What Drives Stock Returns in Japan?

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Abstract

We investigate systematic factors driving stock returns and stock return predictability in Japan. We find that dividend yield, cash-flow yield, and industrial production are systematic pricing factors after controlling for market, value, and size while other macroeconomic factors are not. Value and size premiums become insignificant after adding the industrial production factor to market, value and size factors because the value factor captures the changing fundamentals of Japan's macroeconomic development. For predicting stock returns, our tests using Fama-MacBeth (1973) regressions accept the models of both factor and characteristics for a stock's cash-flow yield, and a characteristics model for a stock's short-term reversal, dividend yield, and earnings yield.

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We investigate systematic factors driving stock returns and stock return predictability in Japan. We find that dividend yield, cash-flow yield, and industrial production are systematic pricing factors after controlling for market, value, and size while other macroeconomic factors are not. Value and size premiums become insignificant after adding the industrial production factor to market, value and size factors because the value factor captures the changing fundamentals of Japan's macroeconomic development. For predicting stock returns, our tests using Fama-MacBeth (1973) regressions accept the models of both factor and characteristics for a stock's cash-flow yield, and a characteristics model for a stock's short-term reversal, dividend yield, and earnings yield.

JEL Classification: G11, G12, G15

Keywords: Systematic risk factor, industrial production, dividend yield, cash flow yield, return predictability

1. Introduction

The Japanese stock market is very interesting because of the unique features of Japan's economic development and its market performance over the past thirty years. It deserves a comprehensive study to identify what systematic factors drive stock returns and what cross-sectional stock characteristics predict stock returns.[1] Until 2014,[2] the Japanese stock market had been the world's second-largest. After Japan was defeated in World War II, the Japanese economy had grown to become the world's second-largest until 2012.[3] Japan's economic development had been export-dependent. By contrast, the U.S. economy has been based on net imports. Economic growth in the USA has been largely driven by technological innovation and consumer consumption.[4] For several decades, the USA has led the world in technological innovation such as information technology and the internet. However, Japan's economic boom was led by fix-asset investment and net export growth until 1990. Since then its economy has been in recession and its stock market as of May 2017 was still more than 50% below its peak.[5] Daniel, Titman, and Wei (2001) argue that a research study on Japan's stock market is an excellent out-of-sample confirmation for asset-pricing results in the U.S. market. They find that in Japan from 1975-1997, a stock's book-to-market ratio (BM) was characteristically the chief driver of its returns and, for predicting returns, that ratio exceeded the factors of market, company size, and value.[6]

On the other hand, Bakshi and Naka (1997) examine macroeconomic models for stock returns and find that habit-forming preferences provide a good characterization of Japanese stock market data. Fama and French (2012) find that there is no unconditional momentum phenomenon in Japan. Investigating from a different point of view, Asness (2011) studies value and momentum as a system and argues that momentum works in Japan because value strategies and momentum strategies correlate

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[1] Chan, Hamao, and Lakonishok (1991) find that earnings yield, firm size, book-to-market ratio, and cash-flow yield are significant time-series predictors of returns for stocks listed on the Tokyo Stock Exchange (TSE) in 1971-1988.
[2] The Chinese stock market became the second largest stock market in the world in 2014.
[3] China's economy emerged as number two by dollar value in 2012.
[4] Domestic consumption in the USA has accounted for over 70% of its GDP growth in the past 80 years.
[5] The U.S.stock market peaked in December 1989, with the Nikkei 225 near 39000 points.
[6] In other words, they accept the characteristics model and reject the factor model for a stock's book-to-market ratio.

negatively. Liang and Wei (2012) find that liquidity risk demands a significant pricing premium for stocks in Japan and global liquidity risk demands a pricing premium across 21 developed-market portfolios.[7] Asness, Moskowitz, and Pedersen (2013) further examine value and momentum in eight different markets and asset classes that include the USA, the UK, Europe, and Japan. They find that globally, value returns have a significant and negative relation to liquidity risk and that momentum returns have a significant and positive relationship to liquidity risk. Hanauer (2014) shows that momentum profits in the Japanese stock market are significantly higher when the market remains in the same condition than when the market changes to another state. Avramov, Cheng, and Hameed (2016) find that value and momentum profits are much larger in liquid market states even though momentum strategies are unconditionally not profitable. Liang (2018b) shows that the volatility risk factor does not significantly price stock returns in Japan while Ang, Hodrick, Xing, and Zhang (2006) show that local market volatility risk factor is a pricing factor in the U.S. market.[8] Kubota and Takehara (2017) show that the new two Fama-French factors—robust-minus-weak profitability factor and conservative-minus-aggressive investment factor—are not significant pricing factors across stocks in Japan.[9] All these studies suggest that asset pricing phenomena can be very different for various stock markets globally. However, researchers have not investigated 1) whether factors of industrial production growth, inflation rate, cash-flow, dividend yield, earnings yield, leverage yield, and return reversal are systematic risk factors for stock returns in Japan, and 2) whether a stock's characteristics besides book-to-market ratio, momentum and idiosyncratic volatility can cross-sectionally predict stock returns after controlling for all systematic risk factors. There is also a lack of research on identifying the macroeconomic drivers of

[7] Pástor and Stambaugh (2003) find that market liquidity risk demands a significant and large pricing premium across stocks in the U.S. market.
[8] Ang, Hodrick, Xing, and Zhang (2009) also find that a stock's idiosyncratic volatility negatively predict stock returns in Japan.
[9] Fama and French (2015) propose these two new factors to explain stock portfolios' returns in the U.S. market. On the other hand, Huynh (2017) find that the Fama-French model can explain returns on COMBO portfolios of Asness, Moskowitz and Pederson (2013) in Japan.

the pricing factors of value and size in Japan.[10] To make investment decisions, global investors would like to know what drives and predicts stock returns in Japan. This paper addresses all these stock pricing issues.

At the macroeconomic level, we find that the unexpected growth of industrial production positively prices stock returns, after controlling for Fama and French's three factors. According to Cox, Ingersoll and Ross (1985) and Merton (1973), this finding confirms that industrial production growth provides investment opportunities. The premium on the value factor, as well as the premiums on factors of market and size, is no longer significant if industrial production growth is included in Fama and French's three-factor model. These results show that in Japan, industrial production growth is critical in pricing stock returns and dominates Fama and French's three factors. Some economists argue that the value factor could capture the changing fundamentals of economic development in the USA.[11] Our findings in Japan support this argument. Our findings also suggest that the size factor might reflect the high sensitivity of small corporations to industrial growth because the premium on the size factor also becomes insignificant after including the industrial production factor in Fama and French's three-factor model. On the other hand, we find that the movement of the yen's exchange rate, and growth in GDP, debt-to-GDP, exports, and imports are not systematic pricing factors for stock returns. Unlike the industrial growth factor, these macroeconomic factors do not reduce the pricing premium of value to insignificance. The pricing premium of size becomes insignificant after adding inflation and the yen's appreciation as factors in the Fama-French three-factor model. These findings suggest that in Japan the pricing factor of size might also capture the risk of both inflation (deflation) and currency exchange rate.

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[10] Fama and French (1998) find that their two-factor model (market and value factors) explains stock returns in international markets including Japan in the1975-1995 period.

[11] Gulen, Xing and Zhang (2011) found that the expected excess returns of value stocks were more sensitive to aggregate economic conditions than growth stocks in the USA. Bai, Hou, Kung and Lu (2015) developed a disaster model and argue that value firms are more sensitive to macroeconomic disaster risk than growth firms.

