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# How Well Do Conventional Stock Market Indicators Predict Stock Market Movements?

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Comments and suggestions are appreciated.

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## How Well Do Conventional Stock Market Indicators Predict Stock Movements?

David S. Allen and Allen B. Atkins

The recent volatility of the stock market has investors scratching their heads over how to know what will happen next. Investors may try to seek counsel from long-standing and traditional market indicators. Two conventional indicators have been the price-to-earnings (P/E) ratio and the dividend yield. The P/E ratio shows how much investors are willing to pay for one dollar worth of earnings. The average P/E ratio for the S&P 500 since 1947 has been 15.23 and it has been above this level since January of 1991. In July of 1999 it reached its highest level of 36.97. The dividend yield is the ratio of the dividends paid by the company to the closing stock price.<sup>1</sup> The average dividend yield for the Standard and Poor's (S&P) 500 from 1947 to 2000 has been 3.85% and it has been below this level since January of 1991. In September of 2000 it reached its lowest point falling to 1.07%.

As one might expect, there has been some research by financial economists to attempt to determine if the use of the P/E ratio and the dividend yield as predictors of market performance is outdated or misleading. Campbell and Shiller (1998) find that, over the past 127 years, when the dividend yield has deviated from the long-term mean, stock prices have changed to bring the dividend yield back towards that mean. They state:

We think that the conventional valuation ratios – the dividend-price and price-smoothed-earnings ratios – have a special significance when compared with many other statistics that might be used to forecast stock prices. Today these ratios are extraordinarily bearish for the U.S. stock market. (p. 24).

Chief market strategist at Salomon Brothers, David Shulman stated that, “Whenever the dividend yield has gotten below 2.85% we’ve had ‘accidents’”.<sup>2</sup>

On the other hand, Goetzmann and Jorion (1993) study the effectiveness of dividend yields in predicting the aggregate stock market and state that, “Overall there is no strong statistical evidence indicating that dividend yield can be used to forecast stock returns.”

Others claim that the dividend yield and P/E ratio may be more useful in analyzing the level of stock prices if they are examined in relation to interest rates. Abbey Cohen, stock market strategist at Goldman Sachs, states that, “You can’t look at dividend yields in a vacuum. The dividend yield at 3% when the Treasury bill is at 2.97% is different than when the dividend yield is 3% and the T-bill rate is 12.”<sup>3</sup> This statement seems reasonable since investors have a choice between investing in interest-bearing securities or stocks, which may pay a dividend in addition to their promise of capital gains. Investors who are interested in growth stocks are less likely to purchase shares that pay a significant dividend and will probably have even less interest in bonds or money market instruments. For investors who are looking for at least some current income, however, there is a real choice between dividend paying stocks or interest bearing securities.

This paper focuses on whether the P/E ratio and the dividend yield in conjunction with interest rates can be helpful in determining if stock prices are over or under valued. We focus on the time period from 1947 to present for several reasons. First, Nelson and Kim (1993) conclude that the predictability of returns from the dividend yield (and other fundamentals) is primarily a phenomenon of the post-World War II era, (i.e. since 1947). Second, stock market behavior from long ago may not be relevant to today’s market.

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<sup>1</sup> This is the definition used in Campbell and Shiller (1998). The data for this section was taken from Shiller’s website [www.econ.yale.edu/~shiller/chapter26.html](http://www.econ.yale.edu/~shiller/chapter26.html).

<sup>2</sup> *The Wall Street Journal*, February 8, 1993.

