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Predictability in bond returns using technical trading rules

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ABSTRACT

The predictability of future returns on bond portfolios at daily frequency is investigated using a large universe of mechanical trading rules that have been popularized in literature on equity and currency markets. The predictability in returns is inversely related to interest rate risk but positively related to default risk. The return predictability is more sensitive to fluctuations in the economic business cycle rather than changes in the Federal Reserve's monetary policy. Returns on portfolios of Treasury bonds are more predictable during the restrictive monetary policy regime, whereas returns on both Treasury bonds and corporate bonds exhibit much better predictability during the economic expansions rather than recessions. The predictability of returns in various segments of the U.S. bond market has declined over time. Findings for the predictability in the highly liquid bond exchange-traded funds are largely in line with the original results of the predictability in bond portfolio returns.

1. Introduction

The predictability of future asset returns based on historical price and return data has been a popular subject in both academic literature and practitioner circles. A myriad of active investment strategies have been designed to exploit time-series predictability of returns. In particular, technical analysis explores time-series predictability of returns and it is typically used by the financial markets participants to predict the price movement for short forecasting horizons. Technical or mechanical trading rules are based on the premise that past price trends predict future price movements and trend-chasing mechanical trading rules are designed to exploit the phenomenon of price continuation. Practitioners have been known to rely on technical indicators and pursue mechanical trading strategies that use past price and volume data to infer future price movements. In financial media journalists frequently turn to financial professionals known as "technicians" or "chartists" for their take on the market's future direction. Based on the results of a survey of 692 fund managers in five countries including the United States, Menkhoff (2010) finds that the share of fund managers that put at least some importance on technical analysis is 87% and that technical analysis becomes the most important forecasting tool in decision making for shorter-term periods.

In contrast to the views of many financial practitioners, most academics have been skeptical about the usefulness of technical analysis. Despite that, numerous research papers investigating the forecasting power of different mechanical trading strategies, charts and patterns have been published over the years. Park and Irwin (2007) review a total of 135 published articles that investigate the application of different mechanical trading rules and strategies to various markets around the world during the 1960–2004 period. Table 1 shows how the total number of such publications is split between subperiods and different markets (equities, currencies, commodities and bonds). It is worth noting several interesting observations from the table. First, the interest in research on technical analysis increased substantially since the early 1990s. During the 1990–2004 period, more than half of empirical studies on technical trading rules covered in Park and Irwin (2007) were conducted. The rise of interest in research on return predictability using mechanical trading rules during that time frame is commonly attributed to two seminal publications, Sweeney (1986) and Brock et al. (1992), which find that technical analysis is able to yield excess returns in currency markets and equity markets, respectively. Second, although a plethora of published literature on

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Table 1
Number of published articles on technical analysis applied to different markets*.

Time period	Equities, equity futures and equity options	Currency exchange rates and currency futures	Commodities and commodity futures	Bonds and bond futures
1960s	9	1	4	–
1970s	6	3	5	–
1980s	6	6	10	2
1990s	22	17	3	–
2000–2004	22	18	1	–

* Based on Park and Irwin (2007).

technical analysis focuses on whether future returns on equities, currencies, commodities or their respective futures can be predicted using past prices, the subject of short-term predictability of returns in bond markets using mechanical trading rules has been studied less closely. There are only two papers on the subject published during the 1960–2004 period that use data for bond futures and none that use data on bonds. Dale and Workman (1980) investigate profitability of 11 moving average rules applied to 90-day Treasury bill futures during the 1976–1978 sample period, and Taylor (1988) explores forecasting power of four price-trend autoregressive moving average trading rules applied to Treasury bond futures during the 1978–1987 sample period. To our knowledge, a large-scale study on time-series predictability in bond returns using mechanical trading rules has not yet been attempted.

A block of literature investigates the predictability of returns and yields in the U.S. bond market using testing techniques other than technical analysis. Ilmanen and Byrne (2003) find that bond yields tend to experience trend continuation in the run-up to major events such as a release of the U.S. non-farm payroll report, and Chua et al. (2006) show that a small number of trading strategies focusing on the mean-reversion of the yield spreads can be highly profitable. Boyd and Mercer (2010) find that successful trading strategies tied to yields on bonds with short maturities can be exclusively based on the use of past information, while Moskowitz et al. (2012) document a significant time-series momentum in the U.S. Treasury bond futures.

