheet Tab

1. Using only 10-K and 10-Q SEC filings, copy five years of balance sheet data into the first tab of the valuation model. If the last filing available is a quarterly report, then use that data for the current year and make sure to have at least 5 years of annual data if your company is cyclical through the quarters.
2. Below the balance sheet data, calculate the working capital for each year using the following formula: Working Capital = Current Assets – Current Liabilities – Effective Cash. Note: Effective Cash = Cash + Marketable Securities
3. Calculate the change in working capital between each year using the following formula: Change in Working Capital $_{Yr2}$ = Working Capital$_{Yr2}$ – Working Capital$_{Yr1}$. There should not be a change in working capital calculation for the earliest year.

4. Calculate the capital expenditures for each year using the following formula: Capital $\text{Expenditures}_{Yr2}$ = (Total Non-Current Assets_{Yr2}) – (Total Non-Current Assets_{Yr1}) + $\text{Depreciation}_{Yr2}$. There should not be a capital expenditures calculation for the earliest year.

Income Statement Tab

5. Using only 10-K and 10-Q SEC filings, copy five years of income statement data into the second tab of the valuation model. If the last filing available is a quarterly report, then use that data for the current year and annualize it by multiplying by the reciprocal of the fraction of the year's data that is available.
6. Below the income statement, calculate the cost of goods sold, net depreciation and amortization (D&A) using the following formula: Cost of Goods Sold, Net D&A = Cost of Goods Sold – D&A. Note: You may need to locate D&A on the statement of cash flows if it is not specifically listed on the income statement. If D&A is already listed on the income statement then it is not included in the Cost of Goods Sold and does not need to be subtracted. This is an important fundamental concept the student should understand – ask yourself: are D&A cash expenses? If so, what does it correspond to?

Value Drivers Tab

7. Copy the income statement into the bottom of the tab.
8. Copy the working capital calculations, the capital expenditures calculations, and the cost of goods sold, net D&A calculations from the balance sheet and income statement tabs into the value drivers tab.
9. For each year of historical data, calculate the percentage of total revenues for which each value driver accounts, with the exception of taxes. Typical value drivers include cost of goods sold, net D&A, change in working capital, capital expenditures, SG&A (selling, general, and administrative expense), research and development, other income, and interest expense. Consider any other income statement line items as value drivers as well.
10. Calculate earnings before interest and taxes plus (EBITDA) using the following formula: EBITDA = 1 – Sum(all expenses except interest, taxes, and D&A)
11. For each year of historical data, calculate the percentage of EBITDA for which taxes account.
12. Calculate the average historical level of total revenues (EBITDA for taxes) for which each value driver accounts.
15. Place a column labeled "standard deviation" directly to the right of the "input" column.

- Use the standard deviation excel formula to calculate the standard deviations for the margins, including the past five years as data points. For revenue growth, calculate the standard deviation of the absolute numbers as opposed to the growth rates. Make sure to calculate the standard deviation of a sample, not a population.

16. Additionally, the analyst must examine the historical asset turnover ratio (net sales/average total assets) as it is a key component of what drives the price of the stock. Declining asset turnover, as a result of large capital expenditures can be leading indicators of future earnings growth. Asset turnovers also bind together capex and revenue assumptions, assuring superior validity. Further, LAT ratio improvements are often leading indicators for margin improvements. Refer to Memo on Asset Turns for additional detail. Also calculate the Useful Life (UL) of the long-term assets. For both LAT and UL, calculate the descriptive statistics that will eventually be used to tune your model (i.e. Min, Mean, and Max).

