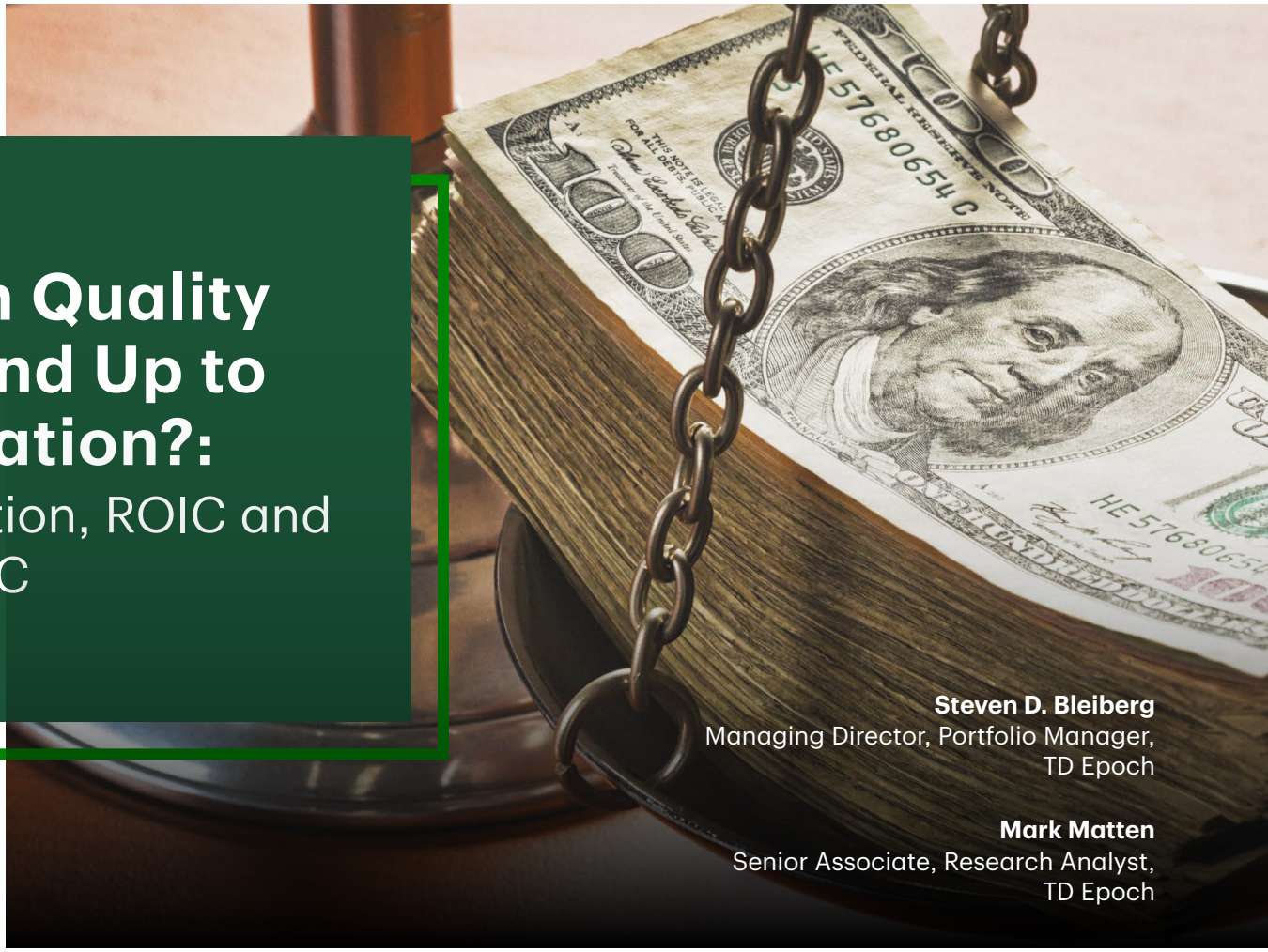
TD Global Investment Solutions

Whitepaper 20 Minutes

Can Quality Stand Up to Inflation?:

