Merrill Lynch

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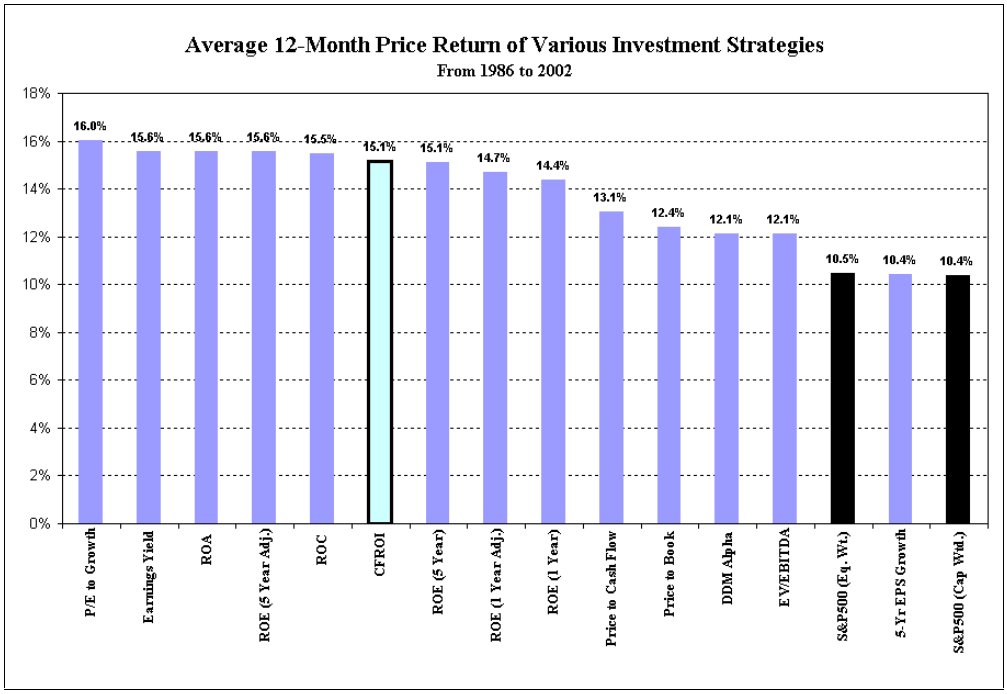
Quantitative Viewpoint

An Analysis of CFROI®

Quantitative

Investment Highlights:

- **In our continuing series of backtesting "new and improved" valuation measures, we have tested using CFROI® as a stock selection strategy.**
- **We have found that a strategy based on CFROI® did outperform the market over the time period studied, but it actually underperformed strategies based on simpler returns-based measures such as ROA and ROC.**
- **The study further supports our contention that reported earnings are the ultimate drivers of stock returns. A low P/E strategy based on reported 12-month trailing EPS outperformed a strategy based on the cash flow-based CFROI®. In addition, our measures of ROA and ROC are based on reported net income.**



Source: Merrill Lynch Quantitative Strategy

Refer to important disclosures at the end of this report.

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Introduction

We maintain that reported earnings are the ultimate driver of stock performance.

We have consistently maintained that reported earnings are the ultimate driver of stock performance, and have tested stock selection models based on newer and "sexier" metrics that are considered by some to be superior in determining a company's true value.

Some of our reports in this vein are:

***An Analysis of Earnings: Reported vs. Operating*, February 1999**

***An Analysis of Low EV/EBITDA*, September 2001**

***An Analysis of EVA® Part I*, December 1997**

***An Analysis of EVA® Part II*, February 1998**

In this new study, we examine the CFROI® Valuation technique to determine its merit as a stock-picking tool.

What is CFROI®?

Cash Flow Return on Investments, or CFROI®, is a measure of company performance developed by Holt Value and Associates. It is based on the assumption that a company can be modeled as a project that generates cash over the useful life of its underlying assets and investments.