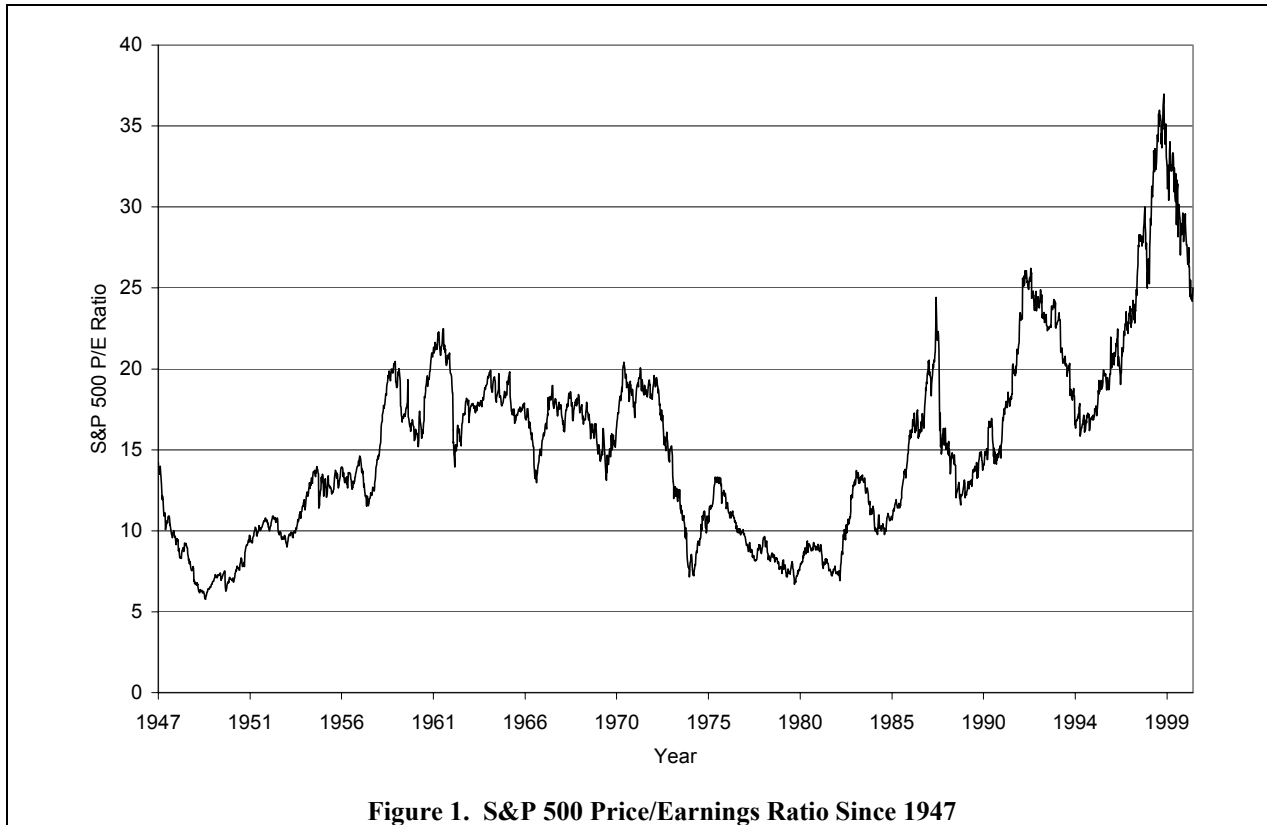
<sup>3</sup> *The Wall Street Journal*, February 8, 1993.

## KEY INDICATORS

### The Price to Earnings Ratio

The price-to-earnings (P/E) ratio is one of the most frequently used indicators. Typically this ratio is in the 7-20 range although firms with high expected future growth can have ratios that are much higher.

