Market Anomalies and Investment Strategies

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Anomalous patterns in stock prices

- Financial economists have documented profitable investment strategies in equity markets.
- Such profitability is attributable to the propensity of firm characteristics to predict future returns.
- Return predictability is unexplained by asset pricing models such as the CAPM and thus establishes anomalous patterns in stock prices.
- Predictive characteristics include market cap, book-to-market ratio, past return, earnings surprises, accruals, idiosyncratic volatility, trading volume, gross profitability, total volatility, credit rating, capital investments, to name a few.
- Harvey, Liu, and Zhou (2015) describes about 316 predictive characteristics, some of which are closely related.
- The ability of such firm characteristics to predict future returns can be attributable to one or more of four sources:
  a. equity under or overvaluation – either short lasting or long lasting
  b. compensation for risk
  c. micro-structure effects (trading costs, illiquidity)
  d. data mining.
An essential question is whether one could still improve \textit{real-time} investment performance using firm characteristics.

Put differently, do market anomalies persist \textit{after their discovery} if microstructure effects are accounted for?

You can run a real-time experiment:

- If anomalies diminish following their discovery then the original source of anomaly is mispricing that disappears upon trading on the anomaly. Data mining is always a concern: “if you torture the data enough nature will always confess.”

- If predictability reflects risk, investors will not essentially trade on the anomalies, and the relatively high anomaly payoff will persist.

- If predictability persists but it does not reflect risk, then asset prices could be explained by behavioral models. There have indeed been many intriguing behavioral theories involving investors’ under or over reaction to news.
Could predictive characteristics improve performance?

- The ability to exploit anomalies in real time investment to improve the risk-return tradeoff is feasible only if anomalies reflect an ongoing mispricing consistent with behavioral theories.

- Eugene Fama – a 2013 Nobel Prize winner - argues that anomalies are consistent with rational pricing. Then, considering predictive characteristics cannot really improve the risk-return tradeoff: if anomaly payoff is high risk is high too.

- Robert Shiller – also a 2013 Nobel Prize winner - claims that markets are irrational and subject to behavioral biases in investors’ expectations. If that is the case, investment performance can be improved in the presence of predictive characteristics.

- Whether markets are rational or not is an ongoing research controversy: the empirical evidence is inconclusive, going both ways.
What is the empirical evidence about the robustness of market anomalies?

- Schwert (2003) shows that anomalies tend to attenuate following their discovery in academic work. Momentum is an exception. Both Schwert (2003) and Jegadeesh and Titman (2001, 2002) show that the relative returns to high-momentum stocks remains after the publication of the Jegadeesh-Titman paper in 1993. **But there is a strong momentum crash in 2009, which follows several other extreme downward movements.**

- Mclean and Pontiff (2015) assert that “academic research destroys stock return predictability.” In particular, there is a 35% post-publication decay, on average, in anomaly payoff. The decay is attributable to price pressure from investors who trade on the anomalies.

- Stambaugh, Yu, and Yuan (2012), Avramov, Chordia, Jostova, and Philipov (2013), and Drechsler and Drechsler (2014) demonstrate that the profitability of trading strategies based on market anomalies is mostly attributable to the **short-leg of the trade.** That imposes hurdles on exploiting anomalies in real time investments due to costly short selling.
What is the empirical evidence about the robustness of market anomalies?

- On the other hand, Boehmer, Huszar, and Jordan (2010) show that heavily traded stocks with the smallest amount of short interest (SIR) produce positive alphas.

- Here, alpha emerges from the long-leg of the trade.

- Positive alphas can either point to equity undervaluation (either short or long lasting) or to the inadequacy of the pricing model to explain the cross section dispersion in average stock returns. Data mining is always a concern.

- The findings of Boehmer, Huszar, and Jordan (2010) motivate several investment designs:
  - Invest in stocks with the lowest short interest ratio.
  - Interact anomalies with the SIR: invest in stocks that are in the top anomaly portfolios and that have the smallest SIR.
Stocks Picking

- Trading on market anomalies could be beneficial since an anomaly based trading strategy is structured, easy to implement, and there are no emotions involved.
- It is unhealthy to involve emotions or to over trade – both of which are known to destroy performance.
- For sure, do not do stock-picking that does not involve systematic trading rules.
- Dalbar research company compared Senior Investment Managers versus benchmarks between the years 1993 and 2012.
- Even senior well-positioned managers realized considerably lower returns than benchmarks.
- The managers dedicated great efforts to identify stocks and bonds that, in their view, were cheap.
- But they did not pay enough attention to asset allocation, the core of performance for the long run.
- The next three slides make the case.
The Failure of Stocks Picking:

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The Implications of Asset Allocation: 1926—2009

Source: *Global Financial Data* (www.globalfinancialdata.com) and Professor Kenneth R. French, Dartmouth College.