Inflation, ROIC and WACC



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The last time that inflation in the U.S. remained above 5% for as long as it has recently, the Dow Jones Industrial Average was below 900, the top-rated show on American television was "Dallas," and Leonid Brezhnev was the head of the Soviet Union, a country that ceased to exist more than 30 years ago. In other words – it's been a while. Which means that there are very few people working in the investment business today who have any experience working in an environment of high inflation. Even an analyst with 30 or 40 years in the business would not have been in the workforce yet when inflation surged in the 1970s and early 1980s. To someone who has spent their entire working life in a world of low and stable inflation, it can be surprising to see the effects that inflation has on some of the financial metrics we use. In this paper, we will talk about the impact that inflation can have on two metrics that we believe are of particular importance – Return on Invested Capital (ROIC) and Weighted Average Cost of Capital (WACC). Ultimately, it is the ability of a company to earn a return on invested capital that is greater than the cost of that capital that drives the value of the business upward.

How Does Inflation Affect the Weighted Average Cost of Capital?

Let's start with how inflation affects the cost of capital, because that is relatively straightforward. The term "weighted average cost of capital" refers to combining the cost of a company's debt with the cost of its equity – each weighted to reflect the company's debt/equity mix — to come up with a single overall number. It is easy to see how inflation affects the cost of debt. A rise in inflation usually results in a rise in interest rates, as lenders demand to be compensated for the decline in the value of a dollar that inflation causes. So, a rise in inflation generally means that companies will have to pay higher interest rates to borrow money. But what about the cost of equity? This is a little hazier, because the cost of equity is a somewhat theoretical concept. Companies don't pay interest on equity capital the way they do on debt, nor are they required to ever pay a dividend. So, what is the "cost" of equity?

There are two ways you can think about the cost of equity capital. One is a kind of bottom-up view: you start with a risk-free rate like a U.S. Treasury bond yield, add an equity risk premium on top of that to reflect the riskiness of equities in general, and then adjust for a company's beta to reflect that company's riskiness in particular. In this framework, if inflation drives government bond yields higher, that higher interest rate flows right through into the cost of equity as well for every company. But there is another way to think about the cost of equity capital, a more top-down view. In the standard discounted cash flow valuation formula (known as the Gordon Growth Model), there is a term called "r," the required return that investors demand from owning a company's stock. We would argue that this number is the company's cost of equity, and it is really best thought of as an opportunity cost. That is, it represents the return that investors demand from a company's stock because it is the return they would expect to earn if they invested their capital in some other investment of similar risk. But does that expected return really move up and down in lockstep with every change in a 10-year government bond yield? Or do investors, when they are thinking about investing in equities, tend to think more about what the long-term expected return on stocks is, a number that in their minds probably does not change much from month to month?

Earlier this year, McKinsey & Co. published a piece on this topic, titled "Markets versus textbooks: Calculating today's cost of equity." The authors' conclusion?

> **Our research shows that during approximately the past 15 years, the cost of equity has been decoupled from government bond rates; monetary policy has manipulated long-term rates to such an extent that Treasury yields no longer reflect what the market actually applies."[1]**

As evidence, the authors point to the behavior of the median price/earnings ratio in the market over time. Using those valuation multiples, together with long-term data on profit growth and ROIC, they calculate the implicit cost of equity that the market is using. (Their approach echoes what we wrote about in our own 2019 white paper "The P/E Ratio: A User's Manual," in which we showed how you can use observed

[1] https://www.mckinsey.com

P/E ratios to back out what assumptions the market is making about growth rates and ROIC. In this case the McKinsey authors made assumptions about growth and about ROIC, based on long term data, and backed out the market's assumption about WACC.)

In essence, the data indicates that changes in the market's implied cost of equity have been driven not by changes in the ten-year Treasury yield, but by changes in expected inflation, which investors add on to what has been a fairly stable expected real return of 6.5% to 7.0%.

And importantly, long-term expectations of inflation do not move that dramatically over short periods of time, certainly less dramatically than the nominal ten-year Treasury yield does. As the authors note, if investors were in fact using the 10-year Treasury yield as the starting point in assessing the cost of equity, we would have seen the median P/E ratio go much higher than it actually did over the last decade, followed by a much steeper fall in 2022. The relative stability of that median P/E implies relatively stable assumptions about the cost of equity. In conclusion, the rise in interest rates in 2022 may not have had that much of an impact on the cost of equity, absent any similar changes in long term inflation expectations.