At the microeconomic level, Hou, Karolyi and Kho (2011) investigate many firm-level characteristics to check their pricing implications for global stock returns and find that global cash-flow yield is the only systematic pricing factor for 27,000 individual stocks in world stock markets. Investors in Japan need to know whether the pricing of value and size factors is robust after controlling for cash-flow yield factor. A stock's fundamental value can also be measured by its earnings yield (E/P), dividend yield (DY), and cash-flow yield (OCF) as well as its book-to-market ratio (value). These measures are critical to a stock's future returns because investors will prefer profitable companies. In fact, we find that factors of cash-flow yield and dividend yield, but not earnings yield, are systematic for pricing stock returns in Japan after controlling for market, value, and size.[12] However, we find that momentum is not a systematic factor for stock returns. Retesting Jegadeesh and Titman's (1993) momentum anomaly in Japan, we confirm Fama and French's (2012) findings that momentum strategy does not unconditionally generate significant profits. Our study does not contradict other studies on momentum in Japan because we did not investigate momentum profitability in different liquidity states and market states, as Asness (2011), Hanauer (2014), and Avramov, Cheng and Hameed (2016) did.[13]

Recently, Liang (2018a) shows theoretically and empirically that market sentiment shock is a systematic pricing factor for stocks in the USA.[14] While the Japanese stock market is still significantly below the peak of December 1989, stocks could be very much oversold when sentiment was weak in a bear market and would reverse their losses the next month. Huang, Liu, Ghon, and Zhang (2010) find in the USA that stocks would exhibit patterns of one-month return reversals. Global investors would wonder whether the return reversal factor may be a pricing factor for Japanese stocks. Furthermore, because Japan's corporations were over-leveraged before its asset-bubble burst, investors expect stocks

[12] The pricing premiums of Fama-French's value and size factors remain significant after adding cash-flow yield and dividend yield. The pricing premium of value remains significant even when including other market factors. In Japan, the size factor also remains significant except when the momentum factor is added.
[13] Their studies are outside the scope of this study.
[14] We will not investigate whether the market sentiment shock is a systematic pricing factor for stocks in Japan because this behavioral pricing factor is outside the scope of this study.

with a high leverage yield to significantly underperform healthier companies and are also curious to know whether leverage yield can be a systematic pricing factor in Japan. However, we find that factors of return reversal and leverage yield are not systematic for pricing stock returns in Japan.

In order to understand how value prices stock returns as a market risk factor or a stock's characteristic, Daniel and Titman (1997) and Daniel, Titman, and Wei (2001) find that the characteristics model is more important than the factor model in predicting stock returns for a firm's book-to-market ratio (value) for data samples up to 1997 in the USA and Japan. Their findings suggest that the covariance of a stock's characteristics with its return is more important than the covariance between its return and the value factor. This implication also challenges the importance of other significant market risk factors constructed from a firm's characteristic variables, such as cash-flow yield and dividend yield. Therefore, global investors would desire to know which driving force, described by either the factor model or the characteristics model, ultimately determines stock returns in the current period. In other words, can they construct stock portfolios that are adjusted for market risk factors to achieve significant alphas?

We use Fama-MacBeth (1973) regressions to test the factor model against the characteristic model for a stock in Japan. We enrich the literature by accepting models of both factor and characteristics for a stock's cash-flow yield and book-to-market ratio for the period 1980-2013. We add to the literature that the cash-flow yield factor is a pricing factor in Ross's (1976) Arbitrage Pricing Theory (APT) framework as well as a significant cross-sectional predictor for stock returns. We also contribute to the literature by suggesting that investors should add the cash-flow yield factor to Fama-French's three-factor model for pricing stock returns in Japan. We also add to the literature by showing that Fama and French's value factor captures the changing economic fundamentals, while the industrial production factor systematically dominates the value factor in pricing stock returns. Global investors can also learn from our empirical tests that the movement of the yen's exchange rate, the inflation rate, import growth, export growth, the return reversal factor, and the leverage yield factor are not significant systematic pricing factors for stock returns in Japan. We also accept that the characteristics model (dividend yield, earnings yield, and return-reversal) can predict stock returns in Japan. Our empirical results on stock return predictability show that global investors can generate significant profits when they construct their portfolios based on a stock's value measured by book-to-market ratio, cash-flow yield, dividend yield, and earnings yield even though the Japanese market is still below its peak. Furthermore, we contribute to the literature by offering comprehensive guidance to global investors on what systematic factors drive stock returns and what stock characteristics predict stock returns in Japan. Global asset managers can gain insights and understanding of the macroeconomic driving forces for the pricing of value and size, on the impact of macroeconomic factors on stock returns, on the pricing of cash-flow yield, on the pricing of dividend yield for stock returns, on the cross-sectional predictability of stock returns, on the profitability of stock portfolios constructed from a stock's characteristics, on the management of systematic risks for stock portfolios, and on hedging strategies for a portfolio's systematic risks in Japan.

2. Theoretical Motivation

Cox, Ingersoll, and Ross (1985) and Merton (1973) suggest that a macroeconomic factor providing a set of opportunities to investors should be a systematic pricing factor across stock returns. Testing their theories, Chen, Roll, and Ross (1986) use Fama-MacBeth (1973) methodology to find that inflation rate and industrial production growth are significant systematic pricing factors for stocks in the US market.[15] Cox, Ingersoll, and Ross (1985) and Merton (1973) suggest that macroeconomic factors such as the gross domestic product (GDP) and growth of industrial production reflect the productivity and growth of an economy.[16] These factors should provide opportunities to investors because private

[15] Santos and Veronesi (2006) also show that labor income, in addition to the market factor, is a systematic pricing factor across Fama and French's (1992) 25 size and value portfolios.
[16] Liu and Zhang (2008) find that the industrial production risk factor explains half of momentum profit in the U.S. market.

corporations are the main drivers of the economic growth and output of an economy. In the past two decades, structural changes in the Japanese economy have been forced by economic challenges such as deflationary pressure and persistently low-to-negative economic growth. These economic rationales suggest that growth in GDP and industrial production should positively price stock returns in the market if they are systematic pricing factor across stocks in Japanese markets. On the other hand, a high inflation rate will lead to an expected increase in a company's operating costs and reduce its profitability. Therefore, a high inflation rate should reduce the set of opportunities available to investors. This economic rationale suggests that the inflation rate should negatively price stock returns if it is a systematic pricing factor across stocks.

The Japanese economy has also been export-dependent, which suggests that export growth should reflect investment opportunities. Import growth, however, should negatively price stock returns because companies suffer from high import growth in an export-dependent economy. It will be interesting to test if both export growth and import growth are pricing factors across stocks in Japan. On the other hand, the Japanese yen has risen substantially over the past three decades. A high exchange rate will negatively affect Japanese companies' profitability because a strong yen hurts Japan's exports. The yen has also become the global currency for investing in high-yield assets including stocks, bonds, and currencies via carry-trade because Japan's monetary policy has kept the yen's interest rate near zero for over two decades.[17] By the end of 2014, Japan's national debt was more than 1 quadrillion yen ($8.4 trillion), more than twice its GDP. It is important to know whether the growth of debt-to-GDP has a systematic effect on the profitability of companies and ultimately their stock returns. However, there is no study in the literature that investigates the pricing of these macroeconomic variables in Japan's stock market. We will undertake that task in this paper.

[17] The Japanese central bank started a negative rate in Japan in 2015. Furthermore, Japan did not open its capital markets to foreign investment until the 1980s.

