Disruptive_FA

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High Level Overview

Problem: Evaluating a company and managing a portfolio has been an opaque task of the financial industry. Analytical research has been typically characterized as tedious and confusing.

Solution: Our final project is a financial advisory Django backed website that takes a stock ticker and returns a recommendation of buy or sell based on company valuations and investor risk assessments.

Data Gathering/Analysis

Collects data from user input and scrapes data from finance websites

Use data to generate financial models and give actionable information to users

User Interface

Upon completion of a brief survey, users will be able to search for personalized financial suggestions

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Project Functionality

Stock Search
Advanced Search
Risk Survey

Stock Search/Advanced Search

Main feature of our product:

- Uses user input to query and update Django database
- Returns stock metrics and analysis

Two possible uses:

- Query directly by stock ticker
- Look for companies that meet user specified parameters
  - Sector
  - Industry
  - Market Cap Range

Risk Survey

Product made to fit the user's preferences:

- Default risk assessment score upon site initialization
- Survey allows for personalization of product calculations
  - Generates page randomly from premade table of questions
  - User radio input affects scale of change
  - Option to revert back to default risk score

Learning from user feedback:

- Ask if user agrees with product stock rating
- Option to submit feedback and train calculations to match user risk preferences

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Data Gathering and Database

Financials and Summary Data
Database Integration and Updates
Challenges

Financials and Summary Data

For each stock, we attempted to pull data from 5 web pages

- Income Statement (NASDAQ)
- Balance Sheet (NASDAQ)
- Cash Flow (NASDAQ)
- Interest Expense (MARKETWATCH)
- Summary Data (NASDAQ)

Financial data was collected in a dictionary like so:

```
fin_data = {'statement_type': {'line_item': [1, 2, 3, 4], …},
            'Statement_type': {'line_item': [1, 2, 3, 4], …},
            …}
```

AAPL Company Financials

Follow

$138.68* **0.32 ↓ 0.23%**

*Delayed - data as of Mar. 9, 2017 - Find a broker to begin trading AAPL now

Exchange:NASDAQ
Industry: Technology
Community Rating: Bullish
View: AAPL Pre-Market

Edit Symbol List
Symbol Lookup

ADPT | NDAQ | SPX | AMZN | TSLA | WFC | GOOG | BRK/A | BRK.A | KURA | K | C | AAPL | FB | MSFT

SYMBOL LIST VIEWS
FlashQuotes
InfoQuotes
STOCK DETAILS
Summary Quote
Real-Time Quote
After Hours Quote
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Call Transcripts

Save Stocks

Income Statement | Balance Sheet | Cash Flow | Financial Ratios

Annual Income Statement (values in 000's) — Get Quarterly Data

Period Ending:	Trend	9/24/2016	9/26/2015	9/27/2014	9/28/2013
Total Revenue		$215,639,000	$233,715,000	$182,795,000	$170,910,000
Cost of Revenue		$131,376,000	$140,089,000	$112,258,000	$106,606,000
Gross Profit		**$84,263,000**	**$93,626,000**	**$70,537,000**	**$64,304,000**
Operating Expenses					
Research and Development		$10,045,000	$8,067,000	$6,041,000	$4,475,000
Sales, General and Admin.		$14,194,000	$14,329,000	$11,993,000	$10,830,000
Non-Recurring Items		$0	$0	$0	$0
Other Operating Items		$0	$0	$0	$0
Operating Income		**$60,024,000**	**$71,230,000**	**$52,503,000**	**$48,999,000**
Add'l income/expense items		$1,348,000	$1,285,000	$980,000	$1,156,000
Earnings Before Interest and Tax		$61,372,000	$72,515,000	$53,483,000	$50,155,000
Interest Expense		$0	$0	$0	$0
Earnings Before Tax		$61,372,000	$72,515,000	$53,483,000	$50,155,000
Income Tax		$15,685,000	$19,121,000	$13,973,000	$13,118,000
Minority Interest		$0	$0	$0	$0
Equity Earnings/Loss		$0	$0	$0	$0

Apple Inc. Common Stock Quote & Summary Data

Follow

$138.68* 0.32 ↓ 0.23%

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Save Stocks — Refresh

Latest News | Price Charts | Trade History | Annual Report | Earnings Report Date