How Does Inflation Affect Return on Invested Capital?

Understanding the effects of inflation on WACC is fairly straightforward – higher inflation likely leads to higher WACC. There may be uncertainty as to how much of an effect there is, but the point is that it's hard to envision a scenario in which higher inflation leads to a lower cost of capital. But when it comes to ROIC, the picture gets hazier.

To see why, remember that the definition of ROIC is NOPAT (net operating profit after tax) divided by invested capital, which is the sum of a company's equity plus its long-term debt. Inflation affects both the numerator and the denominator in the ROIC calculation, so it is not immediately obvious what the net effect is.

Higher inflation could plausibly lead to either higher or lower ROIC. There are three key variables that affect the outcome: 1) margins, 2) capex, and 3) depreciation. Regarding margins, the biggest question is whether a company can maintain its existing profit margins when inflation rises – i.e., can it pass on any increases in its own costs? The answer will vary from industry to industry and from company to company, depending on things like how unique a company's product is or how strong the power of its brand is. As for capex and depreciation, they matter because they affect both the numerator (NOPAT, which is net of depreciation) and the denominator (invested capital) in the ROIC calculation. But inflation affects them differently. Capital expenditures will reflect the impact of higher inflation immediately, as the prices of the things a company spends money on as part of its capital investment – materials, labor – rise. Depreciation expense will rise too, but with a lag, because depreciation is backward looking, based on money spent in the past. When inflation first rises, the vast majority of the depreciation expense will still be based on prices paid prior to the rise in inflation.

To bring this to life, let's consider a hypothetical company, and look at a few scenarios for how inflation might affect that company's ROIC. Be forewarned: we're going to have to discuss some accounting here.

Imagine a world with zero inflation, in which you have been running a business making widgets for twenty years. To make it easier to isolate the effect of inflation on ROIC, we are going to make some simplifying assumptions: the tax rate is zero, your business has no debt, and all the net income is paid out to you the owner as a dividend each year, so there are no retained earnings. After twenty years, the business has achieved a kind of steady state, generating $10 million per year in revenue with a 20% gross margin, i.e., $2 million per year in gross profit. Your capital stock consists of five machines that make widgets. Each one costs $1 million and lasts five years, being depreciated in a straight-line fashion over that period. Each year, you replace one of the machines, spending $1 million on its replacement. After many years of doing this, your balance sheet will show Gross Property, Plant, and Equipment (PPE) of $5 million (five machines at $1 million each), your annual Depreciation expense is $1 million ($200,000 per year for each of the five machines), your Accumulated Depreciation is $2 million (we are sparing you the gory accounting details of how this comes to be the case; you'll just have to trust us), and your Net PPE is $3 million. The numbers don't change from year to year because each year, when you replace one of the five machines, $1 million gets removed from both Gross PPE and from Accumulated Depreciation to reflect the retirement of one fully depreciated machine, only to be replaced by the $1 million cost of the new machine in the Gross PPE number and by the $1 million in annual depreciation in the Accumulated Depreciation number. Since there is no debt and no retained earnings, that $3 million in Net PPE is equal to your invested capital. What is your ROIC? Well, when we subtract the $1 million in depreciation from the $2 million in Gross Profit, we get a NOPAT figure of $1 million. NOPAT of $1 million on an invested capital base of $3 million is an ROIC of 33.3%.

$$\text{ROIC } 33.33\% = \frac{\text{Gross Profit (\$2m) - Depreciation (\$1m) = NOPAT (\$1m)}}{\text{Gross PPE (\$5m) - Accumulated Depreciation (\$2m) = Invested Capital (\$3m)}}$$

Now let's see what happens when we introduce 5% annual inflation into this world. The new widget machine that you buy will rise in price right away, to $1.05 million. But your depreciation expense in this first year of inflation does not go up at all, because it is based on what you paid for the new machines in the five preceding years; the fact that there is 5% inflation this year does not change what you paid for those machines in the past. You raise the price of your widgets by 5%, to keep up with inflation, and find that demand does not decline at all, so the number of widgets sold remains steady and your revenue rises to $10.5 million. What does this mean for your ROIC? **Figure 1** shows some details on your firm's performance during the first year of 5% inflation.