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Asset Allocation: A Longer Horizon


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Technical versus Fundamental Analyses

- Technical rules may be instrumental in stock-picking, after all.
- Avramov, Kaplanski, and Levy (2015) examine the real time forecasting ability of 1599 dual recommendations of leading technicians and fundamental analysts.
- The investment recommendations were broadcasted on the CNBC show “Talking Numbers”
- The fundamental analysts display rather weak forecasting power.
- Technicians did a pretty good job in predicting returns over investment horizons of up to one year, focusing on the largest and most liquid stocks (e.g., AAPLE, GOOGLE, GE, WFC)
- No group was successful among equity and bond indexes, the overall direction of the market, or commodities.
- Technical analysis is related to market anomalies involving prices and volume.
- Fundamental analysis is related to anomalies involving financial statement data - figures and text - as well as any information related to the market, the industry, and the firm.
Description of Anomalies - Broad Categories

- **Price and trading volume**, such as momentum, reversal, turnover, idiosyncratic volatility, illiquidity, downside risk, etc.

- **Price data along with quantities from financial statements**, such as the value effect based on the book to market, cash flows to price, dividend yield, and earnings yield.

- **No price data**, such as earnings momentum, asset growth, capital investment, financial distress, accruals, etc.
The Size Effect

- Banz (1981) and Reinganum (1981) demonstrate that firm-size is negatively associated with future stock returns
- The size anomaly has become one of the focal points for discussions of market efficiency and the formation of multifactor models such as the Fama-French three factor model
- The style box of Morningstar considers size and book to market ratio
- Common criticisms:
  - Weak historical record
  - Long periods of poor performance
  - Concentration in extreme, difficult to invest microcap stocks
  - Concentration of returns in January
  - Absent for measures of size that do not rely on market prices
  - Subsumed by proxies for illiquidity
- Recently, an AQR working paper shows that size matters if you control your junk.
- Junk is related to quality measures to be discussed later.
- So investing in non-junk small stocks could deliver abnormal performance
Past return anomalies: Momentum and Reversal

- They show that a self-financing strategy that buys the top 10% and sells the bottom 10% of stocks ranked by returns during the past 6 months, and holds the positions for the upcoming 6 months, produces profits of 1% per month.
- In assessing past returns, one month prior to the investment should be skipped to avoid short-term price reversals.
- While JT focused on US financial markets, international momentum strategies are studied by Haugen and Baker (1996), Rouwenhorst (1998), and Titman and Wei (2010).
- During short horizons, such as a day, a week, or a month, winner stocks turn losers and vice versa. That is the short term price reversal.
- Avramov, Chordia, and Goyal (2006) show that from a practical investment perspective short term reversal is un-exploitable, as it is attributable to the most illiquid stocks.
- DeBondt and Thaler (1985), Lee and Swaminathan (2000), and Jegadeesh and Titman (2001) document long-term reversal in stock returns. Stocks that perform poorly in the past perform better over the next 3 to 5 years than stocks that perform well in the past.
- Recently, Conrad and Yavuz (2015) show that momentum stocks do not necessarily reverse.
The literature on momentum is vast.

One major theme is the interaction of momentum with market, industry, and firm level effects.

**Momentum and market states:** Cooper, Gutierrez, and Hameed (2004) find that from 1929 to 1995, the mean monthly momentum profit following positive market returns (over the last three years) is 0.93%, whereas the mean profit following negative market return is -0.37%.

**Momentum and market sentiment:** Antoniou, Doukas, and Subrahmanyam (2010) and Stambaugh, Yu, and Yuan (2012) find that the momentum effect is profitable only when the market sentiment is high. The former paper suggests that this result is consistent with the slow spread of bad news during high-sentiment periods. The latter concludes that the profitability of 11 market anomalies (momentum and then others) is attributable to (i) high sentient periods and (ii) the short leg of the trade.

