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DOES THE MARKET P/E RATIO REVERT BACK TO "AVERAGE"?

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Abstract

Compression and expansion of the average market P/E ratio significantly affected U.S. equity returns in both the bear market of 1969-1981 and the bull market of 1982-1999. We compare two models of the market P/E ratio to determine which paradigm is most useful for financial analysts and portfolio strategists trying to anticipate the future direction of the market P/E. We find that the "Fed Model" — where investors benchmark the earnings yield on stocks to the 10-year T-note yield — provides a better description of how the market P/E ratio changes over time than the mean-reverting model posited by Campbell and Shiller (1998, 2001). These results suggest that high market P/E ratios and the low expected return on equities that accompany high-P/E environments could persist for an extended period.

Key words: Fed Model, P/E Ratios, Bond Yields, Mean Reversion, Unit Roots, Nonstationarity, Cointegration.

JEL Classification: C22, C53, E39, G14.

1. Introduction

Historically, expansion and contraction of the average market P/E ratio has had a significant effect on U.S. equity returns. For example, during the bear market of 1969-1981, real returns to U.S. stocks averaged −0.5% per year as the mean market P/E contracted from a high of 21 to a low of 8. In the bull market of 1982-1999 the opposite effect, expansion of the P/E ratio from 8 to 30, contributed to returns that were well above their historical norms. We compare two models of the market P/E to determine which paradigm best describes this ratio's long-term behavior so analysts and portfolio strategists can better anticipate future changes in this metric. We find that, despite the lack of theoretical justification, the "Fed Model" — where investors benchmark the earnings yield on stocks to the 10-year T-note yield — provides a better description of changes in the market P/E ratio than the mean-reverting model posited by Campbell and Shiller (1998, 2001). These results suggest that high market P/E ratios and the low expected return on equities that accompany high-P/E environments could persist for an extended period.

2. Background and Prior Literature

Over the past 35 years, U.S. equity markets have reinforced one of investing's oldest lessons: when the average price/earnings multiple investors are willing to pay for a dollar of corporate earnings is changing, the total return to equities will be determined not only by fundamental drivers such as dividends and earnings, but also by the change in the average market P/E ratio. For example, Ibbotson and Chen (2003) and Ilmanen (2003) estimate that at least 5% of the annual return to U.S. equities from 1982-1999 was due to a P/E "repricing effect" as the average P/E ratio on the S&P 500 index expanded from less than 10 in 1982 to over 30 by year 2000. When this idea plays out in reverse and the market P/E ratio is contracting, however, as it did from 1969-1982 and 2003-2006, the average return to equities is lower than the sum of stocks' dividend yield plus earnings growth.

The idea that unusually high or low market valuation ratios lead to extreme future stock price changes is well-established in the academic literature. For example, Campbell and Shiller (1998, 2001) show that when the average market dividend yield is extremely low, it provides a reliable forecast of future declines in stock prices. The mean reversion of the ratio occurs almost exclusively from an adjustment of prices rather than dividends. Similarly, these authors show that an unusually high market P/E ratio forecasts poor future stock returns as it is stock prices, not earnings, that account for most of the ratio's reversion to its historical mean. Based on market P/E ratios in the late 1990s, they predict that U.S. equities will lose 40% of their value over the period of 1997-2006. Shiller (2002, p. 88) sums up this line of thinking: "… when the price earnings ratio has been high, let's say between 20 and 25, the real return over the next ten years has been meager or negative".

In the mean-reverting model of the market P/E ratio prices and earnings are depicted as nonstationary time series tied together by a unique relationship known as cointegration (Campbell and Shiller, 1987). This model also holds that, because it is a linear combination of two cointegrated variables, the market P/E will be a stationary, mean-reverting time series (vs. nonstationary series such as stock prices, earnings, and GDP, which take "long walks" away from previous values and over sufficiently long horizons never revert back to these values). Shiller's (2002) prediction for "meager or negative" equity returns is based on the persistently high level of the market P/E ratio, which, according to the mean-reverting paradigm, is overdue to complete its reversion back to its long-term average.