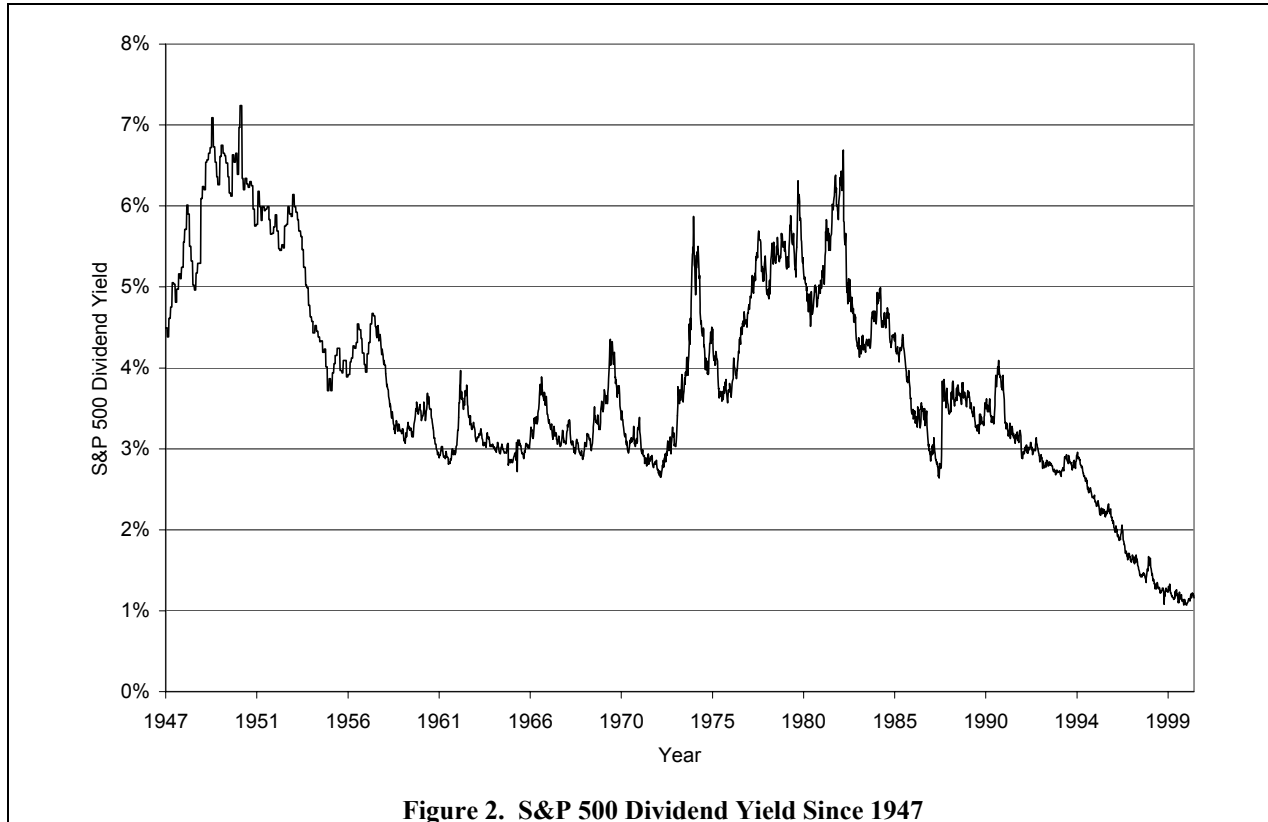
Figure 1 shows a plot of the P/E ratio for the S&P 500 from 1947 to 2000. The average P/E ratio since 1947 has been 15.23 and it has been increasing dramatically in recent years. When P/E ratios get too high some analysts reason that prices are higher than are justified and will likely fall in the near future. Low P/E ratios indicate the opposite. These analysts believe that the P/E ratio exhibits mean-reverting characteristics.



## The Dividend Yield

Since 1947, the average dividend yield for the S&P 500 has been 3.85%, with a range of 7.24% to 1.07%. Low dividend yields are a recent phenomenon with new lows being reached in recent years. In Figure 2, the dividend yield for the S&P 500 Index is plotted for the years 1947-2000. It is clear that the dividend yield has been falling dramatically over the past 20 years. If the dividend yield is a major avenue for returning value to stockholders, the continual reduction in yield may be cause for concern. Several papers and articles devoted to this subject predict either the imminent collapse of the stock market due to an “abnormally” low dividend yield ratio or attempt to explain why dividend yield is no longer an accurate predictor of market performance.

