Trading Project Report

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Based on the Asset allocation process, I am risk-tolerant. So for me I would set 5% of my complete portfolio as risk-free asset like T-bills, the rest part would be mainly stocks and options, using *Black-Scholes model* (Black and Scholes 1973) to hedge risk.

About trading stocks, as a student in math department, I personally preferred using certain algorithms following their historical data, to find some criteria on when to purchase or sell and how much should I invest. Back in China, several efficient platforms are highly recommended like [RiceQuant](#), [UQER](#). The most common algorithm is *Pairs Trading* (Gatev, Goetzmann and Rouwenhorst 2006), that for two stocks or portfolios with similar movement historically, short the winner and buy the loser when the price spread increase then profit when they converge. Another strategy based on the companies' financial data coming from the idea of Graham, value investment. I can set several ranges for each data and choose the stocks that satisfy to invest. However, a bitter truth is that for most of the time, strategies based on value investment win the others. One of those most famous value investment masters is Anthony Bolton (Bolton and Davis 2006), who is distinguished for his Fidelity Special Situations Fund. Sometimes you're required to be a "contrarian". My last belief is that everything is formed in a self-similar pattern from fractal geometry, so that the price charts in a longer time period should be similar to a smaller time period, which can be seen from another famous model LPPL (Fantazzini and Geraskin 2011) that successfully predicted the great loss in 2008, China.

Equity analysis

Since it's a much lower frequency trading like once a week, companies who are underpriced or facing a big opportunity will be my major concerns.

Recently *Costco Wholesale Corporation* announced a new delivery services in response to *Amazon*'s recent action on its delivery services. I think such competition will make profit.

So I do equity analysis on these two first.

COST (Variety shop)

With data obtained online[1], I then implement the statistics method using Excel[2]. Among the $1257 observations, the minimum price is $77.8725 while the maximum is $181.62, and the mean and standard deviation is $127.2940 and $25.4854, respectively.
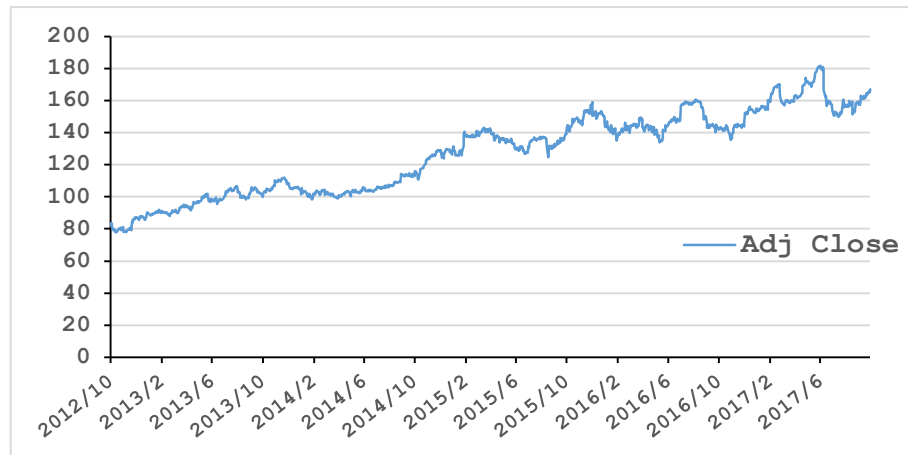
Fig 1 Price Change of COST

Then I sort out of the monthly price data to find the monthly return rate. The following is the historical return, with a 1.05% standard deviation.
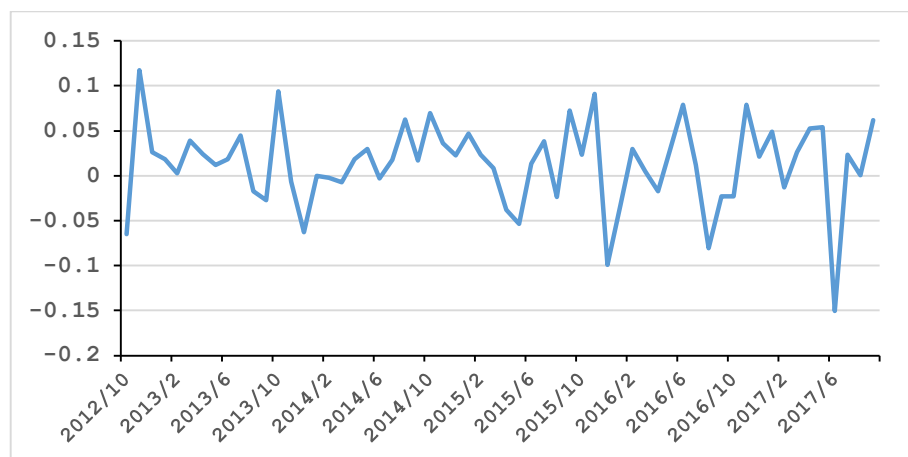
Fig 2 Monthly Return Rate of COST