In this first scenario, we assume that you can maintain your 20% gross margin, so your gross profit rises 5% to $2.1 million. But because your Depreciation expense stays where it was the previous year, at $1 million, all of that increase in gross profit flows through into your NOPAT, which rises from $1 million to $1.1 million – a 10% increase! Notice that the Net PPE figure, which was stable at $3 million when there was no inflation, has risen by the end of the year to $3.05 million, reflecting the higher cost of the new machine you bought this year. In calculating ROIC, we use an average of the Invested Capital at the start of the year and at the end of the year. This didn't really matter when the invested capital was not changing, but now it matters. Using the average invested capital for the year of $3.025 million, the NOPAT of $1.1 million represents an ROIC of 36.4%.

Figure 1: Impact of Inflation in Year 1

Year	Inflation	Annual Capex	Gross PPE	Annual Depreciation	Accumulated Depreciation	Net PPE (Invested Capital)
1	5%	1,050	5,050	1,000	2,000	3,050

							Annual Change In:		
Year	Revenue	Gross Margin	Gross Income	NOPAT	ROIC	Free Cash Flow	Depreciation	NOPAT	Free Cash Flow
1	10,500	20.0%	2,100	1,100	36.4%	1,050	0.0%	10.0%	5.0%

Think about that for a moment. Your costs went up 5%, and you raised your price by 5% as well. Nothing changed in real terms. Yet your ROIC jumped from 33.3% to 36.4%. The last three columns in Table 1 tell the story. They show the annual change in Depreciation, NOPAT, and Free Cash Flow. As we have just noted, Depreciation expense did not rise at all, so the 5% rise in gross profit became a 10% rise in NOPAT, pushing ROIC up. But Free Cash Flow, which does factor in the increased cost of the new machine you had to buy (Free Cash Flow is Gross Income minus the annual capex), only went up 5%, right in line with inflation. In real terms your free cash flow was unchanged, so the real value of the business was unchanged too. Yet the ROIC was higher. Clearly, that higher ROIC is somewhat deceptive. It made the business appear to be more profitable, yet the real free cash flow was unchanged.

Now look at what happens in years 2 through 6 **(Figure 2)** of this inflationary era. Prices for the new widget machines keep rising 5% every year, as does the price you charge for your widgets. As time goes on, the Gross PPE number keeps rising to reflect the higher prices paid for the new machines each year, so the annual depreciation number starts to rise as well. In year 2, for example, Depreciation expense rises 1%. So, the 5% rise in gross profit does not all flow through into NOPAT; in year 2, NOPAT rises 8.6%, compared to 10% the previous year. Once again, though, Free Cash Flow rises 5%, right in line with inflation. You can see that eventually, Depreciation expense catches up to inflation in year 6, rising 5%. Conversely, the rise in NOPAT eventually "catches down" to inflation, also rising 5%. At that point, ROIC has reached 41.3%. Yet as you can see, the annual rise in Free Cash Flow was 5% all along – in other words, in real terms, Free Cash Flow never changed, yet ROIC rose from 33.3% to 41.3%.

Why doesn't the ROIC go back down to where it had been previously once Depreciation, NOPAT, and Free Cash Flow have all stabilized at 5% annual growth? It's because even though

Figure 2: Impact of Inflation in Years 2 Through 6

Year	Inflation	Annual Capex	Gross PPE	Annual Depreciation	Accumulated Depreciation	Net PPE (Invested Capital)
2	5%	1,103	5,153	1,010	2,010	3,143
3	5%	1,158	5,310	1,031	2,041	3,270
4	5%	1,216	5,526	1,062	2,103	3,423
5	5%	1,276	5,802	1,105	2,208	3,594
6	5%	1,340	6,092	1,160	2,318	3,774