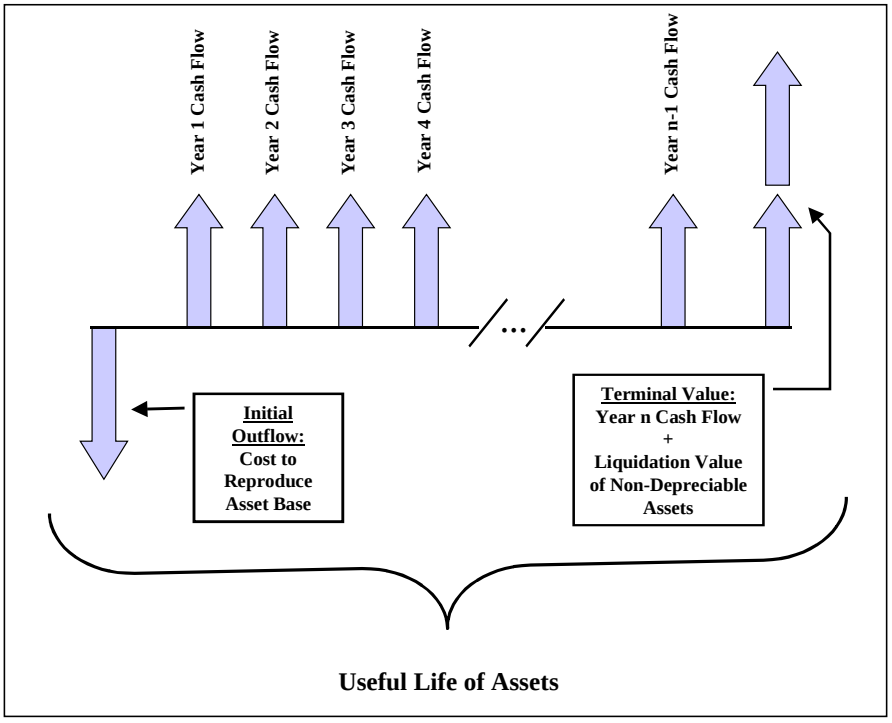
Under this framework, CFROI® is the implied return on these cash flows, or equivalently, the implied *discount rate* in the discounted cash flow model in which:

A The initial cash outlay is the amount required to replicate the asset base (both depreciable and non-depreciable) of the company

B. The terminal cash flow includes the liquidation value of the company's non-depreciable assets.

The following diagram depicts a company modeled as such a set of cash flows.

Diagram: Model of Cash Flows over Asset Life



Source: Merrill Lynch Quantitative Strategy

Where the DDM attempts to model shareholder return, CFROI® focuses on corporate reinvestment -- direct shareholder returns are only implied.

By reducing a company into a finite set of cash flows as depicted above, the implied return is thought to be a valid determinant of how well the company is using its assets and investments. Proponents of CFROI® argue that it measures how efficiently a company generates cash.

One should note that the theory behind CFROI® is similar to that of the traditional Dividend Discount Model (DDM). The main difference between the two is that the DDM attempts to model direct return to shareholders whereas the CFROI® model attempts to model corporate reinvestment. Direct investment returns are implied, but not modeled by CFROI®.

Methodology

To test CFROI® as a stock selection strategy, we calculated the price performance over time of a set of portfolios constructed solely on the basis of CFROI®, keeping fixed all other stock selection factors.

Investment Universe

We defined our investment universe as the S&P 500 Index. The index was reconstituted on a quarterly basis, therefore if a security in the CFROI®-based portfolio was dropped from the S&P 500 during a given quarter, the stock was automatically dropped from the portfolio that same quarter, regardless of its eligibility based on CFROI®. This may have introduced a slight bias toward larger capitalization stocks. However, we considered this effect less damaging to the integrity of the portfolio building process than the effect of widening our investment universe over time.

Data

The historical S&P index constituents used in the study are provided by Merrill Lynch's proprietary software Equity Screen©. All fundamental data used in the study are provided by COMPUSTAT® Annual. Historical monthly inflation rates are provided by Merrill Lynch Economics. We used annual fundamental data since quarterly data was not consistently available for all securities in the universe. The study spans March 1986 to December 2002.