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[1] https://finance.yahoo.com/quote/COST, others are also from Yahoo Finance.

[2] Microsoft® Excel®

The β of COST is calculated based on the S&P 500 index and the least 3-month T-bill rate, 1.03%. After regression, the result is $\beta = 1.20631140004198$, while the value posted is 1.03.

The last step is applying the DDM model. Its Return on Equity is 23.19%; Payout Ratio is 32.12%; 5 Year Average Dividend Yield is $1.05. For the required rate of return

$$k = r_f + \beta(r_M - r_f)$$
$$= 4 \times 1.03\% + 1.2063 \times (12 \times 1.19\% - 4 \times 1.03\%)$$
$$= 16.38\%$$

And in order to use DDM, I have to assume that it is with a constant growth rate

$$g = ROE \times b$$
$$= 23.19\% \times (1 - 32.12\%)$$
$$= 15.74\%$$

$$V_0 = \frac{D_1}{k - g}$$
$$= \frac{1.05}{16.38\% - 15.74\%}$$
$$= 164.06$$

And its current price is no more than $160. Seems that I got a good one.

AMZN (Catalog & Mail Order Houses)

Following the same method, I plot its close price first. This time and later, I will use the monthly data directly given by Yahoo Finance.
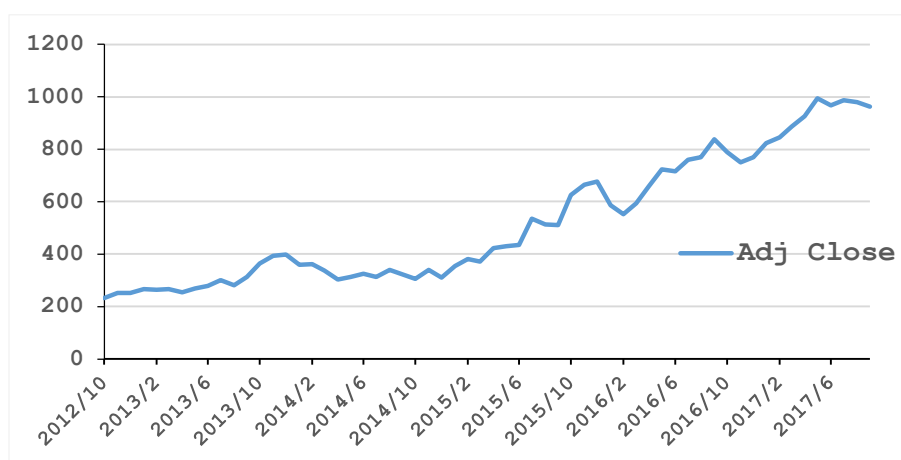