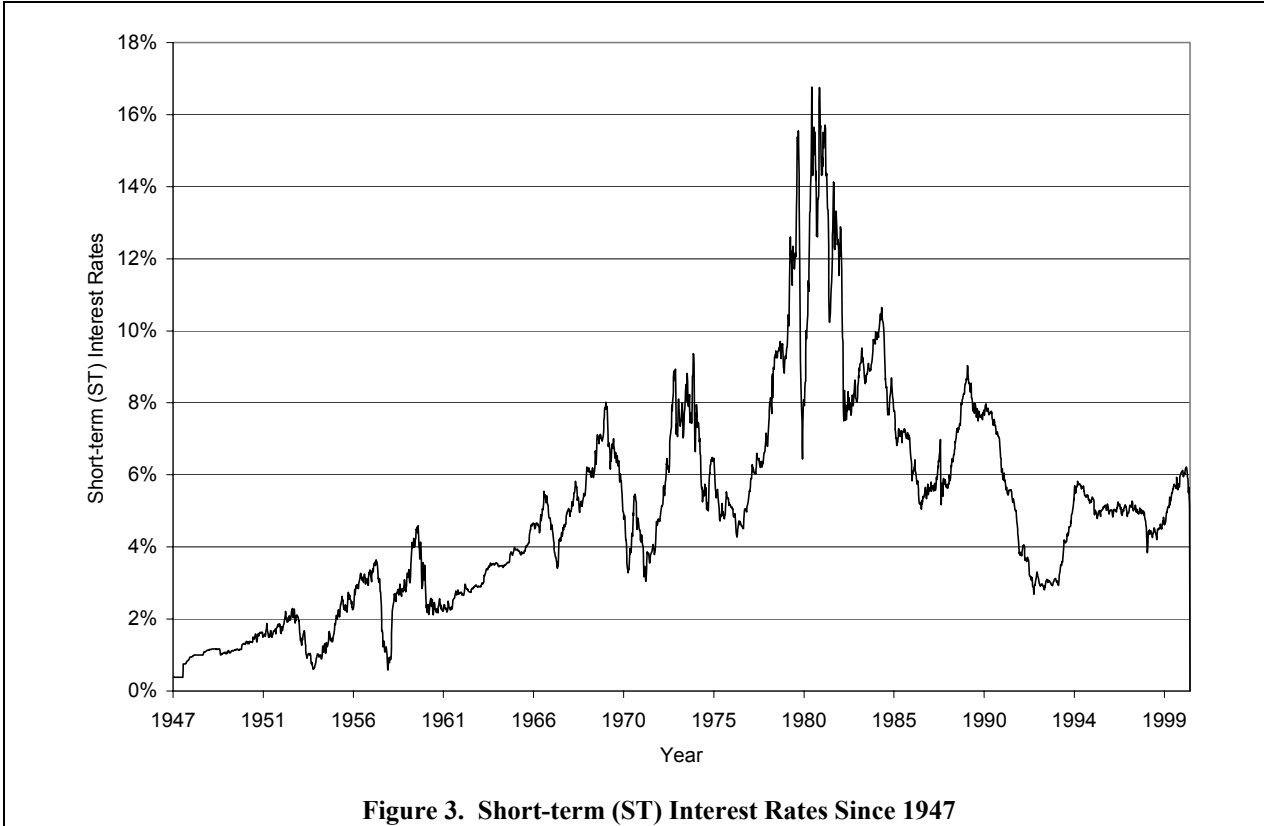
Conventional wisdom (see, for example, McGee, 1998) holds that a dividend yield of 5-6% has represented an undervalued market, while a dividend yield of 3% or less has indicated an overvalued market. The troubling issue for most investors is that the dividend yield has been below 3% since November of 1992.



### Short-Term Interest Rates

A person may decide to invest in the stock market, relying on dividend payments and stock appreciation as a reward for his investment. Alternatively, he may invest in either short-term or long-term interest bearing securities. Since dividends provide current income similar to interest payments, the dividend yield may have some relationship to either short-term or long-term interest rates. If this is the case, it could help explain the current low dividend yield. This is the point that Abbey Cohen makes in her *Wall Street Journal* quote (see footnote 3).

Interest rate data is based on weekly interest rates on three-month Treasury Bills for the entire time period under consideration.<sup>4</sup> Figure 3 shows a plot of short-term interest rates for the years 1947 through 2000. It was less than 2.0% in the late 1940's and early 1950's. It peaked at near 17.0% in 1980 and was in the 4.0-6.0% range at the end of the study period.



<sup>4</sup> Interest rate data for the three-month Treasury Bills was taken from [www.tradetools.com](http://www.tradetools.com).

