Topic 3D – Using Price/Book

Book value is one of the oldest valuation factors studied and used among academicians and practitioners. It is typically implemented through the ratio of Book Value to Market Capitalization, and referred to as Book-to-Market, or BM. Higher BM is usually associated with fundamental undervaluation. It's among the three considerations used in the classic 1993 Fama French paper that pioneered the study of the roles played by factors (beyond the market itself) in equity-return contribution. To remain consistent with the way the factor is presented in Portfolio123, we flip BM upside down and think as we usually do, in terms of per-share P/B.

Theoretical Basis for Using P/B

We know that everything starts with DDM, the Dividend discount Model, which is:

$$P = D/(k-g)$$

We've already seen that we can substitute EPS (or E) for D assuming, as we usually do nowadays, that investors regard all earnings as being theirs and act as if they voluntarily chose to leave all or part of it with the corporation to reinvest in the business. Therefore:

$$P = E/(k-g)$$

In both instances, as well as others involving Sales and Cash Flow, everything hung together in that we related the stock price to an ongoing stream of corporate wealth. P/B is different; now, we relate the stock price to an item on the balance sheet, a static point-in-time snapshot of a company's financial position. This poses a different sort of challenge. Or does it?

We know that ROE is E/Equity, or E/BV. Therefore, we can also say that E = ROE*BV. Now, we can go back to the earnings variation of DDM.

$$P = (ROE * BV)/(k-g)$$

Applying some algebra . . .

$$P/(ROE*BV) = 1/(k-g)$$

$$P/BV, \text{ or } P/B = ROE / (k-g)$$

There we have it. The ideal P/B is Return on Equity divided by the difference between required return and growth.

The Drivers of P/B

As was the case with the other value topics, we now know what drives P/B.

- As risk (part of k) rises, ideal P/B shrinks because it impacts a positive number in the denominator.
- As growth rises, ideal P/B increases because growth is a negative number in the denominator.
- As ROE rises, ideal P/B increases because ROE is a positive number in the numerator

P/B, Lower is Better . . . Sort Of

Assuming you've been through Topics 3A, 3B, and 3C, you know where I'm going: Lower P/B is better *all else being equal*. And here, we have three all-else items that need to be considered: risk, ROE and growth of ROE.

That means if you have a P/B ranking-system factor, but don't have other factors or screening/Buy rules that address risk, ROE and growth of ROE, you may find success based on luck, but that's the only way you can succeed.

Making Our Luck?

So did you expect me to present ROE and growth of ROE as important drivers of P/B? Be honest. Chances are you didn't. You may not have been shocked when I suggested that growth was important to PE, PS. PFCF, etc. Even if you can't trace step by step from DDM to the final metric of your choice, you might still have gotten there anyway. The culture of the investment community today is very growth oriented, as suggested by the existence of the PEG ratio. But putting ROE and expected growth of ROE into a valuation formula . . . that probably did catch you by surprise.

Applying This In a Model

Let's put this into practice. Given that ROE is important to assessing the reasonableness of P/B ratios we have an opportunity to take a short cut.

- Growth is important, but as we'll see when we cover Quality (and as you can see now if you want to peek at this document ([click here](#)) which explained Quality as part of the Smart Alpha Subscriber seminar, ROE is an important indicator of a company's capacity to generate growth. Therefore, we can let ROE do double duty for us here. It's relevant in its own right, and it can serve as a proxy for growth.

- Risk is also important. That same material on Quality explains how and why Quality may be the best risk indicator we have. Hence we can actually have ROE do triple duty by using it as a proxy for risk.

You can, if you wish add additional risk- and growth-oriented factors. Indeed, we'll use multiple factors now, too: We need more than a point-in-time ROE number; we need other

factors that help make us comfortable with the potential sustainability, or at least non-deterioration, of ROE). But focusing on ROE and supporting factors will take us a long way in addressing the all-else that needs to be equal in order to support the lower-P/B-is-better notion.

Let's start with a simple pair context-setting strategies:

- Universe: PRussell3000
- Benchmark: iShares Russell3000 ETF
- Max No. Stocks: (i.e., All)

- Basic Backtest period: MAX (1/2/99 – 12/7/15)
- Rebalance: 4 Weeks
- Slippage: 0.25%

- Rolling Backtest Samples: Every Week
- Length of Sample: 4 weeks
- Test Period: MAX

- Screening Rules

    - Version 1 (undervaluation): Frank("Pr2BookQ")<25
    - Version 2 (overvaluation): Frank("Pr2BookQ")>75

The test results are shown in Table 1.