**Momentum and market liquidity:** Avramov, Cheng, and Hameed (2015) show that momentum is profitable only following periods of high market liquidity.
Momentum Interactions


- **Stock level interactions of momentum:**
  - Hon, Lim, and Stein (2000) show that momentum profitability concentrates in small stocks.
  - Zhang (2006) finds that momentum concentrates in stocks with high return volatility, high cash flow volatility, or high analysts’ forecast dispersion.
Momentum in Bonds

- **Momentum Spillover:** Gebhardt, Hvidkjaer, and Swaminathan (2005) find significant evidence of a momentum spillover from equities to investment grade corporate bonds of the same firm. In particular, firms earning high (low) equity returns over the previous year earn high (low) bond returns over the following year. The spillover results are stronger among firms with lower-grade debt and higher equity trading volume.

- **Bond Price Momentum:** Jostova et al (2013) find significant price momentum in US corporate bonds over the 1973 to 2008 period. Bond momentum profits are significant in the second half of the sample period, 1991 to 2008, and amount to 64 basis points per month. Momentum strategies are only profitable among non-investment grade bonds, where they yield 190 basis points per month. It should be noted that several follow up papers (e.g., Chordia, Goyal, Nozawa, Subrahmanyam, and Tong (2014)) rule out momentum in bond prices.
How could you enhance momentum profitability?

- Han and Zhou (2014) propose a stop loss strategy to avoid the down side risk of momentum. Indeed, momentum could exhibit occasional crashes with the four worst monthly drops of the momentum strategy being as large as $-49.79\%$, $-39.43\%$, $-35.26\%$ and $-34.46\%$. To illustrate the Han-Zhou basic idea, consider a simple 10% stop-loss rule. For winners stocks, sell automatically any stock whenever it drops 10% below the beginning price of the month (which is the close price of the previous month used for forming the momentum portfolio). Similarly, for any loser stock, cover the short position as soon as the stock bounces back 10% from its beginning price of the month. This simple rule raises the average return of the original momentum strategy from 1.01% per month to 1.73% per month, while reduces the standard deviation from 6.07% per month to 4.67%. Hence, the monthly Sharpe ratio of the stop-loss momentum strategy is 0.371, more than double the level of the original momentum strategy (0.166).
George and Hwang (2004) find that profits to a momentum strategy based on nearness to the 52-week high are superior to those where the arrival of news is measured by a return computed over a fixed-length interval in the past (e.g., 6 months). They suggest that price levels are more important determinants of momentum effects than are past price changes. That is, traders use the 52-week high as a reference point against which they evaluate the potential impact of news. When good news has pushed a stock’s price near or to a new 52-week high, traders are reluctant to bid the price of the stock higher even if the information warrants it. The information eventually prevails and the price moves up, resulting in a continuation. Similarly, when bad news pushes a stock’s price far from its 52-week high, traders are initially unwilling to sell the stock at prices that are as low as the information implies. The greatest reluctance is at price levels nearest and farthest from the stock’s 52-week high.
Avramov et al (2015) show that one could implement momentum among top and bottom anomaly portfolios.

They consider 15 market anomalies, each of which is characterized by the anomaly conditioning variable., e.g., gross profitability, idiosyncratic volatility, and dispersion in analysts earnings forecast.

There are 15 top (best performing long-leg) portfolios.

There are 15 bottom (worst performing short-leg) portfolios.

The trading strategy involves buying a subset (e.g., five) top portfolios and selling short a subset of bottom portfolios based on past one-month return or based on expected return estimated from time-series predictive regressions.

