March 31, 2014

Summary of "Misvaluing Innovation"[1]

Some firms are likely to be skilled at certain activities, and some are not, and this skill may be persistent over time. Hence, past track records associated with a given activity represent a straightforward way to gauge the future prospects of firms. In this paper, the authors examine the predictability of firm-level R&D track records for future stock returns, and demonstrate that stock market appears unable to distinguish between "good" and "bad" R&D investment.

The identification of a firm's R&D "ability" is based on a simple framework of using the firm's past success in translating R&D investment into sales growth.[2] There is substantial persistence in firm-level R&D ability: firms in the highest quintile of ability remain in this same top quintile in the following year 70% of the time. To form portfolios, we focus on firms that invest heavily in R&D (above the 70th percentile in R&D scaled by sales) avoiding the selection bias in terms of firms' decision to engage (or not) in R&D. Since firms only report R&D expenses once per year, the portfolios are rebalanced once per year, while returns are calculated on monthly basis.

A portfolio of "GoodR&D" firms, firms with R&D ability in the top quintile, earns value-weighted excess return of 122 basis points per month (t = 2.61) and four-factor alphas, alphas measured against the Fama-French 3 factor model plus the momentum factor, of 78 basis points per month (t = 2.27). In contrast, the portfolio of firms with R&D ability in the bottom quintile (BadR&D) earns -15 basis points per month in four-factor value-weighted alpha (t = 0.56). The spread portfolio that longs GoodR&D and shorts BadR&D firms delivers a four-factor alpha of 93 basis points per month (t = 2.30) or over 11% per year.[3] The "GoodR&D" portfolio loads negatively on value and momentum and positively on size, meaning that the stocks in this portfolio are typically large growth stocks with poor past returns. Meanwhile, the spread portfolio has no significant loadings on any of the four factors.[4] The "GoodR&D" portfolio contains an average of only ten stocks per month, but the percentage of combined market capitalization in this portfolio is larger than that of the "small value" portfolio that is featured prominently in the literature.[5]

Returns to the "GoodR&D" (and spread) portfolios are large and significant in the first year, and then returns remain slightly positive but basically plateau in the second and third years with no reversal. The return predictability is stronger among the firms featured by information opaqueness (providing less earnings guidance).

In sum, the market appears to misvalue the embedded information regarding innovation that is important for fundamental firm value. The findings are reinforced by Fama-MacBeth cross-sectional regression that allows controlling for other R&D-related effects in examining the return predictive power of the R&D ability.[6] To rule out the reverse causality that high-ability firms are good at predicting their future growth in sales and ramp up all firm operations, including R&D, the authors show that high-ability firms invest in R&D activities that yield tangible, successful outcomes in the form of increased numbers of patents, patent citations, and new product innovations, and that conditional on high-ability (correlation between sales growth and lagged R&D expenses), capital

expenditures (CAPEX) and total operating expenses (OPEX) do not predict stock returns. Therefore, the mechanism behind the stock return predictability is likely to be the misvalued the R&D ability that contributes to firms' future fundamental value.

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[1] Cohen, Lauren, Karl Diether, and Christopher Malloy, 2013, *Review of Financial Studies* 26(3), 635-666.

[2] R&D ability is measured as the firm-level, average regression coefficients by projecting sales growth on lagged R&D investments (scaled by sales), using the prior eight years of data. Their results on portfolio returns are robust if sales growth is replaced with various measures of profitability, such as return-on-assets.

[3] The classification of high-ability R&D firms is also predictive of future returns in an international sample (including the United Kingdom, Japan, and Germany) and in the period in the United States (1974-1980) immediately preceding their sample (1980-2009). The results are robust to characteristic adjustment using either 25 size/book-to-market benchmark portfolios or 125 size/book-to-market/momentum benchmark portfolios, and also robust to industry benchmark adjustment.

[4] The four factors are market, size, boot-to-market, and momentum. For more details, please refer to: Fama, Eugene F., and Kenneth R. French, 1993, Common risk factors in the returns on stocks and bonds, *Journal of Financial Economics* 33, 3-56; Carhart, Mark M., 1997, On persistence in mutual fund performance, *Journal of Finance* 52, 57-82.

[5] For the definition of "small value" portfolio, please refer to: Fama, Eugene F., and Kenneth R. French, 1993, Common risk factors in the returns on stocks and bonds, *Journal of Financial Economics* 33, 3-56.

[6] Control variables include the large R&D increases proposed by Eberhart, Maxwell, and Siddique (2004), return on intangible assets defined by Daniel and Titman (2006), and innovative efficiency (patents divided by lagged raw R&D) proposed by Hirshleifer, Hsu, and Li (2013). For more details, please refer to: Eberhart, Allan, William F. Maxwell, and Akhtar R. Siddique, 2004, An examination of the long-term abnormal stock returns and operating performance following R&D increases, *Journal of Finance* 59, 623–50; Daniel, Kent, and Sheridan Titman, 2006, Market reactions to tangible and intangible information, *Journal of Finance* 61, 1605–43; Hirshleifer, David, Hsu, Po-Hsuan, Li, Dongmei, 2013, Innovative efficiency and stock returns, *Journal of Financial Economics* 107, 632-654.