Dynamic quotes: Turn On

Best Bid/Ask	N/A / N/A
1 Year Target	140
Today's High /Low	$ 138.79 / $ 137.05
Share Volume	22,155,904
50 Day Avg. Daily Volume	27,781,959
Previous Close	$ 139
52 Week High/Low	$ 140.2786 / $ 89.47
Market cap	$ 727,590,167,200
P/E Ratio	16.61
Forward P/E(1y)	15.55
Earnings Per Share (EPS)	$ 8.35
Annualized dividend	$ 2.28
Ex Dividend Date	2/9/2017
Dividend Payment Date	2/16/2017
Current Yield	1.64 %
Beta	0.79
NASDAQ Official Open Price	$ 138.74
Date of Open Price	Mar. 9, 2017
NASDAQ Official Close Price	$ 138.68
Date of Close Price	Mar. 9, 2017
Community Sentiment	Bullish

Intraday Chart

News for AAPL

- **Intel's Plan for Its Client Computing Group Business**
  3/10/2017 9:05:00 AM - Market Realist
- **Where Is Apple Trading Compared to Its Moving Averages?**
  3/10/2017 9:05:00 AM - Market Realist
- **Will Apple's iPhone 8 Alienate Emerging Market Consumers?**
  3/10/2017 9:05:00 AM - Market Realist
- **Hewlett Packard Enterprise Company (HPE) Ex-Dividend Date Scheduled for March 13, 2017**
  3/10/2017 9:00:03 AM - NASDAQ.com News
- **Understanding Facebook's Slow Growth Warning**
  3/10/2017 7:36:00 AM - Market Realist

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Consensus Recommendation

Apple Inc.

NASDAQ: AAPL Follow 5,258 followe

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Before the Bell --Real time quotes — Mar 10, 2017 9:20 a.m.

$139.31 +0.63 +0.45%

Volume 129,278

Previous close	Day low	Day high	52 week low	52 week high
$ 138.68	$137.05	$138.79	$89.47	$140.28
-0.32 -0.23%				

Income Statement | Balance Sheet | Cash Flow Statement

Annual Financials

Annual Financials for Apple Inc.

View Ratios

Fiscal year is October-September. All values USD millions.	2012	2013	2014	2015	2016	5-year trend
Sales/Revenue	155.97B	170.87B	183.24B	231.28B	214.23B	
Cost of Goods Sold (COGS) incl. D&A	87.92B	107.24B	112.55B	142.26B	131.51B	
COGS excluding D&A	84.64B	100.48B	104.61B	131B	121B	
Depreciation & Amortization Expense	3.28B	6.76B	7.95B	11.26B	10.51B	
Depreciation	2.67B	5.8B	6.86B	10.01B	9.03B	
Amortization of Intangibles	605M	960M	1.08B	1.25B	1.47B	
Gross Income	68.06B	63.63B	70.69B	89.03B	82.72B	

	2012	2013	2014	2015	2016	5-year trend
SG&A Expense	13.42B	15.31B	18.03B	22.4B	24.24B	
Research & Development	3.38B	4.48B	6.04B	8.07B	10.05B	
Other SG&A	10.04B	10.83B	11.99B	14.33B	14.19B	
Other Operating Expense	-	-	-	-	-	
Unusual Expense	655M	300M	-	-	(548M)	

Database Integration and Update

Each time all of a single stock's data has been put into a dictionary, it is then read into our django database

Ticker	Statement Type	Line Item	Year 1 Value	Year 2 Value	Year 3 Value	Year 4 Value
AAPL	Income Statement	Total Revenue	0	0	0	0
AAPL	Income Statement	Cost of Revenue	0	0	0	0
AAPL	Income Statement	Gross Profit	0	0	0	0

Database Integration and Update

Other databases used

Ticker	Previous Close	Beta	Market Cap	Year High	Year Low	Target	Updated
AAPL	0	0	0	0	0	0	Time
BA	0	0	0	0	0	0	Time
NICE	0	0	0	0	0	0	Time

Based on when this database was last updated, the values will automatically update themselves before proceeding further. This is done through the updated column.