Implementing momentum among anomalies delivers a robust performance even during the post-2000 period.
Time-Series Momentum

This momentum in an absolute strength strategy, while the price momentum is a relative strength one. Here, one takes long positions in those stocks having positive expected returns and short positions in stocks having negative expected returns, where expected return is assessed based on the following equation from Moskowitz, Ooi, and Pedersen (2012):

\[
\frac{r_t^s}{\sigma_{t-1}^s} = \alpha + \beta_h \frac{r_{t-h}^s}{\sigma_{t-h-1}^s} + \varepsilon_t^s
\]

Notice that both left and right hand side variables in that equation are normalized by ex-ante volatility:

\[
\sigma_t^2 = 261 \sum_{i=0}^{\infty} (1 - \delta)^i (r_{t-1-i} - \bar{r}_t)^2
\]

One could interact price momentum and time-series momentum, which amounts to Dual Momentum.
Illiquidity

- Illiquidity is not considered to be an anomaly. However, it is related to the cross section of average returns. Amihud proposes an illiquidity measure which is theoretically appealing and does a good job empirically. The illiquidity measure is given by

\[ ILLIQ_{i,t} = \frac{1}{D_{i,t}} \sum_{t=1}^{D_{i,t}} \frac{|R_{itd}|}{DVOL_{itd}} \]

where

- \( D_{i,t} \) is the number of trading days in the month
- \( DVOL_{itd} \) is the dollar volume
- \( R_{itd} \) is the daily return

The illiquidity variable measures the price change per a unity volume. The higher the change the higher the illiquidity
Turnover

- Turnover has been shown to be negatively correlated with future stock return (see Avramov and Chordia (2006)).

- Turnover can be constructed using various methods:
  - For any trading day within a particular month, compute the money volume in $, divide the volume by the market capitalization, and use the daily average, within a trading month, of the volume/market capitalization ratio as the monthly turnover.
  - You can also use the number of stocks traded rather than the $ amount.
  - The number of transactions is also a feasible measure.
Idiosyncratic Volatility (IVOL) and Total Volatility

- **IVOL**: Ang et al (2006) document a negative effect between IVOL and average return. Here are two conceivable ways to compute monthly estimates of IVOL:
  
  I) For any given month, run daily time-series regressions of excess stock returns on excess market return and then compute IVOL as the variance of the regression residuals. There is some assumption here that the CAPM is the correct asset pricing specification. Of course, imposing a different factor structure yields an alternative IVOL proxy.
  
  II) IVOL can also be computed using a more easy-to-implement method. Specifically, within any month, take the average of the squared difference between the stock and market daily returns.

- **Total Volatility**: Just like the IVOL is negatively associated with the cross section of average returns – also the total volatility (IVOL) exhibits a negative relation. IVOL can be constructed using well known models such as ARCH, GARCH, and EGARCH. You can also consider the realized volatility (RV), which is the average sum of squares of daily returns within any given month.
Downside Risk

- Downside risk is the financial risk associated with losses. There are various downside risk measures which quantify the risk of losses, the expected loss given the realization of a loss, or even the worst case scenario characterizing a particular investment. All downside risk measures exclusively focus on the left tail of the return distribution, whereas volatility measures are both about the upside and downside outcomes. More specifically, any deviation from the mean, either positive or negative, is counted in assessing volatility, whereas only negative deviations are accounted for establishing the downside risk. Typical downside risk measures include the Value at Risk (VaR), expected shortfall, semi-variance, maximum drawdown, downside beta, and shortfall probability. To establish the trading strategy one can focus on VaR, which is a very well-used measure in risk management.
Kelly and Jiang (2014) estimate an interesting downside risk measure – the tail exponent. The tail exponent is an aggregate variable (as opposed to the stock level VaR and expected shortfall) constructed monthly using daily returns. In particular, consider daily returns of all stocks within a particular month and identify the 5th percentile of the cross sectional distribution, or the return threshold. The return threshold is constructed such that 5% of all returns fall below. Then only for those daily returns which fall below the return threshold take the simple average of the natural log of return divided by the return threshold. More formally:

\[ \lambda_t = \frac{1}{k_t} \sum_{k=1}^{k_t} \ln \frac{r_{kt}}{u_t} \]

where

- \( k_t \) is the number of exceedances
- \( u_t \) is the return threshold
- \( r_{kt} \) is the daily return that falls below the threshold
The idea for establishing a trading strategy is to estimate the loading on that factor. A trading strategy would long high beta stocks and short low beta stocks. The suggestion is to computing tail risk in the way advocated by Kelly and Jiang and moreover in a different way. That is, use the difference between actual return and the component that varies with the market – (return minus beta*market return) or market adjusted return. It would be beneficial to examine month by month the correlation between tail risk beta and the various firm level down side risk measures.
The value effect

- A rich and extensive literature documents that various measures of relative value, such as the book-to-market ratio, the earnings-to-price ratio, the dividend-to-price ratio, and the cash-flow-to-price ratio, predict future stock returns.