3. Data and Construction of Variables

Prior to March 1979, few stocks had valid financial variables, so the sample period in this study is March 1979 to December 2013. From DataStream, we download data for the daily total return index and monthly accounting and financial variables for each stock in two Japanese exchange markets. The monthly financial variables are total equity, net income, market capitalization, dividend per share, depreciation, total long-term debt, unadjusted closing price, and shares outstanding. We then construct the characteristics measures of each stock. These measures are a stock's market capitalization (size), book-to-market ratio, cash-flow yield, earnings yield, dividend yield, leverage yield (LEV), return reversal (one-month past return), momentum (past six-month return), total volatility, and idiosyncratic volatility. One-month past return is the return in the previous month and is viewed as a short-term reversal by Jegadeesh (1990). Our momentum is the cumulative return in the past six months (from t-7 to t-1). The book-to-market ratio is the total book equity divided by the total market capitalization. The cash-flow yield is the operating free cash-flow per share divided by the closing price. The earnings yield is the earnings per share divided by the closing price. The dividend yield is the total dividend in the past twelve months divided by the closing price. The leverage yield is the debt-to-equity ratio divided by the closing price. We also calculated the standard deviation of daily return $r_{i,t}$ in each month *t* as the total volatility of each stock *i* as follows.

$$TVOL_{i,t} = \sqrt{Variance(r_{i,t})} \tag{1}$$

We obtained the idiosyncratic volatility ($IVOL_{i,t} = \sqrt{Variance(\varepsilon_{i,\tau,t})}$) of stock *i* in month *t* as the standard deviation of the daily idiosyncratic component $\varepsilon_{i,\tau,t}$ of the following daily CAPM regression.

$$r_{i,\tau,t} = \alpha_{i,t} + \beta_{i,t-1} MKTX_{\tau,t} + \varepsilon_{i,\tau,t},\ \tau = 1,..,D_t \tag{2}$$

where $r_{i,\tau}$ is stock *i*'s excess return, *MKTX* is the daily market portfolio returns minus the daily one-month risk-free rate, and D_t is the number of days in month *t*.

Macroeconomic Factors

From Datastream, we download these macroeconomic variables: GDP, total national debt, consumer price index (CPI), industrial output, total export, total import, and yen exchange rate. As shown in the Appendix, we construct our macroeconomic factors as debt-to-GDP growth, GDP growth, inflation rate (CPI growth), industrial production growth, export growth, import growth, and the yen's appreciation (exchange rate's return). We also regress these macroeconomic growth rates on their last period value in an AR(1) process. In this way, we could decompose these macroeconomic factors into their expected and unexpected components, then estimate their pricing premium. The decomposition is as follows.

$$MFactor_t = \alpha + \beta * MFactor_{t-1} + \varepsilon_t . \tag{3}$$

MFactor is one of the following: GDP growth, debt-to-GDP growth, inflation rate, industrial production growth, the yen's appreciation, export growth, or import growth. The predicted component is $\alpha + \beta * MFactor_{t-1}$ and the unexpected component is the residual ε .

Market Risk Factors

The three Fama-French factors we use for Japan are market, size, and value. The market factor is the market portfolio's return minus the Japanese risk-free rate. Stocks were sorted into three categories based on a stock's value (book-to-market ratio) and market capitalization (size): the top 30% "high" or "big", the middle 40%, and the bottom 30% "low" or "small". The value factor (*HML*) is the value-weighted difference in portfolio returns between the top 30% "high" portfolio and the bottom 30% "low" portfolio. The size factor (*SMB*) is the value-weighted return of the "small" portfolio minus the value-weighted return of the "big" portfolio.

We also investigate other market risk factors might drive stock returns, in addition to market, size, and value factors. The potential market-wide risk factors are cash-flow yield factor (OCFF), leverage yield factor (LEVF), dividend yield factor (DYF), earnings yield factor (EPF), momentum factor (MOM), and return reversal factor (REVF). We also sort all stocks according to their cash-flow yield, earnings yield, and dividend yield, again using the same three (30%-40%-30%) categories, high to low. The cash-flow yield factor (*OCFF*) is the value-weighted difference in return between the "top 30%" portfolio and the "bottom 30%" portfolio based on stocks' cash-flow yield. The earnings yield factor (*EPF*) is the "top 30%" portfolio's value-weighted return minus the "bottom 30%" portfolio's value-weighted return based on stock earnings yield. The dividend yield factor (*DYF*) is the difference between the value-weighted return of the "top 30%" portfolio and the value-weighted return of the "bottom 30%" portfolio, based on stock dividend yield. In constructing the momentum factor, we sort all stocks based on their past six month (t-1 to t-7) returns into the three categories and found that the momentum factor (*MOM*) is the difference between the "losers" portfolio's value-weighted return and the "winners" portfolio's value-weighted return. For past one-month return, stocks are also sorted into three. The return reversal factor (*REVF)* is the difference between the "bottom 30%" portfolio's value-weighted return and the "top 30%" portfolio's value-weighted return. Finally, we sort stocks based on their leverage yield. The leverage yield factor (LEVF) is the value-weighted return of the "top 30%" portfolio minus that of the "bottom 30%" portfolio.

4. The pricing of macroeconomic factors

In this section, we describe our investigation into which macroeconomic factors are pricing factors across stocks and how these variables impact the pricing of value and size in Japan. First, we treat these factors as market risk factors (covariance risk factors) and estimate a stock's sensitivities (betas) to them. We then sort stocks into five portfolios according to these betas. We calculate both equal-weighted and value-weighted returns of these portfolios. We then construct the zero-cost H-L portfolios that take long positions for the portfolios with the highest betas and short positions for the portfolios with the lowest betas. We regress the zero-cost H-L portfolio' returns on CAPM and Fama and French's three-factor model to check if these portfolios could generate significant alphas. Finally, we employ the Fama-MacBeth (1973) method to test whether these macroeconomic factors are systematic market risk factors across stocks and whether the pricing premium of value and size factors are still significant after controlling for these macroeconomic factors. This methodology is the standard procedure for testing the pricing of macroeconomic factors and is also commonly used for testing macroeconomic variables in the work of Aït-Sahalia, Parker, and Yogo (2004), Santos and Veronesi (2006), Yogo (2006), Da (2009), Savov (2011), Boguth and Kuehn (2013) and Liang (2018a). We adjust the *t*-statistics according to Newey and West (1987).

4.1. Alphas of Portfolios Sorted on Betas of Macroeconomic Factors

We first estimate a stock's sensitivities (betas) to macroeconomic factors using the following regression and time-series data for the last five years:

$$R_{i,\tau} = \alpha_{i,t-1} + \beta^{m}_{i,t-1} MKTX_{\tau} + \beta^{h}_{i,t-1} HML_{\tau} + \beta^{s}_{i,t-1} SMB_{\tau} + \beta^{m}_{i,t-1} MFactor_{\tau} + \varepsilon_{i,\tau}, \quad \tau = t-60,\ldots,t-1, \tag{4}$$

where *MKTX* is the market factor, *HML* is the value factor, *SMB* is the size factor, and *MFactor* is one of the macroeconomic factors described above in Section 2. The minimum length for this estimation is two years. We sort stocks into five portfolios according to their betas $\beta^{MF}_{i,t-1}$ and obtain the equal- and value-weighted returns of these portfolios. We then form the zero-cost H-L portfolios that took long positions on stocks with the highest betas and short positions on stocks with the lowest betas. To examine the pricing effect of these zero-cost (H-L) portfolios on the value and size factors and whether returns are significant, we investigate whether the portfolios can generate alphas in CAPM and Fama-French's three-factor model in the following regression:

$$r_{i,\tau} = \alpha_i + \beta_i^1 MKTX_\tau + \beta_i^2 HML_\tau + \beta_i^3 SMB_\tau + \varepsilon_{i,\tau}, \tag{5}$$

where $r_{i,\tau}$ is portfolio *i*'s excess return, *MKTX* is market factor, *HML* is value factor, and *SMB* is size factor. The one-factor model is CAPM. The Fama and French three-factor model combines the market, value, and size factors.

As reported in Table 1, we find that both the equal-weighted and value-weighted zero-cost (H-L) portfolios based on industrial growth and its unexpected occurrence can consistently generate significant positive alphas in Fama and French's three-factor model. These findings further suggest that industrial production growth provides investment opportunities to investors and might be a pricing factor across stocks in Japan. We also find that the value-weighted H-L portfolio formed on the debt-to-GDP factor and its unexpected occurrence generates significant positive alphas in the three-factor model. This might suggest that debt-to-GDP growth might be a good common factor for company profitability in Japan. On the other hand, Japan's economy has been export-dependent. Therefore, import growth can have a negative effect on corporate earnings. We find that the equal-weighted zero-cost portfolios based on import growth generate significant negative alphas in three-factor model. Again, the equal-weighted portfolio sorted by the yen's expected appreciation generates a significant and negative alpha in CAPM, while the value-weighted zero-cost portfolio has a significant and negative alpha in the three-factor model. Next, we use the Fama-Macbeth (1973) methodology to examine whether these macroeconomic factors demand a significant pricing premium and whether these macroeconomic factors have significant impacts on the pricing of value and size factors after adding them to Fama and French's three-factor model.