### Long-Term Interest Rates

Figure 4 shows the long-term interest rates. Bond yields are used to represent long-term interest rates. Specifically, the Federal Reserve Board's 10-15 year Treasury Bond index is used from 1947 to 1975, the 20-year Treasury Bond is used for 1976 and the 30-year Treasury Bond is used after 1976.<sup>5</sup> These data represent weekly bond yields for the thirty-year constant maturity Treasury Bonds. The long-term bond yields were below 4.0% for most of the 1940's and 1950's. They peaked at over 14.0% in 1980 and have settled near 6.0% in recent times.



<sup>5</sup> Interest rate data for the thirty-year constant maturity Treasury Bonds yield information was taken from [www.tradetools.com](http://www.tradetools.com).

## PREDICTIONS OF FUTURE STOCK PRICES BY THE INDICATORS

### The P/E Ratio as a Predictor

Figure 5 shows a scatter plot of the weekly P/E ratios on the S&P 500 versus the subsequent 10-year return of the S&P 500 since 1947. Casual inspection of the graph shows that high P/E ratios are associated with lower subsequent 10-year returns and visa versa. A more precise analysis is possible using regression analysis.

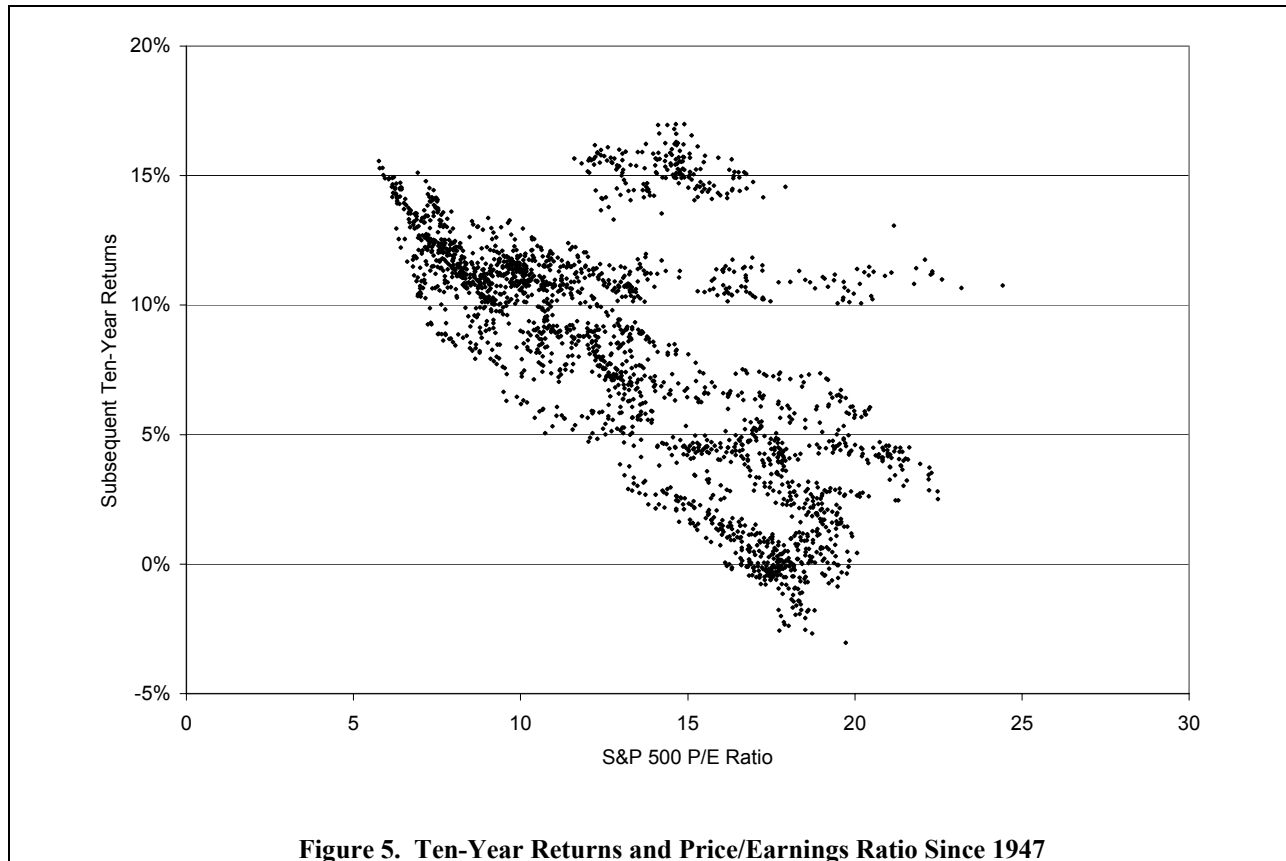


Table 1 shows the regression results using the subsequent returns of the S&P 500 index for 1-year, 5-years and 10-years as the dependent variable. Panel 1 shows the P/E ratio regressed on the returns of the S&P 500.

<b>Table 1</b>				
<b>Regression Results of the Returns of the S&amp;P 500 Regressed on the P/E Ratio, Dividend Yield, Short-term Interest Rates and Long-term Interest Rates; from 1947-2000.</b>				