- It should be noted that book-to-market is one of the oldest effects ever investigated in financial markets. Book-to-Market was not perceived as a market anomaly at the beginning of the century when Ben Graham famously popularized its use. The ratio lost some of it popularity when the Efficient Market Theory and CAPM became main Wall Street theories, but it gained back its position after several studies have documented the outperformance of value stocks.
The value effect

- Pure value effect portfolios are created as long stocks with the highest Book-to-Market ratio and short stocks with the lowest Book-to-Market ratio. Two drawbacks are in order. First, this pure value effect could exhibit substantial drawdowns. The tech bubble decade could be a decent example here. Second, while high book-to-market stocks outperform as a group, individual performance is idiosyncratic. Indeed, it takes very large portfolios of low price-to-book stocks to see the benefits. The “Dogs of the Dow” is perhaps one illustration. The idea behind this concept is that investors could beat the market by selecting the ten highest-yielding Dow stocks. The value factor is still a strong performance contributor in long only portfolios (formed as long stocks with highest Book-to-Market ratio without shorting stocks with low Book-to-Market ratios). One explanation is that investors overreact to growth aspects for growth stocks, and value stocks are therefore undervalued. Fama and French among some other academics perceive the ratio of market value to book value as a risk measure, and therefore the larger returns generated by high book-to-market stocks are simply a compensation for risk. High book-to-market stocks are often those in some financial distress. Nowadays, the value anomaly is a factor used to explain returns in the Three Factor Model, created by Gene Fama and Kenneth French - the three factors being the market return, companies with high book-to-market values, and small stock capitalization.
Earnings Momentum

- **Earnings Momentum:** Earnings momentum pertains to a trading strategy that exploits the post earnings announcement drift effect (e.g., Ball and Brown (1968), Bernard and Thomas (1989), Chan, Jegadeesh, and Lakonishok (1996), and Chordia and Shivakumar (2006)). The conditioning variable is earnings surprise computed as the standardized unexpected earnings (SUE):

  \[ SUE_{it} = \frac{e_{iq} - e_{iq-4}}{\sigma_{it}} \]

  where
  
  - \(e_{iq}\) is the most recent quarterly earnings per share announced as of month \(t\)
  - \(e_{iq-4}\) is the earnings per share announced four quarters ago
  - \(\sigma_{it}\) is the standard deviation of unexpected earnings \((e_{iq} - e_{iq-4})\) over the previous eight quarters.
Revenue Momentum

Revenue Momentum: Chen, Chen, Hsin, and Lee (2010) study the inter-relation between price momentum, earnings momentum, and revenue momentum, concluding that it is ultimately suggested to combine all types rather than focusing on proper subsets. Price and earnings momentum were both described earlier. Revenue momentum is computed as

$$SURGV_{i,t} = \frac{REV_{i,t} - REV_{i,t-4} - \delta_{i,t}}{\xi_{i,t}}$$

where

$$REV_{i,t}$$ is the quarterly revenue of firm $$i$$ in quarter $$t$$

$$\delta_{i,t} = \frac{\sum_{t=1}^{8} REV_{i,t-j} - REV_{i,t-j-4}}{8}$$

$$\xi_{i,t} = \frac{1}{7} \sqrt{\sum_{j=1}^{8} (REV_{i,t-j} - REV_{i,t-j-4} - \delta_{i,t})^2}$$
Asset growth and capital investment

- **Asset Growth:** Cooper, Gulen, and Schill (2008) find companies that grow their total asset more earn lower subsequent returns. They suggest that this phenomenon is due to investors’ initial overreaction to changes in future business prospects implied by asset expansions. The conditioning variable is asset growth, measured as the annual percentage change in total assets.