Revenue Growth Tab

17. Using 10-K and 10-Q SEC filings, copy five years of historical segment revenue data. Do this for both the product segment revenue data and geographic segment revenue data, as available. Annualize final year data as necessary. The student should show a lot of discretion when forecasting revenue, one should ensure that they are projecting segments that are in line with how the business *actually* operates.
18. Calculate the year-on-year (YOY) revenue growth for each pair of consecutive years for every segment using the following formula: YOY Revenue Growth = [(Segment Revenue$_{Yr2}$ – Segment Revenue $_{Yr1}$) / Segment Revenue $_{Yr1}$]. This should be expressed as a percentage.
19. Calculate the historical average YOY revenue growth rate for each segment.
20. Place an "Assumed" column directly to the right of the historical average column.
21. Link the "Assumed" cells to the corresponding historical value cell immediately to the left for now.
22. Project the revenues by segment going forward ten years, using the most recent year's data as year 0. Do this by growing each segment's revenue by its assumed YOY revenue growth rate for each of the ten years. For example, Projected Segment Revenue $_{Yr1}$ = Segment Revenue $_{Yr0}$ * (1 + Assumed YOY Segment Revenue Growth Rate). Do this for both product segment and geographic segment data separately.
23. Find the sum of all of the product segments' revenues for each year to produce a total revenue figure for each year.

24. Calculate the compound annual growth rate (CAGR) using the following formula: CAGR = [(Projected Revenue $_{Yr10}$/ Projected Revenue $_{Yr1}$)^(1/10)] – 1. This should be expressed as a percentage.
25. Repeat steps 18 and 19 for the geographic segment data to produce two separate CAGRs.

Discounted Cash Flow (DCF) Tab

26. Above the actual DCF, list all the assumptions along with their averages and standard deviations, the discount rate of 10 percent, the terminal growth rate of 1.5 percent, the projected revenue growth rate from the revenue growth tab, the assumed revenue growth rate to be used in the DCF, the current price, and the current dividend yield. Also, carry over the descriptive statistics of LAT and UL along with those that are forecasted from the model and the percent of the sum of DCF values contained in the terminal value (these will have to be calculated once the model is complete). Designate a cell for the estimated price to be calculated by the model and a cell to calculate the projected gain or loss on the stock.
27. List out the 11 years to be included in the DCF. Place the period number that each year represents above the actual year, with the current year being period 0 and the tenth projected year being period 10.
28. List the assumed YOY revenue growth rate for each projected year. Link year one's YOY growth rate to the assumed revenue growth rate cell above the DCF. Then, link each future year cell to the previous cell, resulting in each projected year having the same assumed revenue growth rate.
29. Calculate the projected revenue for each projected year (periods 1-10) using the following formula: Projected Revenue $_{Yr1}$ = Projected Revenue $_{Yr0}$ * (1 + Assumed Revenue Growth Rate).
30. Paste in the name of every value driver. Link the assumed percentage of total revenues for each value driver in the projected year one column. Link the next year's percentage of total revenues to the previous year's, starting with year two. This should result in each value driver maintaining its same share of total revenues over every projected year.
31. Calculate the projected values for all value drivers, except interest, taxes, change in working capital, and capital expenditures, for each projected year by multiplying the percentage of total revenues associated with that value driver by the projected total revenue for that year.
32. Calculate the projected EBITDA for each projected year using the following formula: EBITDA = Projected Revenue – Projected Value Driver Values (Except Interest, Taxes, Change in Working Capital, and Capital Expenditures).

33. Calculate projected interest expense for every projected year by multiplying the interest expense share of total revenues for each year by the total projected revenue for that year.
34. Calculate projected taxes for every projected year by multiplying the taxes share of EBITDA for each year by the total projected EBITDA for that year.
35. Calculate Net Operating Profit after Interest and Taxes (NOPAIT) for every projected year using the following formula: NOPAIT = EBITDA – Interest Expense, Net – Taxes.
36. Calculate the projected values of change in working capital and capital expenditures for each projected year by multiplying their respective share of total revenues for each year by the total projected revenue for that year.
37. Calculate the free cash flow (FCF) for every projected year, except the final projected year, using the following formula: FCF = NOPAIT – Increase in Working Capital – Capital Expenditures.
38. Calculate the discounted free cash flow for each projected year using the following formula: $DFCF_T = FCF_T$ / (1+Discount Rate)^T, where T is the time period into the future.
39. Calculate the final projected year (period 10) DFCF differently, including a terminal value, using the following formula: $DFCF_{Yr10}$ = (((FCF $_{Yr10}$ * (1+Terminal Growth Rate) / (Discount Rate – Terminal Growth Rate)) - Long-term Debt) / (1+Discount Rate)^10.
40. Sum all 10 of the projected DFCFs. At this point, you can calculate the percent of the sum contained in the terminal value. Usual values are 40-60%.
41. Calculate effective cash by adding the latest cash balance on the balance sheet to any short-term securities on the balance sheet.
42. Find long-term debt from the balance sheet and/or 10-K or 10-Q.
43. Calculate the equity value using the following formula: Equity Value = Sum of DFCFs + Effective Cash.
44. Find the diluted total shares outstanding from the latest 10-K or 10-Q.
45. Calculate the projected price per share using the following formula: Price per Share = Total Equity Value / Total Diluted Shares Outstanding.
46. Link the estimated price per share cell that you originally put above the DCF to the cell in the DCF where you just calculated the estimated price per share value.
47. Calculate the projected gain or loss on the stock using the following formula: Projected Gain/Loss = (Estimated Price – Current Price) / Current Price. This should be expressed as a percentage.

