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# THE CFROI LIFE CYCLE

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Many valuation models focus on the spread between return on assets and the firm's cost of capital. The market value of a firm's future investments depends on the forecasted pattern of this economic value-added spread in future years. Typically, analysts and portfolio managers have little basis for (and less confidence in) forecasting this spread through time, even though it dramatically impacts the firm's warranted value.

The four primary goals of this article are to:

- Explain why the spread notion is distorted when conventional accounting measures for the return on assets are used.
- Demonstrate that an inflation-adjusted ("real") cash flow return on investment (CFROI) is a preferred measure of return on capital.
- Identify characteristics of classes of firms that explain the magnitude of observed CFROI "fade rates," i.e., the diminution of the spread over time as CFROIs regress toward the cost of capital.
- Show empirically that a strong association exists between stock market winners/losers and actual CFROI changes that are higher/lower than expected CFROI fade rates.

## THE ECONOMIC LIFE CYCLE OF FIRMS

The notion that long-term competition diminishes any spread (positive or negative) between return on capital and the cost of capital is articulated by George Stigler:

> There is no more important proposition in economic theory than that, under competition, the rate of return on investment tends toward equality in all industries. Entrepreneurs will seek to leave relatively unprofitable industries and enter relatively profitable industries [1963, p. 54].

Firms continually strive to earn above-average returns. This attempt can take the form of creating new products or improving existing processes for designing, manufacturing, distributing, or servicing.

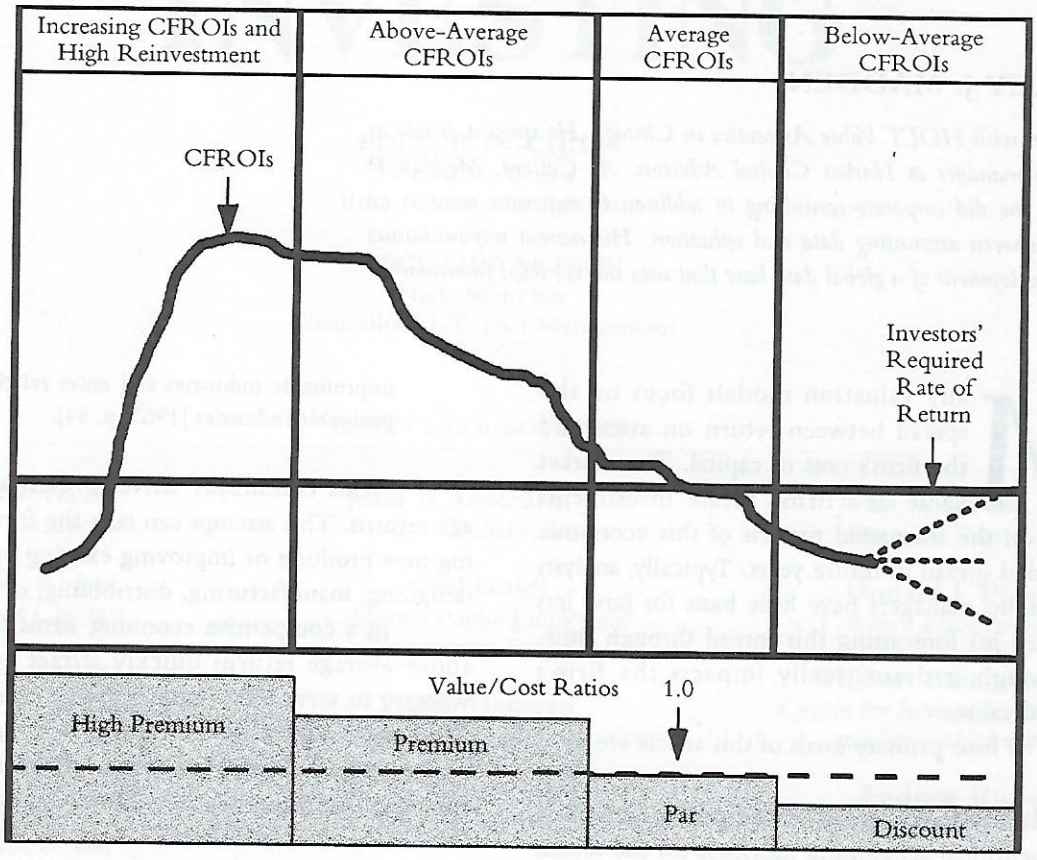
In a competitive economy, firms that achieve above-average returns quickly attract competitors who try to serve the customer even more effectively. Thus, one reasonably anticipates that high-CFROI businesses will ultimately fade toward the average. On the other hand, substantially below-average CFROIs for a number of years set the stage for restructuring. Significant improvement toward earning the cost of capital typically necessitates a shrinking of the firm.

Exhibit 1 shows that a value/cost ratio (see appendix) reflects the market's perception of where a firm is in its life cycle. This ratio is the firm's total market value (debt plus equity) divided by its net assets marked up to current dollars by the general price level deflator.[1] As the numerator and denominator are expressed in monetary units of the same purchasing power, the value/cost ratio is not distorted by inflation over time.

Much as a bond trades above or below par depending on its coupon in relation to the current interest rate, a company's value/cost ratio trades above or below unity, depending on its CFROI in relation to the investors' discount rate (cost of capital). Above-average CFROI firms are accorded "premium" multiples (value/cost exceeds 1.0), and below-average CFROI firms sell at "discount" multiples (value/cost less than 1.0).

For established businesses, the time series of CFROIs indicates the level of *managerial skill*. The market should place considerable weight on managerial skill in forecasting long-term financial results. Support for this proposition is found in 1) premium valuations

**EXHIBIT 1**
**ECONOMIC LIFE CYCLE OF FIRMS**




for start-up firms with highly skilled managements even though above-average CFROIs have yet to be earned, and 2) sudden markups in the prices of historically lagging stocks when incumbent managements are replaced by highly respected managements.