- **Capital Investment:** Titman, Wei, and Xie (2004) document a negative relation between capital investments and returns. The conditioning variable is capital investments to assets, measured as the annual change in gross property, plant, and equipment plus the annual change in inventories divided by lagged book value of assets. Changes in property, plants, and equipment capture capital investment in long-lived assets used in operations many years such as buildings, machinery, furniture, and other equipment. Changes in inventories capture working capital investment in short-lived assets used in a normal business cycle.
Return on Assets

- **Return on Assets (ROA):** Fama and French (2006) find that more profitable firms have higher expected returns than less profitable firms. Later, Wang and Yu (2010) find that the anomaly exists primarily among firms with high arbitrage costs and high information uncertainty, suggesting that mispricing is a culprit. ROA is typically measured as quarterly income before extraordinary items divided by one-quarter-lagged total assets. My concern here is seasonality in activities. Thus, I would propose examining two measures. The first is the original Fama-French variable. Second, take profitability for the most recent four quarters divided by one-year lagged total assets.
Novy-Marks does a good job in describing and comparing seven of the best known and most widely used notions of quality.

These include:

- Graham’s quality criteria from his “Intelligent Investor”
- Grantham’s “high return, stable return, and low debt”
- Greenblatt’s return on invested capital (coming next)
- Sloan’s (1996) accruals-based measure of earnings quality (coming next)
- Piotroski’s (2000) F-score measure of financial strength (coming next)
- Novy-Marx’s (2013) gross profitability (coming next)

He also includes the low volatility/low beta notion used by “defensive equity” strategies, which look more like a traditional value but are often marketed as high quality.

I will also discuss firm’s credit rating, which is an important measure of quality, as well as the G-score.
The Little Book That Beats the Market - by Joel Greenblatt: The idea here is to combine only two financial ratios – earnings yield (EBIT / enterprise value) and return on capital (EBIT/net fixed assets plus working capital). Greenblatt suggests the “magic formula”: purchasing 30 cheap stocks with a high earnings yield and a high return on capital. The receipt is below.

1. Decide on minimum market capitalization (usually greater than $50 million).
2. Exclude utility and financial stocks.
3. Exclude foreign companies (American Depositary Receipts).
4. Compute company's earnings yield = EBIT / enterprise value.
5. Compute company's return on capital = EBIT / (net fixed assets + working capital).
6. Rank all companies above the threshold market capitalization by highest earnings yield and highest return on capital.
7. Invest in 20–30 highest ranked companies.
8. Re-balance portfolio once per year, selling losers one week before the year-mark and winners one week after the year mark.
Quality investing: Accruals

- **Accruals**: Sloan (1996) shows that firms with high accruals earn abnormal lower returns on average than firms with low accruals. Sloan suggests that investors overestimate the persistence of the accrual component of earnings when forming earnings expectations. Here, total accruals are calculated as changes in noncash working capital minus depreciation expense scaled by average total assets for the previous two fiscal years.

\[
\text{Accruals}_{i,t} = \frac{[(\Delta CA_{i,t} - \Delta Cash_{i,t}) - (\Delta CL_{i,t} - \Delta STD_{i,t} - \Delta TP_{i,t}) - Dep_{i,t}]}{\text{ASSET}_{i,t}}
\]

where

- $\Delta CA_{i,t}$ is the change in current assets in year $t$
- $\Delta Cash_{i,t}$ is the change in cash and short-term investments
- $\Delta CL_{i,t}$ is the change in current liabilities
- $\Delta STD_{i,t}$ is the change in debt included in current liabilities
- $\Delta TP_{i,t}$ is the change in income taxes payable
- $Dep_{i,t}$ is the depreciation and amortization expense
- $\text{ASSET}_{i,t}$ is the average total assets of the beginning and end of year $t$
Quality investing: The F-Score

- **F-Score:** This anomaly is due to Piotroski (2000). The idea here is to establish a trading strategy based on the FSCORE and also mix FSCORE with a composite measure of value—termed CV.

  - The FSCORE is designed to identify firms with the strongest improvement in their overall financial conditions while meeting a minimum level of financial performance. In particular, high F-score firms demonstrate distinct improvement along a variety of financial dimensions, while low FSCORE firms exhibit poor fundamentals along these same dimensions.

  - The CV measure uses the traditional four variables studied by Lakonishok, Shliefer, and Vishny (1994), namely, the firm's book-to-market (BM), earnings-to-price (EP), cash-flows-to-price (CP), and sales growth (SG). Higher BM, EP, and CP as well as low SG firms are commonly regarded as value firms. The fifth variable is the equity share turnover, defined above. Low share turnover displays value characteristics. CV is constructed as simple average of all the five factors (SG and TO are negatives).

