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Momentum and mean reversion across national equity markets

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Abstract

Numerous studies have separately identified mean reversion and momentum. This paper considers these effects jointly. Our empirical model assumes that only global equity price index shocks can have permanent components. This is motivated in a production-based asset pricing context, given that production levels converge across developed countries. Combination momentum-contrarian strategies, used to select from among 18 developed equity markets at a monthly frequency, outperform both pure momentum and pure contrarian strategies. The results continue to hold after corrections for factor sensitivities and transaction costs. They reveal the importance of controlling for mean reversion in exploiting momentum and vice versa.

Introduction

Considerable evidence exists that both contrarian and momentum investment strategies produce excess returns. The work of DeBondt and Thaler, 1985, DeBondt and Thaler, 1987, Chopra et al. (1992), Richards (1997), and others finds that a contrarian strategy of sorting (portfolios of) firms by previous returns and holding those with the worst prior performance and shorting those with the best prior performance generates positive excess returns. On the contrary, the work of Jegadeesh and Titman (1993), Chan et al., 1996, Chan et al., 2000, Rouwenhorst (1998), Grundy and Martin (2001), Jegadeesh and Titman (2001), Lewellen (2002), Patro and Wu (2004) and others reveals that a momentum strategy of sorting (portfolios of) firms by previous returns and holding those with the best prior performance and shorting those with the worst prior performance generates positive excess returns.

There is no direct contradiction in the profitability of both contrarian and momentum investment strategies since contrarian strategies work for a sorting period ranging from 3 to 5 years prior and a similar 3 to 5 years holding period, while momentum strategies typically work for a sorting period ranging from 1 month

(or more commonly 3 months) to 12 months and a similar 1 (or 3) to 12 months holding period.[2] The results correlate well with the findings of mean reversion at horizons of around 3 to 5 years and the findings of return continuation for horizons up to 12 months.[3] Furthermore the overreaction hypothesis of DeBondt and Thaler, 1985, DeBondt and Thaler, 1987, as formalized by DeLong et al. (1990), and the behavioral theories of Daniel et al. (1998), Barberis et al. (1998), and Hong and Stein (1999) imply the observed pattern of momentum/continuation at short horizons and mean reversion at long horizons.[4] Of course, apparent overreaction may also be generated in an efficient market when unanticipated persistent changes in risk or risk premia occur: For instance, when a persistent increase in systematic risk comes about, returns are initially low as prices adjust but subsequently are higher as expected returns have increased due to the increased reward for risk; similarly, if previous return realizations correlate with future risk sensitivities, as suggested by Berk et al. (1999), a price pattern resembling overreaction may result.

The purpose of this paper is to explore the implications of an investment strategy that considers momentum and mean reversion jointly. Chan et al. (1996, p.1711) state prominently: "Spelling out the links between momentum strategies and contrarian strategies remains an important area of research". Subsequent research by Lee and Swaminathan (2000), and Jegadeesh and Titman (2001) exploring these links confirms an earlier finding of Jegadeesh and Titman (1993) (hereafter JT) that particular momentum-sorted portfolios experience eventual partial mean reversion. This finding is important since it suggests that momentum and mean reversion, which in principle may occur in different groups of assets, occur in the same group of assets. This reversal pattern, however, needs further corroboration: it is established for U.S. data only; is weak in the 1982–1998 period; may not hold for large firms after risk correction; and appears to be insignificant for prior losers (Jegadeesh and Titman, 2001).

While it is essential to consider momentum and mean reversion effects jointly, traditional *non-parametric* approaches make a combination strategy awkward. One could, for instance, construct a portfolio of firms with a combination of high returns in the previous 1–12 months period and low returns in the previous 3–5 years period, and buy this portfolio. One problem is: what should the holding period be—1–12 months or 3–5 years? But more essential than the selection of a particular holding period is the actual portfolio choice: how should an investor weigh the importance of momentum potential vis-à-vis mean reversion potential?

We utilize the decomposition into permanent and transitory components from Fama and French (1988) and employ a *parametric* approach, as in Jegadeesh (1990), Pesaran and Timmermann, 1995, Pesaran and Timmermann, 2000, and Balvers et al. (2000). Our decomposition assumes all country-specific price components to be transitory. To motivate this assumption, consider the context of a Lucas (1978) production-based asset pricing model that relates asset returns to production growth: transitory differences in productivity imply transitory differences in stock price index levels. The transitory nature of shocks in relative production levels is supported by the growth literature (see for instance, Baumol, 1986, Dowrick and Nguyen, 1989, Barro and Sala-i-Martin, 1995), which finds that "convergence" in per capita GDP occurs between developed countries, suggesting that any relative productivity shocks, and thus relative stock price index levels, are transitory.