Dependent variable = geometric mean return				
Independent variable(s)		Holding Period		
		1 Year	5 Years	10 Years
<b>Panel 1</b>				
P/E Ratio	R-squared	0.1415	0.1203	0.1385
	Intercept	52.2394	18.106	13.3391
	P/E slope	-2.7952	-0.6006	-0.3405
	P/E p-value	<0.0001	<0.0001	<0.0001
<b>Panel 2</b>				
Dividend yield (DY)	R-squared	0.1249	0.1250	0.1251
	Intercept	-36.9827	-0.3265	3.8425
	DY slope	12.0504	2.4418	1.1817
	DY p-value	<0.0001	<0.0001	<0.0001
<b>Panel 3</b>				
Short-term interest rate (ST)	R-squared	0.0017	0.0018	0.0025
	Intercept	6.6472	8.8999	8.9154
	ST slope	0.5825	0.1223	0.0688
	ST p-value	0.0315	0.0312	0.0169
<b>Panel 4</b>				
Long-term interest rate (LT)	R-squared	0.0076	0.0101	0.0125
	Intercept	-3.9019	6.1293	7.3859
	LT slope	2.1452	0.5541	0.3053
	LT p-value	<0.0001	<0.0001	<0.0001
<b>Panel 5</b>				
P/E ratio and Dividend yield (DY) and Long-term interest rate (LT)	Adj. R-squared	0.1769	0.1622	0.1751
	Intercept	7.8105	7.2959	8.3244
	P/E slope	-1.9573	-0.3835	-0.2352
	P/E p-value	<0.0001	<0.0001	<0.0001
	DY slope	7.3334	1.6243	0.7115
	DY p-value	<0.0001	<0.0001	<0.0001
	LT slope	0.5335	0.1259	0.0965
	LT p-value	0.2150	0.2015	0.0664

This regression uses overlapping data because for each new observation of the multi-year returns just one week of data is added (the most recent week) and one week (the oldest week) is subtracted. To correct for the econometric problems caused by overlapping data an autoregressive procedure is used. Without such a correction the adjusted R<sup>2</sup> and the t-statistics are likely to be greatly overstated.<sup>6</sup>