In this paper we compare the Campbell and Shiller view of the time series behavior of the market P/E ratio with the "Fed Model" idea that the market E/P ratio (and thus the market P/E as well) has been benchmarked off the yield on the 10-year T-note since at least the 1960s, and probably longer[1]. The idea behind the Fed Model is that as stocks and bonds compete for investment funds, money flows toward the more attractive asset, i.e., the one with the higher yield. The relationship between the earnings yield on a stock index and nominal T-note yields (Y) has been studied at least as far back as Ziemba and Schwartz (1991), who show the difference E/P − Y is useful in predicting stock market corrections. The term "Fed Model" was apparently coined after a July 1997 Federal Reserve Monetary Policy (Humphrey-Hawkins) Report to Congress made note of the manner in which stock market earnings yields gravitate toward bond yields. The Fed Model is often criticized (e.g., see Asness, 2003) because it requires that investors suffer from inflation illusion when they compare a real variable (E/P) to a nominal one (Y). Despite a lack of rigorous theoretical underpinning, however, support for the validity of the Fed Model as an accurate depiction of how the market P/E is determined has spread from practitioners (Yardeni, 2003) to scholar/practitioners (Asness, 2003) and to academics (Shen, 2003; and Malkiel, 2004).

From a time series perspective, the Fed Model and the Campbell and Shiller (1998, 2001) mean-reverting model of the market P/E cannot both be valid. The conflict between the models arises because the Fed Model implicitly assumes the market earnings yield and P/E ratio are *non*-stationary, and therefore not predictably mean-reverting. The Fed Model holds that the market earnings yield is set relative to the nominal yield on the 10-year T-note, which is well-known to be nonstationary (e.g., Bradley and Lumpkin, 1992; Mehra, 1996; and Tatom, 2002). If the close correlation between the market E/P and interest rates results from investors benchmarking stocks' earnings yield to the 10-year T-note yield — as concluded by the studies referenced above — the E/P ratio (along with the market P/E) should display the same nonstationary characteristics as the 10-year yield.

We investigate the time series characteristics of the market P/E to determine which paradigm best describes the behavior of this ratio. We find that the visual impression imparted by looking at a graph of the long-term E/P ratio and T-note yields — that the series are positively correlated, and this correlation abruptly increases ca. 1960 — is confirmed by a time series analysis of the data. The market E/P ratio, and its reciprocal, the market P/E, shift from stationary to nonstationary as the relation between the market earnings yield and the yield on the 10-year T-note strengthens.

The significance of the relation between the market E/P ratio and T-note yields is further underscored by our finding that, since approximately 1960, the two series have been connected by a unique time series relationship known as cointegration (a detailed explanation follows later in the

[1] Asness (2000, 2003) shows that when the Fed Model is amended to include time-changing stock and bond risk the earnings yield/T-note relation holds at least as far back as the late 1800s.

paper). This supports Asness' (2003) and Yardeni's (2003) description of how investors have come to believe that the market earnings yield should achieve some sort of parity with the yield on the 10-year note, and that "… investors contemporaneously set stock market E/Ps (P/Es) as a function of nominal interest rates" (Asness 2003, p. 21). We conclude that the Fed Model provides a better description of the way the market P/E ratio has been set over the past 45 years than the paradigm of Campbell and Shiller, namely that the market P/E is a stationary series expected to display mean-reverting behavior. Malkiel (2004) reaches the same conclusion based on a different set of econometric tests.

As high-P/E environments are accompanied by low returns on equities[1], the future behavior of the market P/E ratio is an important consideration for financial analysts and portfolio strategists. Our findings regarding the nonstationarity of the E/P ratio suggest that this valuation measure can remain below its mean for an extended period of time, and that its reciprocal, the market P/E, can stay above trend for extended periods — and possibly forever, at least theoretically. The P/E ratio's shift from a stationary to a nonstationary series ca. 1960 implies that it no longer has a mean to which it must revert. This is a plausible alternative explanation for the findings of Carlson, Pelz and Wohar (2002), who conclude, based on more conventional econometric methods, that the market P/E shifted upward to a new, permanent value in the 1990s (between 20 and 25).