To avoid a "look-ahead" bias, we lagged data by three months after the fiscal year-end to ensure that all information used to construct the portfolios would have been available to the investor at that point in time. The only information used on a real-time basis was price, which was used to calculate performance.

Formulae

We drew on the following sources to determine the calculation of CFROI®:

- Bartley J. Madden, *Cash Flow Return on Investment: A Total System Approach to Valuing the Firm* (Oxford: Butterworth-Heinemann, 1999.)

- Professor Aswath Damodaran, "CFROI® Model" (*Damodaran Online* at www.damodaran.com.)

We calculated CFROI® as follows:

1. We determined the life of the assets of the company in years by the following calculation:

   Asset Life (in Years) = Adjusted Gross Plant / Annual Depreciation Depletion & Amortization (DDA) Expense

   Where:

   Adjusted Gross Plant = Gross Property Plant & Equipment (PP&E) – Land & Improvements –Construction In Progress

   (We excluded securities with negative Asset Lives.)

2. We projected the cash flows over the life of the assets (n) with the initial outlay, annual cash flows and liquidation value determined as follows:

   For Year 0 (Initial Outlay):

   CF_0 = (Gross Investments) + (Non-Depreciating Assets)

Where:

Gross Investments = Inflation Adjusted Gross Plant + Intangible Assets + Accumulated Depreciation

And:

Non-Depreciating Assets = Current Assets – Current Liabilities + Gross Land + Other Long-Term Assets

For Years 1 through n-1 representing the stream of cash flows during the asset life:

CF_i = Gross Cash Flow (Total)

Where:

Gross Cash Flow = Net Income + DDA + Interest Expense + Rental Expense + Pension Costs - Pension Service Cost + Minority Interest Expense - Gain on Special Items (after tax)

The effective tax rate was used to calculate after-tax items.

For the Last Year (n) representing the last year of asset life and the final liquidation sale:

CF_n = Gross Cash Flow (Total) + Non-Depreciating Assets (Total)

3. We finally took the internal rate of return (IRR) for this set of cash flows, based on assumptions inherent in standard discounted cash flow analyses.

Inflation Adjustments

The data that we adjusted for inflation were plant and land. We assumed that in order to reproduce the asset base of a company, the assets can be valued at their book values plus accrued inflation over the number of years the assets have been on the books. In other words, inflation adjustments were made based on the *age of the assets*. The age of the assets at any given time can be approximated by the following calculation:

Asset Age = Accumulated Depreciation / Current Depreciation Expense

It is important to note that this is a different calculation than the Average Life of the Assets calculation, which is outlined in the section above. Asset age simply gives us a method for marking tangible assets' book value up to their current values based on inflation.

When adjusting data for inflation in our historical portfolios, we use the average of the actual monthly inflation rate time series stretching back over the *asset age* starting at the point in time at which the portfolio was being created. This proxy is used to simplify calculations, and provides a fairly accurate mark-up. For example, when determining the constituents of the May 1999 portfolio, in order to mark up assets with an average age of 5 years, we would use the monthly inflation rate averaged from May 1994 to April 1999.

This method does not take into account devaluation of assets based on obsolescence, availability of cheaper substitutes, or other factors that are difficult to predict.

Portfolio Construction

We constructed and tracked the following equal-weighted portfolios:

- Top 50 stocks in universe with the highest CFROI®
- Bottom 50 stocks in universe with the lowest CFROI®

For each portfolio, we held the holdings portfolio fixed for one quarter and then re-balanced based on (a.) additions to and deletions from the investment universe as well as (b.) changes in the CFROI® rankings based on changes in annual fundamental data.

Our analysis does not account for transaction costs, however we have no reason to believe that transaction costs using this stock selection strategy would vary significantly from those of other stock selection strategies using returns-based measures.

