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ORIGINAL ARTICLE

Does duration of competitive advantage drive long-term returns in the stock market?

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ABSTRACT

The purpose of this article was to develop a new indicator to estimate the aggregate long-term expected return on stocks. There is not a widely used method to model directly the aggregated expected return of the stock market. Most current methods use indirect approaches. We developed a new indicator that does not need an econometric model to generate expected returns and provides an estimate of the long-term expected returns. The proposed methodology can be used to develop an indicator of future returns of the stock market similar to the yield-to-maturity used for bonds. We used a restricted one-stage constant-growth model – a variant of the residual income model (RIM) – whose main input is the duration of companies' competitive advantage and cyclical adjusted real return on invested capital (ROIC) with a 10-year average. We used a new methodology to develop an indicator of the long-term expected return on the equity market at the aggregate level, considering the duration of the competitive advantage of companies. Our results showed a strong correlation between the estimated implied return on equity (IRE) of current stock prices and realized returns of the 10-year real total return of the index.

Keywords: stock market, return on equity (ROE), implied cost of capital, long-term returns, competitive advantage.

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1. INTRODUCTION

In his 2014 letter to shareholders of Berkshire Hathaway Inc., Warren Buffett (2014, p. 20) wrote:

> What I advise here is essentially identical to certain instructions I've laid out in my will. One bequest provides that cash will be delivered to a trustee for my wife's benefit. […] My advice to the trustee could not be simpler: put 10% of the cash in short-term government bonds and 90% in a very low-cost S&P 500 index fund.

This quote brings two questions to mind: first, what if the Standard & Poor's 500 (S&P 500) is too expensive at the time of purchase? And second, what will be the expected return on investing in this index fund? Our goal in this study is to answer these questions. The first one is related to the role of the duration of companies' competitive advantage, and the second to the estimation of aggregated long-term expected returns of the S&P 500 using the implied return on equity (IRE) that is contained in the current stock prices. We use a restricted one-stage constant-growth model – a variant of the residual income model (RIM) – whose main inputs are the duration of companies' competitive advantage and the cyclical adjusted real return on invested capital (ROIC) as a 10-year average.

Siegel (2005) studies the historical return of investments in the U.S stock market and concludes that the average annual real return in the period from 1802-2004 was 8.38% when using arithmetic averages and 6.82% when using compound averages. These returns exceeded the real long-term annual returns of U.S. government bonds by 4.50% and 3.31% for the respective averages over the same period. Nonetheless, there were subperiods, such as 1966-1981, in which the real return in the stock market was negative (-0.36%). Bernstein (1997) also studies nearly 200 years of data and concludes that the mean nominal basic return on equities was 9.6% with a tendency to regress to the mean, compared with 4.9% of bonds for which the mean reverting tendency did not exist.

Although most of the time investing in the stock market yields higher returns than the bond market, the entry date and the length of the investment period condition the realized return. Studies have explored several economic indicators in order to forecast stock market returns. They can be grouped either as (i) economy-related indicators or (ii) market price-related indicators. Included among the economic indicators are inflation (Campbell & Ammer, 1993), Treasury bill yield (Ang & Bekaert, 2007; Campbell & Ammer, 1993), relative Treasury bill yield compared to the historical average (Lamont, 1998; Lettau & Ludvigson, 2001), differences between the yields of corporate bonds and those of Treasury bills (Campbell & Ammer, 1993; Fama & French, 1989; Pontiff & Schall, 1998), differences between highly ranked corporate bonds and average corporate bonds (Fama & French, 1989; Pontiff & Schall, 1998), and the aggregate wealth-consumption ratio (Lettau & Ludvigson, 2001). These indicators do not consider the current price of the stock index or individual shares, but the effect on the price of shares as a consequence of changes in the level of the economy.

A second group of indicators relates the stock price with other variables. We can divide this group of indicators into two subgroups: the first one includes the yield related indicators (earning yield, dividend yield, dividend plus buybacks yield, and implied cost of capital [ICC]) and the second includes the non-yield related indicators (price earnings ratio [PE] and book to market). The most popular among the first subgroup is the dividend yield (Fama & French 1988; Monteiro et al., 2020; Rozeff, 1984), while the most popular indicators among the second subgroup are the price-earnings ratio (Campbell & Shiller, 1988), the earnings-price ratio (Campbell & Shiller, 1998; Fama & French, 1989), the book-to-market ratio (BM) (Pontiff & Schall, 1998), and dividends and buybacks (Straehl & Ibbotson, 2017).

In general, all these indicators relate the market price of the company or index with one of their economic variables, such as dividends, earnings, book value, and buybacks. Within this group we may also include those indicators that estimate the ICC that is contained in the market price of the stock or index (Botosan & Plumlee, 2002; Claus & Thomas, 2001; Daske et al., 2006; Easton, 2004; Gebhardt et al., 2001; Gordon & Gordon, 1997; Malkiel, 1979; Ohlson & Juettner-Nauroth, 2005). The indicators that estimate the ICC also do not consider the loss of competitive advantage, with the exception of Gebhardt et al. (2001), who partially consider it.