## HOW DO YOU MEASURE THE SPREAD?

Accounting returns are not "nominal" measures, but hybrid numbers reflecting complex interactions of varying past inflation rates and myriad accounting conventions. They are ill-suited to measuring long-term trends in economic performance.

Since the accounting return is not a nominal measure, errors result when measuring the spread between it and a nominal cost of capital. These errors are particularly significant when spreads are compared across companies of varying asset composition and across national borders. Finally, in valuation work, it is helpful to compare the forecasted spread to the past spread. This comparison becomes especially awkward when inconsistencies exist between a measured return on capital and the estimated cost of that capital.

These problems are resolved when the spread is measured as the difference between an inflation-adjusted, or real, return on capital and a real cost of capital. As explained below, the CFROI is calculated in constant monetary units and therefore is a real number.

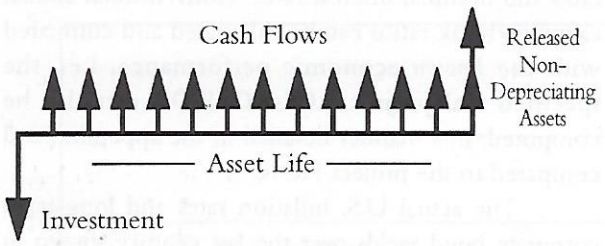
## MEASURING ECONOMIC PERFORMANCE

Measuring the performance of any business investment involves three steps:

1. Specifying cash inflows and cash outflows over the life of the project.
2. Adjusting these cash flows into units of constant purchasing power.
3. Calculating an *achieved* internal rate of return; being adjusted for inflation/deflation, this is a real ROI (return on investment).

From the accountants' perspective, performance centers on *earnings* available to the firm's equity owners. Cash available from depreciation charges is

## EXHIBIT 2
### PROJECT DESCRIPTION



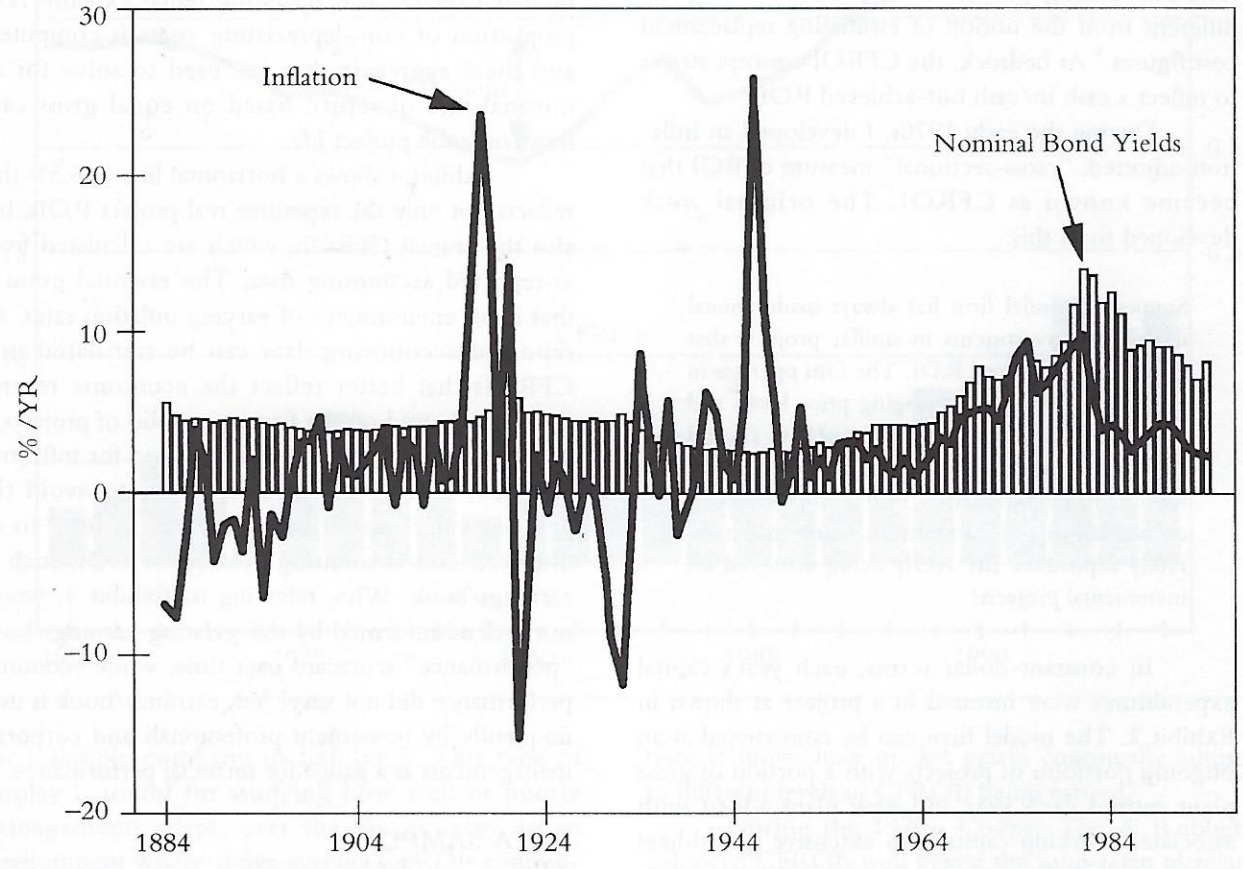

implicitly deemed to be reinvested under the "going firm" assumption. An economic perspective, by contrast, focuses on the total cash available to the firm from prior investments. Management's responsibility is to ensure that cash returns from total committed resources (financed by all the firm's capital suppliers) meet combined debt and equity capital costs.

In this article, accounting numbers are used to translate balance sheet and income statement items into CFROIs. These CFROIs reflect the firm's performance across periods of different inflation rates, and are directly comparable with the CFROIs of other firms, even firms having much different asset mixes.