[Table 1 inserted here]

4.2. Pricing Premium of Macroeconomic Factors

Fama and Macbeth (1973) present a two-stage regression to examine whether a risk factor cross-sectionally prices stock returns and demands a significant pricing premium. First, we estimate the time-series sensitivities (betas) of stocks to these macroeconomic factors and the betas of the three Fama-French factors, using the following regression and data from the past five years:

$$R_{i,\tau} = \alpha_{i,t-1} + \beta^{m}_{i,t-1} MKTX_{\tau} + \beta^{h}_{i,t-1} HML_{\tau} + \beta^{s}_{i,t-1} SMB_{\tau} + \beta^{m}_{i,t-1} MFactor_{\tau} + \varepsilon_{i,\tau}, \quad \tau = t-60,\ldots,t-1, \tag{6}$$

where *MKTX* is the market factor, *HML* is the value factor, and *SMB* is the size factor. The macroeconomic factor, *MFactor*, contains GDP growth, debt-to–GDP growth, inflation rate, industrial production growth, yen appreciation, export growth, and import growth. We then estimate the pricing premiums of these macroeconomic factors using the following regression:

$$R_{i,t} = \alpha + \beta^{m}_{i,t-1}\lambda_{m} + \beta^{h}_{i,t-1}\lambda_{h} + \beta^{s}_{i,t-1}\lambda_{s} + \beta^{mf}_{i,t-1}\lambda_{mf}, \quad t = 0,\ldots,T, \tag{7}$$

where λ_m, λ_h, and λ_s are the pricing premiums of *MKTX, HML,* and *SMB*, and λ_{mf} is the pricing premium of *MFactor*. We adjust the t-statistics according to Newey and West (1987).

As shown in Table 2, the value (HML) factor has a significant pricing premium when we include the above macroeconomic factors except the unexpected industrial production growth. In this four-factor model, the industrial production growth factor is the only pricing factor with a significant pricing premium of 0.36% (t-stat = 1.99) at the 5% level. Our results also show that the industrial production factor is a critical covariance risk across stocks. These results are consistent with our economic rationale and hypothesis for this macroeconomic factor. These results further confirm findings by Cox, Ingersoll and Ross (1985) and Merton (1973) that industrial production growth provides opportunities to investors and hence is a pricing factor across stock returns. Gulen, Xing and Zhang (2011) find that the expected excess returns of value stocks have higher sensitive to aggregate economic conditions than that of growth stocks in the U.S. and propose that the value factor might capture the fundamentals of economic development in the USA. Our finding that the value premium is no longer significant after adding the industrial production factor to Fama and French's three-factor model implies and supports this economic rationale for Japan. By contrast, other macroeconomic factors do not demand a significant pricing premium.

[Table 2 inserted here]

On the other hand, the pricing premium of the size factor is also not significant when we add the factors of industrial production, inflation, and yen appreciation. The size (SMB) factor has a significant pricing premium after we include factors of growth in GDP, Debt-to-GDP, imports, and exports. Although Fama and French (1998) find that value is the only pricing factor in their sample period up to 1995 in Japan, our findings suggest that size can be a pricing factor in the Fama-French model when we extend the sample period from 1995 to 2013. This new finding might be due to the market development and the change of economic structure in Japan. Our results also suggest that the pricing of the size factor could also capture the risks of yen exchange rate, inflation (deflation), and industrial production in Japan. Overall, our tests on macroeconomic factors suggest that industrial production is an important pricing factor for stock returns in Japan.

5. The systematic pricing of market risk factors

In this section, we investigate what other market risk factors are also systematic for pricing stock returns in addition to Fama and French’s three factors, and whether value and size are robust pricing factors for stock returns after controlling for other systematic market risks factors in Japan. The factors considered are the factors of leverage yield (LEVF), dividend yield (DYF), earnings yield (EPF), momentum (MOM), cash-flow yield (OCFF), and return reversal (REVF). We estimate a stock’s sensitivities (betas) to these market risk factors as well as the betas of Fama-French’s three factors. We then sort stocks into five portfolios by the betas of these market risk factors and calculate both the equal-weighted returns and value-weighted returns for these portfolios. We subsequently form the zero-cost H-L portfolios that take long positions in the portfolios with the highest betas and short positions in the portfolios with the lowest betas. We then regress the time-series returns of H-L portfolios on CAPM and the Fama-French three-factor model to check if these portfolios generated significant alphas. A significant alpha in the Fama-French model can suggest that there might be another significant market risk factor for pricing stocks in Japan. In this way, we can also check whether these market factors overlap with the value and size factors in their pricing effect on stock returns. Finally, we use the Fama-MacBeth (1973) methodology to examine our empirical objectives for Japan. This methodology is a standard procedure in the literature and has been also used for testing market risk factors in the work of Fama and French (1993), Carhart (1997), Fama and French (1998), Ang, Hodrick, Xing, and Zhang (2006), Hou, Karolyi and Kho (2011), Kubota and Takehara (2017) and Liang (2018b). We also adjust the *t*-statistics according to Newey and West (1987).

5.1. Alphas of Portfolios Sorted on Market Risk Factors

We began by estimating a stock's sensitivities (betas) to the market risk factors using the following regression and time-series data for the last five years.

$$R_{i,\tau} = \alpha_{i,t-1} + \beta_{i,t-1}^{m} MKTX_{\tau} + \beta_{i,t-1}^{h} HML_{\tau} + \beta_{i,t-1}^{s} SMB_{\tau} + \beta_{i,t-1}^{l} LocalFactor_{\tau} + \varepsilon_{i,\tau,}$$

$$\tau = t-60, .., t-1 \quad (8)$$

where *MKTX* is the market factor, *HML* is the value factor, *SMB* is the size factor, and *LocalFactor* is one of the leverage yield factor (LEVF), dividend yield factor (DYF), earnings yield factor (EPF), momentum factor (MOM), cash-flow yield factor (OCFF), and return reversal factor (REVF). We also sorted stocks into five portfolios according to their betas $\beta_{i,t-1}^{l}$ and calculate the equal- and value-weighted portfolio returns. We then form the zero-cost (H-L) portfolios that take long positions on stocks with the highest betas and short positions on stocks with the lowest betas. We then regress the zero-cost (H-L) portfolios on CAPM and the three-factor stated in the regression (5). As reported in Table 3, we find that the H-L portfolios formed on earning yield factor and cash-flow yield factor generate significantly positive alphas in the three-factor model. The market betas of these two hedged portfolios are also significantly negative. The H-L portfolios formed on momentum's beta generate significant positive alphas in the three-factor models. The zero-cost H-L portfolios formed on the beta of the return reversal factor generate significant negative alphas in the three-factor model. Interestingly, we find the zero-cost portfolios formed on the betas of cash-flow yield factor, betas of momentum factor and betas of earning-to-price factor have significant negative market betas in these regressions. We then employ the Fama-Macbeth (1973) methodology to examine whether these market risk factors demand a significant cross-sectional pricing premium in Japan.

[Table 3 inserted here]

5.2. Pricing premium of systematic market risk factors

Following the Fama-MacBeth (1973) procedure, we estimate the time-series sensitivities (betas) of stocks to these market risk factors using the following regression of data from the past five years:

$$R_{i,\tau} = \alpha_{i,t-1} + \beta^{m}_{i,t-1} MKTX_{\tau} + \beta^{h}_{i,t-1} HML_{\tau} + \beta^{s}_{i,t-1} SMB_{\tau} + \beta^{l}_{i,t-1} LocalFactor_{\tau} + \varepsilon_{i,\tau,}$$

$$\tau = t-60,..,t-1 \quad (9)$$

where *MKTX* , *HML* and *SMB* are the three Fama-French (1992) factors in Japan. The local market risk factor, *LocalFactor*, is of the leverage yield factor, dividend yield factor, earnings yield factor, cash-flow yield factor, momentum factor, or return reversal factor. We then estimate the pricing premiums of these local market risk factors using the following regression:

$$R_{i,t} = \alpha + \beta^{m}_{i,t-1}\lambda_m + \beta^{h}_{i,t-1}\lambda_h + \beta^{s}_{i,t-1}\lambda_s + \beta^{l}_{i,t-1}\lambda_l, \quad t = 0,...,T, \quad (10)$$

where λ_m, λ_h, and λ_s are the pricing premiums of *MKTX, HML* and *SMB*, and λ_l is the pricing premium of *LocalFactor*. We also adjust the *t*-statistics according to Newey and West (1987).

