THE CROSS SECTION OF STOCK RETURNS

By Seung Mo Choi. The views expressed herein are those of the author and should not be attributed to the International Monetary Fund, its Executive Board, or its management.

June 2013

I LOOK AT THE COMPANY FIRST.
I TRY TO EVALUATE IT AND THEN I LOOK AT THE PRICE.

IF THE PRICE IS WAY LESS THAN WHAT I VALUED, THEN I AM GOING TO BUY IT.*

MARKET VALUE (PRICE)
INTRINSIC VALUE
BUY!

SO-CALLED VALUE INVESTING USUALLY IMPLIES A STRATEGY TO BUY "UNDERPRICED" STOCKS.
UNDERPRICED
OVERPRICED

ON SOME OCCASIONS, YOU MIGHT KNOW A FIRM'S BUSINESS SITUATION BETTER THAN OTHER INVESTORS.

I WORK IN THIS FIRM, SO I KNOW IT BEST.

THE STOCK PRICE WILL PROBABLY GO UP BECAUSE THE FIRM HAS GOT A NEW, IMPORTANT INVENTION!

BUT IT IS ALMOST IMPOSSIBLE FOR AN AVERAGE INVESTOR TO ANALYZE ALL FIRMS IN THE MARKET.

BUFFET HAS EXPERIENCE AND RESOURCES, ...

... AS WELL AS HIS OWN ANALYSTS.

BUT WE DON'T!

ARE THERE SOME EASY WAYS FOR US TO PICK UP THE FIRMS THAT WILL CERTAINLY GO UP?

* A TV INTERVIEW. RETRIEVED FROM http://www.youtube.com/watch?v=i6BUIPdUpA.
Comparing a firm's stock price to some easily observed variables might still provide "partly useful" information.

**PRICE-TO-BOOK RATIO**

A book value means the accounting value (on the balance sheet).

So it's assets minus liabilities.

Although sometimes defined in a little bit more complicated way.

**Balance Sheet**

Although sometimes defined in a little bit more complicated way.

Market Value

Book Value

(Market capitalization) = (Price per share) x (Number of shares outstanding).

More technically,

"Price-to-Book Ratio" = \[
\frac{\text{Market Value}}{\text{Book Value}} = \frac{\text{Price per Share}}{\text{Book Value per Share}}
\]

Also known as "Market-to-Book Ratio" and "Price-to-Equity Ratio."

The price-to-book ratio compares how the firm is valued in the market relative to its accounting value.

- If the ratio is higher than one, then the firm is valued higher in the market than in the book.

Historically, firms with lower price-to-book ratios had a tendency to provide higher average returns.

Higher average return: lower price-to-book ratio

Lower average return: higher price-to-book ratio

So if the market value is lower than the book value, ... then the stock is "underpriced" in the market, so the price will go up eventually, right?

Intrinsic Value

Market Value (Underpriced)
That might be a way to understand this effect. But be careful when you say something is "underpriced."

That is, it is possible that those higher average returns arise as a compensation for higher risks.

High risk → High return

Low risk → Low return

Then, it's not necessarily "underpriced." Perhaps it is correctly priced.

**Portfolio consisting of bottom 30% price-to-book-ratio stocks:**
- Average return: 12.8%
- Return volatility: 27.4%

Portfolio consisting of top 30% price-to-book-ratio stocks:
- Average return: 8.0%
- Return volatility: 21.0%


Note (for those who are really curious):

Not all risks are captured by return volatility. For example, a correlation between the return and the GDP may be an additional source of risks that affect the average return.

Then, why do the stocks with lower price-to-book ratios...

... tend to provide the returns higher on average but more volatile?

The answer doesn't seem to be very clear yet.

But some background discussions on the price-to-book ratio might be useful.

The stocks with higher price-to-book ratios tend to be young or at a growing stage.

[... high price-to-book ratio] is characteristic of growth stocks, ...

... that is, stocks with persistently high earnings on book equity...

... that result in high stock prices relative to book equity.*

Kenneth R. French (1954)

Dartmouth College

SO IT IS LIKE THIS:

HIGH

GROWTH STOCKS

VALUE STOCKS

LOW

IF THE FIRM IS GROWING FAST, IT IS OKAY THAT THE PRICE IS RELATIVELY HIGH (COMPARED TO, SAY, THE BOOK VALUE).