3. Data and Terminology

The stock price index, P/E ratio and earnings data used in the study are taken from the database generously maintained and updated by Shiller (2005). These data are available for download from his website. Interest rate data are obtained from the Federal Reserve Economic Database (FRED II), and the current market P/E ratio and dividend yield are obtained from the New York Fed website.

Shiller's data, at the time it was accessed for this study, extend from January 1871 to June 2004. We use all the observations in the database. Our time period labels indicate the beginning of a 10-year period, so the label 1960-1994, for example, refers to the 10-year periods beginning in 1960 through 1994 (with the last 10-year period ending in 2004). The data are adjusted for inflation as shown by Shiller (2005). Unless otherwise specified, all references to stock returns and earnings refer to real stock returns and earnings.

The analysis that follows is based on monthly P/E ratios calculated using each month's real price and 1-year trailing earnings (the P/E1), as well as a P/E ratio calculated from 10-year smoothed earnings (the P/E10) as in Campbell and Shiller (1998, 2001). The first metric is more widely referenced by everyday market participants, while the second metric is thought to be computationally superior as it is less affected by short-term fluctuations in reported earnings[2].

4. The Time Series Behavior of the Market P/E Ratio

Campbell and Shiller (1998, 2001) show that below-average D/P ratios and/or above-average P/E ratios forecast future declines in stock prices, as these valuation ratios are thought to be reliably mean-reverting over long periods of time. In the case of either ratio it is the change in stock prices, rather than earnings or dividends, that accounts for the majority of the ratios' reversion to the mean. The ability of these ratios to remain at record levels for so long is a puzzle, as these authors recognize:

> *The very fact that ratios have moved so far outside their historical range poses a challenge ... to our view that they are substantially driven by mean reversion ... There is no purely statistical method to resolve finally whether the data indicate that we have entered a new era, invalidating old relations, or whether we are still in a regime where ratios will revert to old levels (2001, p. 17).*

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[1] See Asness (2000, 2003), Campbell and Shiller (1998, 2001), Carlson, Pelz and Wohar (2002), Ibbotson and Chen (2003), Ilmanen (2003), Malkiel (2004), Shiller (2000, 2002) and Weigand and Irons (2006).

[2] Whenever we refer to the market P/E or E/P ratios without the "1" or "10" designations we are intentionally making general observations about these ratios.

We use a time series approach to address the questions posed by Campbell and Shiller (2001). It is our contention that the reliability of the mean-reverting properties of the market P/E ratio cannot be reconciled with Asness' (2003) and Yardeni's (2003) view of the way investors benchmark the market E/P ratio to the yield on the 10-year T-note. The fact that investors have learned (whether correctly or incorrectly) to set the market earnings yield according to the Fed Model heuristic has invalidated the mean-reverting properties of the E/P ratio. Nominal interest rates are well-known to be nonstationary[1], which means that time series of interest rates can take long walks away from any previous mean value and, technically speaking, never have to return. If the market earnings yield is set based on interest rates, the time series of the E/P ratio will be non-stationary as well. Nonstationary series do not display mean reversion because, from a statistical perspective, these series do not have a meaningful relation to any past "average" value.