Table 1

	Presumed Overvaluation	Benchmark	Presumed Undervaluation
Basic Backtest			
Annualized Return %	5.83	5.32	8.72
Stan. Dev. %	21.61	-15.82	28.42
Max. Drawdown %	-64.59	-55.77	-73.91
Sharpe	0.28	0.28	0.37
Sortino	0.37	0.37	0.57
Beta	1.20	- -	1.48
Annualized Alpha %	0.65	- -	4.11
Rolling Backtest (Excess 4-week Returns)			
Avg. of All Periods	0.14	- -	0.55
Avg. of Up Periods	0.73	- -	1.70
Avg. of Down Periods	-0.80	- -	-1.29

We see some confirmation that lower P/B ratios can be associated with better forward-returns, but not enough to warrant making this the basis for an investing strategy. Both strategies list too many stocks. The more volatile Presumed Undervaluation strategy's margin of victory is very narrow and we see that it is actually worse in bear markets. We

should not be surprised at this. We just assumed lower P/B is better without having accounted for all else that may or may not be equal.

The situation appears dramatically crazier more dramatic when we apply Pr2BookQ Quick Ranks to the entire PRussell universe and select the 15 stocks with the highest ratios and the 15 with the lowest ratios.

Table 2

	Highest P/B ratios	Benchmark	Lowest P/B ratios
Basic Backtest			
Annualized Return %	10.93	5.32	-31.54
Stan. Dev. %	26.58	-15.82	73.31
Max. Drawdown %	-68.32	-55.77	-99.85
Sharpe	0.44	0.28	-0.21
Sortino	0.62	0.37	-0.37
Beta	1.20	- -	2.39
Annualized Alpha %	6.67	- -	-23.22
Rolling Backtest (Excess 4-week Returns)			
Avg. of All Periods	0.51	- -	-49.35
Avg. of Up Periods	1.32	- -	-45.12
Avg. of Down Periods	-0.81	- -	-56.15

Recall that this is a Max-period (starting January, 1999 set of tests). The chart showed a huge plummet early on, as Internet stocks were crashing, but looks horizontal afterward. Was the latter caused by the scale of the graph, or the fact that P/B alone isn't really so horrible if we can eliminate the historic circa-2000 crash? Table 3 answers that by showing the results of a five-year (12/7/10-12/7/15) backtest.

Table 3

	Highest P/B ratios	Benchmark	Lowest P/B ratios
Basic Backtest			
Annualized Return %	4.64	12.62	-44.61
Stan. Dev. %	20.32	12.46	47.72
Max. Drawdown %	-33.99	-21.89	-95.71
Sharpe	0.33	1.03	-1.01
Sortino	0.45	1.46	-1.49
Beta	1.15	--	2.24
Annualized Alpha %	-7.82	--	-54.77
Rolling Backtest (Excess 4-week Returns)			
Avg. of All Periods	-0.45	- -	-44.31
Avg. of Up Periods	-0.15	- -	-41.48
Avg. of Down Periods	-1.08	- -	-50.14

So much for it being a matter of visual scale. It's pretty clear that investing in the 15 stocks having the lowest P/B ratios isn't a value strategy; it's a value trap, a horrific nightmarish value trap, one of the worst I've ever encountered.

Actually, though, assuming we're tuned into theory and logic, nothing in these tables should surprise us.

Note first that if for some ungodly reason we absolutely positively must limit ourselves to picking 15 stocks based only on P/B, we're better off – much, much, much better off – choosing stocks with the highest ratios, the ones some folk might think are the most overvalued.

But we shouldn't listen to such folk because they are not wired into theory and logic. The algebra presented above that got us from the DDM to Book-Value-based-valuation was based very heavily on the positive relationship between P/B and ROE (directly through the ROE variable itself and indirectly through ROE's influence on growth and risk). Assuming, as I do, that the market isn't stupid, irrational or bamboozled by incompetent and/or nefarious analysts, we have to assume, based on the algebra presented above, that investors are accepting high P/B ratios because ROE is good. This assumption isn't sufficiently clean-cut to support a high P/B strategy but it suggests that the link between ROE and P/B is out there and being generally recognized in the market.

So what we're really doing when we use P/B is recognizing that in general, low P/B stocks are likely to be basket cases, and trying to filter through the corporate wreckage to find instances of security mis-pricing; inefficiencies involving stocks with low P/B ratios that, based on ROE, deserve higher P/B ratios. We're looking for oddities.