The cash in/cash out framework of an achieved ROI handles inflation differently from a "replacement cost" framework.[2] This can be illustrated using a simple example. Consider a $100 investment in a machine with an approximate one-year life; the machine has generated $200 of cash by year-end; the general price level remains unchanged; and the cost to replace the worn-out machine with an identical machine has risen to $200. One conventional inflation-adjusted accounting procedure computes net income as zero, because it applies a "replacement cost" depreciation charge of $200.

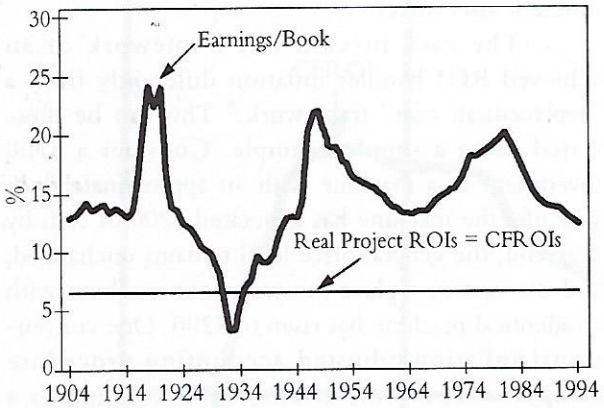
But, in fact, the capital owners achieved a 100% return in purchasing power, because $100 was committed, and, one year later, $200 of equivalent

## EXHIBIT 3
### INFLATION AND CORPORATE BOND YIELDS 1884–1994




Sources: "Economic Report of the President" [1994]; "Historical Statistics of the United States" [1975, p. 1003]; "Long-Term Economic Growth" [1966, p. 200].

**EXHIBIT 4**
**EARNINGS/BOOK CORRESPONDING TO SUCCESSIVE 6.5% REAL PROJECT ROIs, 1904–1994**




purchasing power is received. Whether the machine is replaced is a separate issue.

The key idea is that inflation adjustments need to be performed from the perspective of the firm's capital owners. This requires that all cash inflows and outflows be adjusted to units of equivalent purchasing power. This procedure is quite different from the notion of estimating replacement cost figures.[3] At bedrock, the CFROI concept strives to reflect a cash in/cash out-achieved ROI.

During the early 1970s, I developed an inflation-adjusted, "cross-sectional" measure of ROI that became known as CFROI. The original work developed from this:

> Suppose a model firm has always made annual *incremental* investments in similar projects that achieve the same real ROI. The firm operates in an environment with changing price levels and varying nominal interest rates. How should *aggregate* data, as reflected in the accounting statements, be translated into a time series of cross-sectional annual return measures that accurately reproduce the ROIs being achieved on incremental projects?

In constant-dollar terms, each year's capital expenditures were invested in a project as shown in Exhibit 2. The model firm can be constructed as an ongoing portfolio of projects with a portion of gross plant retired each year and new plant added with associated working capital. An extensive spreadsheet starts with year-by-year real project ROIs and translates this into real cash outflows and inflows.

From these real cash flows, we can calculate conventional accounting statements that include the complex effects of a specified time series of inflation rates and nominal interest rates. Conventional annual earnings/book ratios can be calculated and compared with the *known* economic performance, i.e., the specified real project ROIs. CFROIs can also be computed, in a manner detailed in the appendix, and compared to the project ROIs.

The actual U.S. inflation rates and long-term corporate bond yields over the last century shown in Exhibit 3 provide an especially relevant environment for illustrative purposes. After incorporating asset composition, financial leverage, and dividend payouts similar to the S&P Industrials of the last two decades, and using a 6.5% real project ROI (the approximate long-term corporate average), the resulting firm displays the time series earnings/book roller coaster of Exhibit 4.[4]

The inflation adjustment portion of the CFROI calculation begins by marking up the layers of gross plant to current dollars of a specified year, using the GDP deflator as the measure of changes in purchasing power. A project life is estimated by dividing gross plant by depreciation charges. Gross cash flow includes net income, depreciation charges, interest expense, and operating rental expense. The proportion of non-depreciating assets is computed, and these aggregate data are used to solve for an internal rate of return based on equal gross cash flows over the project life.