As reported in Table 4, we find that the value (HML) and size (SMB) factors have a significant pricing premium. This finding reconfirms our previous suggestion that the size factor has also been a significant risk factor in Japan for the last three decades. Intriguingly, we find that the cash-flow yield factor and dividend yield factor demand a significant pricing premium across stocks after controlling for market, value and size factors in the Fama-French model. On the other hand, factors of momentum, earnings yield, and return-reversal are not systematic pricing factors for pricing stocks in Japan. Our results support the argument of Hou, Karolyi and Kho (2011) that cash-flow yield factor is most important in global stocks while cash-flow yield factor is also critically important within the Japan's stock market. Our findings suggest a new four-factor model that systematically prices stocks in Japan which includes Fama and French's three factors and either our cash-flow yield factor or dividend yield factor. However, this four-factor model does not include the momentum factor suggested by Carhart (1997). The next research question is what stock characteristics can cross-sectionally predict stock returns in Japanese stock markets after controlling these systematic market risk factors.

[Table 4 inserted here]

6. Cross-sectional predictability of stock returns

In this section, we investigate how a stock's characteristics can cross-sectionally predict stock returns in Japan. We first sort all stocks into five portfolios based on characteristics of size, book-to-market ratio (BM), cash-flow yield, earnings yield, leverage yield, dividend yield, short-term reversal, momentum, total volatility, and idiosyncratic volatility. We calculate both equal-weighted returns and value-weighted returns for these portfolios. We then construct the zero-cost portfolios (5-1) that take long positions on the portfolios with the highest values of these variables and take short positions on the portfolios with the lowest values of these variables. We first check on the portfolios' returns and risk-adjusted excess returns (alphas) in table 5 and table 6. We then use Fama-MacBeth's (1973) regressions to investigate the cross-sectional predictability of stock returns. This is the standard procedure for testing the predictability of stock returns in cross-section and is used in the work of Daniel and Titman (1997), Kent, Titman, and Wei (2001), Ang, Hodrick, Xing, and Zhang (2006, 2009), Huang, Liu, Ghon, and Zhang (2010), Cakici, Chan, and Topyan (2015), and Liang (2018b). We adjust the *t*-statistics according to Newey and West (1987).

6.1 Returns of portfolios sorted on a stock's characteristics

As shown in Table 5, we find that both the highest portfolios and the H-L portfolios sorted on book-to-market, dividend yield, earnings yield, and cash-flow yield generate significantly higher future one-month returns. The positive returns of the H-L portfolios are contributed mainly by the positive returns in the high portfolio for these stock characteristics. The H-L portfolios sorted on return-reversal also generate significantly lower one-month returns. As book-to-market, dividend yield, earnings yield, and cash-flow yield are a stock's value measures, we can infer that a stock's value can cross-sectionally generate significantly higher returns in Japan. On the other hand, portfolios sorted on size, momentum, total volatility, idiosyncratic volatility, and leverage yield do not generate significantly higher returns.

[Table 5 inserted here]

The findings related to dividend yield are different from Ang and Bakeart's (2007) results in the U.S. market, where the dividend yield cannot univariately predict excess returns for the 1935-2011 period. Our portfolio constructions are unconditional. Our findings on momentum are consistent with the findings of Fama and French (2012), that there is no momentum in Japan. We do not conduct momentum strategies on different liquidity states and market states as Asness (2011), Hanauer (2014), and Avramov, Cheng and Hameed (2016) did because these studies are outside the scope of this study. Our findings on short-term reversal are similar to the findings by Jegadeesh (1990) in the period 1934-1987 and by Huang, Liu, Ghon, and Zhang (2010) for the period 1963-2004 in the U.S. market. High (stock) total volatility and idiosyncratic volatility do not significantly lower future one-month raw returns. On the other hand, Ang, Hodrick, Xing, and Zhang (2009) document that idiosyncratic volatility from the world market three-factor model generates significant negative alphas for the multifactor model and characteristic loading for Fama-Macbeth (1973) regressions in Japan and the Asia region for the 1980-2003 period. We will perform our analysis on this phenomenon in subsections 6.3 and 6.4, where we estimate the alphas of multi-factor models and the pricing premium of a stock's characteristics by using the Fama-Macbeth (1973) regressions.

6.2 One-dollar ($1) payoff of portfolios sorted on a stock's characteristics

It is critical to note in Table 5 that portfolios formed on the highest value of book-to-market, dividend yield, earnings yield, and cash-flow yield significantly generate large positive future one-month returns in the two-decade bear market period when the aggregate Japanese stock market dropped over 62.21%. We estimate the $1 investment payoff of these portfolios and compare it with the $1 payoff on the aggregate Japanese stock market from January 1980. In Figure 1, we investigate the cumulative payoff in dollar terms for investing $1 in these portfolios having the highest values of these stock characteristics. We monthly rebalance the portfolios in the 1980–2011 period. We compare this payoff with the cumulative payoff from $1 invested in the aggregate stock market. We find that the investing strategies based on a stock's book-to-market, dividend yield, earnings yield, cash-flow yield, leverage yield, short-term reversal, momentum, size, total volatility, and idiosyncratic volatility grew $1 into $115.98, $81.88, $433.86, $281.49, $6.62, $7.50, $4.43, $4.41, $2.91, and $3.18 respectively, while the aggregate stock market turned $1 into a mere $2.76, in the 1980–2011 period. The monthly compounding returns of these investing strategies are 1.25%, 1.15%, 1.59%, 1.48%, 0.49%, 0.53%, 0.39%, 0.39%, 0.28% and 0.30% while the aggregate stock market only delivered 0.27% in this period. In other words, these investing strategies rewarded investors 42.0, 29.6, 157.1, 101.9, 2.40, 2.72, 1.61, 1.60 and 1.07 fold in investment than the Japanese aggregate stock market did. We find similar results for the sample period extended to 2013.

[Figure 1 inserted here]

It is intriguing to note that four investing strategies actually rewarded investors with huge positive returns in the bear market that spanned two decades from 1990 to 2011. These investing strategies are based on book-to-market, dividend yield, earnings yield, and cash-flow yield. They turned a $1 into $4.77, $4.25, $17.17, and $10.91, implying large profits of 377%, 325%, 1617%, and 991% respectively, while the stock market plunged 62.21% after reaching its peak in January 1990. These results are intriguing and suggest that the top 20% of companies with high valuation qualities could still consistently reward investors with huge positive returns even though they take huge risks and invest in stocks during a two-decade recession and bear market. In addition, every one of these investing strategies continued to generate positive returns between the pre-global financial crisis peak in 2007 and December 2011. It is also critical to note that none of investing strategies based on non-fundamental measures rewarded investors with positive returns in the bear market that spanned two decades from 1990 to 2011 when the stock market plunged 62.21%. In fact, these investing strategies turned a $1 investment into $0.96, $0.45, $0.44, $0.36 and $0.40 in this period, implying losses of 3.76%, 55.27%, 56.33%, 63.52%, and 60.15%. In addition, the investing strategy based on short-term reversal gave a peak return of $19.43 in February 2006 while the aggregate stock market peaked much earlier in January 1990. However, this strategy shed $13.64 to finally close at $5.79 (a 70% loss from the peak) in March 2009 which was also when the stock market hit the bottom during the global financial crisis. In this sub-period, this strategy largely underperformed the other investing strategies and the aggregate market.