  - The mixed FSCORE-CV strategy is implemented as follows. Take long positions in (i) high FSCORE high CV stocks, (ii) high FSCORE middle CV stocks, as well as (iii) middle FSCORE high CV stocks. We can examine each of the three groups. If short selling is permitted—then short (i) low CV low FSCORE stocks, (ii) low CV middle FSCORE stocks, as well as (iii) low FSCORE middle CV stocks. The high/middle/low categories are formed based on the top 30%, middle 40%, and top 30%, respectively. Again, we can examine each of the three groups.
Novy-Marx (2013) discovers that sorting on gross-profit-to-assets creates abnormal benchmark-adjusted returns, with more profitable firms having higher returns than less profitable ones. Novy-Marx argues that gross profits scaled by assets is the cleanest accounting measure of true economic profitability. The farther down the income statement one goes, the more polluted profitability measures become, and the less related they are to true economic profitability. Gross profitability in a given year $t$ is computed as follows: $GP_{i,t} = \frac{REV_{i,t} - COGS_{i,t}}{ASSET_{i,t}},$ where $REV_{i,t}$ is the total revenue) in year $t$, $COGS_{i,t}$ is the cost of goods sold, and $ASSET_{i,t}$ is the total assets.
Financial distress: Campbell, Hilscher, and Szilagyi (2008) find that firms with high failure probability have lower, not higher, subsequent returns. Campbell, Hilscher, and Szilagyi suggest that their finding is a challenge to standard models of rational asset pricing. The failure probability is estimated by a dynamic logit model with both accounting and equity market variables as explanatory variables. Using Ohlson (1980) O-score as the distress measure yields similar results. Avramov, Chordia, Jostova, and Philipov (2009) use credit ratings as a proxy for financial distress and also document the same phenomenon: higher credit rating firms earn higher returns than low credit rating firms.
Quality investing: The G Score

**G Score:** The G-Score is due to Mohanram (2005). It combines traditional fundamentals, such as earnings and cash flows, with measures tailored for growth firms, such as earnings stability, growth stability and intensity of R&D, capital expenditure and advertising. A long–short strategy based on GSCORE earns significant excess returns, though most of the returns come from the short side. Thus, to form an attractive trading strategy one could take long positions based on the F-Score or the F-score combined with the book-to-market ratio and short position based on the G-score.

The formation of the G-score based on 8 binary variables as follow:

- **G1** is equal 1 if a firm’s ROA is greater than the contemporaneous median ROA for all low BM firms in the same industry and 0 otherwise. ROA, defined as the ratio of net income before extraordinary items scaled by average total assets.

- **G2=1** if a firm’s cash flow ROA exceeds the contemporaneous median for all low BM firms in the same industry and 0 otherwise. Cash flows ROA is similar to the above-defined ROA except that operating cash flows replace net income.

- **G3=1** if a firm’s cash flow from operations exceeds net income and 0 otherwise.
Quality investing: The G-Score

- G4 = 1 if a firm’s earnings variability is less than the contemporaneous median for all low BM firms in the same industry and 0 otherwise.

- G5 = 1 if a firm’s sales growth variability is less than the contemporaneous median for all low BM firms in the same industry and 0 otherwise.

- G6, G7 and G8 are defined to equal 1 if a firm’s R&D, capital expenditure and advertising intensity respectively, are greater than the contemporaneous medians of the corresponding variables for all low BM firms in the same industry and 0 otherwise. The intensity of R&D, capital expenditure and advertising are measured by deflating these variables by beginning assets.

- The signals relating to profitability and cash flows (G1:G3) as well as those related to conservatism (G6:G8) are created using the annualized financials. The two signals earnings variability and sales growth variability (G4,G5) are generated from quarterly financials of the past 4 years, with the constraint that at least six quarters information be available. While quarterly information might induce variability owing to seasonality, the industry adjustment should mitigate this.
Net stock issues and composite equity issues. Ritter (1991) and Loughran and Ritter (1995) show that, in post-issue years, equity issuers under-perform matching non-issuers with similar characteristics. Net stock issues is measured as the growth rate of the split-adjusted shares outstanding in the previous fiscal year. The stock issuing market has been long viewed as producing an anomaly arising from sentiment-driven mispricing: Smart managers issue shares when sentiment-driven traders push prices to overvalued levels.