Data Pulling/ Database Challenges

- Inconsistent formatting of information on web pages
  - On Nasdaq the summary data did not give consistent data values (eg. some stocks did not have beta or daily high/low)
  - MarketWatch has a similar problem with finding the interest expense
- Missing data values
  - Interest expense was a key metric that was not always supplied by NASDAQ, thus we had to pull from other websites
  - Company has not been public for long enough to give enough information for an accurate DCF
- Data integration takes a long time
  - Beautiful Soup works relatively slowly and it takes ~2 seconds to load each stock into the Django database
  - We have ~7,000 stocks, resulting in a ~4 hour process

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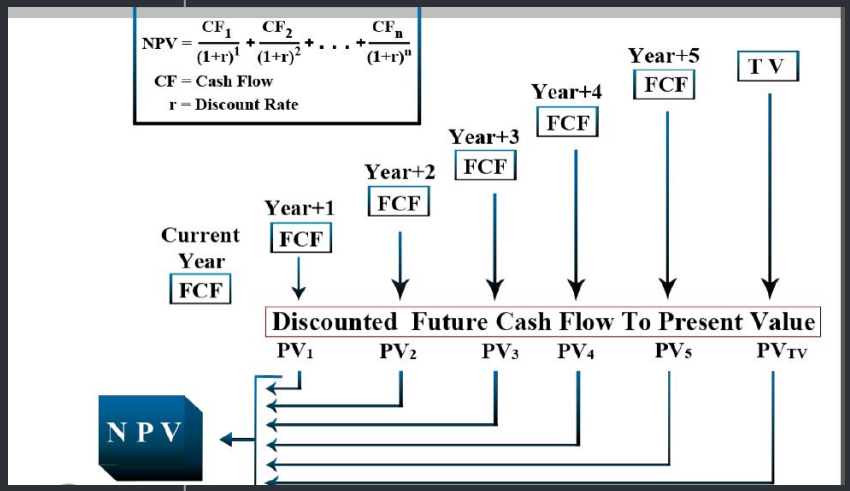
Data Algorithms

DCF Calculations
Estimations (Linear Regression, Risk Aversion Test)
Notable Algorithms
Assumptions
Challenges

DCF: Discounted Cash Flow



Equity Value = NPV - Debt - PS - MI + Cash

Equity Value / Shares = PPS

- What: A common way of valuing an established company.
- Discounted: Cash is worth more now than in the future. Therefore, "discounting cash" represents future value as what it would be worth today.
- How: Estimates how much a company is expected to make in the future
- How far into the future: 5 years
- Goal: Find actual price per share

DCF Estimations

- Future values: e.g. revenue, cost of revenue, SGA, etc.

-> Estimation: Linear Regression

- Expected return (given investor's risk averseness)

-> Risk Aversion Test

-> cost of equity = Rf + ß(**RM** - RF)

- Cost of Debt

-> Interest Coverage Ratio = EBIT / Interest Expense

-> Derivative of its credit rating

DCF Notable Algorithms

Linear Regression

Account for Missing Data:

```
count = 0
if year_value_lst[i] == 0:
    Count += 1

if count > 0 and count < len(year_value_lst):
    potential_error = True
```

$$a = \frac{(\sum y)(\sum x^2) - (\sum x)(\sum xy)}{n(\sum x^2) - (\sum x)^2}$$

$$b = \frac{n(\sum xy) - (\sum x)(\sum y)}{n(\sum x^2) - (\sum x)^2}$$

Curry Function

```
def partial(func, *args, **keywords):
    def newfunc(*fargs, **fkeywords):
        newkeywords = keywords.copy()
        newkeywords.update(fkeywords)
        return func(*(args + fargs), **newkeywords)
    newfunc.func = func
    newfunc.args = args
    newfunc.keywords = keywords
    return newfunc

curry = partial(get_values, slope = m, y_int = y)
curry(x_val) = y_value
```

DCF Assumptions:

- Risk Free Rate: 10-year treasury yield = 2.587%
- Growth Rate: Average between Inflation and GDP growth rate = 1.24%
- Corporate Tax Rate: 35%
- Constant Credit rating cost of debt values: AAA = 4%, AA = 4.5%, A = 5%, BBB = 5.5%, BB = 8.5%, B = 10%, CCC or lower = 12%

DCF Challenges:

- Unreliable future values
- Missing data
  - Not located in one website (e.g. Interest Expense)
  - Newer Companies in particular
- Accurate Risk Aversion Score
  - Adjusted with user input through risk survey
- Cost of Debt
  - Calculation error when dividing by zero
  - Difficult to Data Pull YTM Long Term Debt