6.3 Alphas of zero-cost portfolios

In this sub-section, we investigate whether a stock's characteristics of size, book-to-market ratio (BM), cash-flow yield, earnings yield, leverage yield, dividend yield, return reversal, momentum, total volatility, and idiosyncratic volatility can generate alphas after controlling for Fama and French's three factors in equation (5). As reported in Table 6, we find that the zero-cost 5-1 portfolios formed on the book-to-market ratio, dividend yield, earnings yield, and cash-flow yield can consistently generate significant alphas for CAPM and the three-factor model while momentum strategy does not generate profitable alphas. Our tests are unconditional and consistent with Fama and French (2012).[18] The results on cash-flow yield are similar to the findings of Lakonishok, Shleifer, and Vishny (1994) in the USA. The zero-cost 5-1 portfolios formed on a stock's idiosyncratic volatility can generate significantly negative alphas for the three-factor model. These results on a stock's volatility are also consistent with those of Ang, Hodrick, Xing, and Zhang (2009). We also find that smaller stocks and low-return stocks can generate higher alphas in the three-factor model. To find a clearer result, we then investigate the cross-sectional predictability of these characteristics using Fama-Macbeth (1973) regressions after controlling for the significant systematic risk factors we found in the previous section.

[Table 6 inserted here]

6.4 The Cross-Sectional Predictability of a Stock's Characteristics Controlled for Factors

We also employ the two-step multiple regression approach of Daniel and Titman (1997) and Kent, Titman, and Wei (2001) to investigate how a stock's characteristics compete with market systematic risk factors in predicting stock returns in Japan.[19] This approach is the methodology of Fama-MacBeth (1973) regressions. The market systematic risk factors are market, value, size, cash-flow yield,

[18] Again, we do not conduct momentum strategies on different liquidity states and market states as what Asness (2011), Hanauer (2014), and Avramov, Cheng and Hameed (2016) did because these studies are out of the scope of this study.
[19]Daniel and Titman (1997) reject the Fama and French three-factor model but accept the characteristics model in the 1973-1993 period in the USA. market. Kent, Titman, and Wei (2001) also reject the factor model and accept the characteristics model for the book-to-market ratio in the Japanese market in the 1975–1997 period.

and dividend yield. In the first step, we estimate the betas of risk factors using the following regression and data for the past five years.

$$R_{i,\tau} = \alpha_{i,t-1} + \beta_{i,t-1}^{m} MKTX_{\tau} + \beta_{i,t-1}^{h} HML_{\tau} + \beta_{i,t-1}^{s} SMB_{\tau} + \beta_{i,t-1}^{l} LocalFactor_{\tau} + \varepsilon_{i,\tau,}$$

$$\tau = t-60,..,t-1 \quad (12)$$

where Fama and French's three factors are market (*MKTX*), value *(HML*) and size (*SMB*). The *LocalFactor* is either the cash-flow yield factor (*OCFF*) or the dividend yield factor (DYF). We then investigate whether a stock's characteristics can significantly predict stock returns after competing with these market risk factors using the following Fama-MacBeth regression:

$$R_{i,t} = \alpha + \beta_{i,t-1}^{m}\lambda_m + \beta_{i,t-1}^{h}\lambda_h + \beta_{i,t-1}^{s}\lambda_s + \beta_{i,t-1}^{l}\lambda_l + \beta_{i,j,t-1}^{ch} Ch_{i,j,t-1} t = 1, \ldots., T \quad (13)$$

where λ_m, λ_h, and λ_s are the pricing premiums of *MKTX, HML*, and *SMB.* λ_l is pricing premium of *DYF* or *OCFF. Ch* is one of the characteristics of a stock. These characteristics are market capitalization (MV), book-to-market ratio (BM), cash-flow yield (OCF), return reversal (REV), dividend yield (DY), earnings yield (EP), idiosyncratic volatility (IDVOL), total volatility (TVOL), and leverage yield (LEV). We test each characteristic separately with this four-factor model because these characteristics are highly correlated. We adjust *t*-statistics according to Newey and West (1987).

As reported in Table 7, we find that a stock's book-to-market ratio, cash-flow yield, dividend yield, earnings yield, return reversal, total volatility and idiosyncratic volatility significantly predict stock returns after controlling for market, value, size and cash-flow yield factors (OCFF). They can do the same after we replace the cash-flow yield factor with the dividend yield factor. The results on a stock's total volatility and idiosyncratic volatility are consistent with those of Ang, Hodrick, Xing, and Zhang (2009). We also find that a stock's size and leverage yield cannot predict stock returns after controlling for these market factors. Our results show that both the factor model and the characteristics model drive stock returns for a stock's cash-flow yield. On the other hand, we find that the dividend yield factor does not demand a significant pricing premium if we include a stock's dividend yield. This finding suggests that for dividend yield we should accept the characteristics model and reject the factor model. Our results further confirm our previous explanations and suggestions on the size factor, cash-flow yield, and short-term reversal phenomena in the two biggest stock markets in developed countries. As cash-flow yield, dividend yield and book-to-market ratio are measures of a stock's value to market price, our findings show global investors that portfolios formed on a stock's value can generate significant profits even when the overall market is below its peak or in a bear market. Investors should consider a stock's value as their top criteria when they construct their portfolios and investing strategies in Japanese stock markets.

[Table 7 inserted here]

7. Conclusion

We comprehensively investigate what systematic factor drives stock returns and what stock characteristics predict stock returns in Japan. We contribute the literature by finding that the cash-flow yield factor and dividend yield factor systematically price stock returns after controlling for Fama and French's three factors. We also contribute to the literature by finding that industrial production growth is a systematic pricing factor for stock returns after controlling for Fama and French's market, value, and size factors. Our empirical tests also interestingly show that the pricing premium of the value (HML) factor becomes insignificant when we add the production growth factor in Fama and French's three-factor model. This finding contributes to the literature that the value factor captures the fundamentals of macroeconomic variables and economic development in Japan. These findings enrich the literature by revealing to investors that industrial production growth, the cash-flow yield factor, and the dividend yield factor are critical and systematic driving forces for stock returns in Japan.

We further enrich the literature by empirically investigating the cross-sectional stock return predictability. We find that a stock's book-to-market ratio, cash-flow yield, dividend yield, earnings yield, and return reversal significantly predict stock returns after controlling for market, size, value, cash-flow yield and dividend yield factors. Contributing to the literature, our empirical results for Japan accept both the factor model and characteristics model for a stock's cash-flow yield, and the characteristics model for its dividend yield, earnings yield, and return reversal. These empirical results on the stock return predictability affirm global investors they can achieve significant profits from their portfolios constructed on a stock's value measured by a stock's book-to-market ratio, cash-flow yield, dividend yield and earnings yield even though the whole Japanese market is still below its peak. Overall, our study adds to the literature that we offer a comprehensive guidance to the literature and to global asset managers for understanding the impact of macroeconomic factors on stock returns, the systematic market risk factors for pricing stocks returns, the cross-sectional predictability of stock returns, the profitability of various stock portfolio constructions, the systematic risk management of stock portfolios, and the strategies of hedging systematic portfolio risks in Japan.

Appendix

Debt-to-GDP growth 外债? 内债? 以美元计价..