BECAUSE THESE GROWING FIRMS FOCUS MORE ON ACCUMULATING CAPITAL, ...

... THEY ARE LESS LIKELY TO PAY DIVIDENDS.

WE USED ALL OUR CASHFLOW FOR INVESTMENT... SORRY.

ON THE OTHER HAND, THE STOCKS WITH LOWER PRICE-TO-BOOK RATIOS TEND TO PAY DIVIDENDS.

GIVE US DIVIDENDS!

HERE, SIR!

SUCH STOCKS ARE OFTEN CALLED "VALUE STOCKS."

VALUES STOCKS ...
TEND TO BE STOCKS THAT HAVE SOME DIFFICULTIES. [...] EUGENE F. FAMA (1939) U. OF CHICAGO

BUT GROWTH STOCKS ARE PROFITABLE AND EXPANDING...

IT MAKES SENSE TO ME THAT THE TROUBLED FIRMS [VALUE STOCKS] HAVE HIGHER COSTS OF CAPITAL [AVERAGE STOCK RETURNS].*

<table>
<thead>
<tr>
<th>LOWER PRICE-TO-BOOK RATIO</th>
<th>HIGHER PRICE-TO-BOOK RATIO</th>
</tr>
</thead>
<tbody>
<tr>
<td>VALUE STOCK</td>
<td>GROWTH STOCK</td>
</tr>
<tr>
<td>HIGHER TENDENCY</td>
<td>LOWER TENDENCY</td>
</tr>
<tr>
<td>TO PAY DIVIDENDS</td>
<td>TO PAY DIVIDENDS</td>
</tr>
<tr>
<td>HIGHER AVERAGE RETURN</td>
<td>LOWER AVERAGE RETURN</td>
</tr>
<tr>
<td>HIGHER VOLATILITY</td>
<td>LOWER VOLATILITY</td>
</tr>
</tbody>
</table>

* CLIENT INSIGHTS'S INTERVIEW WITH EUGENE FAMA: "WHY SMALL CAPS AND VALUE STOCKS OUTPERFORM."

SO VALUE STOCKS TEND TO BE MORE RISKY, SO THEY PROVIDE HIGHER AVERAGE RETURNS AS A COMPENSATION.

AGAIN, THERE CAN BE VARIOUS VIEWS, BUT I THINK THAT'S ONE OF THE CONVINCING STORIES.

BUT JUST AS ANY INDICATOR, THE BOOK VALUE PROVIDES ONLY INCOMPLETE INFORMATION ABOUT A FIRM.
SINCE IT IS LIKELY THAT AN INCREASING FRACTION OF A FIRM'S WORTH WILL BE CAPTURED BY INTELLECTUAL PROPERTY, ...

BOOK VALUE MAY BECOME AN EVEN MORE IMPERFECT INDICATOR OF FIRM VALUE IN THE FUTURE.*

JEREMY J. SIEGEL (1945-)
U. OF PENNSYLVANIA

2. PRICE-EARNINGS RATIO

WHAT ELSE MIGHT WE USE TO COMPARE TO THE PRICE?

ANOTHER USEFUL ONE IS EARNINGS.

*SIEGEL (2007), P. 152.

EARNINGS ARE THE NET BENEFITS OF A FIRM'S OPERATION.

LET'S MAKE SALES....

IF A FIRM'S PRICE-EARNINGS RATIO IS HIGHER COMPAARED TO OTHER FIRMS, ...

"PRICE-EARNINGS RATIO"

\[
\text{PRICE PER SHARE} \quad \frac{\text{EARNINGS PER SHARE}}{}
\]

... THE FIRM IS VALUED HIGH RELATIVE TO WHAT IT IS MAKING FROM ITS OPERATION.

THAT MEANS THE FIRM IS PROBABLY GROWING... JUST LIKE ME?

BUT IT IS ALSO POSSIBLE THAT EARNINGS ARE TEMPORARILY LOW.

SO ONE SHOULD BE CAREFUL INTERPRETING PRICE-EARNINGS RATIOS.

EMPIRICALLY, THE STOCKS WITH LOWER PRICE-EARNINGS RATIOS TEND TO PROVIDE HIGHER AVERAGE RETURNS.