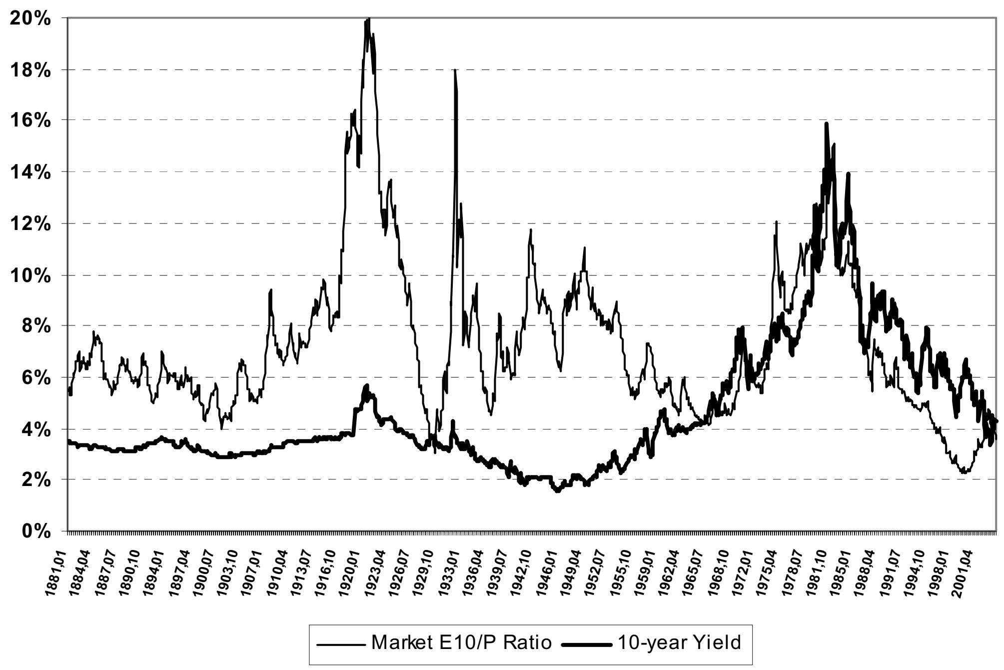

Fig. 1. Bond Yields and the Market E10/P Ratio (The graph depicts the monthly yield on the 10-year T-Note and the stock market E10/P ratio from 1881-2004)

Figure 1 plots the monthly yield to maturity on the 10-year Treasury note and the monthly value of the market E10/P ratio from 1881-2004. Although at first glance it appears as if the two series have moved closely together since 1960, they are also significantly related prior to that time. The correlation coefficient between the series is +0.42 from 1881-1959, and +0.81 from 1960-2004[2]. The longstanding correlation between the variables is consistent with Asness' (2003) and Yardeni's (2003) description of the way investors have used the Fed Model to benchmark the market E/P ratio to T-note yields as far back as the 1880s. It is also apparent from the graph that the yield on the 10-year T-note displays the "long-walk" characteristics consistent with nonstationarity. It takes 20 years for this series to return to its average of 6.5% over the 1960-2004 period.

We argue that if investors have been benchmarking the market E/P ratio to bond yields, then the market E/P ratio must have taken on the same characteristic of nonstationarity. And, if

[1] See Bradley and Lumpkin (1992), Mehra (1996), Tatom (2002), and our results reported below.
[2] The E1/P ratio and the 10-year yield have a correlation coefficient of +0.02 from 1881-1959, which rises to +0.72 from 1960-2004.

the E/P ratio is nonstationary, its reciprocal, the P/E ratio, will also be nonstationary[1]. If we are correct and this is the case, we will have offered an answer to Campbell and Shiller's (2001) question regarding the impending mean reversion of the market P/E ratio. Nonstationarity of the market P/E implies that this ratio can remain at its current level (or even increase further) for years, decades, and possibly forever — at least theoretically. As long as inflation and interest rates remain low, and investors continue to set the market earnings yield using the Fed Model, there are no fundamental forces urging the market P/E ratio to revert to its historical average.

The most common statistical tests for nonstationarity, also known as a unit root, come from Dickey and Fuller (1979)[2]. The Dickey-Fuller (DF) procedures test whether a time series can be modeled as an autoregressive (AR) series:

$$Y_t = \rho Y_{t-1} + u_t , \quad (1)$$

where the regression coefficient on the first lag of the series equals 1.0 (thus the term "unit root"). Notice that if $\rho = 1$, the effects of prior realizations in the series never fully die out. For this reason nonstationary series are sometimes referred to as "long memory processes".