Results

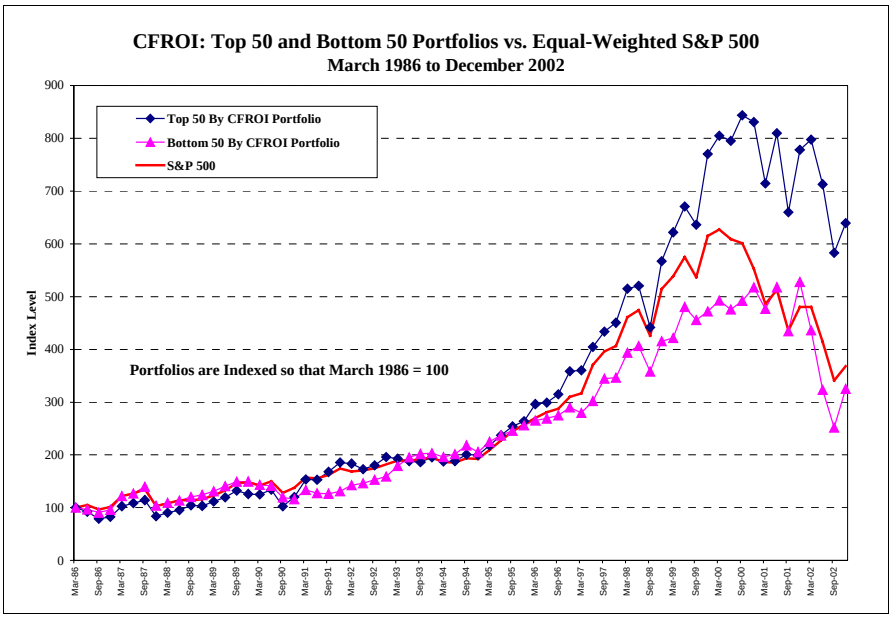
At first glance, the portfolios' absolute performance numbers suggest that CFROI® may be effective for stock picking. Indeed, the high CFROI® portfolio outperformed the S&P500 and the low CFROI® portfolio under-performed the S&P500.

	Average Quarterly Performance	Average Annual Performance
Top 50 CFROI®	3.6%	15.1%
S&P 500 Equal Weighted	2.7%	10.5%
S&P500 Cap Weighted	2.5%	10.4%
Bottom 50 CFROI®	2.5%	9.7%

Source: Merrill Lynch Quantitative Strategy

The following graph shows the performance of the two CFROI®-based portfolios against the performance of the equal-weighted S&P500 over the period studied.

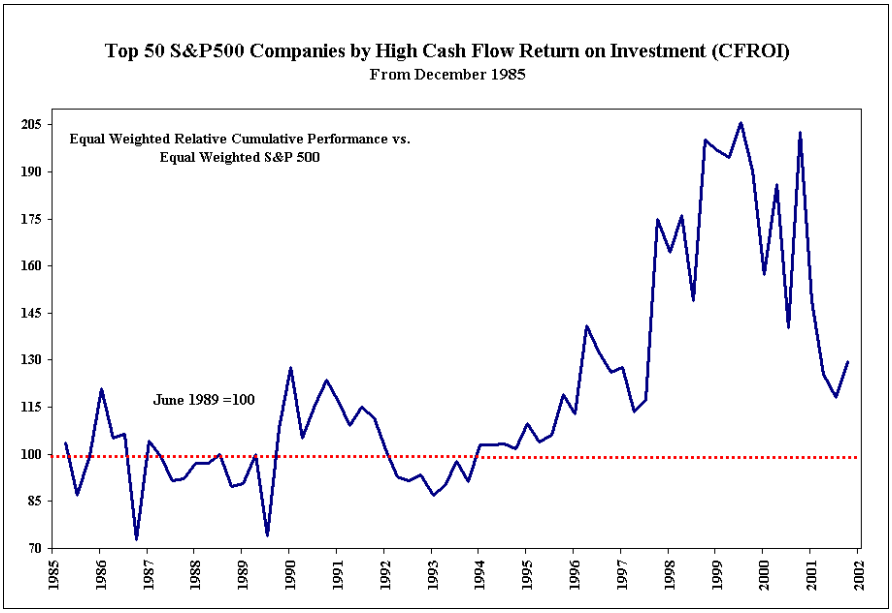
The high CFROI® portfolio outperformed the S&P500 and the low CFROI® portfolio underperformed the S&P500.