Daniel and Titman (2006) study an alternative measure, composite equity issuance, defined as the amount of equity a firm issues (or retires) in exchange for cash or services. Under this measure, seasoned issues and share-based acquisitions increase the issuance measure, while repurchases, dividends, and other actions that take cash out of the firm reduce this issuance measure. They also find that issuers under-perform non-issuers.
Corporate Anomalies

- **External Financing.** Finance research has documented negative relation between transactions of external financing and future stock returns. In particular, future returns are typically low following IPOs (initial public offerings), SEOs (seasoned public offerings), debt offerings, and bank borrowings. Conversely, future stock returns are typically high following stock repurchases. Richardson and Sloan (2003) are the first to summarize all external financing transactions in one measure. They show that their comprehensive measure of external financing has a stronger relation with future returns relative to measures based on individual transactions. The external financing measure, denoted by $\Delta X\text{FIN}$, is constructed as follows:

$$
\Delta X\text{FIN} = \text{Total cash received from issuance of new debt and equity offerings minus cash used for retirement of existing debt and equity. All components are normalized by the average value of total assets.}
$$
This measure considers all sorts of equity offerings including common and preferred stocks as well as all sorts of debt offerings – straight bonds, convertible bonds, bank loans, notes, etc. Interest payments on debt as well as dividend payments on preferred stocks are not considered as retiring debt or equity. However, dividend payments on common stocks are considered as retiring equity. In essence, dividends on common stocks are treated as stock repurchases. The $\Delta X\text{FIN}$ measure can be decomposed as:

$$\Delta X\text{FIN} = \Delta C\text{Equity} + \Delta P\text{Equity} + \Delta Debt$$

where

$\Delta C\text{Equity} =$ common equity issuance minus common equity repurchase minus dividend

$\Delta P\text{Equity} =$ Preferred equity issuance minus retirement and repurchase of preferred stocks

$\Delta Debt =$ debt issuance minus debt retirement and repurchase.
ETFs Building on Corporate Anomalies

- PKW – This ETF buys at least 90% of stocks comprising the NASDAQ Buyback Achievers Index. Buying back stocks has been followed with increasing future returns.

- CSD – This ETF attempts to follow an equity index called the Beacon Spin-Off Index. According to The Economist, a driving force of the proliferation of spin-offs is what it calls the “conglomerate discount” — that stock markets value a diversified group at less than the sum of its parts." There are many examples of spin-offs in financial markets. For instance, in 2012, ConocoPhillips, a major energy company, spun off its downstream assets and midstream assets to create the independent energy company Phillips 66.

- TOFR - The investment seeks to track the 2 For 1 Index. The index is an equally-weighted index, comprised of companies listed on a U.S. stock exchange that have recently undergone a stock split of two new shares for every one existing share (or, in some cases, an exchange ratio of greater than two shares for one share). The fund generally invests substantially all, but at least 80%, of its total assets in the securities comprising the index. Stock splits increase the number of shares outstanding and decrease the value of each outstanding share, with a net effect of zero on the company's market capitalization. However, before and after a company announces a stock split, the stock price normally rises.
Payoff to Anomalies

The following graphs display payoffs to operating profitability, momentum, and book to market effects

The payoffs are based on the data library of Kenneth French

Then I will show some payoffs to ETF-s which implement anomalies
Momentum

Prof. Doron Avramov, The Jerusalem School of Business Administration, The Hebrew University of Jerusalem, Investment Strategies
Book-to-Market

Prof. Doron Avramov, The Jerusalem School of Business Administration, The Hebrew University of Jerusalem, Investment Strategies
Size Effect

Prof. Doron Avramov, The Jerusalem School of Business Administration, The Hebrew University of Jerusalem, Investment Strategies
Invest in Momentum

1 Year

5 Years

Prof. Doron Avramov, The Jerusalem School of Business Administration, The Hebrew University of Jerusalem, Investment Strategies
Invest in Minimum Volatility Stocks

1 Year

4 Years (since establish)
Invest in Spin-Off

1 Year

5 Years
Invest in Buy Back

1 Year

5 Years
1 Year

INDEXSP:INX +2.57%  QUAL +4.82%

2 Years (since establish)

INDEXSP:INX +23.32%  QUAL +28.50%