For ease of testing, the DF tests are usually re-written as:

$$\Delta Y_t = \delta Y_{t-1} + u_t . \quad (2)$$

in this case the null hypothesis of $H_0 : \delta = 0$ (series has a unit root, i.e., is nonstationary) is tested vs. the alternative hypothesis of $H_1 : \delta < 0$ (series is stationary). The Augmented Dickey-Fuller (ADF) procedures extend the tests shown above by testing for a unit root in the presence of drift (allowing for an intercept term in the regression) and a time trend, and accounting for autoregressive lags of the independent variable:

$$\Delta Y_t = \alpha + \beta T + \delta Y_{t-1} + \sum_{i=1}^{n} \lambda_i \Delta Y_{t-i} + u_t . \quad (3)$$

Augmented Dickey-Fuller unit root tests on the monthly time series of 10-year T-note yields and the market E1/P, E10/P, P/E1 and P/E10 ratios using data from 1960-2004 are reported in Table 1. The table shows that the null hypothesis of nonstationarity cannot be rejected for any of the series using autoregressive lag lengths between 6-12 (we find the same results for lag lengths of 0, 2, and 4). The 10-year T-note yield and the market E1/P, E10/P, P/E1 and P/E10 ratios are all nonstationary from 1960-2004. We also run unit root tests to see if the 1960-2004 period consists of two regimes, where post-1980 the strong increase in the P/E ratio is due to a secular time trend rather than nonstationarity. We find that this is not the case, however. Even after detrending the P/E and E/P series from 1980-2004, we cannot reject the hypothesis of a unit root at any lag length of the ADF tests.

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[1] Malkiel (2004) compares the predictive power of the Campbell and Shiller P/E model and the Fed Model using data from 1970-2003, and reports significant serial correlation in the regression residuals when modeling the level of the market earnings yield as a function of bond yields. This serial correlation is consistent with modeling these time series without taking their nonstationarity into account.

[2] If the underlying time series follows an ARMA (p,q) process rather than an AR(p) process, the Phillips-Perron (1988) unit root tests will have greater power than the Dickey-Fuller tests. We examine the autocorrelation and partial autocorrelation functions of the T-note yield and E/P and P/E series and find that they do not display any moving average characteristics. As the series have significant autoregressive terms and no significant moving average terms, we use the ADF unit root tests.

Table 1

Test for the Presence of a Unit Root in Time Series of Nominal 10-Year Treasury Note Yields, Market E/P Ratios and Market P/E Ratios

The table reports the results of Augmented Dickey-Fuller tests for unit roots in time series of 10-Year T-Note yields, market E/P ratios and market P/E ratios. The data span 1960-2004. The null hypothesis is that the time series has a unit root (i.e., failing to reject $\delta = 0$ implies nonstationary).