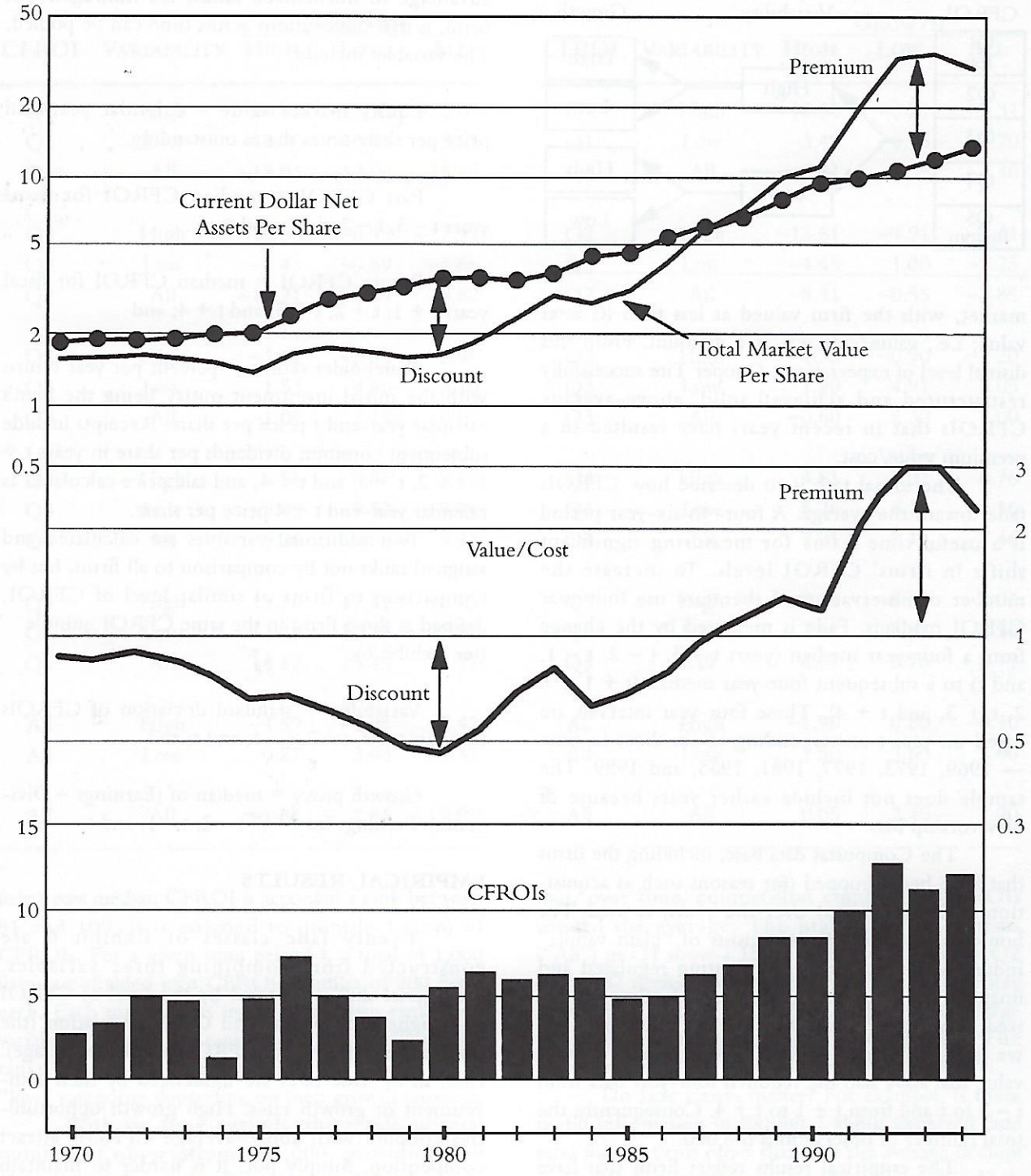
Exhibit 4 shows a horizontal line at 6.5% that reflects not only the repetitive real project ROIs, but also the annual CFROIs, which are calculated from as-reported accounting data. The essential point is that in an environment of varying inflation rates, as-reported accounting data can be translated into CFROIs that better reflect the economic returns actually achieved on the firm's portfolio of projects.

This exercise identifies the need for inflation-adjusted, or real, CFROIs in order to avoid the "rubber ruler" distortions that are intrinsic to all historical cost accounting proxies for ROI, such as earnings/book. Who, referring to Exhibit 4, would not feel misinformed by the gyrating earnings/book "performance" scorecard over time, while economic performance did not vary? Yet, earnings/book is used frequently by investment professionals and corporate managements as a gauge for financial performance.

## DATA SAMPLE

The CFROI life-cycle process is described

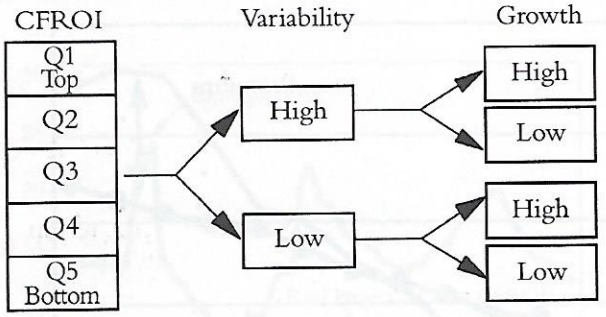
**EXHIBIT 5**
**COOPER TIRE & RUBBER 1970–1994**




for a sample company in Exhibit 5. This type of display is useful for studying how well or poorly managements adapt, over the longer term, to an environment where above-average CFROIs continually attract competition and below-average CFROIs create pressure on management to improve. In addition, it shows how market prices continually adjust to different levels of CFROIs being earned.

During the 1970s, Cooper Tire & Rubber delivered CFROIs well below the long-term plateau of 6.0% to 6.5% CFROIs earned in the U.S. industrial sector. It was appropriately penalized by the

**EXHIBIT 6**
**FADE CLASS CONSTRUCTION**




market, with the firm valued at less than its asset value; i.e., value/cost was at a discount. From this dismal level of expectations, Cooper Tire successfully restructured and achieved solid, above-average CFROIs that in recent years have resulted in a premium value/cost.

The initial task is to describe how CFROIs fade toward the average. A four- to six-year period is a useful time frame for measuring significant shifts in firms' CFROI levels. To increase the number of observations, I therefore use four-year CFROI medians. Fade is measured by the change from a four-year median (years $t-3$, $t-2$, $t-1$, and t) to a subsequent four-year median ($t+1$, $t+2$, $t+3$, and $t+4$). These four-year intervals are based on year t corresponding to six slices in time — 1969, 1973, 1977, 1981, 1985, and 1989. The sample does not include earlier years because of survivorship bias.

The Compustat data base, including the firms that have been dropped (for reasons such as acquisition or bankruptcies) over the years, is used. For homogeneity, the sample consists of "plain vanilla" industrial/service firms, eliminating regulated and financial firms, oil and gas firms, and other specialized asset firms.[5] At each of the six points in time, we pick the largest 1,000 firms on equity market value that have had the required four-year data from $t-3$ to t and from $t+1$ to $t+4$. Consequently, the total number of observations is 6,000.

The empirical results reflect firms that have complete four-year data from $t-3$ to t and from $t+1$ to $t+4$. No significant differences in results are seen when the analysis is repeated using a sample of the top 1,000 firms, including those with incomplete data $t+1$ to $t+4$ (i.e., dropped from Compustat during that time).

Variables are calculated for each firm in year t and then ranked high to low within all 1,000 firms in the universe at time t. Each firm receives a normalized rank score ranging from 1 to 100. An advantage to normalized ranks, for homogeneous firms, is that observations across time can be pooled. The variables include:

Equity market value = calendar year-end price per share times shares outstanding;

Past CFROI = median CFROI for fiscal years $t-3$, $t-2$, $t-1$, and t;

Future CFROI = median CFROI for fiscal years $t+1$, $t+2$, $t+3$, and $t+4$; and

Shareholder return = percent per year return with the initial investment outlay being the firm's calendar year-end t price per share. Receipts include subsequent common dividends per share in years $t+1$, $t+2$, $t+3$, and $t+4$, and sale price calculated as calendar year-end $t+4$ price per share.