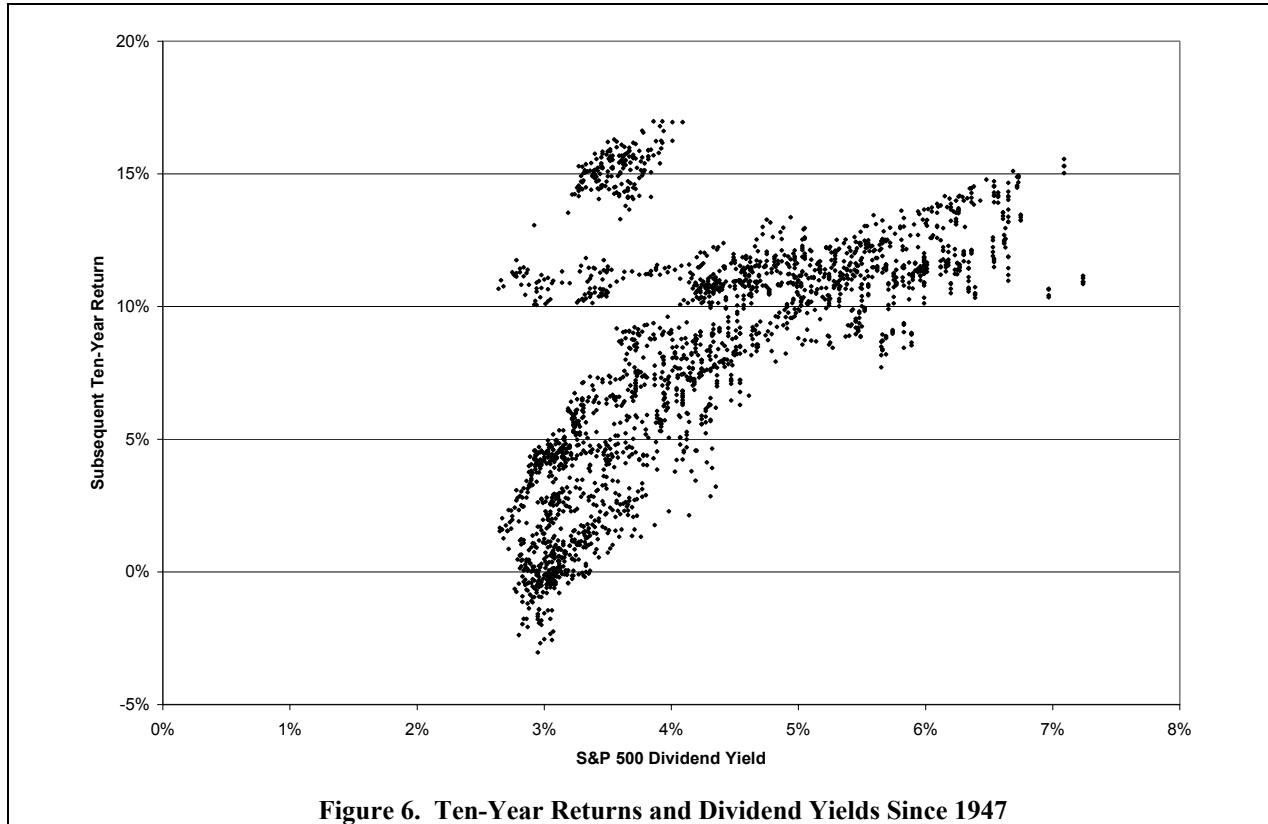
<sup>6</sup> With overlapping observations, an OLS regression of the form  $Y_t = \beta_0 + \beta_1 X_t + u_t$  will have autocorrelated errors of the form:  $u_t = \rho u_{t-1} + \varepsilon_t$  with  $-1 < \rho < +1$ , where  $\rho$  is the coefficient of autocorrelation and where  $\varepsilon_t$  is a stochastic disturbance which satisfies the OLS assumptions. Gujarati (1978, p. 226) indicates that the errors,  $u_t$ , may properly be interpreted as an autoregressive process, so we use the SAS AUTOREG procedure which "... estimates parameters in regression models when the data are time series and the error term is an autoregressive process" (SAS Institute, 1984, p. 183).



The coefficient of the P/E ratio is a highly significant ( $p < .0001$ ) and the  $R^2$  for the regression is .1385 indicating that about 14% of the variation in the 10-year returns is explained by the P/E ratio. We also analyze the relationship using the subsequent 5-year return and the 1-year return on the S&P 500 (the scatter plots are not included here) and the results are essentially unchanged. Clearly the P/E ratio is a significant and important aid in explaining future stock returns. As the  $R^2$  shows, however, it leaves about 86% of the variation in stock returns unexplained and presumably caused by other factors. This is troubling for investors hoping for a precise relationship.

### The Dividend Yield as a Predictor

Figure 6 shows a scatter plot of the weekly dividend yield on the S&P 500 versus the subsequent 10-year return on the S&P 500 index. Again, a casual inspection of the graph shows that high dividend yields are associated with higher future returns and visa versa.