Fig 3 Price Change of AMZN

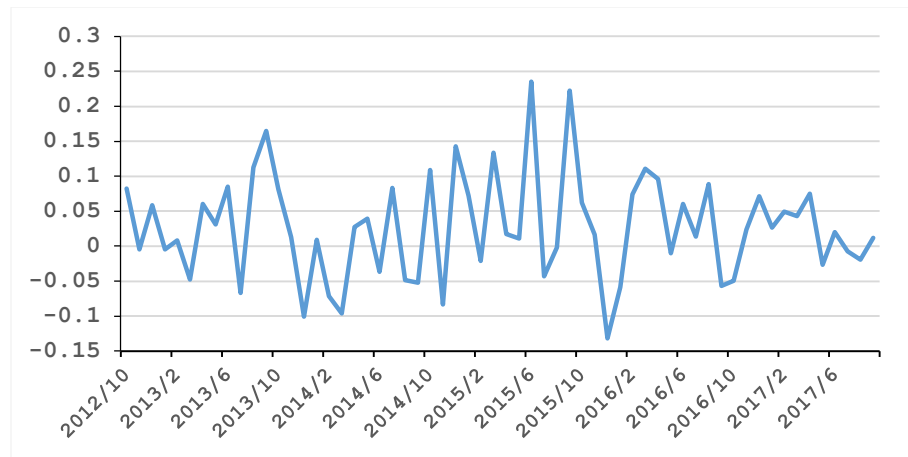And the month return rate figure of AMZN

Fig 4 Monthly Return Rate of AMZN

Then using the regression to calculate β, which is 1.44162 (the value posted is 1.31). The last step is applying the DDM model; while AMZN didn't pay any dividends so far, so I may choose another one to complete this analysis.

SJM (Processed & Packaged Goods)

I love the jam they produce, and they pay dividends! So here's the analysis result.

Among the 60 observations, mean price level is about $\$107.50$, ranging from $\$76.44$ to $\$149.84$, mean return rate level is about 0.648%, a tiny number, and the return rate goes from -14.061% to 18.615%. The following is its price trend.
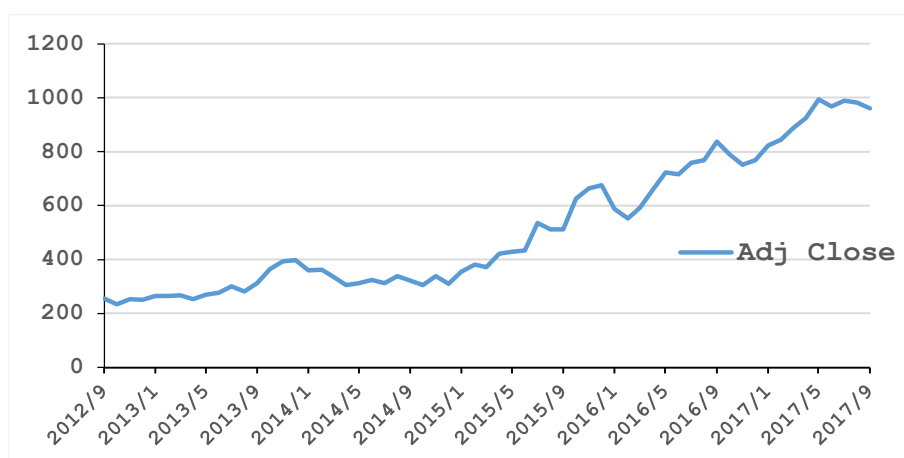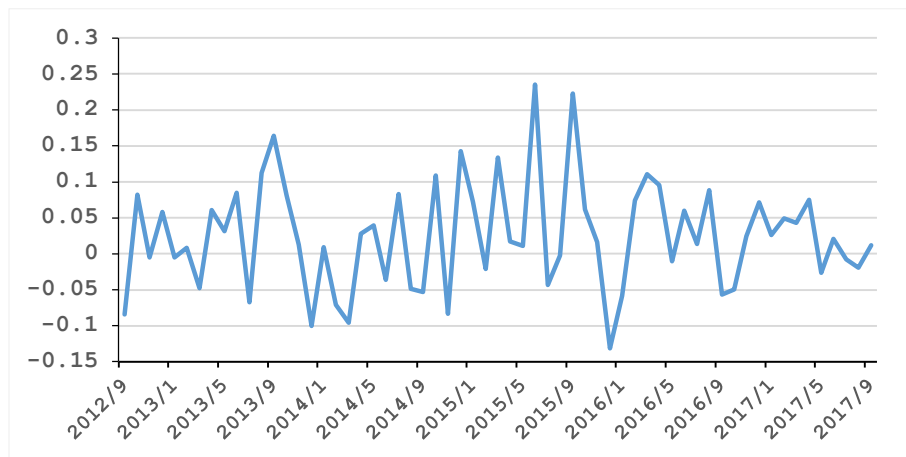

Fig 5 Price Change of SJM

And its trend of return rate.

Fig 6 Monthly Return Rate of SJM

The β by regression is 0.63, while the posted value on Yahoo Finance is 0.36.