Panel A: Augmented Dickey-Fuller Tests							
Lags		10-Yr Yields	E1/P Ratio	E10/P Ratio	P/E1 Ratio	P/E10 Ratio	5% Crit.
6	δ	−0.00038	−0.00199	−0.00115	−0.00004	−0.00025	
	t-statistic	−0.24	−1.21	−0.70	−0.02	−0.17	−1.95
8	δ	−0.00044	−0.00199	−0.00112	0.00014	−0.00035	
	t-statistic	−0.27	−1.20	−0.69	0.08	−0.23	−1.95
10	δ	−0.00054	−0.00197	−0.00110	0.00033	−0.00042	
	t-statistic	−0.34	−1.19	−0.67	0.19	−0.28	−1.95
12	δ	−0.00050	−0.00192	−0.00110	0.00044	−0.00052	
	t-statistic	−0.31	−1.17	−0.68	0.25	−0.35	−1.95
Panel B: Augmented Dickey-Fuller Tests with Drift							
Lags		10-Yr Yields	E1/P Ratio	E10/P Ratio	P/E1 Ratio	P/E10 Ratio	5% Crit.
6	δ	−0.00625	−0.00803	−0.00535	−0.00847	−0.00433	
	t-statistic	−1.43	−1.74	−1.33	−1.82	−1.17	−3.34
8	δ	−0.00663	−0.00814	−0.00518	−0.00785	−0.00474	
	t-statistic	−1.51	−1.75	−1.28	−1.67	−1.28	−3.34
10	δ	−0.00730	−0.00777	−0.00506	−0.00718	−0.00510	
	t-statistic	−1.66	−1.66	−1.24	−1.51	−1.37	−3.34
12	δ	−0.00706	−0.00660	−0.00523	−0.00678	−0.00560	
	t-statistic	−1.60	−1.40	−1.29	−1.41	−1.49	−3.34
Panel C: Augmented Dickey-Fuller Tests with Drift and Trend							
Lags		10-Yr Yields	E1/P Ratio	E10/P Ratio	P/E1 Ratio	P/E10 Ratio	5% Crit.
6	δ	−0.00326	−0.00879	−0.00648	−0.01155	−0.00637	
	t-statistic	−0.68	−1.84	−1.56	−2.19	−1.56	−3.78
8	δ	−0.00382	−0.00891	−0.00631	−0.01087	−0.00681	
	t-statistic	−0.79	−1.85	−1.52	−2.03	−1.67	−3.78
10	δ	−0.00485	−0.00853	−0.00619	−0.01013	−0.00722	
	t-statistic	−1.00	−1.76	−1.48	−1.87	−1.76	−3.78
12	δ	−0.00436	−0.00729	−0.00633	−0.00969	−0.00778	
	t-statistic	−0.89	−1.49	−1.52	−1.77	−1.88	−3.78

We next provide an alternative test of Asness' (2003) finding that investors set the market earnings yield based on the 10-year T-note yield by testing the two series for cointegration. Cointegration defines a unique long-term relationship between two or more nonstationary series, where the economic (or in this case, behavioral) forces that cause the series to be nonstationary also result in their moving together through time. This tendency is well-described by Granger:

> *At the least sophisticated level of economic theory lies the belief that certain pairs of economic variables should not diverge from each other by too great an extent, at least in the long run (1986, p. 213).*

If investors have been benchmarking the market earnings yield to the 10-year T-note yield in the manner described by Asness (2003) and Yardeni (2003), we contend that the same nonstationary (stochastic) trend is common to both series. Finding that the two series are cointegrated supports the idea that investors have tied the market E/P ratio to bond yields via the relationship depicted by the Fed Model.

Cointegration between two nonstationary series is established by testing whether a linear combination of both series is stationary. Although nonstationary series are usually differenced before being analyzed in a regression framework, the "cointegrating regression" shown in Equation 4 is an exception, because we are testing whether the nonstationarity of the earnings yield variable is explained by the nonstationarity of the yield variable — if this is the case, the regression residuals will be stationary. We regress the level of the market E1/P and E10/P ratios on the level of the T-note yield using monthly data from 1960-2004, corresponding to the point in time when the correlation between these time series increases:

$$E/P_t = \alpha + \beta\left(Yield_t\right) + u_t . \tag{4}$$

Finding the regression residuals u_t are stationary implies that the E/P ratio and bond yields evolve around the same stochastic trend; i.e., the series are cointegrated.

We run Augmented Dickey-Fuller tests and ADF tests with a drift term, and find that the hypothesis of nonstationarity in the residuals is rejected at the one percent level for all lag lengths. This confirms that the market earnings yield and the 10-year T-note yield have been cointegrated since 1960. These findings provide strong support for the idea that the benchmarking of the market E/P ratio to bond yields in the manner described by the Fed Model has resulted in these series tracking more closely together over the past half century. As long as investors retain their belief in the validity of the Fed Model, there is no indication, from a statistical point of view, that the two series will stop moving together. If inflation and interest rates remain low, the market E/P ratio can remain at its current low level, and market P/E ratios are under no pressure to revert to any former mean value. If inflation accelerates and interest rates rise, however, the Fed Model predicts a rise in the market E/P ratio and further compression of the market P/E.