48. Calculate the long-term assets for each projected year in the row below discounted free cash flow. This is done by adding the previous year's long-term assets to the present year's capital expenditures , and then subtracting out the present year's depreciation and amortization.

49. Calculate the projected long-term asset turnover ratio for each projected year in the row below discounted free cash flow . This is done with the following formula: Projected $Sales_T$ / Average(Long-term $Assets_T$, Long-term $Assets_{T-1}$).

- The LAT projections will tie the revenue and capex projections together and ensure further validity in your assumptions. Check to make sure that these LAT ratios are in-line with historicals, and if not, determine why the deviation could be realistic.
- LAT cannot go up indefinitely, without existential evidence – this is due to the fact that it is unlikely to grow revenue without reinvesting capital back into the business (i.e. CAPEX should be greater than D&A). This is an issue that will be company specific – one must justify the assumptions of the cash flow drivers.

50. Calculate the useful life of the projected long-term assets in the row below discounted free cash flow. This is done with the following formula: Long-term $Assets_T$ / Depreciation and $Amortization_T$.

- The useful life calculation allows the modeler to notice any trends relating depreciation to capex, with sales as an independent variable in the relationship. Useful life and LAT projections prove very useful when considered together.
- If useful life increases and depreciation stays stagnant, management is often anticipating revenues to grow materially.
- If depreciation stays stagnant and capex is growing, this will drive useful life down. If the capex is not driving sales growth, management should slow capex and drive up useful life. One caveat of useful life is that it is not uncommon for companies to change their depreciation accounting. Remain cognizant of this fact and show discretion when tuning your model accordingly.

Post-Model Considerations

- Does this stock have a cyclically depressed price in a secularly growing business?
- Are there recent events or impending catalysts in the industry, or within the company specifically, that could hinder mean reversion over the long-term in margins, revenue growth, asset turnovers or other value drivers?

  - Keep in mind: those betting that "this time is different" lose most of the time.
- Does management have cash and get paid to make a mean reversion happen if the company is currently trading below the mean of the distribution?
- Is the company growing its balance sheet faster than the income statement? Is this due to lots of acquisitions? If so, be wary.
- It is difficult to diversify stocks, but an intelligent investor can diversify cash flows.
- Return on Invested Capital (ROIC) is an essential metric to analyze when running the valuation model. There are varying definitions of ROIC, but essentially it is best to look at cash operating profit after taxes divided by invested capital. Cash operating margin and long-term asset turnover (LAT) are key drivers of ROIC. Although the product of the margin and LAT do not exactly give ROIC, it is a good estimate. To be exact, one must account for capitalizing advertising and R&D expense such that you include these in invested capital and their associated effects in NOPAT. These adjustments vary from analyst to analyst.
- LAT improvement generally indicates future margin improvement (read: LAT memo).
- ROIC can be less than the weighted average cost of capital (WACC) and still return cash to stakeholders because the cost of capital is a theoretical discount rate.
- If firms' ROIC in an industry are unstable and prove unpredictable, this may be primarily due to margin depression and fluctuation. To remedy this, pricing must improve, and in many industries, this implies cutting supply. An efficient way to change industry supply is to consolidate. Thus, if ROIC in the industry is unstable, consolidation may occur between the industry's participants. An example of this ROIC analysis at the time this memo was written is the disk drive industry. Seagate Technology (STX) and Micron Technology (MU) are obvious examples of this at the time of writing. These firms dominate the hard disk-drive (HDD) market.