Two additional variables are calculated and assigned ranks not by comparison to all firms, but by comparison to firms of similar level of CFROI, defined as those firms in the same CFROI quintile (see Exhibit 6):

Variability = standard deviation of CFROIs for years $t-3$, $t-2$, $t-1$, and t; and

Growth proxy = median of (Earnings − Dividends)/Earnings for $t-3$, $t-2$, $t-1$, and t.

## EMPIRICAL RESULTS

Twenty fade classes of Exhibit 6 are constructed from combining three variables. Managerial skill is reflected by the level of CFROI (the higher, the better) and CFROI variation (the smaller, the better when CFROIs are above average). Also, firms' fade rates are influenced by their reinvestment or growth rates. High growth opportunities coupled with above-average CFROIs attract competition. Simply put, it is harder to maintain high CFROIs when coupled with high growth than with low growth. A particular fade class combines 1) one of five CFROI quintiles, plus 2) high or low variability, plus 3) high or low growth.

Exhibit 7 uses pooled observations of ranked variables ranging from 1 (lowest) to 100 (highest), like rungs on a ladder. For example, if in a given year t, a

**EXHIBIT 7**
**CHANGE IN CFROI RANK t TO t + 4**
**AVERAGES FOR EACH FADE CLASS**

| CFROI | VARIABILITY | GROWTH HIGH | GROWTH LOW | GROWTH ALL |
|---|---|---|---|---|
| Q1 | High | −26.69 | −17.33 | −22.01 |
| Q1 | Low | −11.20 | −6.75 | −8.97 |
| Q1 | All | −18.95 | −12.04 | −15.49 |
| Q2 | High | −16.98 | −8.99 | −12.99 |
| Q2 | Low | −8.43 | −0.89 | −4.66 |
| Q2 | All | −12.71 | −4.94 | −8.82 |
| Q3 | High | −3.62 | −2.30 | −2.96 |
| Q3 | Low | 1.53 | 4.66 | 3.10 |
| Q3 | All | −1.04 | 1.18 | 0.07 |
| Q4 | High | 8.56 | 9.85 | 9.20 |
| Q4 | Low | 9.96 | 9.52 | 9.74 |
| Q4 | All | 9.26 | 9.68 | 9.47 |
| Q5 | High | 15.76 | 17.51 | 16.63 |
| Q5 | Low | 12.48 | 13.35 | 12.91 |
| Q5 | All | 14.12 | 15.43 | 14.77 |
| All | High | −4.59 | −0.25 | −2.42 |
| All | Low | 0.87 | 3.98 | 2.42 |
| All | All | −1.86 | 1.86 | 0.00 |

**EXHIBIT 8**
**CHANGE IN CFROI RANK t TO t + 4**
**MEDIANS FOR EACH FADE CLASS**

| CFROI | VARIABILITY | GROWTH HIGH | GROWTH LOW | GROWTH ALL |
|---|---|---|---|---|
| Q1 | High | −13.36 | −6.21 | −9.31 |
| Q1 | Low | −3.45 | −0.15 | −1.70 |
| Q1 | All | −7.31 | −2.35 | −4.40 |
| Q2 | High | −13.61 | −4.91 | −8.41 |
| Q2 | Low | −4.45 | 1.20 | −1.25 |
| Q2 | All | −8.31 | −0.55 | −3.85 |
| Q3 | High | −4.30 | −0.90 | −2.20 |
| Q3 | Low | 1.90 | 4.91 | 3.05 |
| Q3 | All | −0.60 | 2.30 | 1.00 |
| Q4 | High | 4.81 | 8.01 | 6.76 |
| Q4 | Low | 8.26 | 8.11 | 8.16 |
| Q4 | All | 7.01 | 8.11 | 7.46 |
| Q5 | High | 9.91 | 8.51 | 9.06 |
| Q5 | Low | 7.61 | 8.81 | 8.16 |
| Q5 | All | 8.61 | 8.76 | 8.71 |
| All | High | −1.90 | 0.80 | −0.40 |
| All | Low | 1.50 | 3.60 | 2.60 |
| All | All | 0.05 | 2.40 | 1.20 |

firm's past median CFROI is accorded a rank between 81 and 100, it is assigned to quintile 1 (top) of CFROIs. For a given time period t, a total of 1,000 firms are divided into CFROI quintiles of 200 firms each. Each quintile has its member firms ranked on variability, "high" for ranks above 50 and "low" for ranks 50 and below. Similarly, firms fall into "high" or "low" categories depending on their growth rankings.

With six time periods, the resulting total number of observations is 6,000, providing 300 observations for each of the twenty fade classes in Exhibit 7. Consider the fade class for Q1 (quintile 1) with high variability and high growth. The *average* change in CFROI rank (i.e., fade) from "t" to "t + 4" is −26.69, based on 300 observations. This is equivalent to dropping a little over twenty-six rungs on the CFROI ladder.

Exhibit 7 data support the life-cycle premise that, over time, competition compresses CFROIs toward the average. The highest CFROI firms ("All") in Q1 show a 15.49 decline, followed by Q2 with 8.82 decline, while firms in Q3 on average stay at that level with a 0.07 fade. Q4 firms on average improve 9.47 rungs on the CFROI ladder. The lowest quintile (Q5) firms, on average, gain 14.77.

Do fade classes matter? For example, is there useful information in Exhibit 7 about expected fade rates for Q1 firms other than that the average decline is 15.49? Intuitively, one would expect that high CFROIs coupled to high-growth opportunities would attract substantial competition, and the data show that high-growth Q1 firms do fade faster than low-growth Q1 firms (−18.95 versus −12.04).