5. When Did the P/E Ratio Become Nonstationary?

The tests reported in Table 1 show that the market P/E has been nonstationary since at least 1960. Consider Figure 2, which depicts the market P/E1 and P/E10 ratios from 1881-2004. The ratios display different time series characteristics before and after the period of 1950-1960. Prior to this time the P/E1 ratio reverts to its long-term mean of 15 (16 for the market P/E10) with almost predictable regularity. The time between crossings of its mean are short compared with the post-1960 period. Beginning sometime between 1950 and 1960 the market P/E ratio begins to deviate from its mean for longer periods. Between 1960 and the late 1980s the P/E1 wanders away from its mean of 15 for periods of 8, 4, 3, and 12 years. The last time the market P/E1 was at 15 was in January 1995, when it began its inexorable march upwards.

The visual evidence presented in Figure 2 strongly suggests that the market P/E ratio was mean-reverting (stationary) prior to the period 1950-1960. The time series properties of the P/E ratio subsequently change, however, as increased benchmarking of the E/P ratio to bond yields results in the series becoming nonstationary. We test this hypothesis by running the ADF unit root tests on the monthly market P/E1 and P/E10 ratios from 1881-1959. We find that the series are stationary over this period, based on ADF tests with drift using 6, 8, 10, and 12 autoregressive lags[1].

[1] The t-statistics range between −3.35 and −3.76, rejecting the hypothesis of nonstationarity at the 5% level.

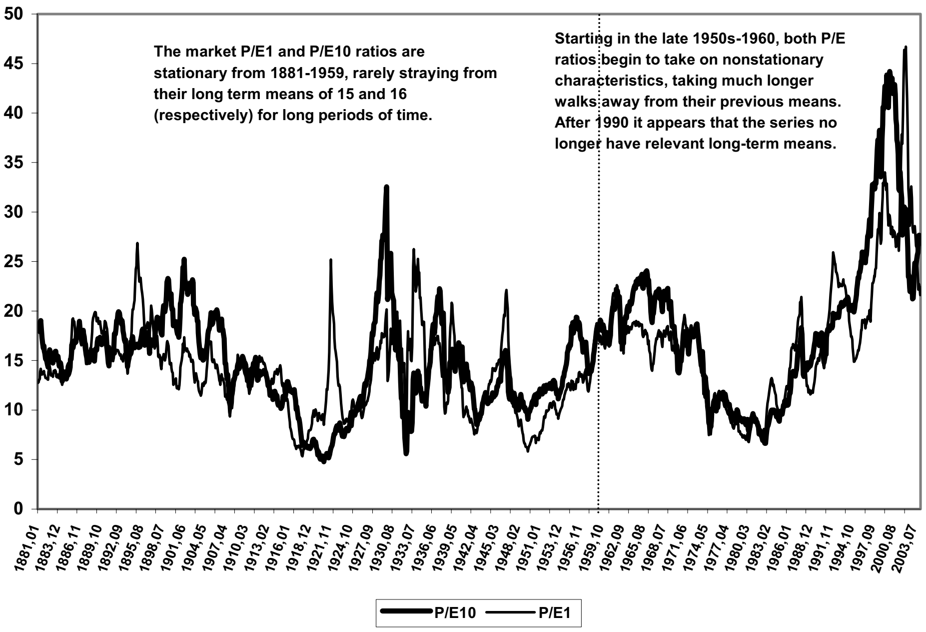

Fig. 2. The Market P/E1 and P/E10 Ratios, 1881-2004 (The graph depicts the monthly market P/E1 and P/E10 ratios from 1881-2004)

This finding is consistent with the idea that investors' increased awareness of the validity of the Fed Model stems from approximately 1960, and that the benchmarking of the market earnings yield to bond yields has induced nonstationarity in the market P/E ratio. The change in the time series characteristics of the market P/E ratio coincides with a significant increase in the correlation between the market earnings yield and bond yields, consistent with an increased awareness of the Fed Model by market participants.