Specific parameter estimates obtained under the assumption that cross-country price index shocks are transitory allow construction of an expected returns indicator that naturally combines the potential for momentum and mean reversion into one number. Investing occurs *at each point in time* in the asset or portfolio of assets with the highest indicator at that time (while shorting the assets with the lowest indicator). Applying the parametric investment switching strategies to a sample of 18 developed national equity markets, we find that strategies combining momentum and mean reversion typically yield excess returns of around 1.1–1.7% per month and generally outperform pure momentum and pure mean reversion

strategies, which in turn outperform a random-walk-based strategy. The excess returns remain similarly high after correction for basic factors such as global beta risk, the Fama–French factors and exchange rate risk factors, and survive adjustment for transactions costs.

The results sustain the view that full mean reversion occurs in all cases where momentum drives prices away from original levels. Accordingly, mean reversion tendencies should be expected for all assets that display momentum. It is not the case that some assets are responsible for the empirical findings of mean reversion with others responsible for momentum. The analytical decomposition of returns into momentum and mean reversion effects enables us to identify how the effects are interrelated. We find empirically a strong negative correlation between the two effects of −35%, implying that it is important to control for momentum when studying mean reversion and vice versa. Momentum persists longer than previously found in isolation and mean reversion takes place quicker.

Cutler et al. (1991) and Asness et al. (1997) have previously investigated both mean reversion (or the related value effect) and momentum among national equity markets. These studies are methodologically different from ours and do not explicitly connect the momentum and mean reversion effects. Van der Hart et al. (2002) do combine momentum and value potential in predicting excess returns across firms in emerging national equity markets but use ad hoc weights in the combination. Methodologically we follow Balvers et al. (2000) (hereafter BWG) who employ a parametric approach, but focus on mean reversion only.[5]

The outline of the paper is as follows. In Section 2 we describe the model and a decomposition of expected return into a global risk component, the country-specific potential for mean reversion, and the country-specific potential for momentum. Section 3 discusses the Morgan Stanley Capital International (MSCI) data for the index returns in 18 developed equity markets over the 1970–1999 period and estimation issues. Illustrative parameter estimates are provided in Section 4 and basic results for pure and combination momentum with mean reversion strategies and random-walk-based strategies are presented in Section 5. We also discuss correction for factor sensitivities and adjustment for transactions cost in this section. Various robustness issues are covered in Section 6. Section 7 concludes with an appraisal of the results and further discussion of the implications.

Section snippets

An integrated mean reversion-momentum model

We adapt the model of Fama and French (1988) and Summers (1986) to apply in a global context and to allow for momentum as well as mean reversion in equity prices. The model is methodologically similar to the mean reversion model of Balvers et al. (2000) who work with annual data, do not examine momentum effects, and consider relative returns rather than returns specifically adjusted for global beta risk. Our focus and contribution is the explicit joint consideration of momentum and mean…

Data

Monthly returns data are obtained from the MSCI equity market price indexes for a value-weighted world average and 18 countries with well-developed equity markets: Australia, Austria, Belgium, Canada, Denmark, France, Germany, Hong Kong, Italy, Japan, the Netherlands, Norway, Singapore, Spain, Sweden,

Switzerland, the United Kingdom, and the United States. We use here the prices with reinvested gross dividends (that is, before withholding taxes; see Morgan Stanley Capital International (1997)…

Parameter estimates for a baseline model and pure strategy models

To illustrate the implications of considering momentum and mean reversion simultaneously, we examine the parameters of a baseline combination model estimated using the full sample from December 1969 to December 1999. The model is Eq. (5) with $\delta^i=\delta$, $\rho_j{}^i=\rho$ (for all countries i and lags j), and $\sigma_\eta{}^{i2}=\sigma_\eta{}^2$, and assumes a lag structure for the momentum effect with monthly lags up to 12 (J=12). The literature on momentum effect finds momentum effects of generally less than a year. However, as shown…

Trading strategy returns

The empirical model of Eq. (5) is applied with 12 possible momentum lags and a one-month holding period (or more if the latest available information does not induce a portfolio change). For the sake of comparison to existing approaches, we initially also consider pure momentum and pure mean reversion strategies and related variations of the combined momentum-mean reversion strategy. In Table 3, Table 4, Table 5, we display four special cases based on Eq. (5): the pure momentum model of JT, the…

Return results for alternative strategies

Panel A in Table 7 first summarizes again, as Models 1–4, the returns for the basic strategies (combination, pure momentum, pure mean reversion, random walk) for the baseline case of a one-month holding period and 12 momentum lags if applicable (J=12, K=1); also listed are the average portfolio turnover rate discussed above, the world market beta, and the expected return—this information we use in the following to discuss robustness. Models 5 and 6 in Panel A give the returns on the baseline…

Summary and appraisal of results

A simple trading strategy that draws on the combined promise for momentum and mean reversion in 18 national stock market indexes, produces significant excess returns. The strategy is neither purely contrarian nor purely momentum-based; it instead uses the information of all previous price observations to aggregate endogenously the mean reversion potential with the momentum potential into a single indicator. Investing in the national market with the highest indicator and short selling the…

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