Quantitative Screening for Equity Investments

Introduction

During the equity research process identifying investments is a data intensive process. According to the World Federation of Exchanges, there are roughly 10,000 listed companies in the Americas across 10 exchanges; 25,000 listed companies in Asia across 19 exchanges; and 10,000 listed in Europe, Middle-East and Africa across 27 exchanges bringing the total close to 45,000 companies.

The purpose of this paper is to demonstrate how quantitative models can assist in the equity screening process. Many fund managers deploy quantitative screening to find companies for potential investments. There are many different types of equity screens including valuation, momentum, industry, analyst rating, sentiment, etc. This paper will focus on valuation and revenue growth.

Definitions	
Enterprise Value	Market Value of Debt + Market Value of Equity – Cash and Cash Equivalents
Free Cash Flow	EBIT (1-tax rate) + Depreciation + Amortization - Change in Net Working Capital - Capital Expenditure
EBITDA	Earnings Before Interest Taxes Depreciation and Amortization
Book Value	Total Assets - Total Liabilities
Performance	Stock price as of May 14, 2018 / Stock price as of December 31, 2011
Quartile	Values that divide your data into quarters
1st Quartile	The lowest 25% of numbers
2nd Quartile	The next lowest 25% of numbers (up to the median)
3rd Quartile	The second highest 25% of numbers (above the median)
4th Quartile	The highest 25% of numbers

Describe the Data

The data used is the Core US Fundamental Equity Data from Quandl (https://www.quandl.com/databases/SF1). The data consists of 16 years of history for 10,000 companies and 123 indicators. After filtering and cleaning the data, the dataset from Quandl includes roughly 2,600 companies and will evaluate performance from December 2011 to May 2018 against six valuation metrics as of December 2011 and one-year revenue growth from December 2010 to December 2011. The six valuation metrics used are listed below:

Valuation Metrics

1) Enterprise Value / Revenue
2) Enterprise Value / Free Cash Flow
3) Enterprise Value / EBITDA
4) Price / Book or Market Value / Book Value
5) Price / Earnings
6) Price / Sales

Summary of Key Findings

- When grouped into quartiles by valuation, quartiles with lower valuation metrics in 2011 outperformed from 2011 to 2018.
- Enterprise Value to Free Cash Flow (EV/FCF) was the strongest indicator of outperformance among valuation metrics with a mean return multiple of 2.27x for the 1st EV/FCF Quartile.
- When grouped into quartiles by revenue growth, quartiles with higher revenue growth in 2011 outperformed from 2011 to 2018.
- Companies in the 1st EV/FCF Quartile and 4th Revenue Growth Quartile in 2011 were the largest outperformers from 2011 to 2018 overall with a mean return multiple of 2.75x.
- To put these findings into action, a web scraper was created that pulls companies currently in the 1st Quartile EV/FCF and 4th Quartile Revenue Growth – as of 5/27/2018, top picks from the screen for further qualitative analysis include: GameStop, ChangYou, Frontier Communications, Sanderson Farms, and Alcoa.

Correlation

There is a slight negative correlation between 2011 valuation metrics and performance through 2018, indicating that lower valuation metrics are slightly correlated with higher performance from 2011 to 2018.

There is a slight positive correlation between 2011 revenue growth and performance through 2018, indicating that higher earnings growth in 2011 is correlated with higher performance from 2011 to 2018.

	EV/REV	EV/FCF	EV/EBITDA	PB	PE	P/S	Rev Growth	Performance
Correlation to Performance	-4%	-1%	0%	-1%	-3%	-4%	+3%	100%

Quartiles

Enterprise Value to Free Cash Flow (EV/FCF) is the most predictive valuation metric with a mean return of 2.27x for the 1st quartile (lowest EV/FCF) compared to 1.66x for the 4th quartile (highest EV/FCF). Free Cash Flow is cash available to shareholders after operational expenses and capital investments. Companies with the strongest outperformance had lower EV/FCF - the price paid in 2011 for the cash flow available to shareholders was lower.

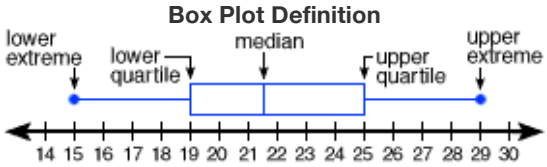
Revenue Growth was also a strong indicator of outperformance with a mean return of 2.16x for the 4th quartile (highest revenue growth) compared to 1.59x for the 1st quartile (lowest revenue growth). Companies with the highest revenue growth in 2011 outperformed from 2011 to 2018. This is a signal that one-year revenue growth is potentially a good indicator of future revenue growth.

Combining EV/FCF and Revenue Growth yielded the best results. Companies in the 1st EV/FCF Quartile and 4th Revenue Growth Quartile sharply outperformed, evidence that supports the Growth at a Reasonable Price (GARP) investment strategy.