6. Implications for Future Stock Returns

Previous research (Ibbotson and Chen, 2003 and Ilmanen, 2003) indicates that the P/E repricing effect may have accounted for 5-6% of the annual returns earned in the great bull market of the prior two decades. The Campbell and Shiller (1987, 1998, 2001) depiction of the market P/E as a mean-reverting, stationary combination of two cointegrated variables describes the P/E ratio pre-1960, but since that time the Fed Model does a better job of describing changes in the market P/E.

Our interpretation of these findings is that as long as investors retain their belief in the Fed Model, the market P/E ratio will essentially be a slave to nominal interest rates. It is worth noting, however, that investors have more to gain from setting the market earnings yield to interest rates during periods when rates are falling – thus the tremendous boost to equity returns from the P/E repricing effect 1982-1999. As the Fed Model appears to be driven more by cognitive error than economic fundamentals, it is not out of the question that investors will simply abandon their belief in this model if interest rates rise dramatically and the mirror image of the Fed Model story – a reverse repricing effect driven by falling P/E ratios – threatens to exert a negative influence on equity returns.

7. Conclusions

We investigate the econometric implications of Asness' (2003) analysis of how investors use the Fed Model to benchmark the market earnings yield to the yield on the 10-year T-note. We show that, since approximately 1960, bond yields and market E/P ratios have tracked more closely together over time; so closely, in fact, that the market E/P ratio has become cointegrated with 10-year T-note yields. These findings support Asness' (2003) and Yardeni's (2003) depiction of the way investors use the Fed Model. A time series analysis of the market E/P and P/E ratios reveals that these ratios were stationary prior to 1960, but adopted nonstationary characteristics as the correlation between the market earnings yield and the yield on the 10-year T-note abruptly increased. This increase in correlation and change in the time series behavior of the market earnings yield is consistent with an increased awareness of the Fed Model on the part of investors.

One noteworthy implication of these findings is that behavioral factors, in this case the benchmarking of earnings yields to bond yields, can influence market variables into a cointegrating relationship in the same manner as economic factors. This represents another boost for the rapidly-growing field of behavioral finance, an area of study that has contributed greatly in recent years to our understanding of financial markets.

Perhaps most interesting, however, are the implications for future stock returns based on the nonstationarity of the market P/E ratio. The time series characteristics of this key market valuation measure suggest that it can remain above trend for extended periods — and possibly forever. There may be no reason to fear the profoundly negative market returns expected to accompany the P/E ratio's reversion to its mean, as the nonstationarity of the ratio implies that it no longer exhibits mean-reverting properties. From a statistical perspective, describing the P/E ratio in terms of a "normal" or "expected" range is not meaningful, as nonstationary series have no relation to any past average value, over either the short run or the long run.

Whether this represents a permanent shift or just a long-lived but temporary deviation from the ratio's former time series properties remains to be seen. For now at least, widespread acceptance of the Fed Model by market participants has resulted in a new era, where the market P/E ratio can deviate from its prior historical norm for long periods, and potentially forever. It may indeed "be different this time", especially in light of the fact that the Fed Model is regarded as largely ad hoc, depicting a relationship between macroeconomic and financial time series that is not supported by theoretical considerations. Investors could simply abandon their belief in the Fed Model if interest rates rise further, essentially decoupling the longstanding relation between market earnings yields and interest rates. If investors retain their belief in the Fed Model, however, rising inflation and interest rates would lead to increases in the market E/P ratio, which would increase the likelihood of a reverse repricing effect and bear market returns as the market P/E ratio compresses. We agree with Asness (2003) — investors have good reason to "Fight the Fed Model".

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