As for DDM model, its Return on Equity is 7.83%; Payout Ratio is 63.03%. 5 Year Average Dividend Yield is $\$2.20$. I use the same required rate of return $k = 16.38\%$. And still, I have to assume that it is with a constant growth rate

$$
\begin{aligned}
g &= \text{ROE} \times b \\
&= 7.83\% \times (1 - 63.03\%) \\
&= 2.90\%
\end{aligned}
$$

$$
\begin{aligned}
V_0 &= \frac{D_1}{k - g} \\
&= \frac{2.20}{16.38\% - 2.90\%} \\
&= 16.32
\end{aligned}
$$

And its current price is about $\$105$. I believe this time the DDM model failed, since generally that model is only fit for those regulated public utilities.

APPL (Electronic Equipment)

Apple Inc. recently release its new mobile phone, iPhone X. To be frank, its appearance shocked me completely. However somehow, it's still worth an investment. Not only do they pay dividends, but also "the rich" will not refuse to show off their wealth in such a chance, even not their real wealth. Like some fashion forward designs, they may soar up the sky later

and Apple is meant to be a dragon not a dragon fly. See the analysis result.

For APPL's price change, it ranges from $52.05 to $163.36 with mean $98.65; and for its return rate, it ranges from -14.4% to 14.1% with mean 1.22%. See the figures below for more details
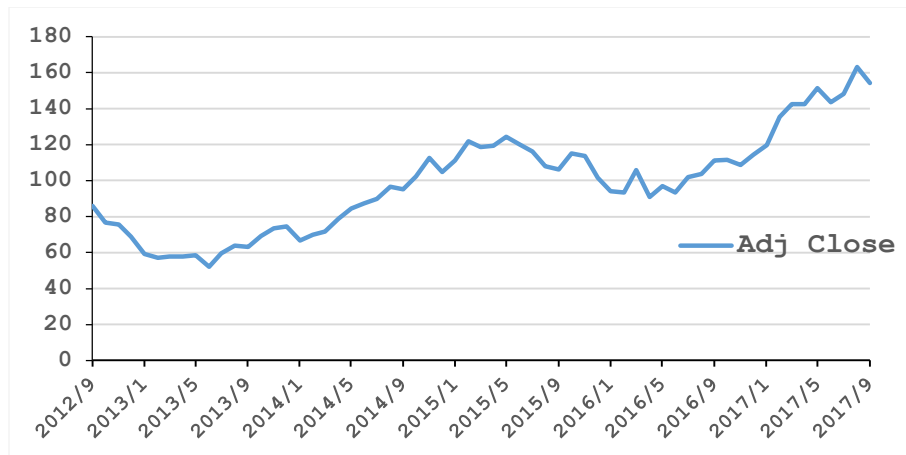

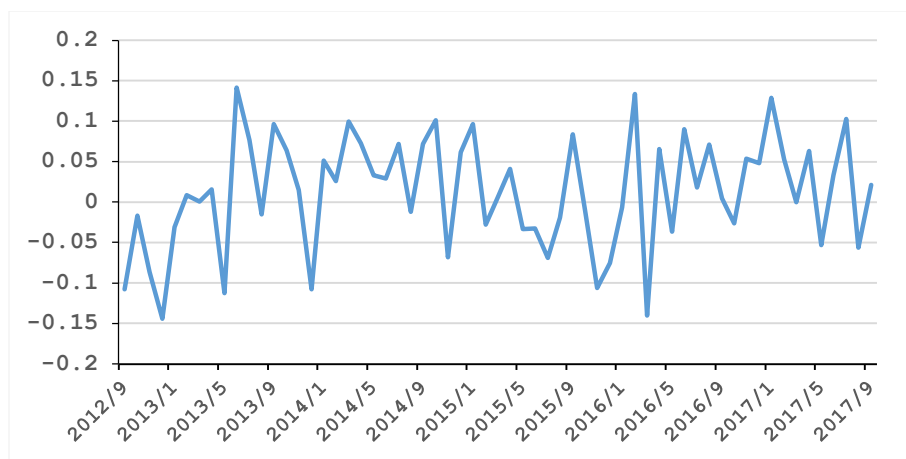**Fig 7 Price Change of APPL**

And the trend for the return rate

Fig 8 Monthly Return Rate of APPL

The β by regression is -0.26, posted value is 1.39; such a difference! Now I am questioning whether it is right to using a five-year-long period to analysis for all kinds of stocks. But perhaps I should stop here because there's still many other projects to do which

are due next week, and I may keep researching during the winter break.

