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Long-run bulls and bears

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ABSTRACT

A central challenge in asset pricing is the weak connection between stock returns and observable economic fundamentals. We provide evidence that this connection is stronger than previously thought. We use a modified version of the Bry–Boschan algorithm to identify long-run swings in the stock market. We call these swings long-run bull and bear episodes. We find that there is a high correlation between stock returns and fundamentals across bull and bear episodes. This correlation is much higher than the analogous time-series correlations. We show that several asset pricing models cannot simultaneously account for the low time-series and high episode correlations.

1. Introduction

Consumption-based asset pricing models in the tradition of Lucas (1978) and Breedan (1979) emphasize the theoretical link between asset returns and economic fundamentals, such as consumption growth. Much of the empirical literature has tested these theories using annual, quarterly, and higher frequency data. Classic examples include Shiller (1981), Hansen and Singleton (1982), and Mehra and Prescott (1985). A central challenge that has emerged from this work is the apparent weak relation between stock returns and observable economic fundamentals.

In this paper, we re-examine this relation using an empirical strategy inspired by Burns and Mitchell's (1946) work on business cycles which uses expansions and recessions as the basic unit of analysis.[1] In this spirit, we investigate whether the elusive relation between economic fundamentals and asset prices emerges more clearly across long-run bull and bear episodes.

We begin by reproducing the standard finding that consumption and output growth are weakly correlated with stock returns. We then use a modified version of the algorithm developed by Bry and Boschan (1971) to identify peaks and troughs in long-run stock market trends. We call "bulls" the episodes that occur between a trough and a peak and "bears" the episodes that occur between a peak and a trough. These bull and bear episodes are identified using *only* stock market

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[1] Stock (1987) pursues a modern version of this approach.

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data. We find that the correlation between stock returns and fundamentals across bull and bear episodes is much higher (about twice as high) than the time-series correlations. This finding holds for the U.S., G7, and OECD countries.

As a check on our procedure, we also date episodes using only consumption data or only output data rather than stock returns. Once again, we find that for the U.S., G7, and OECD countries, the correlation between stock returns and fundamentals across bull and bear episodes is much higher than the time-series correlations.

Our results are consistent with the idea that fundamentals do not drive stock prices at short and even relatively long periods of time. But over the course of episodes sparked by major technological, military or political events, stock prices do reflect fundamentals.

We investigate whether this new fact–episode correlations between stock returns and fundamentals are much stronger than time-series correlations–is consistent with three asset-pricing models. The first is the external-habit model proposed by Campbell and Cochrane (1999). The second is the long-run risk model proposed by Bansal et al. (2012). The third is the valuation-risk model proposed by Albuquerque et al. (2014). We find that none of these models can explain our basic fact.

Both the external-habit model and the long-run risk model do well at accounting for the high episode correlations. However, they imply time-series correlations between stock returns and consumption growth which are too high relative to the data, even taking sampling uncertainty into account. This result holds at the one-, five-, ten- and 15-year horizons. As stressed in Albuquerque et al. (2014), this shortcoming reflects the fact that the only source of uncertainty in those models comes from the production side of the economy. The valuation-risk model of Albuquerque et al. (2014) accounts for the time-series correlations at all horizons when sampling uncertainty is taken into consideration. However, the model fails to account for the high episode correlations.

We investigate whether the difference between the time-series and episode correlations might be an artifact of the historical sample that we have at our disposal. At least for the U.S., this possibility seems very unlikely. The evidence is somewhat more mixed for the G7 and OECD countries.

We redo our analysis using dividends and earnings as alternative measures of fundamentals. Our results for earnings growth are similar to those that we obtain with consumption and output growth. The results with dividend growth are more nuanced. Dividend growth is uncorrelated with stock returns at a yearly frequency. However, these series are correlated at the 5- 10- and 15-year horizon, with a point estimate of roughly 0.5. There is a great deal of sampling uncertainty associated with the episode correlation so that one cannot reject the hypothesis that the episode and the long-horizon correlations are the same. A similar pattern emerges for the G7 countries.[2]

Considering the evidence as a whole, we are left with a puzzle: why is the correlation between stock returns and fundamentals much stronger across bull and bear episodes than the time-series correlations?

Our paper is organized as follows. In Section 2 we describe our modified version of the Bry–Boschan filter, the data we use, and our empirical results. Section 3 describes the three asset-pricing models we consider and their implications for time-series and episode correlations between stock returns and fundamentals. Section 4 concludes.

2. Measuring long-run booms and busts

There is a long tradition of characterizing turning points in economic time series that goes back at least to the work of Burns and Mitchell (1946) on dating business cycles. This tradition gave rise to a large literature that uses time-series methods to estimate turning points (see Stock and Watson, 2010 and the references therein). An early, important contribution to this literature is Bry and Boschan (1971) who develop an algorithm for dating the beginnings and ends of recessions. This algorithm has recently been used to characterize high-frequency bull and bear stock markets (see e.g. Pagan and Sossounov, 2003 and Gonzalex et al., 2005).

This paper focuses on low-frequency swings in the stock market which we refer to as long-run bulls and bears. The solid line in Fig. 1 displays an annual index of U.S. stock prices for the time period 1869–2013. It is evident that there are periods of irregular length in which stock prices are dominated by either upward or downward movements. To determine the turning points that mark the beginning and end of long-run bulls and bears, we develop a modified version of the Bry and Boschan (1971) algorithm.

The remainder of this section is organized as follows. In Section 2.1, we describe the modified Bry–Boschan (1971) algorithm. In Section 2.2 we describe the data we use. In Section 2.3 we apply the algorithm to U.S. data and discuss historical events around the identified turning points. In Section 2.4 we revisit a classic question in asset pricing: what is the correlation between fundamentals (consumption and output growth) and realized returns to the stock market? We also extend our basic analysis to G7 and OECD countries. In Section 2.5 we pursue an alternative strategy for dating long-run bulls and bears, which relies on consumption and output data. In Section 2.6 we conduct tests to assess whether our results are spurious in the sense of being an artifact of the filter that we use to date bull and bear episodes. We also discuss the possibility that our results might reflect small-sample bias.

[2] We cannot do this analysis for OECD countries because of data availability.