Source: Merrill Lynch Quantitative Strategy

The following chart shows the performance since inception of the Top 50 by CFROI® portfolio relative to the equal-weighted S&P500.

CFROI performed very well during the bubble period when earnings were less important to many investors.



Source: Merrill Lynch Quantitative Strategy

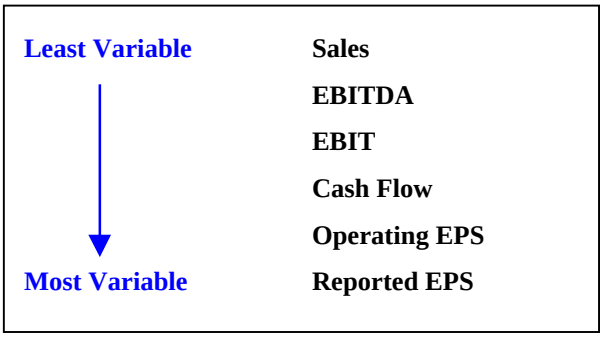
While the Top 50 by CFROI® portfolio clearly outperforms the equal-weighted S&P500 over time, it does not appear to do so in a systematic way, but instead exhibits irregular levels of both over- and under-performance.

Moreover, even though this strategy outperforms the equal-weighted S&P500, when comparing average annual performance with the performance of other stock selection methods that we follow, we saw that CFROI® performs either in-line with or worse than our other returns-based portfolios including ROC and ROA. The cover chart depicts the performance of the CFROI® strategy within the context of our other models' performance statistics.

In some cases, portfolios constructed according to a returns-based measure using reported earnings outperformed the counterpart based on free cash flow.

Our other returns-based metrics use reported earnings as opposed to free cash flow. The fact that portfolios constructed according to a returns-based metric using reported earnings outperformed a counterpart based on free cash flow supports our long standing theory: reported earnings are a better predictor of stock performance than are other fundamental variables.

We have argued that using anything other than reported earnings to evaluate a company might cause investors to underestimate the risk of a company. The diagram below depicts the order of variability of earnings measures. We see that reported earnings are more variable than operating earnings, which in turn are more variable than free cash flow, which is used for our CFROI® calculation.



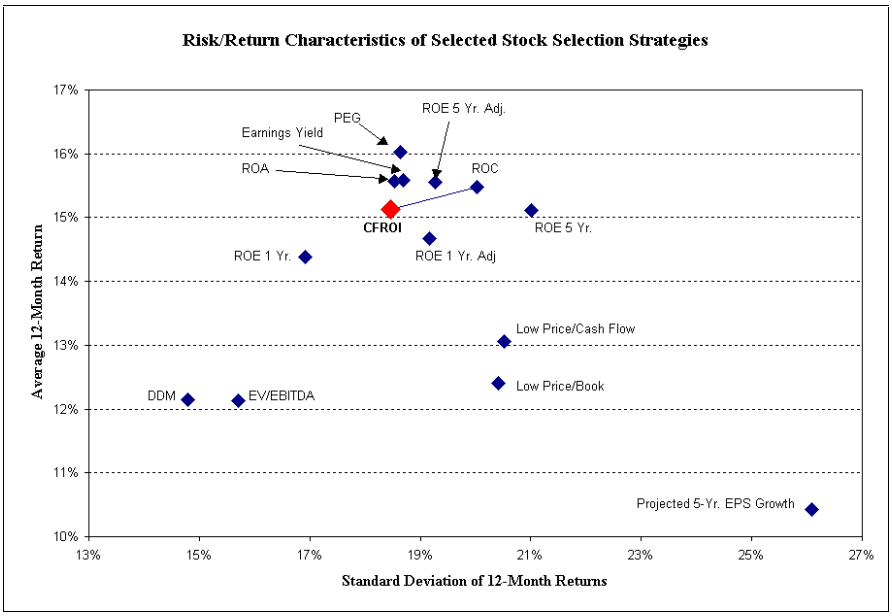
Source: Merrill Lynch Quantitative Strategy