All aforementioned studies rely on the use of monthly return data to reach their conclusions. Meanwhile, a segment of literature suggests that the use of monthly data may fail to detect or underestimate the return predictability if timing decisions occur at a more frequent interval. Bessembinder et al. (2009) analyze the empirical power and specification of test statistics designed to detect abnormal bond returns and find that using daily data significantly increases the power of the test, relative to the monthly data, even if the available time series of daily bond returns is short. Reisman and Zohar (2004) demonstrate that using weekly data improves the degree of return predictability compared to the monthly data usage. Gebhardt et al. (2005) show that stock prices adjust to new information more quickly than bond prices which may imply that bonds are more likely than equities to experience momentum when frequent data are analyzed. A number of works assess the predictability in bond returns using daily and intraday data (Hotchkiss and Ronen, 2002; Downing et al., 2009; Goyenko et al., 2011; Hong et al., 2012) but their analyses are largely confined to the investigation of the informational efficiency of bond market relative to stock market by examining cross-dependencies and lead-lag relations between the returns on bonds and equities, restricted to a single segment of the bond market or characterized by a relatively short sample period.

We do not attempt to convince one whether technical analysis is a self-fulfilling prophecy. Looking upon a larger scale, the purpose of this paper is to expand the scope of research on the predictability of returns and market efficiency in the bond markets. Time-series predictability of returns is tested for a variety of bond portfolios at daily frequency via the utilization of mechanical trading rules that have been popularized in the literature on the short-term predictability of returns in equity and foreign exchange markets. A universe of 27,000 mechanical trading strategies is employed, and the Superior Predictive Ability (SPA) bootstrapping technique and its stepwise extension is utilized to account for data snooping bias to evaluate the degree of short-term predictability in returns on a set of bond indexes. Statistically significant predictability is found in returns on the aggregate bond index covering the entire universe of the U.S. bond market as well as in the selected segments of the market after accounting for data snooping bias and mitigating for the potential nonsynchronicity bias arising from infrequent trading of the bond index components.

Further analysis reveals that the returns on the U.S. bond portfolios with shorter maturities are more predictable than the returns on the U.S. bond portfolios with longer maturities suggesting that the predictability in bond returns is negatively related to interest rate risk. This outcome has been found valid for both Treasury bonds and corporate bonds. For corporate bonds, the short-term predictability in bond returns is also found to be positively related to default risk: the returns on bond portfolios with high-risk low-quality bonds tend to be more predictable than the returns on the portfolios of low-risk high-quality bonds.

The predictability of returns in various segments of the U.S. bond market has declined over time. Such evidence can be interpreted as a consequence of the increased competitiveness for profits among traders and arbitrageurs that resulted in the improved market liquidity. Other potential explanations of the observed phenomenon of the weakening of the predictive power of mechanical trading rules would include the expansion of computational powers and technological advances which resulted in the proliferation of algorithmic trading and the reduction in transaction costs followed by the improved liquidity conditions in the market and the introduction of new investment vehicles in the form of exchange-traded securities that allow to trade baskets of bonds at low cost.

The predictability in returns on bond portfolios has been found to be more sensitive to the fluctuations in the economic business cycle rather than the changes in the monetary policy. While the returns on Treasury bond indexes tend to be more predictable during the restrictive monetary policy regime, the examination of return predictability in corporate bond indexes under different monetary policy regimes reveals no clear evidence whether returns are significantly better predictable during one of the regimes. Meanwhile, returns on both Treasury bond indexes and corporate bond indexes exhibit much better predictability during the economic expansions rather than the recessions. The evidence of the varying degree of predictability in bond returns across business expansions and recessions offers support for the adaptive market hypothesis which suggests that changing business conditions and market environment can result in temporary market inefficiencies that open opportunities for abnormal profitability.

The impact of transaction costs on the predictability of bond returns is hard to determine as transaction costs in the bond market are difficult to measure precisely and they must have declined over time. The factor of transaction costs is incorporated into analysis by assessing the predictability of returns in the most liquid exchange traded funds that have been designed to replicate the performance of a number of popular bond indexes. The obtained findings for the bond exchange-traded funds confirm the original results showing that the bond return predictability is negatively related to the interest rate risk but positively related to the default risk and that the predictability of returns in bond portfolios has been largely eliminated since the early 2000s.

The rest of the paper is structured as follows. Section 2 discusses the data on bond returns used for the analysis of short-term