We divide the domestic total debt level by the GDP level each quarter and obtain the debt-to-GDP ratio. The monthly Debt-to-GDP growth is this ratio's quarterly growth rate in each month within this quarter.

$$Debt-to-GDP_t growth = (\frac{Debt_t}{GDP_t} / \frac{Debt_{t-1}}{GDP_{t-1}}) - 1 \quad \text{(A1)}$$

GDP growth

The GDP growth rate in each quarter is the current quarter's GDP minus last quarter's GDP divided by last quarter's GDP. The GDP growth rate for a month within that quarter is then the growth rate in this quarter.

$$GDPGrowth_t = \frac{GDP_t - GDP_{t-1}}{GDP_{t-1}}. \quad \text{(A2)}$$

Inflation rate

The inflation rate in each month is the current month's CPI minus last month's CPI divided by last month's CPI.

$$InflationRate_t = \frac{CPI_t - CPI_{t-1}}{CPI_{t-1}} \quad \text{(A3)}$$

Industrial production growth

The growth rate of industrial production (IP) in each quarter is measured as the current quarter's IP minus last quarter's IP divided by last quarter's IP. The industrial production growth for a month within that quarter is the industrial production growth in this quarter.

$$IPGrowth_t = \frac{IP_t - IP_{t-1}}{IP_{t-1}}. \quad \text{(A4)}$$

Export growth and import growth

The export (EXP) growth is constructed as the current quarter's EXP minus last quarter's EXP divided by last quarter's EXP. The growth rate of export for a month within that quarter is then the growth rate in the current quarter. We can also construct the import (IMP) growth as the current quarter's IMP minus last quarter's IMP divided by last quarter's IMP. The growth rate of import for a month within that quarter is then the growth rate in this quarter.

Export growth:

$$EXPGrowth_t = \frac{EXP_t - EXP_{t-1}}{EXP_{t-1}} \tag{A5}$$

Import growth:

$$IMPGrowth_t = \frac{IMP_t - IMP_{t-1}}{IMP_{t-1}}. \tag{A6}$$

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References

Ait-Sahalia, Yacine, Jonathan A. Parker, and Motohiro Yogo, 2004, Luxury Goods and the Equity Premium, *Journal of Finance* 59 (6): 2959-3004.

Ang, A. and Bekaert, G. (2007) Stock Return Predictability: Is It There? Review of Financial Studies, 20, 651-707.

Ang, Andrew, Robert J. Hodrick, Yuhang Xing, and Xiaoyan Zhang, 2006, The cross-section of volatility and expected returns, *Journal of Finance,* 61,259-276.

Ang, Andrew, Robert J. Hodrick, Yuhang Xing, and Xiaoyan Zhang, 2009, Higher idiosyncratic volatility and lower expected stock returns: International and further U.S. evidence, *Journal of Financial Economics* 91, 1-23.

Asness, Clifford, 2011, Momentum in Japan: The Exception that Proves the Rule, *Journal of Portfolio Management*, 37, 4, 67-75.

Asness, Clifford, Lasse Pedersen and Tobias Moskowitz, 2013, Value and Momentum Everywhere, *Journal of Finance*, 68,3, 919-985.

Avramov, Doron, Si Cheng, and Allaudeen Hameed, 2016, Time-Varying Liquidity and Momentum Profits, Journal of Financial and Quantitative Analysis, 51, 6, 1897-1923.

Bakshi, Gurdip S., and Atsuyuki Naka, 1997, An empirical investigation of asset pricing models using Japanese stock market data, *Journal of International Money and Finance*, 16,1,81-112.

Bai, Hang, Kewei Hou, Howard Kung, and Lu Zhang, 2015, The CAPM strikes back? An investment model with disasters, working paper, Fisher College of Business, The Ohio State University.

Boguth, Oliver and Lars-Alexander Kuehn, 2013, Consumption Volatility Risk, *Journal of Finance*, 68 (6), 2589-2650.

Cakici, Nusret, Kalok Chan and Kudret Topyan, 2015, Cross-sectional stock return predictability in China, *The European Journal of Finance, 23, 581-605*.

Chan, Louis K. C., Yasushi Hamao, and Josef Lakonishok, 1991, Fundamentals and stock returns in Japan, *Journal of Finance* 46, 1739-1764.

Chen, Nai-Fu, R. Roll, and S. Ross, 1986, Economic Forces and the Stock Market, *Journal of Business*, 59, 1986, 383-403.

Carhart, Mark M., 1997, On persistence in mutual fund performance, *Journal of Finance* 52, 57-82.

Cox, John, Jonathan Ingersoll, Jr., and S. Ross, 1985, An Intertemporal General Equilibrium Model of Asset Prices, *Econometrica* 53, 363-384.

Daniel, Kent, and Sheridan Titman, 1997, Evidence on the characteristics of cross-sectional variation in stock returns, *Journal of Finance* 52, 1-33.

Daniel, Kent, Sheridan Titman, and K.C. John Wei, 2001, Explaining the cross-section of stock returns in Japan: factors or characteristics? *Journal of Finance* 56, 743-766.

Da, Zhi, 2009 "Cash Flow, Consumption Risk, and the Cross-section of Stock Returns", *Journal of Finance*, 63, 2, 923-956.

Daniel, Kent, Sheridan Titman, and K.C. John Wei, 2001, Explaining the cross-section of stock returns in Japan: factors or characteristics? *Journal of Finance* 56, 743-766.

Fama, Eugene F., and Kenneth R. French, 1992, The cross-section of expected stock returns, *Journal of Finance* 47, 427–465.

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.

Fama, Eugene F., and Kenneth R. French, 1998, Value versus growth: International evidence, *Journal of Finance* 53, 1975-1999.

Fama, Eugene F., and Kenneth R. French, 2012, Size, Value, and Momentum in International Stock Returns, *Journal of Financial Economics* 105, 3, 457-472.

Fama, E. F., and K. R. French (2015), 'A Five-Factor Asset Pricing Model', *Journal of Financial Economics*, 116(1), 1–22.

Fama, Eugene. F., and James D. MacBeth, 1973, Risk, return, and equilibrium: Empirical tests, *Journal of Political Economy* 71, 607-636.

Gulen, Huseyin, Yuhang Xing and Lu Zhang, 2011, Value versus Growth: Time-Varying Expected Stock Returns, *Financial Management* 40, 2, 381-407.

Hanauer, Matthias, 2014, Is Japan Different? Evidence on Momentum and Market Dynamic, *International Review of Finance*, 14, 1, 141-160.

Hou, Kewei Hou, G. Andrew Karolyi and Bong-Chan Kho, 2011, What Factors Drive Global Stock Returns?, *Review of Financial Studies*, 24 (8): 2527-2574.

Huang, Wei, Qianqiu Liu, Rhee S. Ghon, and Liang Zhang, 2010, Return Reversals, Idiosyncratic Risk and Expected Returns, *Review of Financial Studies*, 23,1,147-168.

Huynh, Thanh D., 2017, Conditional asset pricing in international equity markets, *International Review of Economics and Finance*, 49, 168-189.

Kubota, Keiichi and Hitoshi Takehara, 2017, Does the Fama and French Five-Factor Model Work Well in Japan? *International Review of Finance*, 18, 1, 137-146.

Lakonishok, Joseph, Andrei Shleifer, and Robert W. Vishny, 1994, Contrarian investment, extrapolation, and risk, *Journal of Finance* 49, 1541-1578.

Liu, Laura Xiaolei and Lu Zhang, Momentum profits, factor pricing, and macroeconomic risk, 2008, *Review of Financial Studies*, 21 (6), 2417-2448

Liang, Samuel Xin, 2018a, The Systematic Pricing of Market Sentiment Shock, *The European Journal of Finance, 24, 18, 1835-1860.*

Liang, Samuel Xin, 2018b, Market Volatility Risk and Stock Returns around the World, working paper, Tyndale University College and Seminary.

Liang, Samuel Xin and John K.C. Wei, 2012, Liquidity risk and stock returns around the world, *Journal of Banking and Finance*, 36, 3274-3288.

Jegadeesh, Narasimhan, 1990, Evidence of predictable behavior of security returns, *Journal of Finance* 45, 881-898.

Jegadeesh, Narasimhan and Titman, Sheridan, 1993, Returns to buying winners and selling losers: implications for stock market efficiency, *Journal of Finance*, 48, 65-91.

Merton, Robert C., 1973, An intertemporal capital asset pricing model, Econometrica 41, 867-887.

Newey, W., and K. West, 1987, A Simple Positive Definite, Heteroscedasticity and Autocorrelation on Consistent Covariance Matrix, *Econometrica*, 55, 703-705.

