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journal homepage: www.elsevier.com/locate/jfecThe role of shorting, firm size, and time on market anomalies[☆]Ronen Israel^a, Tobias J. Moskowitz^{b,*}^a AQR Capital Management, United States^b University of Chicago and NBER, United States

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ABSTRACT

We examine the role of shorting, firm size, and time on the profitability of size, value, and momentum strategies. We find that long positions make up almost all of size, 60% of value, and half of momentum profits. Shorting becomes less important for momentum and more important for value as firm size decreases. The value premium decreases with firm size and is weak among the largest stocks. Momentum profits, however, exhibit no reliable relation with size. These effects are robust over 86 years of US equity data and almost 40 years of data across four international equity markets and five asset classes. Variation over time and across markets of these effects is consistent with random chance. We find little evidence that size, value, and momentum returns are significantly affected by changes in trading costs or institutional and hedge fund ownership over time.

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1. Introduction

The returns to portfolios based on firm size, value, and momentum have presented a challenge to asset pricing

theory since their discovery.¹ The pervasiveness, robustness, and magnitude of the return premia associated with size, value, and momentum has made them the focal point for discussions of market efficiency as well as critical inputs for describing the cross section of expected returns. These market anomalies have been shown to be robust in other stock markets, other time periods, and

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¹ Initially, these were challenges to the Capital Asset Pricing Model (CAPM). Small stocks on average outperform large stocks (based on market capitalization), even after adjusting for market exposure (Banz, 1981; Roll, 1983; Fama and French, 1992). Likewise, value stocks, with high ratios of fundamental or book value to market value (such as book-to-market equity, cash flow-to-price, or earnings-to-price ratios) outperform growth stocks, which have low book-to-price ratios (Stattman, 1980; Rosenberg, Reid, and Lanstein, 1985; DeBondt and Thaler, 1985; Fama and French, 1992; Lakonishok, Shleifer, and Vishny, 1994). There is also positive momentum in stock returns. Stocks that have done well relative to other stocks over the last six months to a year continue to outperform their peers over the next six months to a year, and stocks that have done relatively poorly continue to underperform (Jegadeesh and Titman, 1993; Asness, 1994; Fama and French, 1996; Moskowitz and Grinblatt, 1999; Grinblatt and Moskowitz, 2004).

other asset classes (Chan, Hamao, and Lakonishok, 1991; Hawawini and Keim, 1995; Fama and French, 1998, 2012; Rouwenhorst, 1998; Griffin, Ji, and Martin, 2003; Asness, Moskowitz, and Pedersen, forthcoming) and have motivated the use of empirical asset pricing models that incorporate their returns (Fama and French, 1993, 2012; Carhart, 1997; Asness, Moskowitz, and Pedersen, forthcoming). The vast literature on these anomalies has generated a wide debate as to the underlying explanations for these return premia, which generally fall into two categories: rational risk-based models or behavioral theories. Also, a lack of consensus exists on the implementability of these strategies in practice. Both of these issues are paramount to discussions of market efficiency with respect to these anomalies.

Given the disparate views in the literature, we take stock of the empirical evidence of these market anomalies, to shed some light on these issues. We investigate three questions. First, how important is short selling to the profitability of these strategies? Second, what role does firm size play in the efficacy of these investment styles? Third, how have the returns to these strategies and the role of size and shorting varied over time? The importance of size, shorting, and time to the profitability of these strategies helps identify possible explanations as well as implementation costs associated with each anomaly. Without having to specify a trading cost model, which is investor specific, we acknowledge that small stocks are more costly and more difficult to trade and that shorting is more costly and more constrained. Arbitrage activity and capital are, therefore, likely to be more limited in small stocks and when shorting. Consistent with this view, many behavioral theories suggest stronger returns among smaller, less liquid securities and when there is negative news (Hong and Stein, 1999; Hong, Lim, and Stein, 2000; Lee and Swaminathan, 2000). How these effects have evolved over time could also help reveal what drives these anomalies. We examine how these effects have varied with changes to trading costs and institutional ownership over time, including the surge in hedge fund activity over the last two decades.

We examine the role of shorting from two perspectives: the value added from short selling of assets in a long-short portfolio and the value added from underweighting stocks relative to a benchmark (e.g., the market portfolio). Because short positions are generally more costly to maintain than long positions and because some investors are restricted from taking short positions (e.g., mutual funds and institutions) the net of trading cost returns could be substantially lower and not accessible to many investors, if shorting is an important driver of the profits to these strategies.

The role of firm size also plays a dual part in our study. First, we examine the return premium associated with size. Second, we examine the interaction between firm size and the return premia to value and momentum, including the interaction of firm size with the importance of shorting for these strategies. If the bulk of the returns to these strategies is concentrated among small or micro-cap stocks, then the fraction of the market affected by these anomalies could be small. Moreover, trading costs are typically highest among the smallest stocks, and small stocks are the most difficult

and costly to short. Hence, the interaction between firm size and the other anomalies provides insight into the implementation costs of these strategies.

Using data over the last 86 years in the U.S. stock market (from 1926 to 2011) and over the last four decades in international stock markets and other asset classes (from 1972 to 2011), we find that the importance of shorting is inconsequential for all strategies when looking at raw returns. For an investor who cares only about raw returns, the return premia to size, value, and momentum are dominated by the contribution from long positions. Shorting only matters if investors care about returns relative to a benchmark, such as the market portfolio. Looking at market-adjusted returns (market alphas), long positions comprise the bulk of the size premium, capture about 60% of the value premium, and comprise half of the momentum return premium. Long-only versions of value and momentum deliver positive and significant alphas relative to the market.

Looking across different size firms, we find that the momentum premium is present and stable across all size groups. Little evidence exists that momentum is substantially stronger among small cap stocks over the entire 86-year US sample period. The value premium, meanwhile, is largely concentrated only among small stocks and is insignificant among the largest two quintiles of stocks (largest 40% of NYSE stocks).²

The contribution to value and momentum profits from shorting varies with firm size. Shorting becomes less (more) important for momentum and more (less) important for value strategies as firm size decreases (increases). However, across all size groups, we cannot reject that the abnormal profits to value and momentum trading are generated equally by long and short positions.

We examine the robustness of these findings over time and in relation to time series variation in trading costs, institutional ownership, and hedge fund assets. First, we find that significant momentum returns are present across size categories in every 20-year subsample we examine, including the most recent two decades that followed the initial publication of the original momentum studies. Moreover, the findings of Hong, Lim, and Stein (2000) and Grinblatt and Moskowitz (2004) that momentum is markedly stronger among small cap stocks and on the short side seems to be sample specific. Outside of the samples studied in those papers [most notably, 1980 to 1996, the sample period covered in Hong, Lim, and Stein (2000)], we find no evidence that momentum is stronger among small stocks or from shorting, and, over the entire period that includes those samples, no significant difference emerges in momentum returns across size groups or from shorting. Returns to value investing, however, are consistently stronger among small cap stocks in every subperiod and are largely nonexistent among large cap

² We follow the academic literature and, specifically, Fama and French (1992, 2008, and 2010) in forming portfolios that use all publicly traded stocks on the NYSE, Amex, and Nasdaq. This means our smallest size groupings of stocks contain mostly micro-cap stocks that could be difficult to trade and implement in a real-world portfolio. The smallest grouping of stocks contain firms that are much smaller than firms in the Russell 2000 universe.

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