							Annual Change In:		
Year	Revenue	Gross Margin	Gross Income	NOPAT	ROIC	Free Cash Flow	Depreciation	NOPAT	Free Cash Flow
2	11,025	20.0%	2,205	1,195	38.6%	1,103	1.0%	8.6%	5.0%
3	11,576	20.0%	2,315	1,285	40.1%	1,158	2.0%	7.5%	5.0%
4	12,155	20.0%	2,431	1,369	40.9%	1,216	3.1%	6.6%	5.0%
5	12,763	20.0%	2,553	1,447	41.3%	1,276	4.1%	5.7%	5.0%

everything is now growing at the same rate, depreciation as a percentage of sales is permanently lower than it used to be, and that affects the NOPAT margin. When inflation was zero, the annual depreciation expense ($1 million) was 10% of sales ($10 million). Now, depreciation as a percentage of sales has settled at a lower plateau, around 8.7%. This is because of the way that sales reflect higher prices immediately, while there is still that lag in the way that higher prices show up in the annual depreciation expense. This matters because the NOPAT figure is net of the annual depreciation expense. So, whereas the NOPAT margin before inflation was 10%, now it is 11.3% each year, and that leads to higher ROIC.

In **Figure 3**, we consider an alternate scenario, one in which you are not able to maintain your gross margin at 20%. Once again, we will see that the ROIC number can be somewhat deceptive.

In this scenario, your gross margin deteriorates because of inflation. Although your revenue grows 5% each year, your Cost of Goods Sold grows a little faster than that (perhaps your workforce manages to negotiate a 6% pay hike), so your gross profit grows by less than 5%. As you can see, over the six years in the table your gross margin deteriorates from the 20% you had earned earlier down to 17.8%. Everything on the left side of the table is the same as in Figures 1 and 2: you are still paying 5% more each year for your new machine, and your Depreciation expense rises over time just as it did before. What happens to ROIC in this scenario? Amazingly, it is unchanged at 33.3% each year, just where it was before inflation accelerated. (Okay, we picked gross margin numbers that would produce a 33.3% ROIC each year.) But look at the last three columns in the table. NOPAT

Figure 3: Impact of Inflation When Gross Margin Cannot be Maintained

Year	Inflation	Annual Capex	Gross PPE	Annual Depreciation	Accumulated Depreciation	Net PPE (Invested Capital)
1	5%	1050	5050	1000	2000	3050
2	5%	1103	5153	1010	2010	3143
3	5%	1158	5310	1031	2041	3270
4	5%	1216	5526	1062	2103	3423
5	5%	1276	5802	1105	2208	3594
6	5%	1340	6092	1160	2318	3774

							Annual Change In:		
Year	Revenue	Gross Margin	Gross Income	NOPAT	ROIC	Free Cash Flow	Depreciation	NOPAT	Free Cash Flow
1	10500	19.1%	2009	1009	33.3%	959	0.0%	0.9%	-4.1%
2	11025	18.5%	2040	1030	33.3%	937	1.0%	2.1%	-2.2%
3	11576	18.1%	2098	1067	33.3%	940	2.0%	3.6%	0.3%
4	12155	17.9%	2176	1114	33.3%	960	3.1%	4.4%	2.2%
5	12763	17.8%	2272	1167	33.3%	995	4.1%	4.8%	3.7%
6	13401	17.8%	2385	1225	33.3%	1045	5.0%	5.0%	5.0%

grew more slowly than inflation in the first five years, before finally getting to 5% growth (i.e., matching inflation) in year 6. And Free Cash Flow actually falls in the first two years, then grows more slowly than inflation for the next three years before it too finally catches up to inflation in year 6. These figures tell us that the value of the firm falls in this scenario (driven by the decline in gross margin), yet the ROIC figures give no real hint of that.

This is a useful point at which to note that of course it is not ROIC alone that matters, but the spread between ROIC and the cost of capital.

And in both of these scenarios, the rise in inflation would presumably have raised the cost of capital – particularly if you were using what we called the "bottom-up" approach to calculating the cost of capital, starting with a risk-free interest rate; the rise in inflation would almost certainly have raised that risk-free rate. But even if you used the "top-down" approach, using some sort of long-term expected return for equities as the cost of equity capital, it is reasonable to assume that if inflation shifted to a seemingly permanent higher plateau, investors would want to be compensated for that and would demand a higher return than they had previously. So, in the first scenario, ROIC may have risen, but so did the cost of capital, so the change in the ROIC vs. WACC spread was minimal. This meshes well with the idea that there was no change in the real value of the firm, because the free cash flow rose in line with inflation. And in the second scenario, where we said that the real value of the firm fell because the free cash flow either fell outright or rose more slowly than inflation for a few years, this too aligns with the fact that ROIC was steady, because in the context of a rising WACC, the firm's spread between ROIC and WACC would have narrowed. All of which leads us to our next question.