As for DDM model, its Return on Equity is 36.03%; Payout Ratio is 26.50%. 5 Year Average Dividend Yield is $1.83. Then after assuming the constant growth rate

$$
\begin{aligned}
g &= \text{ROE} \times b \\
&= 36.03\% \times (1 - 26.50\%) \\
&= 26.48\% > 16.38\% = k
\end{aligned}
$$

Guess I failed another time, bad luck.

PEP (Beverages - Soft Drinks)

Everyone drink in the dining area of KSU, and the cups they use are all with the logo of Pepsi. Also, after a month I tried KICKSTART in America for the caffeine inside, I started to realize it's a sub-brand of Pepsi. So maybe it's a good choice?

And seeing from the recent report, its quarterly results before the Oct. 4 opening bell earnings that handily beat expectations, while revenue was just slightly below the mark, similar to Intel's results. (Kilgore and Linnane 2017). Here's the analysis result

Of all the observations, the close price range from $59.36 to $115.8 with mean $57.45; and for the return rate, it goes from −6.66% to 9.21%, with mean value 1.07%. See the below trend pictures for more details.
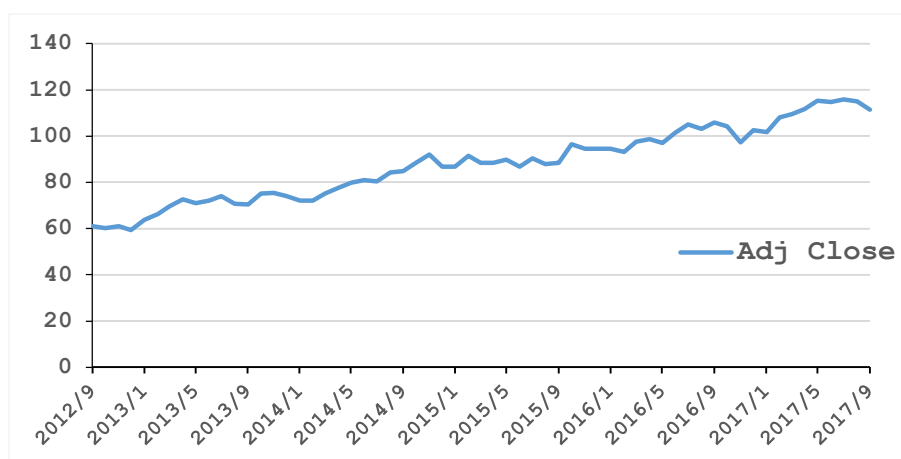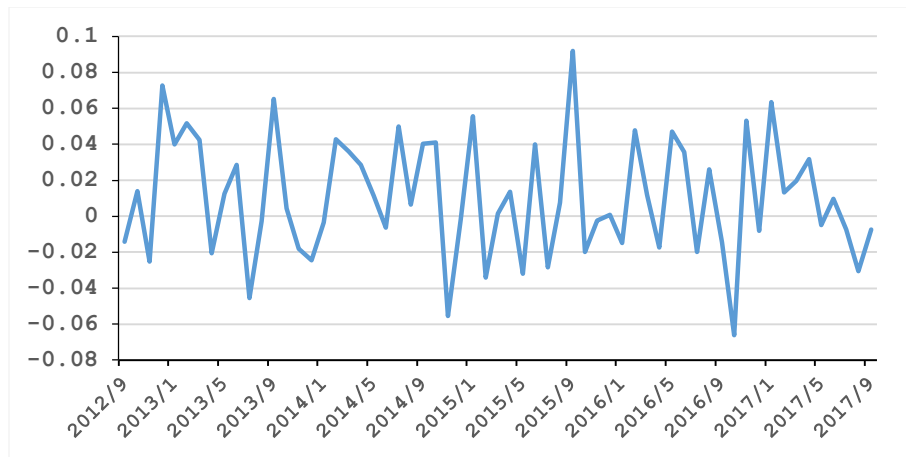

Fig 9 Price Change of PEP

Fig 10 Monthly Return Rate of PEP

Using regression, I get the $\beta = -0.0917047228253252$ however the posted value is 0.66; then use $k = 16.38\%$ and DDM under constant growth assumption

$$\begin{aligned}
g &= \text{ROE} \times b \\
&= 53.73\% \times (1 - 64.36\%) \\
&= 19.15\% > 16.38\% = k
\end{aligned}$$

Last try.