Given the above, we aver that the duration of companies' competitive advantage is an important determinant of long-term expected returns on equity at the aggregate level. The above indicators do not account for diminishing competitive advantages over time. They also provide results that need to be modeled to determine an expected return. Such models are frequently subject to statistical limitations such as structural breakpoints, autocorrelation, and heteroscedasticity. Hence, our contribution is to use a new methodology to develop a new indicator that does not need an econometric model to generate the expected returns. Besides, due to the fact that our indicator is based in the model of Forsyth (2019), it also includes the effect of companies' competitive advantage and provides a better estimate of the long-term expected returns at the aggregate level.

In the next section we explain the model developed by Forsyth (2019), a variant of the RIM that we will use to estimate our indicator called the IRE, but at the aggregate level. In the third section, we propose a method to model stock market returns with the IRE model at the aggregate level, while in the fourth and fifth sections we present the results and discuss them, respectively. The last section concludes the research and presents implications and future topics of research.

2. THE IRE MODEL WITH COMPETITIVE ADVANTAGE

The model we use to estimate the IRE is based on Forsyth (2019). He developed the following equation that is an alternative formula, but mathematically identical, to the one-stage constant growth formula:

$$PVE_0 = BVE_1 + \frac{BVE_1 \times (ROE_1 - K_E)}{K_E} + g \times BVE_1 \times \frac{\frac{(ROE_1 - K_E)}{K_E}}{K_E - g} = \frac{CF_1}{K_E - g} \quad (1)$$

in which PVE is the market price of the stock, BVE is the initial book value of equity, ROE is the return on equity, K_E is the cost of equity, g is growth, and CF_1 is the cash flow to equity in period 1.

Equation 1 indicates that the PVE is equal to the sum of: (i) the value of the current equity investments; (ii) the present value of the return over the cost of capital of the current equity investments; and (iii) the net present value of all future equity investments. It also shows that the value of a company depends on the amount invested in the form of the BVE, the ROE, the growth, and the cost of capital.

The ROE is estimated dividing the net profit of the period by the initial book value of the same period. There is an alternative methodology that considers the average book value of the period. The RIM literature uses the initial book value instead of the average value; therefore, we will use the initial book value to estimate the ROE.

Although there can be several drivers of long-run equity returns, such as institutional trade persistence (Dasgupta et al., 2011), dividends, and buybacks (Straehl & Ibotsson, 2017), we focus our analysis on the effect of the duration of companies' competitive advantage that the literature has so far neglected.

We understand competitive advantage as the ability of a company to generate sustained extraordinary returns over time that exceed its cost of capital. In an environment of perfect competition, the return equals the cost of capital. If a company is able to differentiate from its competitors, it obtains a competitive advantage that allows it to generate an additional return than its cost of capital. The excess or extraordinary return is the consequence of the competitive advantage, and it is expected to decrease over time as a result of the competitive forces of the market. According to Porter (1985, p. 11), "the fundamental basis of above-average performance in the long run is sustainable competitive advantage". Porter (1980, p. 5) adds, "competition in an industry continually works to drive down the ROIC towards the competitive floor rate of return […] is approximated by the yield on long-term government securities adjusted upward by the risk of capital loss".

Hence, the value of equation 1 depends on the persistence of the competitive advantage, that is, the difference between the ROE and K_E. Jacobsen (1988) studies the behavior of stock returns and finds that the return on investment has a mean reverting behavior and that the competitive advantage disappears over time. Wiggins and Ruefli (2002) reach a similar conclusion, with the exception that while most companies in their sample have a mean reverting tendency, a small group sustain their competitive advantage over time.

In order to incorporate the fact that competitive advantage cannot last forever, we modify equation 1 that assumes that the competitive advantage remains in perpetuity. We split competitive advantage into (i) the advantage that is derived from previous investments at the beginning of the base period and (ii) the advantage that is obtained from future investments. Future investments assume that each year for the remaining life of the company, new investment opportunities with positive net present values will exist and that each of the investments made each year will yield perpetual competitive advantage.

To incorporate different time restrictions into the duration of competitive advantage for current investments and for future investments, Forsyth (2019) converts the perpetuities of equation 1 to annuities and ends up with the following equation:

$$PVE_0 = BVE_1 + BVE_1 \times (ROE_1 - K_E) \times \frac{1}{K_E} \times \left(1 - \frac{1}{(1+K_E)^P}\right)$$
$$+ \left[g \times BVE_1 \times (ROE_1 - K_E) \times \frac{1}{K_E} \times \left(1 - \frac{1}{(1+K_E)^M}\right)\right] \times \frac{1}{K_E - g} \times \left(1 - \frac{(1+g)^X}{(1+K_E)^X}\right) \quad (2)$$

in which P is the number of years the competitive advantage of previous investments lasts, X is the number of years in which companies find new investment opportunities with competitive advantage, and M is the number of years that the competitive advantage of the new investments in each period lasts.

Equations 1 and 2 were developed by Forsyth (2019) to be applied to individual companies. In this work, we will apply the same equations to a group of companies that form the S&P 500 index. Instead of using the equations to determine the value of the index, we will use them to estimate the implied return contained in the stock prices of the index, which is a broader application of the previous proposal. We expect that this new variable will explain the long-term returns from investing in the stock market.

For equation 2, we consider three-time frames for equity investments. We start with current or existing investments in the base period and assume that the gap between ROE and K_E lasts for P years, and in year P+1 the ROE equals K_E. Then we consider the number of years in which the company finds projects with a positive net present value that add to its value and limit this period to X years.