Which Change Matters More: WACC or ROIC?

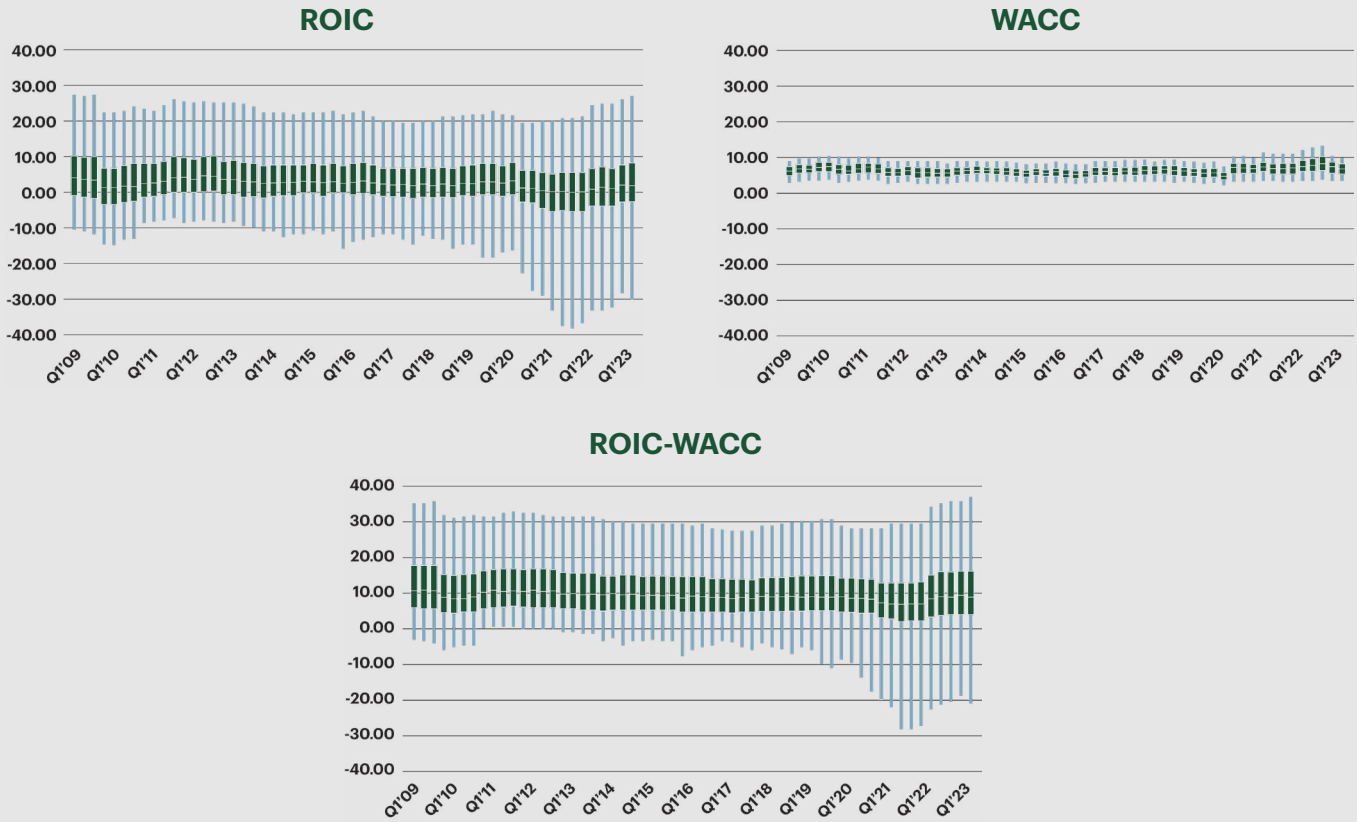
Over the last eighteen months, as interest rates rose, we have often been asked how the rise in rates was affecting the WACC of companies that we look at. The questioners often assumed that slight changes in WACC would tip the balance for many companies between earning a premium over their cost of capital versus earning less than their cost of capital. But the people asking this question never asked what was happening to ROIC during this same period. What's more, the questioners never wondered whether the very forces that were driving changes in WACC might simultaneously be responsible for even larger changes in ROIC, in the same direction. That might seem counterintuitive, but let's look at some data.