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Django User Interface

App Structure
Database Interactions
Challenges

App Structure

Home:

- Base page
- URL path to all other apps

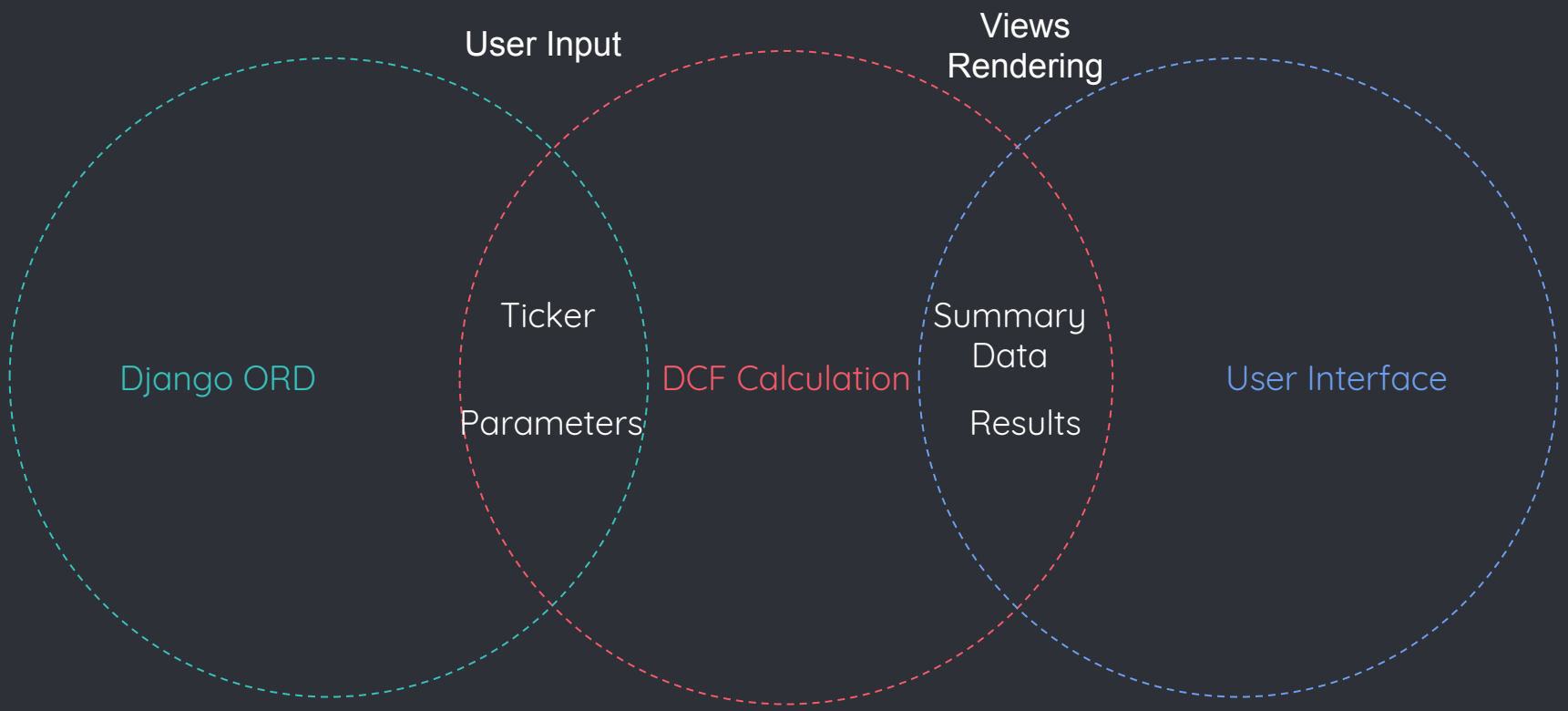
Stock Search:

- Hold the models for all stock data
- Allows user to query ORD
- Outputs stock results/metrics page

Risk Survey:

- Form for user to input risk preferences
- Update or reset risk score object

Database Interactions



Django Challenges

- Understanding the framework
  - Keeping track of each part of each new app
- Applying data pulling work to Django ORD
  - Interactions with the shell
- Learning html, Django template, Djinja
  - Dynamically rendering pages
  - Passing dictionaries through html templates

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Project Demo

Audience Participation

6 Conclusion

Lessons
Future Development

Questions?