In the year X+1, the new projects developed by the company have a ROE that equals K_E, so they do not add value. Finally, each of the new investments made during the next X years yields a return that exceeds its cost of capital for M years, and in year M+1 the ROE equals K_E. Thus, P is defined as the number of years that the current investments yield a competitive advantage, X is the number of years that the company finds new investments that yield returns exceeding its cost of capital, and M is the number of years in which each of the new investments generate a competitive advantage.

The IRE estimated from equation 2 is the value of K_E that equates both sides of the equation. We then use the resulting value to assess its relationship with the stock market's long-term returns. We also estimate the implied return contained in the traditional one-stage constant growth model with equation 1. We call this return's value the unrestricted IRE (UIRE), as it does not consider any restrictions on the duration of the competitive advantage. The UIRE is the value of K_E that equates both sides of equation 1.

3. METHODOLOGY

We study the relation between the IRE and the long-term equity returns. Hence, using the IRE values for each period that are estimated with equation 2, we perform the following linear regression:

$$R_i = \alpha + \gamma \times IRE_i \quad (3)$$

in which R_i is the annualized geometric average of in the stock market for the next 10 years starting in period i and IRE_i is the IRE for period i.

3.1 Number of Stages and Investment Horizon

To estimate the IRE, we have to decide whether to use a one-stage model or a multi-stage model. Equation 1 is a one-stage constant growth model, and equation 2 adds restrictions to the previous equation. Additionally, we also have to choose the time horizon on which to evaluate the returns. Frequently, a two-stage model is used to distinguish an explicit time horizon for a competitive advantage and an implicit time horizon for the steady state returns. Botosan and Plumlee (2002), Claus and

Thomas (2001), Daske et al. (2006), Easton (2004), Easton et al. (2002), Gordon and Gordon (1997), and Malkiel (1979) use a multi-stage model in which they use analysts' forecasts of dividends and earnings growth for the following periods (which vary from two to five with the exception of Malkiel [1979] who uses 20 years instead), while Claus and Thomas (2001) also estimate the ICC using a one-stage model for the dividend discount model (DDM).

Gebhardt et al. (2001) use a three-stage model that starts with a two-year analyst forecast, followed by a second intermediate period in which the forecasted ROE has a linear transition from the value shown in the second-year forecast until it equals the median ROE of the industry. In the third stage, they assume that the median ROE of the industry remains as a perpetuity and use it in a non-growth perpetuity to estimate the terminal value. However, it is also possible to consider a one-stage model with restrictions where the restrictions represent the duration of the company's competitive advantage, hence we use a one-stage model with restrictions instead of a multi-stage model.

Once an investment is made, it is usually not easy to liquidate the assets because most investments are irreversible. Thus, to properly evaluate the performance of such investments, we wait until they mature and show results. Studies have used different time horizons to estimate stock market returns.

For example, Rozeff (1984) uses yearly returns, Pontiff and Schall (1998) use monthly and yearly returns, Fama and French (1988) use month, quarter, year, two-year, three-year, and four-year returns, Lettau and Ludvigson (2001) use returns that range from quarterly to six years, and Campbell and Shiller (1988) use year, three-year, and 10-year horizons. We consider that the life of long-term bonds is a reasonable period to observe the performance of the investments made. We match the "wait and see" period of stocks with the lifetime of the long-term bonds – specifically that of the 10-year Treasury bond.

3.2 The Variables

3.2.1 Return on the stock market

We estimate the stock market returns (R) of the S&P 500 index using equation 4. We use the total real return of the index that adds back the dividends paid and assumes these dividends are reinvested in the index and yield the same future returns as the S&P 500. In equation 3 we use the yearly compound real return of the stock market for 10 years to mimic the 10-year Treasury bond.

$$R = \left(\frac{VI_F}{VI_I}\right)^{\frac{1}{L}} - 1 \qquad (4)$$

in which VI_F is the final value of the index, VI_I is the initial value of the index, and L is the number of years between the dates of the final value of the index and the initial value of the index.

3.2.2 Return on equity

We estimate the ROE by dividing the net profit of the last four quarters by the initial BVE at the first quarter of the set. Due to leverage changes over time, we use equation 5 to unlever each ROE to obtain the nominal ROIC. For this return, we assume that the cost of debt is equivalent to the yield of a 10-year Treasury bond. We then estimate the real ROIC by deflating the nominal ROIC according to inflation. We use a rolling window average of the last 10 years to stabilize the ROIC and to estimate a cyclical adjusted real ROIC. We then estimate the real ROE with the current leverage. The resulting ROE is used to estimate the IRE of equation 2:

$$ROIC_1 = \frac{ROE_1 + \frac{D_1}{BVE_1} \times \left(K_D \times (1 - t)\right)}{1 + \frac{D_1}{BVE_1}} \qquad (5)$$

in which ROIC is return on invested capital, D is the initial book value of debt, K_D is the cost of debt, and t is the corporate tax rate in period 1.

We adjust the market value of equity to incorporate the changes in leverage by adding the variations of the present value of the tax shield to the market value of equity that is estimated by multiplying the change in debt with the effective tax rate.

The procedure just described uses historical returns to estimate the IRE instead of forward-looking earnings based on analyst forecasts. Easton and Sommers (2007) study analysts' estimate and conclude that they are biased upwards and that they usually give an optimistic forecast of future earnings.