To start, we would point out that the variation in WACC across the thousands of publicly traded companies is much narrower than the variation in ROIC. **Figure 4** on the following page, shows three charts all using the same scale on the vertical axis. They show the ranges, from the 5th to the 95th percentile, for ROIC, WACC, and ROIC–WACC for all of the companies in the MSCI ACWI extended market universe and the Russell 3000 that passed the liquidity criteria in the Capital Reinvestment Screen (minimum market capitalization of $250 million and average

daily trading volume over the previous year of $10 million per day) on a quarterly basis back to 2009, which is when our historical data for that screen begins. The range from the 25th to the 75th percentile is shown in a green shade.

Notice that the 25th-75th percentile range for ROIC (the green area in the first chart) is wider than the entire 5th-95th percentile range for WACC in the center chart. This suggests that changes in ROIC can easily outweigh changes in WACC. Now look specifically at the period from 2020 to 2022 in these charts. In 2020, when the COVID pandemic hit, the median cost of capital edged downward. That's because interest rates fell. Why did they fall? Because there was a sharp economic contraction going on. Well, that same contraction was also responsible for a drop in the median ROIC. And the third chart shows that despite a falling WACC, which you might think would improve ROIC-WACC spreads, the median ROIC–WACC spread fell. Now look at 2022. The median WACC rose as the 10-year Treasury yield rose. Long term interest rates were rising because the economy had recovered from the COVID shock, and was growing again. And that resumption of growth pushed the median ROIC up at the same time. Sure enough, the third chart shows that even as the median WACC was rising, the median ROIC-WACC spread was rising too.

Figure 4: Range of Metrics for the MSCI ACWI Investable Market Index and the Russell 3000 that Pass the Capital Reinvestment Screen 2009 to 2023



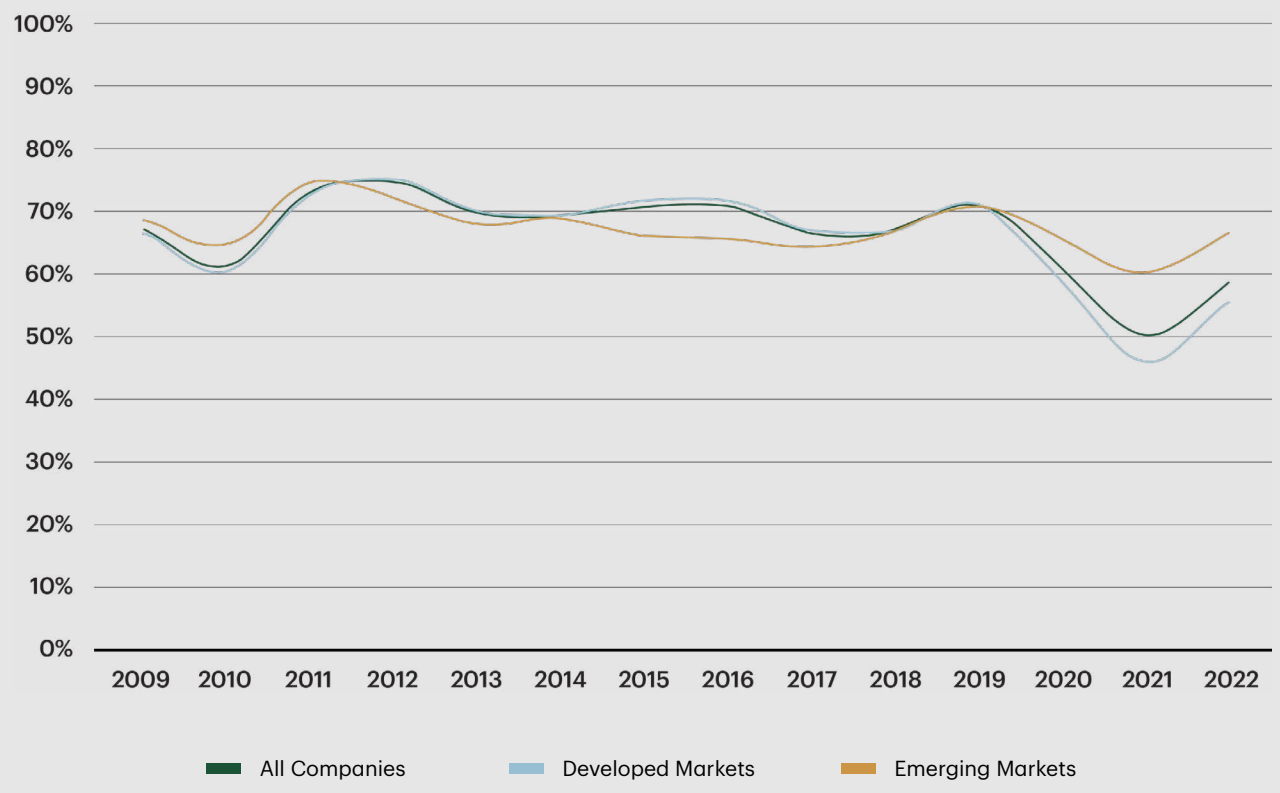
Source: FactSet Research Systems, Epoch Investment Partners, Inc. Excludes companies with low market cap (<$250M) or low volume (250 day ADV < $10M)