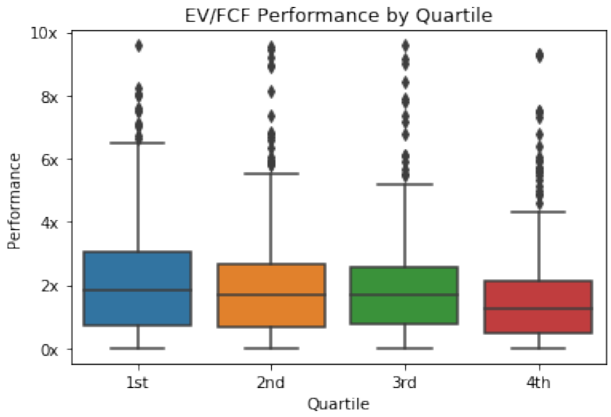
Valuation Metrics			
	1st Quartile	**4th Quartile**	**Difference**
EV / FCF			
Mean	2.27x	1.66x	0.61x
Median	1.86x	1.25x	0.61x
P/S			
Mean	2.22x	1.67x	0.55x
Median	1.62x	1.39x	0.23x
P/B			
Mean	2.25x	1.91x	0.34x
Median	1.91x	1.54x	0.37x
P/E			
Mean	2.11x	1.86x	0.25x
Median	1.65x	1.38x	0.27x
EV / Revenue			
Mean	2.06x	1.85x	0.21x
Median	1.52x	1.53x	-0.01x
EV/EBITDA			
Mean	2.12x	1.94x	0.18x
Median	1.49x	1.53x	-0.04x
Growth Metric			
	4th Quartile	**1st Quartile**	**Difference**
Revenue Growth			
Mean	2.16x	1.59x	0.57x
Median	1.64x	1.23x	0.41x
Combined			
	1st Quartile EV/FCF & 4th Quartile Revenue Growth	**4th Quartile EV/FCF & 1st Quartile EV/FCF**	**Difference**
EV/FCF & Revenue Growth			
Mean	2.75x	1.39x	1.36x
Median	2.24x	0.98x	1.26x

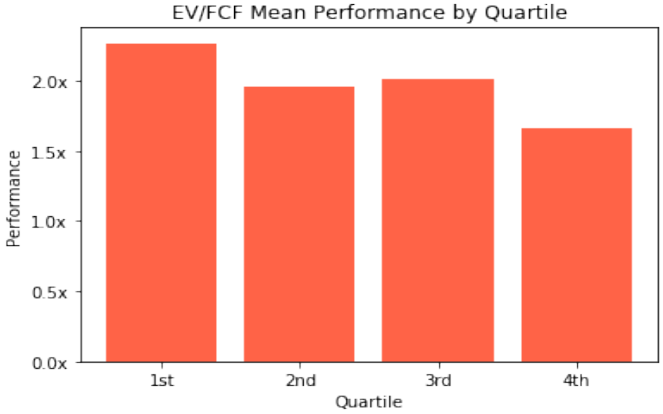
Quartile Graphs

Below are box plots and mean bar graphs of performance for EV/FCF, Revenue Growth, and Combined. The box plots represent the lower quartile (median of the 1st quartile) to upper quartile (median of the 4th quartile), the line in the middle of the box is the median, and the whiskers extend to show the rest of the distribution with the dots being outliers.

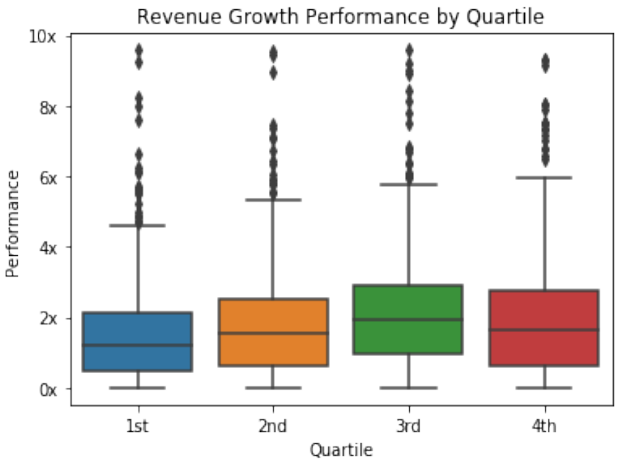


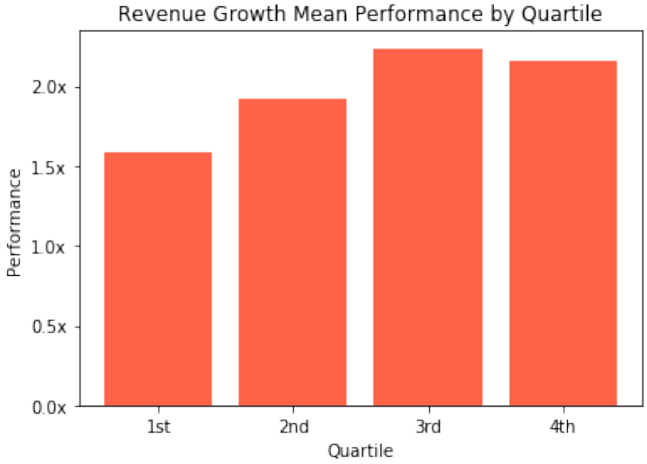
Enterprise Value to Free Cash Flow (EV/FCF)