3.2.3 Growth

To estimate long-term real growth, we use the average real growth of the U.S. economy for the last 10 years and add the expected inflation. This leads us to assume that on average companies grow at a similar rate as the economy. This does not assume that all companies grow at the same rate, as there will be some that grow at higher or lower rates, but on average they will grow at the same rate as the economy.

In relation to growth, short-term improvements in efficiency can lead to growth in sales and profits within the same investment. Once we have implemented the optimal practices, the growth rates of sales, profits, and investments should be equal. In the long term, if ratios such as ROIC, net profit, or asset turnover grow at different rates, they equal 0 or infinite, but if they grow at the same rate, the ratios are stable over time. Gross domestic product (GDP) growth reflects the growth in the total net sales of the economy and thus is a good proxy of investment growth when companies reach stability in their operations.

3.2.4 Duration of the competitive advantage

The only literature we have found that estimates the duration of the competitive advantage is Mauboussin and Johnson (1997). They estimate the implied competitive advantage period of the S&P 500. We do not use the results of this study since we consider that there can only be one implicit value in equation 2, which is obtained by assigning values to all the other components of the equation.

Other studies, such as Hillen and Lavarda (2020) and Miller and Friesen (1984), study the different stages that the company goes through and the duration in some of the stages. The lifetime of a company will normally exceed the duration of the competitive advantage, as the later will be part of some of the stages.

Considering that there is no literature that we can use to estimate the duration of competitive advantage, we have proceeded to estimate it in an indirect way. We have assumed that the average lifespan of companies in the S&P 500 index is a measure of the duration of competitive advantage. To do this, we have considered the date of entry into the index for each company and the average time that companies have remained in the index for each period.

As indicated previously, P stands for the number of years for which the competitive advantage lasts for existing investments, X is the number of years that the company finds investment opportunities with a competitive advantage, and M is the number of years that a new investment in each period yields a return that exceeds its cost of capital.

As long as there is a year in which returns exceeds the cost of capital, it is considered that the company maintains its competitive advantage. This means that the duration of variable X will mark the last year in which the company will make investments that generate a return that exceeds the cost of capital and that this last investment will last M years, so the duration of the competitive advantage will be the sum of M+X. However, it could happen that the competitive advantage related to X+M is different than the original one related to P and the later could last longer than the sum of M+X, in which case the duration of the competitive advantage will be the value of P.

As companies lose their ability to create value through investments over time, a reasonable assumption is that future investments with competitive advantage have a shorter lifespan (M) than existing investments (P). Similarly, if the latter is true, another reasonable assumption is that the number of years in which companies are able to create investments with competitive advantages (X) should be less than the actual competitive advantage of those investments (M). Henceforth we assume that $P > M > X$ and based on these assumptions, we pick the simplest fractions that make this true, thus $M = \frac{3}{4}P$ and $X = \frac{2}{3}P$. We have also tested other fractions from ¼ to 1 to determine the relevance of using other fractions in the results.

Our proposed model has a similar effect as that of Gebhardt et al. (2001), who assume that the ROE trends towards the cost of capital and equals it in the last stage of the model. It also considers the possibility that a company may take on projects that destroy value when the ROE is below the cost of capital. Nevertheless, we consider this situation to be unlikely, and if it does happen the period of value destruction will be limited by the values of P, M, and X.

We have not found a reliable measurement for the duration of the competitive advantage in the literature. The average time a company remains in the index as a proxy for this variable has limitations. The criteria of adding or eliminating a company of the index is not necessarily related to its competitive advantage. Companies have many years of existence before entering the index and most of them continue existing after leaving it. Nonetheless, if a company continue being successful over time, it is usually kept as part of the index, and if in average they stay a longer or shorter period, could be a sign that the duration of the competitive advantage is changing over time. More research is needed to determine a reliable indicator of the duration of the competitive advantage.

3.2.5 BVE and PVE

BVE is the value of equity shown in the financial statements at the beginning of each quarter, which is the same as the end of the previous period. PVE is the market price of stock.

3.3 Creating a Representative Company for the S&P 500

To estimate the ROE, we construct an average company for the S&P 500. We consider all companies with available information and multiply the market value of each company, the BVE, the value of the debt, and the net income of each company by an averaging factor that is calculated using market value weights. We use the average company for each quarter to estimate the ROE for each period, then we unlever it to obtain the nominal ROIC that we deflate to obtain a 10-year average real ROIC. We then lever the real ROIC with the current debt to equity ratio to obtain the adjusted ROE used to compute the IRE in each period. The only relation between different periods is the real ROIC that is estimated with the available information for each quarter.

The advantage of using a representative company is that we only need a subset of companies in the index in order to estimate the IRE. Therefore, it is enough to use only the companies with complete information, and discard those with incomplete information. In this sense, we pay attention to the rebalancing of the index through the available information, but not through returns as in Siegel and Schwartz (2006).

3.4 Estimating the IRE

We estimate the value of IRE that equates both sides of equation 2. The IRE limits (i) the period of time in which the return of current equity investments exceeds the company's cost of capital, (ii) the number of years that the company finds new equity investments with a return that exceeds the cost of capital, and (iii) the number of years that each of the new investments has a return that exceeds the cost of capital. After the period established for each of the above cases, the company's return equals its cost of capital.