Figure 5 shows what this meant in terms of how many companies were earning a premium over their cost of capital.

In the years prior to the pandemic, the percentage of companies whose ROIC was greater than their WACC was pretty stable at around 70%, with emerging markets generally having a slightly lower percentage than that. In 2020 and 2021, despite the drop in the median WACC that was occurring, the percentage of companies earning a premium over their cost of capital fell to just over 50%. Interestingly, the decline was steeper in developed markets than in emerging markets. And in 2022, even as the median WACC was rising, the percentage of companies earning more than their cost of capital rose – not all the way back to the pre-pandemic level, but higher than it had been in 2020 and 2021.

The lessons here are 1) changes in ROIC can matter more than changes in WACC, because they vary over a much wider range, and 2) because of this fact, changes in WACC may not have the effect you would expect on how many companies are earning a premium over their cost of capital. Periods of higher cost of capital may actually see more companies earning a premium, and vice versa.

Figure 5: Percent of Companies in the MSCI ACWI Investable Market Index and the Russell 3000 with ROIC Greater Than WACC



Source: FactSet Research Systems, Epoch Investment Partners, Inc. companies with low market cap (<$250M) or low volume (250 day ADV < $10M)

Conclusion

Inflation introduces distortions into the world of financial metrics. In this essay we have only skimmed the surface of this topic (the most notable omission here is the impact of inflation on taxes, and the resulting impact on NOPAT, which can be significant), but we just wanted to illustrate some of the basic operating mechanics about how a rise in inflation affects a few of the metrics that we care particularly about, ROIC and WACC. Higher inflation almost certainly leads to higher nominal WACC, though by how much is unclear. Evidence of recent years suggests that investors do not necessarily adjust their "required return" on equities for every tick in the 10-year Treasury yield. Rather, they may rely on a longer-term inflation expectation, so if they expect a rise in inflation to be temporary the effect on the cost of capital may be muted, especially for companies with little or no debt. As for ROIC, the dynamics are more complicated, because there are multiple variables that drive ROIC – the key ones being margins, capex, and depreciation — and inflation's effects on these variables will differ across industries and companies. But the key lesson to remember is that when inflation rises, interpreting changes in ROIC can be tricky. A company's ROIC might rise, implying better profitability, even as its free cash flows only grow in line with inflation. And a stable ROIC might imply steady profitability, yet could be masking a decline in free cash flow. It is always important to focus not just on ROIC but on free cash flow as well, but particularly so in periods of high inflation. Finally, we saw that rising WACC can go hand in hand with rising ROIC, and the net effect may be that more companies earn a premium over their cost of capital, while periods of lower WACC may see fewer companies earning a premium over their cost of capital. As the saying goes, be careful what you wish for.

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