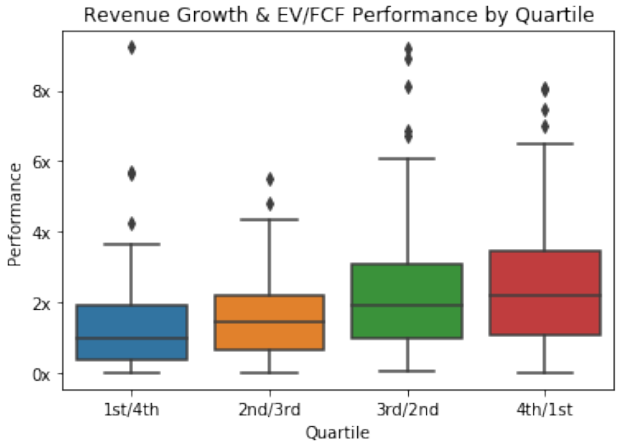


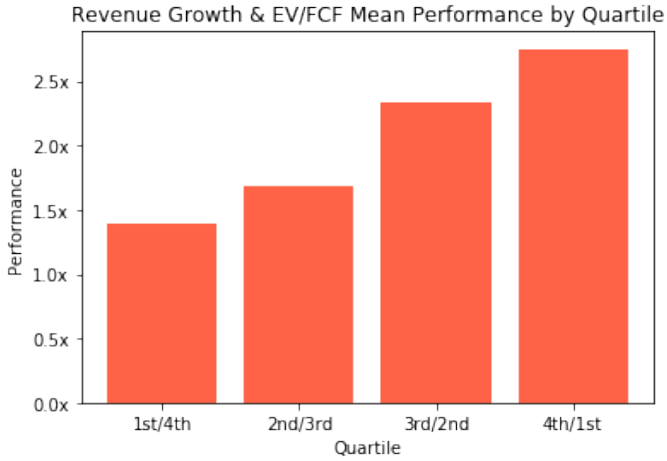
Revenue Growth





EV/FCF and Revenue Growth Combined





Regression

Low EV/FCF and high Revenue Growth combined are the strongest indicators of outperformance and appear to be a good quantitative screen. Regression models were trained on 80% of the data using Performance as target with EV/FCF and Revenue Growth as features. The results from the regression model support the hypothesis that EV/FCF and Revenue Growth combined are better indicators of outperformance. Using the remaining 20% of the data for testing, performance predicted by the model for companies in the 1st EV/FCF Quartile and 4th Revenue Growth Quartile is 2.5x, compared to 2.0x for a sample of companies from the 1st Quartile EV/FCF.

PREDICTED PERFORMANCE			
EV/FCF			
	1st Quartile	**4th Quartile**	**Difference**
Random Forest Regression	2.0x	1.6x	0.4x
Gradient Boosted Regression	2.3x	1.7x	0.6x
Combined			
	1st Quartile EV/FCF & 4th Quartile Revenue Growth	**4th Quartile EV/FCF & 1st Quartile Revenue Growth**	**Difference**
Random Forest Regression	2.5x	1.3x	1.2x
Gradient Boosted Regression	2.5x	1.3x	1.2x

Conclusions & Recommendations

Valuation metrics are good indicators of outperformance with EV/FCF being the strongest indicator of outperformance. Revenue Growth is also important to consider. EV/FCF and Revenue Growth combined are better predictors of outperformance than valuation metrics alone. Specifically, companies in 1st EV/FCF Quartile and 4th Revenue Growth Quartile in 2011 showed the strongest outperformance from 2011 to 2018 with a mean return multiple of 2.75x.

Putting Recommendations into Action with a Web Scraper

A web scraper screened 22,000 listed companies pulling financial information from Yahoo Finance and creating a table of companies in the 1st EV/FCF Quartile and 4th Revenue Growth Quartile as of May 27th 2018. Below are 5 top picks for further qualitative research:

Frontier Communications (FTR)
https://seekingalpha.com/symbol/FTR?s=ftr

Gamestop (GME)
https://seekingalpha.com/symbol/GME?s=gme

Changyou (CYOU)
https://seekingalpha.com/symbol/CYOU?s=cyou

Alcoa (AA)
https://seekingalpha.com/symbol/AA?s=aa

Sanderson Farms (SAFM)
https://seekingalpha.com/symbol/SAFM?s=safm