3.5 Data

We used the data on S&P 500 firms to compute the IRE for each quarter. We obtain the price data from the Centre for Research in Security Prices (CRSP) and the financial information from Compustat. The information about stock prices is available for a significant part of the index's history, but we can only find financial statements for approximately 400 of the companies in the S&P 500 starting from 1975 until 2020. If the company has a different closing month than March, June, September, or December, then we combine the financial data reported for each quarter with the market capitalization at the end of these four months.

The S&P 500 total return is taken from Ibbotson (2018), the return on government bonds is taken from the U.S. Bureau of Economic Analysis (2019) (https://data.oecd.org/interest/long-term-interest-rates.htm), inflation is calculated from the consumer price index that comes from the U.S. Bureau of Labor Statistics (2019) (https://www.bls.gov/cpi/data.htm), the GDP growth comes from the Organization for Economic Co-operation and Development (2019) (https://data.oecd.org/gdp/quarterly-gdp.htm#indicator-chart), the expected inflation comes from the Federal Reserve Bank of St. Louis (2019) (https://fred.stlouisfed.org/series/T10YIE), and the effective tax rate is calculated from the corporate profits after tax and the Federal Government tax receipts on corporate income that come from the U.S. Bureau of Economic Analysis (2019) (https://apps.bea.gov/iTable/iTable.cfm?ReqID=13&step=1#).

4. RESULTS

4.1 Statistical Considerations

In order to run the regression, we first test the total return of the stock market (R) and the IRE for stationarity. For this purpose, we run the Kwiatkowski-Phillips-Schmidt-Shin tests (KPSS) (Kwiatkowski et al., 1992). The test rejects the null hypothesis that the variables are stationary ($p \sim 0.1$ for R and $p < 0.05$ for IRE).

We also run the augmented Dickey Fuller test (ADF) (Dickey & Fuller, 1979), but it fails to reject the null hypothesis of the presence of unit roots ($p = 0.5078$ for R and $p = 0.2481$ for IRE). With these results we conclude that both the IRE and R are not stationary and must be integrated.

We determine the order of integration by using both the KPSS and ADF test. The results show that when using the first order finite differences we cannot reject the null hypothesis of stationarity, but we can reject the null hypothesis of a unit root present in both series that allows us to conclude that both variables are stationary in the first order integration (KPSS: $p >> 0.1$; ADF: $p << 0.01$ for R and KPSS: $p >> 0.1$; ADF: $p << 0.01$ for IRE).

We detect the presence of structural breakpoints using the Bai-Perron method, so we test for cointegration using the Saikkonen & Lütkepohl (2001) extension of the Johansen method. The test returns $p < 0.01$ for the presence of cointegration and $p > 0.1$ for cointegration of order above one with which we conclude there is cointegration of order one.

The results of the regression for the IRE using equation 3 are shown in Table 1. Table 1 covers a period starting in the first quarter of 1975 and ending in the first quarter of 2010. Using the IRE estimated in the first quarter of 2010, we forecast the return for the next 10 years that end in 2020. Although we have data to estimate the IRE for the period from 2008-2020, we do not have the 10-year return during the last period, which is required to run the regression.

The R^2 of regression is robust and demonstrates that the IRE and the total return of the S&P 500 are correlated. Hence, the IRE is a statistically significant indicator to estimate the 10-year geometric return of the S&P 500. The R^2 of the IRE is 45.71% and has an intercept of 0.045 and a slope of 0.6469. We were expecting an intercept with a value close to 0 and a slope of 1.

Figure 1 shows the realized 10-year returns for the testing period with the estimated IRE. We have also included the UIRE, which is the implied return of the traditional one-stage constant growth model. The IRE better forecasts the realized return of the S&P 500 in comparison to the UIRE, but the UIRE keeps a more stable value over time. The values shown are the raw values that are estimated by using the explained procedures without using a regression.

As we are plotting the UIRE, we also give the results of the regression of the UIRE as the independent variable with the total return of the stock market as the dependent variable for the period from 1975Q1-2010Q1. This indicator has strong statistically significant results with an R^2 of 30.48%, an intercept of -0.043, and a slope of 1.28.

Table 1
Results of the regressions of the implied return on equity (IRE) as independent variable with the total return as dependent variable for the period 1975Q1-2010Q1

	IRE
R^2	45.71%
Intercept	0.0454 (***)
Slope	0.6469 (***)

Notes: *This table shows the results of the regression between the IRE determined from equation 2 as the independent variable with the total return of the stock market as the dependent variable. The data reflect the annualized returns for the 10-year periods and encompasses the period from 1975Q1-2010Q1.*
****, **, * = significance at 99, 95, and 90% level of confidence, respectively.*
Source: *Elaborated by the authors.*

