

## ANALYSIS OF BULL/BEAR MARKET PATTERNS IN THE STOCK MARKET INDEX DATA

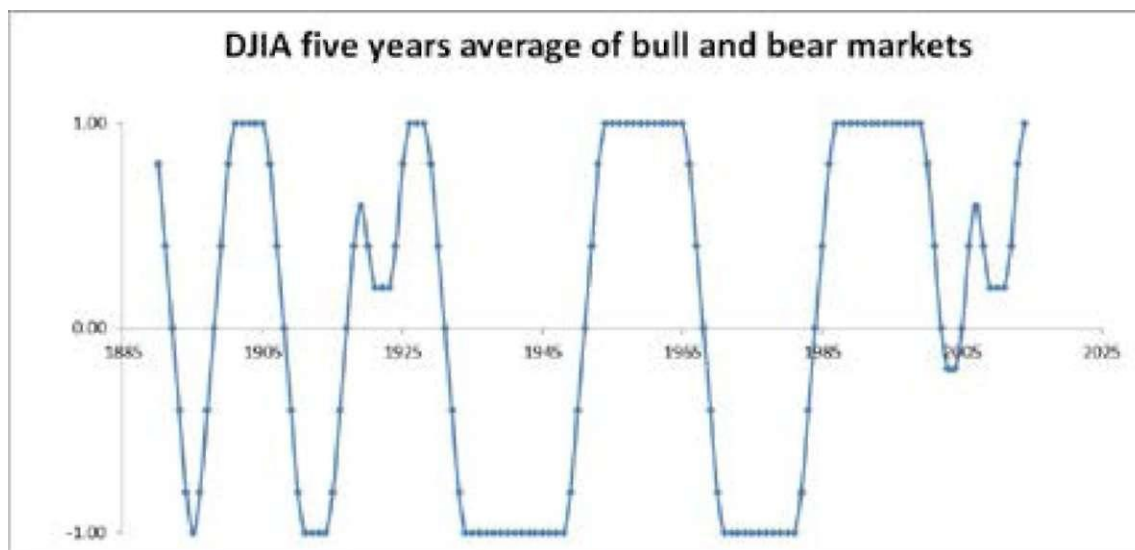
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**Introduction.** One of the tools in financial forecasting is technical analysis where patterns that predict future prices and market behavior are identified from past market data. Technical analysis uses charts to identify predictive patterns - it can be applied to the analysis of prices of stocks, currencies, precious metals, commodities, various indices, futures, or financial derivatives. The underlying assumption is that the current price is the summary of all information available, that price movements are a combination of random fluctuations and periods of non-random patterns, and that accurate forecasting can be performed without knowing the specific reasons that cause price changes. Technical analysis often fails to forecast disruptive events, such as formation of bubbles, crises, and emergence of systemic risks.

**Materials and methods.** We have analyzed 130 years of data of bull and bear markets (BB markets) of the Dow Jones Industrial Average (DJIA). The term "bull market" refers to a period of index price increases; "bear market" refers to a period of price decreases that are higher than a given percentage value, typically 20%. We quantified each year as "bull year", "bear year", or "change year" and quantified the values for each: 1 for bull year, -1 for bear year, and 0 for change year. The five year sliding window has been plotted (Figure 1).

**Results and discussion.** Five year average charts showed that the 2005-2014 pattern of BB markets resembles the pattern of 1917-1926 that preceded the Great Depression of 1929 (Figure 1). Assuming that over the long periods the sum total number of bull and bear years shows oscillatory behavior around the 0 base, we forecast a prolonged bear market that will start around 2018. Strengthening of this hypothesis requires additional analysis, in particular addressing possible data biases and serial dependencies.



**Figure 1.** DJIA five years average of bull and bear markets

Five-year average of bull and bear markets of DJIA data (Fig. 1) over the last 130 years, where the horizontal axis shows a year, while vertical axis shows the BB index where "1 stands" for a continuous bull market, -1 stands for a continuous bear market, and intermediate values show various mixes of the BB market over the preceding five years period.