**Figure 6. Ten-Year Returns and Dividend Yields Since 1947**

Next we regress the dividend yield of the S&P 500 on the subsequent 1-year, 5-year and 10-year returns of the S&P 500, again using the autoregressive process. The results are shown in panel 2 of table 1. The coefficient on the dividend is highly significant ( $p < .0001$ ) for all three return periods. The  $R^2$  for each regression is approximately 0.12-0.13, showing that about 12-13% of the variation in subsequent returns is explained by the dividend yield. So the dividend yield is also a significant and important aid in explaining future stock returns but explains a smaller portion of subsequent returns than does the P/E ratio.

### Short-Term Interest Rates as a Predictor

Next we present an analysis of interest rates to see if they can help improve the explanatory power of the P/E ratio and the dividend yield. The third panel shows the results of regressing the subsequent return earned by the S&P 500 index on weekly short-term interest rates. For all three return periods, the  $R^2$  for the corrected regression is less than .003. The coefficient on the short-term interest rate is significant at the 5% level in each case. It is clear, however, that short-term interest rates do not explain much of the variation in long-run stock returns.

### **Long-Term Interest Rates as a Predictor**

Panel 4 of Table 1 shows the results of regressing the subsequent returns on the S&P 500 index on weekly long-term interest rates. For all three return periods the coefficient on the long-term interest rate variable is highly significant ( $p < .0001$ ). For the ten-year return period, the  $R^2$  for the regression of these two variables is .0126 and for the 1-year and 5-year regressions the adjusted  $R^2$ s were both just below 0.01. By itself, the long-term interest rate is only slightly better than the short-term interest rate in explaining future stock returns and explains only 1.3% of the variation in 10-year returns.

### **Combinations of Indicators as Predictors**

It is worth investigating Abbey Cohen's assertion that indicators should be viewed in conjunction with interest rates. Panel 5 of Table 1 shows the results of subsequent returns on the S&P 500 regressed on the P/E ratio, the dividend yield and long-term interest rates. The long-term interest rate was chosen over the short-term interest rate because in the regressions it is a more significant variable in explaining returns. For 10-year returns the regression has an adjusted  $R^2$  of .1751. This is a slight improvement over the  $R^2$ s shown in earlier panels and indicates that more of the variation in returns can be explained by the new regression. The coefficients of the dividend yield and the P/E ratio are both highly significant ( $p < .0001$ ). The coefficient on the long-term interest rate is marginally significant with a p-value of .0664. The p-values for the long-term interest rates are not as strong using 1-year and 5-year returns. It is not very comforting that even when the P/E ratio, the dividend yield and long-term interest rates are used in combination that only 17.51% of the variation in subsequent returns is explained. Apparently these conventional market indicators are not terribly helpful.

### **WHAT DOES THE MODEL TELL US ABOUT POTENTIAL FUTURE RETURNS?**

It is interesting to see what the regression analysis above predicts for stock returns over the next one, five and ten years. At the end of the year 2000 (on 12/29/2000) the P/E ratio was 24.57, the dividend yield was 1.19% and the long-term interest rate was 5.44%. What does the regression equation from Panel 5 of table 1 predict? For a one-year holding it predicts a return of -34.47%. For five-year and ten-year holding periods it predicts compound annual returns of 0.49% and 3.92% respectively. These predicted returns are, of course, extraordinarily low. This is not surprising given that the year-end P/E ratio of 24.57 is well above its average of 15.23 and that the dividend yield of 1.19% is well below its average of 3.85%. This serves to point out that a regression model can give extreme predictions when the input variables are far from their means. The problem with the regression is that the P/E ratio has been above its mean and the dividend yield has been below its mean since January of 1991. Any investor who was not in the market during the 1990's missed out on the extraordinary returns that were realized. The regression results also show that a model with an adjusted  $R^2$  that is less than 0.20 cannot be relied on for market timing purposes.

### **CONCLUSIONS**

Although the P/E ratio and the dividend yield have been used for decades as conventional market indicators, they are not overly helpful in predicting aggregate market movements. Even when used in conjunction with interest rates the P/E ratio and dividend yield explain less than 20% of the movement in market returns. Investors who relied on these indicators over the past decade were more than likely lead astray. Given the results presented above, it is not surprising that these indicators tend to be misleading.

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