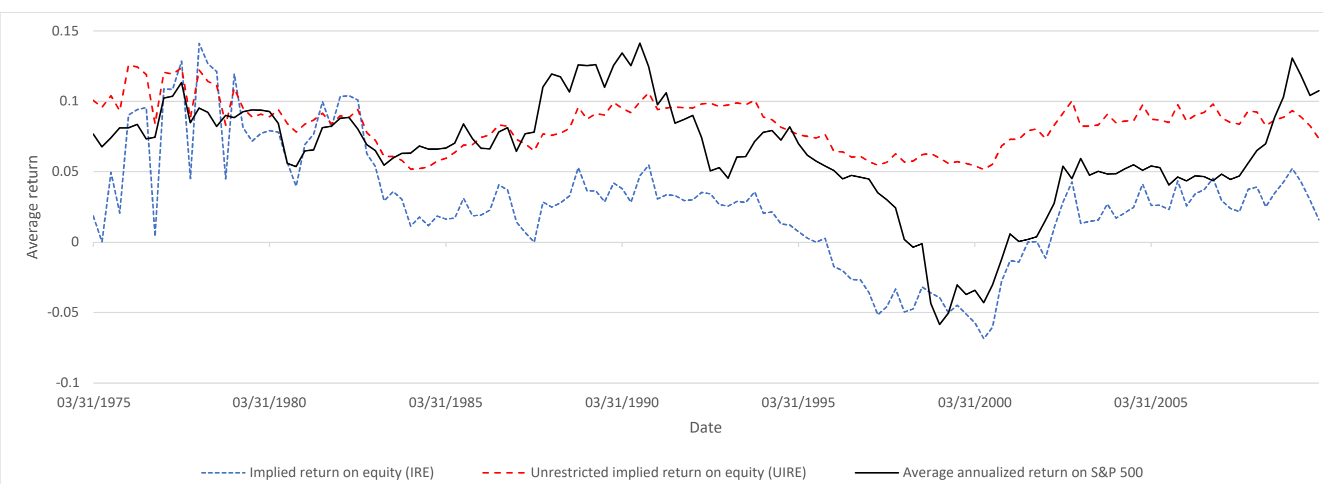

Figure 1 *Realized returns, IRE and UIRE for the period 1975Q1-2010Q1.*
Notes: *This figure shows the annualized 10-year forward geometric average returns for the Standard & Poor's 500 (S&P 500). The returns shown are: (i) the realized returns; (ii) the IRE that uses the restricted version of the model determined from equation 2; and (iii) the UIRE that uses the unrestricted version of the model determined from equation 1. The IRE and UIRE are the solutions to equations 2 and 1, respectively. The results are shown for each quarter for the period from 1975Q1-2010Q1.*
Source: *Elaborated by the authors.*

4.2 Robustness of the Results

We test the realized returns for different periods, from one year to 15 years (not reported). The results are statistically significant, but weak when explaining the one-year returns using the IRE. The R^2 improves as the forecasting period extends up to the 13-year forecast. In years 14 and 15, the R^2 marginally decreases.

We also test other combinations of M and X as fractions of P with values of ¼, ⅔, ½, ¾, and 1. The results are in Table 2. They are statistically significant for all combinations. The lowest R^2 is 42.11% and the p-value is below 0.0001. We can conclude that the different relations of P, M, and X will not change the main conclusions of this paper.

Table 2
R² for different combination of P, M, and X for the period 1975Q1-2010Q1

m/x	1/4	1/3	1/2	2/3	3/4	1
1/4	47.93%					
1/3	47.90%	47.83%				
1/2	47.79%	47.58%	46.98%			
2/3	47.55%	47.32%	46.81%	45.92%		
3/4	47.44%	47.23%	46.18%	45.71%	45.00%	
1	46.89%	46.45%	45.20%	44.51%	43.81%	42.11%

Notes: *This table shows the R^2 of the regression between the implied return on equity (IRE) determined from equation 2 as the independent variable with the total return of the stock market as the dependent variable for different combinations of P, M, and X. The data encompasses the period from 1975Q1-2010Q1.*
Source: *Elaborated by the authors.*

We test different variations of the average number of years in which the company stays in the S&P 500 to estimate the value of P, M, and X. Our results show that the IRE is relatively stable under small variations of P, M, and X.

We select the 10-year average of the cyclical adjusted real ROIC as the base case scenario. We have also tested other periods of average ROIC that start in year 1 and go to year 10. The best results come from the base case scenario of 10 years, but using the other averaging windows still yields significant results. Similarly, the use of the nominal ROE yields statistically significant results.

The variations in the ROE and the growth rate have an effect on the IRE. The ROE variations within one standard deviation (SD) of the historical mean affect the IRE around +/-1.01% with +/-2.16% for two SDs. Growth variations within one SD account for -/+2.61% with -/+5.21% for two SDs.

4.2.1 Use of overlapping time series

Our results are also subject to some limitations because we use overlapping series. The problem with overlapping time series within econometrical data is a well-known issue as presented by Britten-Jones et al. (2011) and Harri and Brorsen (1998). The use of rolling averages produces undesirable autocorrelations that bias the regression results and favor rejections of the null. Harri and Brorsen (1998) offer two main causes for an overlapping series: when the series itself has implicit overlapping such as a yearly return series and when long-term averages are used to smooth out short-term noise.

The IRE is due to the second cause, while the IRE itself is not averaged, part of its inputs is the result of long-term averages, in particular the ROE is calculated as a 10-year average, and the levering procedure introduces a long-term average for the debt lever. Conversely, it is not possible to use non-overlapping periods of the IRE as these periods result in insufficient data points. Therefore, its construction depends on variables susceptible to overlapping that has the double downside of the IRE having no short-term estimate equivalent that could be harnessed for short-term period estimations while still being susceptible to overlapping in its construction.

Hansen and Hodrick (1980) propose variants to the penalty terms for the SD of the parameters. These methods rely on a correction factor to the parameter's SD based on a ratio between overlapping levels and the sample size. In this study, the overlapping to sample size ratio is 40/140, which is approximately one third. Using the appropriate factor, the p-value has a strong shift while still being within 95% of significance ($p < 0.05$).