Similarly, if variability for above-average CFROIs is useful in discerning the level of managerial skill, then low-variability Q1 firms should fade

## EXHIBIT 9
## CFROI Change and Shareholder Return

| Past CFROI | Variability | Growth | Ranked Shareholder Returns #Obs | Win | Loss | W/L | Ranked CFROI Change Within Fade Class: Top 25 % #Obs | Win | Loss | W/L | Middle 50% #Obs | Win | Loss | W/L | Bottom 25% #Obs | Win | Loss | W/L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Q1 | High | High | 300 | 72 | 130 | 0.55 | 75 | 38 | 17 | 2.24 | 150 | 30 | 60 | 0.50 | 75 | 4 | 53 | 0.08 |
| Q1 | High | Low | 300 | 62 | 70 | 0.89 | 75 | 30 | 8 | 3.75 | 150 | 27 | 31 | 0.87 | 75 | 5 | 31 | 0.16 |
| Q1 | Low | High | 300 | 96 | 88 | 1.09 | 75 | 50 | 4 | 12.50 | 150 | 39 | 35 | 1.11 | 75 | 7 | 49 | 0.14 |
| Q1 | Low | Low | 300 | 78 | 59 | 1.32 | 75 | 38 | 6 | 6.33 | 150 | 35 | 23 | 1.52 | 75 | 5 | 30 | 0.17 |
| Q2 | High | High | 300 | 65 | 115 | 0.57 | 75 | 36 | 10 | 3.60 | 150 | 24 | 51 | 0.47 | 75 | 5 | 54 | 0.09 |
| Q2 | High | Low | 300 | 83 | 62 | 1.34 | 75 | 42 | 3 | 14.00 | 150 | 34 | 25 | 1.36 | 75 | 7 | 34 | 0.21 |
| Q2 | Low | High | 300 | 72 | 95 | 0.76 | 75 | 36 | 5 | 7.20 | 150 | 31 | 44 | 0.70 | 75 | 5 | 46 | 0.11 |
| Q2 | Low | Low | 300 | 72 | 42 | 1.71 | 75 | 33 | 3 | 11.00 | 150 | 34 | 13 | 2.62 | 75 | 5 | 26 | 0.19 |
| Q3 | High | High | 300 | 79 | 89 | 0.89 | 75 | 32 | 13 | 2.46 | 150 | 38 | 41 | 0.93 | 75 | 9 | 35 | 0.26 |
| Q3 | High | Low | 300 | 67 | 71 | 0.94 | 75 | 32 | 3 | 10.67 | 150 | 31 | 32 | 0.97 | 75 | 4 | 36 | 0.11 |
| Q3 | Low | High | 300 | 87 | 68 | 1.28 | 75 | 41 | 3 | 13.67 | 150 | 40 | 27 | 1.48 | 75 | 6 | 38 | 0.16 |
| Q3 | Low | Low | 300 | 65 | 40 | 1.63 | 75 | 34 | 3 | 11.33 | 150 | 29 | 16 | 1.81 | 75 | 2 | 21 | 0.10 |
| Q4 | High | High | 300 | 66 | 96 | 0.69 | 75 | 33 | 10 | 3.30 | 150 | 29 | 42 | 0.69 | 75 | 4 | 44 | 0.09 |
| Q4 | High | Low | 300 | 84 | 59 | 1.42 | 75 | 31 | 9 | 3.44 | 150 | 45 | 15 | 3.00 | 75 | 8 | 35 | 0.23 |
| Q4 | Low | High | 300 | 88 | 65 | 1.35 | 75 | 44 | 6 | 7.33 | 150 | 40 | 25 | 1.60 | 75 | 4 | 34 | 0.12 |
| Q4 | Low | Low | 300 | 73 | 37 | 1.97 | 75 | 37 | 0 | NA | 150 | 31 | 11 | 2.82 | 75 | 5 | 26 | 0.19 |
| Q5 | High | High | 300 | 66 | 99 | 0.67 | 75 | 33 | 13 | 2.54 | 150 | 31 | 47 | 0.66 | 75 | 2 | 39 | 0.05 |
| Q5 | High | Low | 300 | 63 | 98 | 0.64 | 75 | 27 | 21 | 1.29 | 150 | 27 | 44 | 0.61 | 75 | 9 | 33 | 0.27 |
| Q5 | Low | High | 300 | 84 | 61 | 1.38 | 75 | 41 | 7 | 5.86 | 150 | 39 | 24 | 1.63 | 75 | 4 | 30 | 0.13 |
| Q5 | Low | Low | 300 | 78 | 56 | 1.39 | 75 | 33 | 8 | 4.13 | 150 | 41 | 19 | 2.16 | 75 | 4 | 29 | 0.14 |
| Totals: | | | 6,000 | 1,500 | 1,500 | 1.00 | 1,500 | 721 | 152 | 4.74 | 3,000 | 675 | 625 | 1.08 | 1,500 | 104 | 723 | 0.14 |

more slowly. The data in Exhibit 7 show that they do; i.e., –8.97 for all firms with low variability in Q1 versus –22.01 for high variability.

The observed relationship of managerial skill and growth opportunities also is observed in Q2 and Q3, but the magnitude is smaller as CFROIs approach the average level. CFROIs that are below average (Q4 and especially Q5) may indicate a need to restructure the firm. Restructuring typically brings volatility to CFROIs and a reduction in asset growth.

Moreover, low variability for below-average firms can be associated with a "business as usual" complacency by top managements, which is clearly not wanted for firms with unsatisfactory returns on capital. Consequently, variability and growth for Q4 and Q5 have understandably different implications than for higher quintiles. This is reflected in the data, which show fade as not strongly related to variability or growth for Q4 and Q5 firms.

An alternative measure of actual fades would focus not on averages for each fade class, but on the experience of the typical firm in each class. Exhibit 8 is similar to Exhibit 7, except that it uses the *median* change in CFROI ranks. The same basic relationships are evident, although the median calculation substantially dampens the effect of extreme changes in some of the members of a class.