GE (Diversified Machinery)

So for the description of statistics, the adjusted close price range from $\$17.77$ to $\$30.55$ with mean $\$24.47$; and the monthly return rate range from -9.62% to 15.70% with mean 0.49%. More details are shown below.
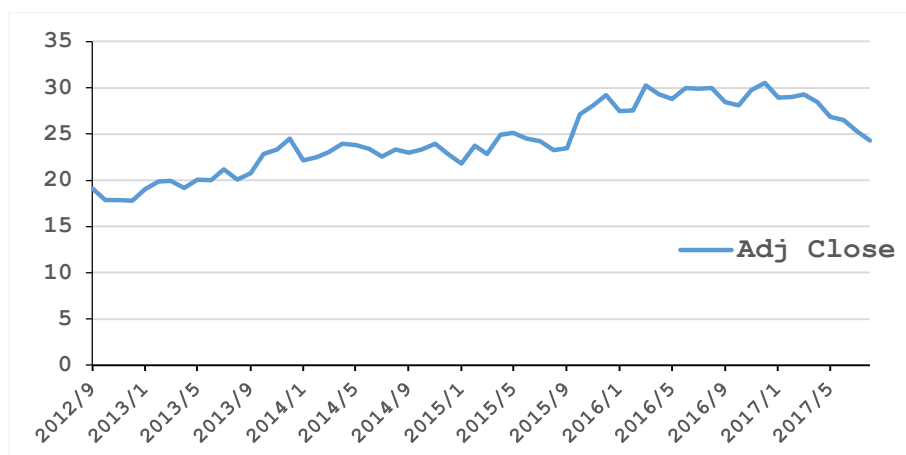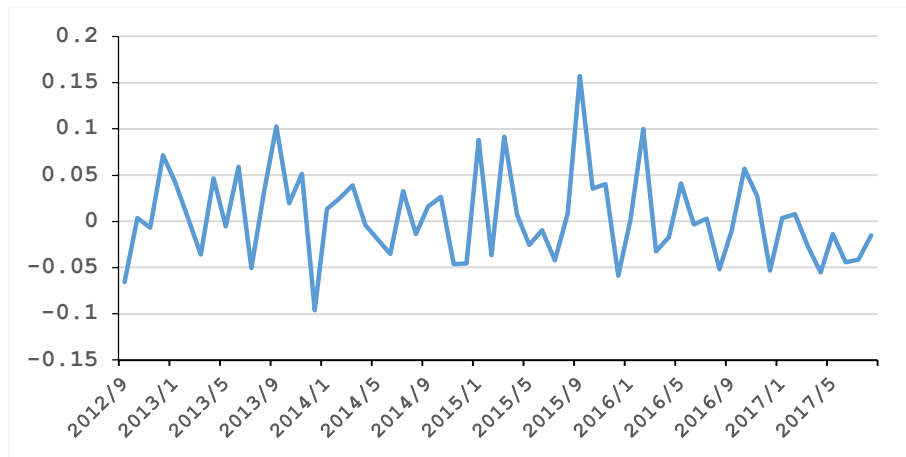

Fig 11 Price Change of GE

Fig 12 Monthly Return Rate of GE

Then the β, as calculated by regression is -0.23, nonetheless the posted one is 1.08. I may figure why they show such great difference later but now the main goal is to verify whether the requirements of DDM are satisfied

$$g = \text{ROE} \times b$$
$$= 9.52\% \times (1 - 109.20\%)$$
$$= -0.88\% < 16.38\% = k$$

$$V_0 = \frac{D_1}{k - g}$$
$$= \frac{3.24}{16.38\% - (-0.88\%)}$$
$$= 20.90$$

Slightly lower than the price now which is only about $24. Got to wait it to get down lower.

Summary Table and Reflection

Why I fail so many times? Personally, besides the reasons on the book, I figure out some others possible lurking factors. One is using the S&P 500 as the market index. It's true that it's hard to find a better one as for the whole market, but nobody uses that as an adjustment on the the price, or do it inversely.

See the summary table below for the end of this section.

Name of Stock	COST	SJM	GE
Min Close Price			
Max Close Price			
Mean Close Price			
Min Return Rate			
Max Return Rate			
Mean Return Rate			
β (posted β)			
V_0 (by DDM)			

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