4.2.2 Forecasting ability

Elton (1999) evaluates the relation between expected returns and realized returns by testing the effect of relevant news on the prices of assets and concludes that the expected returns are a very poor measure of the realized returns. Also, the deviations are not cancelled out over time that indicates more research is needed to find new ways to test the expected returns.

We find that there is autocorrelation with an error at one lag. Although we could solve the problem with an AR(1) model, as we are forecasting returns 10 years ahead, the error will not be observable until 39 quarters into the future, so we cannot adjust the model to correct for this problem. We also test the model for heteroscedasticity.

When testing the null hypothesis of homoscedasticity with the Lagrange multiplier statistics, we obtain a value of 2.72 with a p-value of 0.099, and an F-value of 2.73 with a p-value of 0.100 that leads us to conclude that we are able to reject the null hypothesis of homoscedasticity and accept heteroskedasticity.

Studies like Goyal and Welch (2003) and Inoue et al. (2017) have identified a parameter instability in financial forecasting. A structural breakpoint analysis that uses the procedure of Bai (1997) shows that the regression coefficients are not stable over time because they have four breakpoints independent of weighting. Even though the R^2 of the regression is high and the variables are cointegrated, the results of the regression are not as good as expected because of the four structural breakpoints in the sample period, first-order autocorrelation, and values of the parameter that differ from the expected values.

In order for the model to have good explanatory power, we need values that approximate an intercept of 0 and a slope of 1 in equation 3, but our parameters vary too much over time. When running an out-of-sample test, the results are not as good as the in-sample results when applying equation 2. In Figure 2, we compare the realized returns with the out-of-sample forecasts for the period from 1975Q1-2010Q1. The results show that the indicator contains information that explains the realized returns, but faces statistical limitations when forecasting the expected returns.

The main reason why the out-of-sample model does not have similar results to those of the in-sample model is due to the structural breakpoints of the series, which cause the slope and the intercept to have erratic values that do not converge to a value in time. Even the slope, which we expected to have a value of 1.0, finds periods with values close to 0.

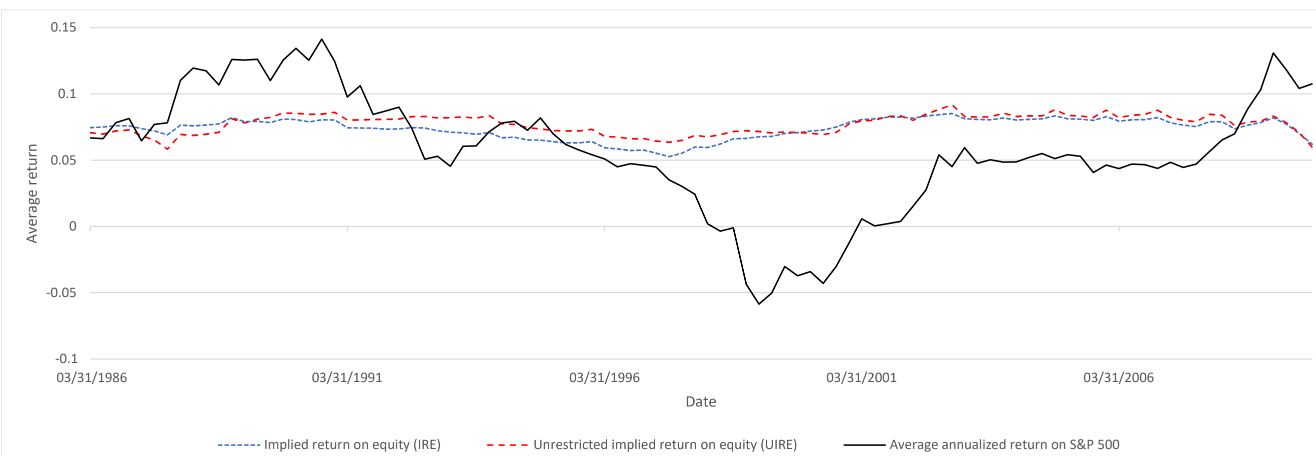

Figure 2 *Realized returns and expected out-of-sample returns from the regression with the IRE and UIRE for the period 1975Q1-2010Q1.*

Notes: *This figure shows the annualized 10-year forward average geometric returns of the Standard & Poor's 500 (S&P 500). The returns shown are: (i) the realized returns; (ii) the estimated IRE from the out-of-sample regression of equation 3 using the IRE from equation 2 as an independent variable and the realized returns as a dependent variable; and (iii) the estimated UIRE from the out-of-sample regression using the UIRE from equation 1 as an independent variable and the realized returns as a dependent variable. The results are shown for each quarter for the period from 1985Q1-2010Q1.*

Source: *Elaborated by the authors.*

The objective of this study is to propose a new indicator that considers the duration of the competitive advantage to explain the realized returns at the aggregate level and not to forecast the expected returns. Furthermore, these problems are also present in all competing indicators, such as the cyclical adjusted price earnings ratio (CAPE) (Campbell & Shiller, 1988), PE (Campbell & Shiller, 1998; Fama & French, 1989), and BM (Pontiff & Schall, 1998).