To anyone who has read the Piortroski paper that bequeathed F-Scores to the world, this should sound familiar. This was Piotroski's research thesis. Before his work, it was assumed that to find such aberrations, one would have had to research companies through qualitative understanding of businesses, etc. What we now know as the F-Score was a bunch of stuff Piotroski cobbled together in order to demonstrate that we could find such aberrations using actual accounting data. He didn't specifically use ROE. But he did use a set of factors the constellation of which is consistent with companies experiencing good and sustainable ROEs.

Let's try this out.

We'll stick using a Pr2BookQ Quick Rank but instead of applying it to the PRussell3000 universe as a whole, we'll prequalify the universe by limiting it to companies with decent or better ranks under the Portfolio123 Basic: Quality ranking system, which like Piotroski's F-Rank, isn't ROE per se but a lot of things that paint a picture of a company with decent ROEs that are likely to be sustainable.

So here's our screening rule: Rating ("Basic: Quality")>75

Our test results are in Table 4.

Table 4

	Highest P/B ratios	Benchmark	Lowest P/B ratios
Basic Backtest			
Annualized Return %	5.32	5.32	25.06
Stan. Dev. %	20.87	-15.82	30.78
Max. Drawdown %	-54.20	-55.77	-60.46
Sharpe	0.25	0.28	0.83
Sortino	0.36	0.37	1.30
Beta	0.92	- -	1.34
Annualized Alpha %	1.25	- -	21.49
Rolling Backtest (Excess 4-week Returns)			
Avg. of All Periods	0.13	- -	1.73
Avg. of Up Periods	-0.00	- -	2.54
Avg. of Down Periods	0.34	- -	0.43

Some interesting observations:

- Consistent with what theory and logic suggest, a strategy of identifying low P/B shares accompanied by good ROEs can point us toward instances of security mis-pricing from which we can handily profit.
- Notice the high standard deviation of the low-P/B model. We have to guard against being inappropriately mathematical. The test shows strong gains. Strong gains push standard deviation upward. Although this is the quant definition of higher risk, it's the quants that have it wrong. Our down-market rolling test results shows that although we'd like to think we can do better, the strategy as-is is not the risk disaster the standard deviation misleads some into assuming.
- High P/B, though not in and of itself, a desirable strategy is likewise not a dumpster fire given the generalized link between P/B and ROE.
- High P/B, in and of itself, may loosely signify low risk given the P/B-ROE relationship and ROEs status as an indicator of business risk (which eventually shows through as equity risk).

The P/B - quality model is stored and set for group visibility:
https://www.portfolio123.com/app/screen/summary/154041?st=1&mt=1

Why Work with a Screening Rule?

Knowing the reverence many have for use of ranking systems and, in some cases, inclination to downplay the screening process (aside from some liquidity rules), I should address why I didn't simply do a two-factor ranking system based on P/B and ROE, or a two-composite system based on P/B and a collection of ROE-related factors.

Ranking with ROE or any proxy is not what I want to do. I have a specific goal. Recognizing the general principle that low P/B signifies corporate disasters, I want to uncover aberrations; situations where ROEs are such that the stocks deserve higher P/Bs than they have.

Use of a multi-factor ranking can distract from that goal. We might get cases with very low P/B ratios (in an ascending sort) and decent ROEs. But we could just as easily wind up with stocks that have very high ROEs and middle-of-the-road P/B ratios. If that's what one wants, fine. But it's not the goal presented here. Overweighting the P/B factor would not help. ROE, or the set of ROE proxies, is important. It's critical. Tables 2 and 3 should have made that clear. So how do we help ourselves if we cut the rank weight of ROE!

Bottom line: If you start working on a model with the idea that it's going to feature a ranking system, you're off in the wrong direction. Start with an idea, and let relative uses of ranking system and screening rules flow naturally from what you're trying to do.

Next Up

This completes the course's coverage of mainstream value. The next major topic will be Quality, a big topic but one that is incredibly important (as you've already started to see). But before going there, I want to do one more thing in Value: Special Topics.

One thing I want to discuss is asset plays. You've probably heard the phrase many times, so we should address it.

I also want to talk about Discounted Cash Flow (DCF). Many claim it's the best way to approach value. I want to show you that although theoretically correct, in practice, such claims are mainly puffery aimed at impressing those who don't know better. (Classic DCF is right there with classic DDM in the sounds-great-but-we-can't-really-do-it category). But as with DDM, the creative among us can adapt DCF to get something that can work on Portfolio123. I'll show you how next time. (Hint: If the noise-value model didn't inspire you to learn ShowVar, perhaps the next one will do the trick.)