HIGH PRICE-EARNINGS RATIO

LOWER AVERAGE RETURNS

LOWER AVERAGE RETURNS

HIGHER AVERAGE RETURNS

A POSSIBLE EXPLANATION IS THAT THOSE FIRMS ARE MORE LIKELY TO BE VALUE STOCKS.

EUGENE FAMA

RECALL WHAT I EXPLAINED EARLIER!

3. PRICE-DIVIDEND RATIO

ONE MAY ALSO USE DIVIDENDS AS A VARIABLE TO COMPARE TO THE PRICE.

PORTFOLIO CONSISTING OF BOTTOM 30% PRICE-EARNINGS-RATIO STOCKS:
AVERAGE RETURN: 13.8%
RETURN VOLATILITY: 23.0%

PORTFOLIO CONSISTING OF TOP 30% PRICE-EARNINGS-RATIO STOCKS:
AVERAGE RETURN: 7.0%
RETURN VOLATILITY: 18.8%

* U.S. DATA FROM 1952-2012. SEE THE PREVIOUS NOTE FOR SOURCE.
"PRICE-DIVIDEND RATIO" = \( \frac{\text{PRICE PER SHARE}}{\text{DIVIDENDS PER SHARE}} \)

A DIVIDEND YIELD IS, ROUGHLY, ITS RECIPROCAL.

EMPIRICALLY, THE FIRMS WITH LOW PRICE-DIVIDEND RATIOS TEND TO PROVIDE HIGHER AVERAGE RETURNS.

BUT RETURNS ARE MORE VOLATILE.

SO THEY ARE LIKELY TO BE VALUE STOCKS?

PORTFOLIO CONSISTING OF BOTTOM 30% PRICE-DIVIDEND-RATIO STOCKS:
AVERAGE RETURN: 10.4%
RETURN VOLATILITY: 23.5%

PORTFOLIO CONSISTING OF TOP 30% PRICE-DIVIDEND-RATIO STOCKS:
AVERAGE RETURN: 7.8%
RETURN VOLATILITY: 21.5%

* U.S. DATA FROM 1927-2012. SEE THE PREVIOUS NOTE FOR SOURCE.

SO FAR, WE FOCUSED ON PRICE NORMALIZED TO SOMETHING.

- PRICE-TO-BOOK RATIO
- PRICE-EARNINGS RATIO
- PRICE-DIVIDEND RATIO

SIZE

BUT THERE ARE POTENTIALLY USEFUL VARIABLES NOT DIRECTLY USING THE PRICE.

THE MARKET VALUE (MARKET CAPITALIZATION) IS AMONG THOSE USEFUL VARIABLES.

THAT IS, SMALLER FIRMS TEND TO PROVIDE HIGHER AVERAGE RETURNS.

HENCE, SHAREHOLDERS OF SMALLER FIRMS NEED TO BE COMPENSATED BY HIGHER AVERAGE RETURNS.
A firm's leverage measures how much it has borrowed relative to its size.

LEVERAGE = \frac{DEBT}{MARKET VALUE}

High-leverage firms tend to provide higher average returns.

Again, this might be because high-leverage firms are more risky.

Empirically, past performance is an indicator for future average returns.

Higher return last year → Higher return this year

Lower return last year → Lower return this year

That is, past short-term "winners" tend to provide higher average returns.

Robert W. Vishny  
U. of Chicago

[... news is incorporated only slowly into prices...]

Which tends to exhibit positive autocorrelations over these horizons.*

Higher return

Good news revealed

Less than 1 year

Lower return

But the momentum effect seems to disappear as time goes by.

*Barberis, Shleifer and Vishny (1998), P. 308.

Thirty-six months after portfolio formation, the losing stocks have earned about 25% more than the winners.*

Werner DeBondt  
Depaul U.

"Long-term reversal"

The momentum effect and long-term reversal are often taken as counter examples to the efficient market hypothesis.

News should be immediately reflected in prices at an efficient market!

Hence, the real market is not efficient.

*De Bondt and Thaler (1985), P. 804.

But there is on-going research that they might naturally arise even at an efficient market.*

"Beta"

Beta (β) is a usual notation for a slope in a statistical regression analysis.

\[ Y_t = \alpha + \beta X_t + \varepsilon_t \]

*For example, Choi and Kim (2013).