We argue that we should avoid using a statistical regression model given the parameter instability and statistical limitations previously discussed. Besides, although non-yield indicators will help us to locate a relative position considering current market prices, they will not give us an expected return. The IRE is an expected return, so we need to know the way to obtain the IRE with the lowest possible error. Table 3 shows the raw IRE, which is estimated without a regression analysis, has a standard error of the mean (SEM) of 3.27%, while the SEM of the out-of-sample regression is 4.40%. Furthermore, the positive mean error of the raw IRE indicates that the duration of the competitive advantage is higher than average. As expected, the in-sample model of the IRE has the smallest SD of 2.92%. Nonetheless, when using the out-of-sample model, the SD increases to 4.40%. Hence, comparing the raw value of the IRE with the realized returns, the SD is 3.27%. We argue that the increase in the SD is not as dramatic as the out-of-sample model.

In Figure 1 we presented the historical realized return and the estimated values of the IRE and UIRE without a regression. We observe that most of the time the realized returns are within the limits of the UIRE and IRE. To improve the forecasting capacity of the IRE, we have to find a better estimator of the duration of the competitive advantage, assume that the mean error incorporates the shortage of the estimation of the competitive advantage, or alternatively use a combination of the IRE and UIRE.

The statistical limitations mentioned above and the analysis of the mean errors and SDs leads us to propose the use of the raw IRE without statistical modelling to estimate future returns. This conclusion is in line with the recommendation of de La Grandville (1998), who asserts that the use of easy and direct formulas is better for estimating long-term expected returns than using approximations from regression models.

Table 3
Mean error and standard error of the mean (SEM) of the implied return on equity (IRE) and the 10-year realized returns for the period 1975Q1-2010Q1

	Mean error	SEM
Raw IRE without regression	3.55%	3.27%
With regression – In-Sample	0.00%	2.92%
With regression – Out-of-sample	-1.65%	4.40%

Notes: *This table shows the mean error and the SEM when we estimate the implied return on equity (IRE) without a regression (raw IRE) and with regression (in-sample and out-of-sample).*
Source: *Elaborated by the authors.*

5. DISCUSSION

The inclusion of the duration of the competitive advantage as a new variable in the literature to explain the long-term expected return in the stock market improves the explanatory power of the previous indicators developed in the literature. The traditional indicators are related to the ROE as it can be explained as a result of the value of the index, the price to book ratio, the PE, the leverage, and the dividend yield. The duration of the competitive advantage will limit the value of the ROE over time, and this is considered when estimating the IRE.

All yield and non-yield indicators show similar statistical limitations: first-order autocorrelation and structural breakpoints of the parameters in the sample period. Some of them also show heteroskedasticity. As the number of observations is relatively small, we do not have enough independent periods so overlapping periods are needed, which adds additional statistical problems.

The parameters of the regression models are not reliable as they vary over time. It is better to use a variable whose resulting value is the estimated long-term profitability, to avoid the use of regression models to estimate it. We believe this is the main advantage of the IRE.

The main practical application we see for this indicator is to have and expected return of an index to create diversified portfolios. We can combine this expected return with the SD of the index to obtain a risk adjusted return to form efficient portfolios. If we believe that the market takes time to adjust to certain events, we could find tactical deviations to have a positive alpha in a diversified portfolio. We believe that the proposed methodology can be used to create an indicator of the expected return of every index that can be permanently updated with the movements of the market. The duration of the competitive advantage should be considered when forming new portfolios to match the duration of the portfolio with the average competitive advantage of its constituents.

6. CONCLUSION

The stock market can be seen as a long-term "bond" with a variable growing coupon in which the ROE is multiplied by each period's initial equity investment minus the reinvestment needs as the yearly coupons. The initial equity investment, increased by the growth experienced during the life of the "bond", is redeemed at the end of the period. Hence, when the market price of the stock increases, the yield is lower, while the opposite occurs when the stock price decreases.

The market can experience sudden moves in shorter periods of time, but in the long term it moves towards its intrinsic value, while correcting for any temporary deviation. The main advantage of the IRE is that it is an indicator that yields the long-term forecasted return on the stock market as a value and it is estimated considering the duration of the competitive advantage. The IRE is also simple to estimate when using a one-stage constant growth model based on fundamentals.

Furthermore, the IRE faces similar statistical limitations, such as the overlapping series problem like the other competing indicators that raise doubts on the ability of the current statistical models to forecast returns. Even using inferential statistics, the models show autocorrelation, the values of the parameters are not stable, and four or more structural breakpoints as well as confirmed heteroscedasticity.

We favor the use of yield indicators whose results are the expected returns, so the results obtained using the parameters of the modeled IRE should not be used to forecast the returns, but instead to estimate a raw value of the IRE to find the expected return.

Our proposed IRE can be used to determine the long-term expected return of an equity portfolio, since the metric can also be calculated for other indexes in the United States of America or abroad. The stock exchange's estimated future returns can be included in financial reports in a similar way to how portfolio managers currently present the yield to maturity of fixed income instruments. The models can also be used to simulate the effect of variations in the price of the stock index in the expected long-term return. Furthermore, institutional investors could also use the IRE in order to design future investment scenarios, and pension fund managers could suggest that their affiliates move their retirement funds between different available funds over a time frame of 10 years.

A future line of research for the proposed model and method is the estimation of the duration of the competitive advantage. We argue that this must vary over time and that the average time a company remains in the S&P 500 index is a good proxy of the variability of this indicator. Nonetheless, the number of years in the index could be a relatively short period of time. More research is needed to determine the duration of the competitive advantage because our results show that it drives long-term stocks returns.

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