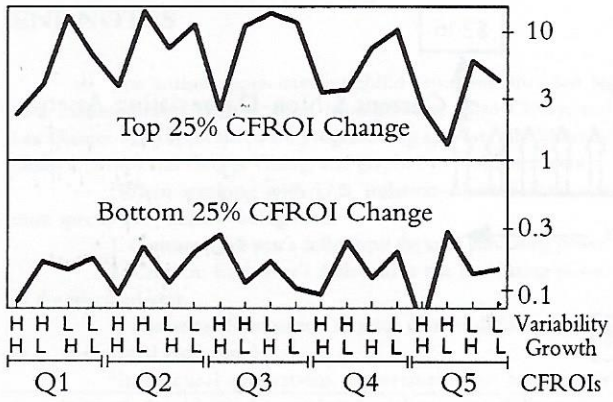
In summary, the fade rates of Exhibits 7 and 8 have plausible interpretations and warrant more extensive study. The results presented here suggest the possibility that CFROI changes that deviate from firms' typical fade rates for their class may be related to winners and losers in the stock market.

## WINNERS AND LOSERS

Firms whose changes in economic performance are above "market expectations" become winners for their common stock owners. Firms with changes below expectations become losers. Consequently, the empirical findings for fade classes suggest that investors should *assess expectations within the context of fade classes.*

I do not offer here "rules" for picking winners and losers. Rather, I want to show that *deviations from expected life-cycle performance* characterize

## EXHIBIT 10
### RATIOS OF WINNERS/LOSERS WITHIN FADE CLASS




winners and losers.

Exhibit 9 defines a winner (loser) as a stock that is in the top (bottom) quartile of shareholder return for all stocks in the universe over a four-year period of t to t + 4. CFROI change is ranked high to low *within each fade class* based on the difference between future CFROI and past CFROI. CFROI change is then segregated into three groups for each fade class: top 25%, middle 50%, and bottom 25%.

The bottom row of Exhibit 9, under Ranked Shareholder Return, shows 6,000 total observations, yielding 1,500 winners (25%) and 1,500 losers for a winner/loser ratio of 1.00. What is noteworthy is that the top 25% of all CFROI change within a fade class provides a winner/loser ratio of 4.74, while the bottom 25% of CFROI change within a fade class gives a winner/loser ratio of 0.14. The probability of these ratios being that much higher or lower than 1.0 due to pure chance is infinitesimal.[6]

A graphic summary of the winner/loser ratios is displayed in Exhibit 10.

## CONCLUSION

Simple measures reflecting managerial skill and growth opportunities can define fade classes that go a long way toward explaining observed CFROI fade rates. When put within the context of fade classes, CFROI changes are shown to play a significant role in the process that generates winners and losers in the stock market. To argue that a stock will outperform/underperform the general market over the coming four years, the investor in most cases should argue that future CFROIs will change at a rate that is more/less favorable than is typical of that firm's fade class.

## APPENDIX
### GROSS CASH FLOW AND CFROI

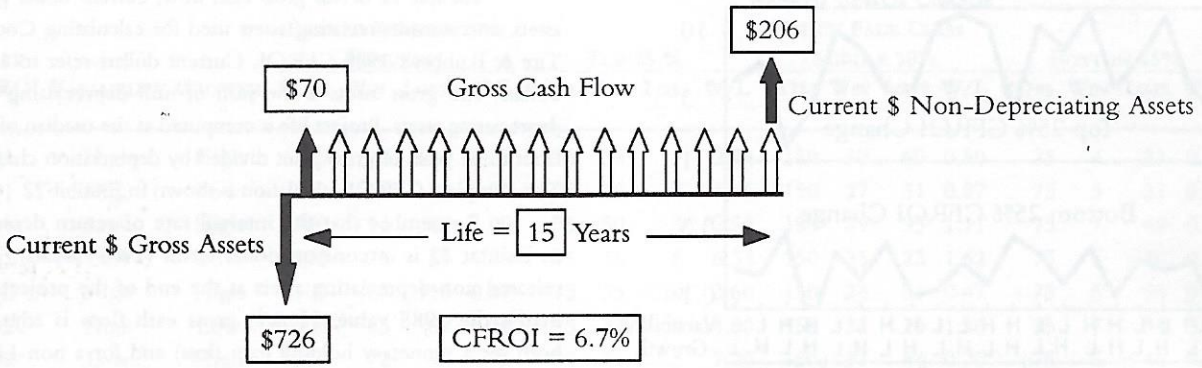
Exhibit 11 details gross cash flow, current dollar gross assets, and non-depreciating assets used for calculating Cooper Tire & Rubber's 1988 CFROI. Current dollars refer to 1988 dollars, and gross assets is the sum of non-depreciating and depreciating assets. Project life is computed as the median of the latest three years of gross plant divided by depreciation charges. The complete CFROI calculation is shown in Exhibit 12.

Remember that the internal rate of return depicted in Exhibit 12 is in constant-dollar terms (1988 dollars). The released non-depreciating assets at the end of the project life match the 1988 value. Hence, gross cash flow is adjusted both for a monetary holding gain (loss) and for a non-LIFO

## EXHIBIT 11
### COOPER TIRE & RUBBER 1988, $ MILLIONS

| | | |
|---|---|---|
| | Net Income | 41 |
| + | Depreciation | 20 |
| + | Interest | 6 |
| + | Rental Expense | 6 |
| + | Minority Interest | 0 |
| +/– | After–Tax Reversal Special Items | 0 |
| +/– | Monetary Holding Gain (Loss) | –3 |
| – | Inventory Adjustment | 0 |
| | Gross Cash Flow, Current $ | 70 |
| | Monetary Short-Term Assets | 161 |
| – | Non-Debt Short-Term Liabilities | –84 |
| (A) | Net Monetary Assets Excluding Debt | 77 |
| | Inventories | 68 |
| | Current $ Markup Inventories | 49 |
| | Land | 9 |
| | Current $ Markup Land | 3 |
| | Investments | 0 |
| (B) | Non-Depreciating Assets, Current $ | 206 |
| | Gross Plant | 348 |
| | Current $ Adjustment Gross Plant | 106 |
| | Leased Property | 66 |
| | Deferred Charges | 0 |
| | Intangibles | 0 |
| (C) | Depreciating Assets, Current $ | 520 |
| (D) | Current $ Gross Assets = (B) + (C) | 726 |

## EXHIBIT 12
### CFROI Calculation Requires Four Inputs




inventory adjustment consistent with maintaining 1988 purchasing power for net working capital including inventories. The monetary holding gain (loss) is approximated as that year's GDP deflator change times net monetary assets excluding debt with a maximum cap equal to 10% of gross cash flow. The inventory adjustment is that year's PPI change times the estimated amount of FIFO inventories with a maximum cap also equal to 10% of gross cash flow.

