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# Time-series momentum as an intra- and inter-industry effect: Implications for market efficiency



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### ABSTRACT

Existing studies on time-series predictability in equity returns base their analysis on the usage of a broad market index or individual stocks showing that trend chasing trading rules have largely been futile. This paper shows that trend continuation is predominantly an intra-industry rather than a market-wide or a single-company effect. After adjusting for data snooping bias, trend chasing trading rules achieve superior predictability for a number of sectors and industries in the 1990s. A simultaneous application of trading rules to each sector or industry individually yields superior predictability on the aggregate market level in the 1990s implying that time-series momentum can also be experienced as an inter-industry effect, i.e., momentum can travel across industries reflecting the phenomenon of sector rotation. Sector and industry portfolios exhibit no predictability in their returns in the 2000s due to a persistent negative autocorrelation in their return series. A sharp and sustained rise in correlations between sectors and industries observed since the early 2000s makes it difficult for actively managed trading strategies to outperform the passive benchmarks.

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## 1. Introduction

An extensive body of finance literature examines the degree of predictability of equity returns based on past performance or historical price patterns. Two existing strands of research focus on

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different aspects of return forecasting: cross-sectional predictability and time-series predictability. The cross-sectional predictability of equity returns is commonly associated with the phenomenon of cross-section momentum where trading strategies that buy past winners and sell short past losers have been shown to earn significant profits (Jegadeesh and Titman, 1993, 2001, 2011). Meanwhile, the existence of time-series predictability in equity returns has often been associated with evidence of the deviation of a return series from a random walk. Even though such anomaly could be revealed by applying a series of variance ratio tests or other testing techniques, a few questions would still remain. Is it possible to take advantage of serial correlation in returns by utilizing a proper trading strategy? How do you choose such a trading strategy ex-ante? If the profitability of trading strategies has been shown ex-post, can it be legitimately attributed to data snooping bias? Could transaction costs erase any profits generated by trading strategies thus implying that time-series predictability in returns can, in fact, co-exist with market efficiency? An application of technical analysis that comprises mechanical trading strategies which trigger buy and sell signals without regard to market fundamentals or personal judgment could help to answer the posed questions. Its prevalent use by the financial market professionals has been featured in the academic literature (e.g., Menkhoff, 2010) as the expansion of computational powers, introduction of new trading vehicles, and reduction in costs of trading that took place over the last decade has allowed market participants to use a great variety of trading rules and techniques at a low cost.

While the focus of cross-section momentum is the relative performance across different securities, time-series momentum<sup>1</sup> defines strong predictability of future returns based solely on the security's own past returns considered in isolation from returns on other securities. The existence of time-series momentum is commonly associated with a trending behavior in the asset price caused by positive serial autocorrelations in the asset returns. The existing literature on cross-sectional predictability suggests that time-series momentum can be more prevalent in certain segments of the U.S. equity market.

Moskowitz and Grinblatt (1999) show that cross-section momentum effects in the U.S. equity market are mainly driven by industry factors and their results suggest further that serial autocorrelations in industry portfolio returns largely contribute to profits on strategies based on cross-section momentum. Using a different method of decomposing momentum profits into the components, Pan, Liano, and Huang (2004) provide direct support to the findings of Moskowitz and Grinblatt (1999). Significant positive serial autocorrelations in returns of a stock portfolio can be caused by the phenomenon of a lead-lag effect where returns on some subset of stocks in the portfolio lag or follow returns on another subset of stocks. Lo and MacKinlay (1990) document that returns on large stocks lead returns on small stocks since returns of small firms are correlated with past returns of big firms, but not vice versa. Hou (2007) elaborates that the lead-lag effect between large firms and small firms is largely an intra-industry phenomenon by showing that the industry cross-section momentum is predominantly about large firms leading same-industry small firms, which is consistent with the hypothesis that the lead-lag effect is primarily driven by the within-industry news dissemination. Since positive serial autocorrelation is, by definition, the primary factor behind the time-series momentum, its significant contribution to the cross-section momentum in industries shown in the existing literature suggests that time-series momentum can exist in industry portfolios even when there may be no evidence of it on the aggregate market level. The time-series momentum strategies are also more likely to succeed when applied to portfolios of stocks with similar characteristics such as industry affiliation than individual stocks since returns on individual stocks have generally been shown to be negatively correlated (Lo & MacKinlay, 1990). And due to the evidence of lead-lag effects on industry level, industry portfolios are more likely to exhibit time-series momentum in their returns than portfolios based on grouping methods other than industry affiliation.<sup>2</sup>

Meanwhile, there is no any empirical evidence on the existence or lack of time-series predictability at the level of sector or industry in the literature on the application of active trend following trading

<sup>1</sup> The term "time-series momentum" is formally introduced by Moskowitz, Ooi, and Pedersen (2012) and it may often be used interchangeably with "trend effect."

<sup>2</sup> Chan et al. (2007) show that stock groupings based on industry affiliation exhibit stronger out-of-sample homogeneity properties that groups formed on a mechanical classification scheme based on a statistical cluster analysis.

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