Risk/Return

In order to determine whether the CFROI® portfolio's performance comes at the expense of an excessive amount of risk, we compared the risk and return characteristics of several of our portfolios over time. The following chart shows two characterizations of risk-return data for several portfolios that we track. In the first graph, the vertical axis measures the compound annual average return and the horizontal axis measures the risk in the form of standard deviation of returns over the period studied. The second chart is essentially the same except that risk of the portfolio is defined as probability of loss (the percentage of negative returns in the entire set of 12-month returns.)

Our risk/return analysis shows that the CFROI® strategy's higher returns appear to be largely attributable to the strategy's higher risk

In the following charts, "Northwest" strategies have historically had higher returns with less risk than have "Southwest" strategies. Our risk/return analysis shows that the CFROI® strategy's higher returns appear to be largely attributable to the strategy's higher risk. This is quite apparent when comparing the strategy's standard deviation/return characteristics to those of our Dividend Discount Model (DDM). There appears to be little difference in the risk-adjusted returns of the CFROI® strategy versus those of many other strategies tested. However, CFROI® appears to be superior, on a risk/return basis, to strategies such as Low P/CF, Low P/B, or high projected 5-Year EPS Growth. It appears to be slightly inferior to strategies such as ROA, Low P/E (high earnings yield), and Low P/E-to-Growth.



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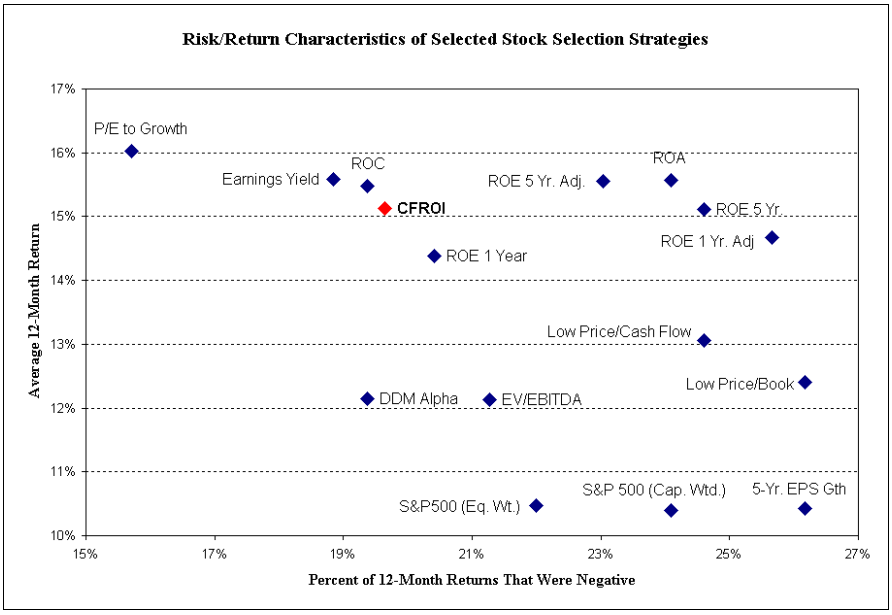

Source: Merrill Lynch Quantitative Strategy

Conclusion

CFROI® does not appear to be a clearly inferior strategy, as have some others we have tested in the past. However, it does not appear to be a clearly superior strategy either. It does appear to be preferable relative to traditional cash flow-based approaches (such as Price to Cash Flow), but it does not stack up as well as other returns-based measures or against simple valuation statistics based on reported earnings.

As we have done in previous reports, we question whether the incremental returns of strategies based on "new and improved" measures justify the time, effort and cost required to implement them.

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Coverage Universe	Count	Percent	Inv. Banking Relationships*	Count	Percent
Buy	1110	43.46%	Buy	391	35.23%
Neutral	1236	48.39%	Neutral	319	25.81%
Sell	208	8.14%	Sell	43	20.67%

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