## EXHIBIT 13
### Value/Cost

| | |
|---|---|
| Current $ Non-Depreciating Assets | $ 206 |
| Current $ Gross Plant | 454 |
| (Current $ Depreciation Reserves) | –196 |
| Net Leased Property | 35 |
| Deferred Charges | 0 |
| Intangibles | 0 |
| Total Current $ Net Assets | $ 499 |
| Equity Market Value Using Average of High and Low Stock Prices for the Year | $ 423 |
| Short-Term Debt at Book | 3 |
| Long-Term Debt at Book | 68 |
| Debt Value of Leases | 35 |
| Debt Value of Pension Obligations | 25 |
| Other Liabilities | 7 |
| Total Debt | $ 138 |
| Total Market Value = Equity + Total Debt | $ 561 |

$$\frac{\text{Value}}{\text{Cost}} = \frac{\text{Total Market Value}}{\text{Current \$ Net Assets}} = \frac{561}{499} = 1.12$$

Operating leases are capitalized with an estimated real debt rate applied to rental expense covering the full project life. The as-reported 1988 gross plant is in historical dollars and is converted to current dollars with a factor of 1.30. This factor reflects marking up each layer of plant from its original dollars to 1988 dollars. It is estimated using project life, smoothed past real growth rates, and the GDP deflator. The higher past inflation rates, the longer the project life, and the slower the asset growth, then the higher the current dollar/historical dollar markup to gross plant. For convenience, the same factor is used to translate as-reported land into current dollars. With similar calculation logic, accumulated depreciation reserves are marked up to current dollars.

Cooper Tire's 1988 value/cost is detailed in Exhibit 13. The debt value of pension obligations is calculated as the projected benefit obligation less plan assets at market value plus any liability due to other postretirement benefits. Other liabilities exclude this postretirement liability.

Recent accounting rule changes provide information that impacts the calculation of gross cash flow. A consistent treatment is to add back the periodic pension cost, then deduct the service cost, and add back the estimated interest cost for postretirement benefits. This makes service cost an economic operating outlay, and classifies pension debt and postretirement liabilities as debt owners.

For more complicated firms than Cooper Tire, more advanced CFROI analysis can be warranted. Complicating issues would include: high R & D; sporadic plant revaluations (U.K.); discretionary changes to reserve accounts (Germany); very old plant (railroads); gyrating project lives; natural resource reserves; large financial subsidiaries; cross-holdings (Japan); financial spread businesses with little plant; substantial past write-offs of goodwill (IBM/Lotus), or related adjustments that understate the actual cost of the firm's investments; or end-of-year versus beginning-of-year timing of cash flows.

The treatment of an item on the performance side (CFROI calculation) must be matched with consistent treatment on the valuation side. For example, if deferred taxes on the income statement are included in gross cash

flow, an estimate of the debt value of deferred taxes on the balance sheet must be incorporated when estimating the firm's residual or equity value.

## ENDNOTES

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[1]When working with U.S. inflation-adjusted data, one must specify the "dollars" being used:

1. Constant: Each year's dollars have the same purchasing power.
2. Current: Each year's dollars have the purchasing power of the specified year.
3. Historical: Summation of prior current dollar quantities (e.g., as-reported gross plant).

[2]In practical applications, replacement cost has a vague meaning and should not be confused with current dollars. The value/cost ratio differs from Tobin's "q ratio" in that the q ratio uses estimated replacement costs for net assets.

[3]Adjusting for changes in the purchasing power of the monetary unit is appropriate for typical industrial companies whose assets wear out over periods approximated by their accounting lives, even though their replacement costs can dramatically differ from the general price level. In this case, the purpose is to reflect an achieved measure of performance on *operating assets*; i.e., "How well did we do?" On the other hand, realizable market values are appropriate to answer the question, "What should we do?" when dramatic changes occur in asset values. Market values also apply to business units whose purpose is to earn capital gains by holding assets (e.g., real estate and land companies).

[4]The model firm in Exhibit 4 uses a 6.5% real project ROI where life is fifteen years, 20% of current dollar gross assets is non-depreciating and released in the fifteenth year, and gross cash flows are equal over the project life. Straight-line depreciation is used. Debt has a maturity equal to the project life and pays nominal interest at the rate corresponding to the long-term bond yield for the year of issuance.

The annual real asset growth rate is 3%, which determines the constant-dollar investment outlays for each year's new plant and related net working capital. Nominal outlays are computed consistent with the time series of inflation rates. Common dividends represent 25% of the sum of net income plus depreciation. Debt approximates 35% of as-reported net assets.

The model firm takes fifteen years (project life) to build up to a full portfolio of projects; this covers the years 1889 to 1903. Beginning in 1904, year-by-year additions to plant and new debt also involve plant retirements and debt repayments. Equity financing and share repurchase are the year-by-year, balancing variables, and, for the assumptions employed, these amounts are quite small.

[5]Excluded industries include SIC codes in the 2830s, 2900s, 4000s, 4400s, 4600s, 4800s, 4900s, and 6000s, as well as SIC codes under 1500 and over 8100.

[6]A 3 × 3 contingency table is constructed with CFROI change as top 25%, middle 50%, or bottom 25%. Shareholder return is also split this way. This provides a Chi-square of 1,053.7 and, with four degrees of freedom, translates to a standardized normal deviate of 23.19.

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