In financial economics, "beta" usually means the "β" in this equation:

(Firm i's stock return)\text{,} = \alpha_i + \beta_i \times (\text{return on the portfolio of all stocks in the market})\text{,} + \varepsilon_i

To be more precise, the returns should be net of the risk-free return.

That is, beta measures:

- By how much an individual firm's stock return moves...

But we will just keep it simple.

... when the return on the market as a whole moves.
THE RETURN ON THE PORTFOLIO OF ALL STOCKS IS STILL VOLATILE.

IF AN INDIVIDUAL STOCK'S BETA IS HIGH ENOUGH, THE STOCK AMPLIFIES THIS HIGH VOLATILITY OF THE MARKET EVEN FURTHER.

HIGHER BETA
- MORE SENSITIVE TO THE MARKET'S MOVEMENT
- MORE VOLATILE

HENCE, HIGHER BETAS NEED TO BE COMPENSATED BY HIGHER AVERAGE RETURNS.

STILL, SOME PORTION OF A FIRM'S AVERAGE RETURN MAY REMAIN UNEXPLAINED FOR SOME STOCKS.

(FIRM'S AVERAGE STOCK RETURN)
= (AVERAGE RETURN EXPLAINED BY BETA)
= (UNEXPLAINED PART)

THIS UNEXPLAINED AVERAGE RETURN IS OFTEN CALLED "ALPHA."

IF ALPHA IS RELATIVELY HIGH, ONE MIGHT ARGUE THAT THIS STOCK PROVIDES HIGHER AVERAGE RETURNS IN EXCESS OF WHAT IT "NEEDS" TO.

THEN, A HIGHER VALUE OF ALPHA IS GOOD BECAUSE IT IS "FREE."

LOOKING FOR A HIGHER ALPHA...

ONE WOULD EXPECT THAT A TRAINED EXPERIENCED PROFESSIONAL WHO SPENDS ALL DAY READING ABOUT MARKETS AND STOCKS...

SHOULD BE ABLE TO OUTPERFORM SIMPLE INDEXING STRATEGIES.*

THAT IS, THE QUESTION IS, ARE THE ALPHAS OF PROFESSIONALLY MANAGED FUNDS HIGHER?

* COCHRANE (1999), P. 50.
THE RESULTS DO NOT SUPPORT THE EXISTENCE OF SKILLED OR INFORMED MUTUAL FUND PORTFOLIO MANAGERS.*

MARK M. CARHART

NOTE (FOR THOSE WHO ARE REALLY CURIOUS):

THIS RESULT IS BASED ON A MORE SOPHISTICATED MODEL THAN THE ONE WE DISCUSSED.

JOHN COCHRANE

[...] ACTIVE MANAGEMENT DOES NOT GENERATE SUPERIOR PERFORMANCE, ESPECIALLY AFTER TRANSACTION COSTS AND FEES.*

* CARHART (1997).

HOWEVER, INTERPRETING THE ESTIMATED VALUES OF ALPHA AND BETA FOR EACH ASSET IS NEVER AN EASY TASK.

THE CONCEPTS OF ALPHA AND BETA ARE BASED ON MANY ASSUMPTIONS.

FOR EXAMPLE, IT ASSUMES THAT FIRMS ARE DIFFERENT MAINLY BECAUSE BETAS ARE DIFFERENT, ...

FIRM A

\[ \beta = 2 \]

ASSUMPTIONS

FIRM B

\[ \beta = \frac{1}{2} \]

... AND BASICALLY, THERE IS NOTHING ELSE THAT EXPLAINS WHY FIRMS' AVERAGE RETURNS ARE DIFFERENT FROM EACH OTHER.

\[ \beta = 1.3 \]

OUR AVERAGE RETURNS ARE IDENTICAL (DISREGARDING ALPHA)!

IF FIRMS ARE DIFFERENT FROM EACH OTHER IN SOME OTHER PERSPECTIVES IN REALITY, ...

- DIFFERENT INDUSTRIES
- DIFFERENT MANAGERIAL SKILLS
- OTHERS

... THEN THE TRUE VALUE OF "BETA" WILL BE DIFFERENT FROM THE ONE ESTIMATED BASED ON THOSE STRONG ASSUMPTIONS.

HIDDEN CARD!

OMITTED VARIABLE BIAS

FURTHERMORE, YOU MIGHT AGREE THAT HIGHER AVERAGE RETURNS ARE A COMPENSATION FOR RISKS.