Differing Definitions

(1) Working capital = Current Assets – Current Liabilities – Cash & Cash Equivalents

(2) Capital Expenditure$_t$ = (Long-term Assets)$_t$ – (Long-term Assets)$_t$-1 + D&A$_t$

(3) Discount Rate = 10%

(4) Terminal Value$_{10}$ = [Free Cash Flow$_{10}$ *(1+g)] / (r-g) – (Long-term Debt)
Discounted Cash Flow$_{10}$ = PV (Terminal Value$_{10}$) =(Terminal Value$_{10}$) / (1+10%)^{10}

Reasoning for Differing Definitions

(1) Working Capital: Note that the line item 'cash and cash equivalents' is subtracted from working capital. The reason is that cash should not be treated as an asset. By definition, an asset has to generate cash and has to be a use of cash. It simply does not make sense to argue that cash is a use of itself. Conceptually this is difficult to grasp – the amount of cash on the balance sheet is usually a *capital allocation decision made by management*. For instance, Apple has accumulated a significant amount of cash on their balance sheet over the course of many years as of the time of this writing. This would arbitrarily make it seem that the company needs to reinvest working capital into the company to perform day-to-day operations when in fact it is simply done to keep the company's balance sheet healthy. To conflate *capital allocation* with *using cash to operate the business* is the main reason why we do not treat cash as a current asset in working capital.

(2) Capital Expenditures: By analyzing the change in the company's asset base within the CAPEX calculation, the analyst is able to capture the total amount of cash spent on acquiring new long-term assets. This is very important from the perspective of an investor because this cash is no longer available to the shareholders. Moreover, depreciation and amortization expense is added back to CAPEX even though this is a non-cash expense. This is done because all depreciable assets will have to be replaced one day. Once that day comes, the replacement of each asset will require cash, which will be a cost against free cash flow.

(3) Discount Rate: We do not use the company's WACC for two reasons. The first reason is that a company's WACC is constantly changing through time. However, more importantly, the second reason is that the investor is more concerned about his or her opportunity cost of capital, not the opportunity cost of capital from the perspective of the firm. By definition, WACC is the cost of capital for the firm, which is very different from the investor's cost of capital. Thus, the investor should use a discount rate that reflects his or her opportunity cost of capital, such as the average return of the S&P 500, which happens to be 10%.

(4) Instead of using a terminal multiple, we elect to use a perpetual growth model. This formula simply happens to be an extension of Gordon's Growth Model, except the face value of the company's long-term debt is subtracted from the expression to achieve a terminal value. Here we make the assumption that the company's total debt will be repaid at year 10. It is unreasonable to assume that the company will pay back its debt immediately; the firm will typically roll over its debt. Consequently, we believe that dealing with the firm's debt in year 10 is the most realistic approach. As a result of assuming that the company's debt will be repaid in year 10, we also assume that interest expense in year 10 is equal to zero.

When to sell an investment

- The current price lies on the right hand side of the probability distribution curve.
- Historical averages change in a way that causes the above to be the case.
- When the market price is falling precipitously and is well below the mean of the distribution, do the following:
    - Check the company's corporate debt to see whether the bonds are trading below par. Bonds trading at or below $0.50 on the dollar are almost surely signaling a company-wide problem that will affect all capital-holders. Keep in mind the bond market is less liquid than equity markets and this may cause extreme volatility in times of distress.
    - Observe the credit default swap market for this company as these swaps act as "bond insurance." If these prices soar, this could also indicate a systemic problem that is not isolated to equity.
    - In light of all of the information, ask yourself, "Is the downward move systemic throughout the company or just equity-related?" If the evidence points toward a systemic problem, sell the investment.

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