THERE IS NO SUCH THING AS A FREE LUNCH!
IF YOU DO, THEN IN A PERFECTLY SPECIFIED EQUATION, ALPHA SHOULD BE ESTIMATED TO BE MORE OR LESS ZERO FOR EVERY ASSET.

WANTED
DEAD OR ALIVE
α
REWARD: RETURN OF α

I AM NOT SAYING ALPHA IS USELESS, BUT PERHAPS WE SHOULD BE VERY CAREFUL ABOUT IT.

IF ALPHA IS NOT ZERO, THEN THE AVERAGE RETURN CAN BE HIGHER FOR NO REASON!

DISCUSSION

IF YOU ARE WELL INFORMED OF A FIRM, THEN YOU MIGHT WANT TO GO FOR IT.

ALL IN!

BUT AN AVERAGE INVESTOR DOESN'T HAVE ECONOMICALLY MEANINGFUL INFORMATION ABOUT MANY FIRMS.

NOT EVERYONE CAN BE A WARREN BUFFET, RIGHT?

WE REVIEWED SEVERAL DIMENSIONS OF CROSS-SECTIONAL CHARACTERISTICS OF STOCK RETURNS.

<table>
<thead>
<tr>
<th>HIGHER AVERAGE RETURNS</th>
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</tr>
</thead>
<tbody>
<tr>
<td>LOWER PRICE-TO-BOOK RATIOS, PRICE-earnings RATIOS, AND PRICE-Dividend RATIOS</td>
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</tr>
<tr>
<td>SMALLER FIRMS</td>
<td>LARGER FIRMS</td>
</tr>
<tr>
<td>HIGHER LEVERAGE</td>
<td>LOWER LEVERAGE</td>
</tr>
<tr>
<td>PAST SHORT-TERM WINNERS</td>
<td>PAST SHORT-TERM LOSERS</td>
</tr>
<tr>
<td>PAST LONG-TERM LOSERS</td>
<td>PAST LONG-TERM WINNERS</td>
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</tbody>
</table>

SOME OF THESE EFFECTS OVERLAP EACH OTHER.

AND SOME OF THESE EFFECTS MIGHT HAVE BECOME WEAKER NOWADAYS.

STRONG
WEAK
TIME
SOMETIMES STRONGER, SOMETIMES WEAKER!
AND THERE ARE OTHER CROSS-SECTIONAL PROPERTIES SOME PEOPLE CLAIM TO BE IMPORTANT.

- RETURN ON EQUITY
- TRADING VOLUME
- VOLATILITY
- PUT-CALL RATIO
- ...

BASED ON SOME OF THESE FIRM CHARACTERISTICS, DIFFERENT INVESTMENT STRATEGIES CAN BE FORMED.

- SMALL-CAP INVESTING
- GROWTH INVESTING
- ...

IT SHOULD BE NOTED THAT EVEN WARREN BUFFETT MENTIONED THE FOLLOWING, SUGGESTING THE IMPORTANCE OF "PASSIVE" INVESTING.

YOU NAME IT.

[...] IF YOU INVESTED IN A VERY LOW COST INDEX FUND...

... WHERE YOU DON'T PUT THE MONEY IN AT ONE TIME, BUT AVERAGE IN OVER 10 YEARS — ...

WARREN BUFFET

... YOU'LL DO BETTER THAN 90% OF PEOPLE WHO START INVESTING AT THE SAME TIME.*

YOU DO NOT NECESSARILY HAVE TO "ALL IN" FOR A FEW FIRMS AT EACH TIME TO BE A GOOD INVESTOR.


IT MIGHT ALSO BE A FINE INVESTMENT TO FORM UP A PORTFOLIO OF A LOT OF STOCKS WITH SIMILAR CHARACTERISTICS THAT YOU WANT...

AN EXAMPLE:

I AM WILLING TO TAKE THE RISK!

I AM BUYING THE SMALLEST 30% FIRMS!

... AND HOLD IT FOR A RELATIVELY LONG TIME.

- DIVERSIFY TO ELIMINATE SOME OF FIRM-LEVEL RISKS.
- HOLD FOR LONG TO SAVE TRANSACTION AND MANAGEMENT FEES.

REFERENCES