Pástor, Lubos, and Robert F. Stambaugh, 2003, Liquidity risk and expected stock returns, *Journal of Political Economy* 111, 642-685.

Ross, Stephen A., 1976, The arbitrage theory of capital asset pricing, *Journal of Economic Theory* 13, 341-360.

Santos, Tano, and Pietro Veronesi, 2006, Labor Income and Predictable Stock Returns, *Review of Financial Studies*, 19 (1): 1-44.

Savov, Alexi, 2011, Asset Pricing with Garbage, *Journal of Finance*, 66, 1, 177-201.

Yogo, Motohiro, 2006, A Consumption-Based Explanation of Expected Stock Returns, *Journal of Finance* 61 (2): 539-580.

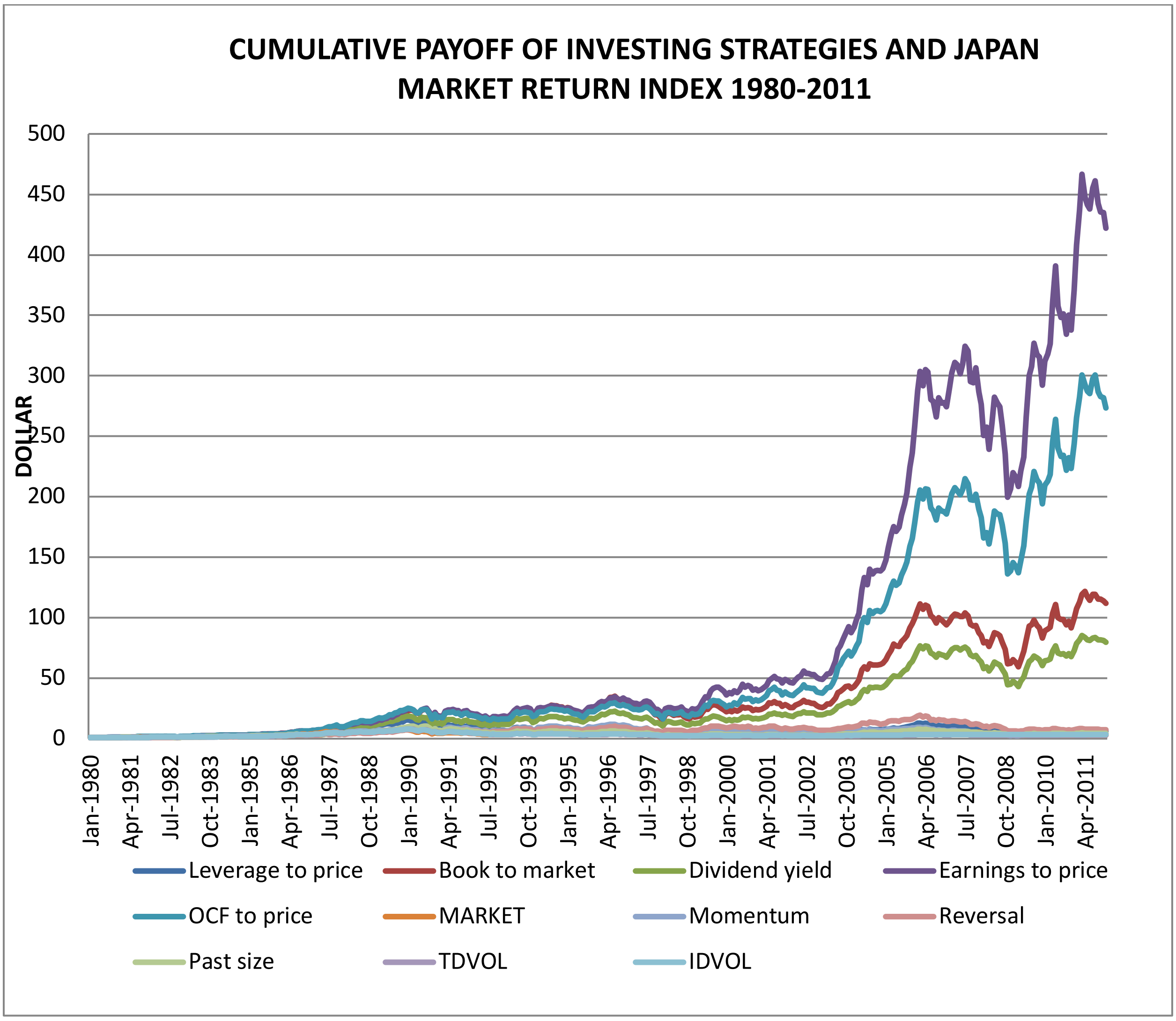

Figure 1. Cumulative Payoff of $1 Invested in Japan's Total Market Index and in Monthly Rebalanced Portfolios with the Highest Size, Momentum, Reversal, Total Volatility, Idiosyncratic Volatility, Book-to-Market, Dividend Yield, Earnings-to-Price (Earnings Yield), Cash Flow-to-Price (Cash-Flow Yield), and Leverage-to-Price (Leverage Yield) in the Japanese Stock Market.

Table 1: Alphas of zero-cost portfolios based on macroeconomic factors

We sorted all stocks into five portfolios on their sensitivity to the macroeconomic factors estimated from past five years in the following regression in 1980-2013.

$$R_{i,\tau} = \alpha_{i,t-1} + \beta^{m}_{i,t-1} MKTX_{\tau} + \beta^{h}_{i,t-1} HML_{\tau} + \beta^{s}_{i,t-1} SMB_{\tau} + \beta^{mf}_{i,t-1} MFactor_{\tau} + \varepsilon_{i,\tau}, \quad \tau = t-60,...,t-1, \qquad (1)$$

where *MKTX* is market factor; HML is value factor; SMB is size factor; and *MFactor* is one of the macroeconomic factors that are GDP growth, debt-to-GDP growth, inflation rate, industrial production growth, Yen appreciation, export growth and import growth. We calculate the equal- and value-weighted one-month return and construct the zero-cost portfolio (5-1) that takes long positions for the highest beta and short positions for the lowest betas. Panel A, Panel B and Panel C report their alphas in Fama and French's three-factor model for the 1981-2013 period.

$$R_{i,\tau} = \alpha_{i,t-1} + \beta^{m}_{i,t-1} MKTX_{\tau} + \beta^{h}_{i,t-1} HML_{\tau} + \beta^{s}_{i,t-1} SMB_{\tau} + \varepsilon_{i,\tau}, \qquad (2)$$

The 1-factor model has the market factor MKTX. The 3-factor model includes the Fama-French value factor HML and size factor SMB. The t-statistics are in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Alphas of multifactor model

i-Factor	Debt to GDP		GDP Growth		CPI Growth		Export Growth		Import Growth		Industry Growth		Yen Appreciation	
Model	ew	vw	ew	vw	ew	vw	ew	vw	ew	vw	ew	vw	ew	vw
1	0.09	0.08	-0.07	0.09	0.04	0.10	-0.13	-0.10	-0.13	-0.03	0.16	0.33	-0.25	-0.06
	(0.80)	(0.39)	(-0.64)	(0.46)	(0.39)	(0.55)	(-1.15)	(-0.51)	(-1.11)	(-0.14)	(1.22)	(1.58)	(-1.25)	(-0.23)
3	0.30***	0.21	-0.15	0.11	-0.07	-0.27	-0.18	-0.10	-0.33	-0.11	0.39***	0.59***	0.17	-0.02
	(2.70)	(1.05)	(-1.28)	(0.55)	(-0.68)	(-1.46)	(-1.56)	(-0.50)	(-2.90)	(-0.55)	(3.25)	(2.77)	(0.90)	(-0.08)

Panel B: Alphas of multifactor model (Predicted component)

i-Factor	Debt to GDP		GDP Growth		CPI Growth		Export Growth		Import Growth		Industry Growth		Yen Appreciation	
Model	ew	vw	ew	vw	ew	vw	ew	vw	ew	vw	ew	vw	ew	vw
1	0.05	0.13	-0.05	0.05	0.07	-0.10	-0.10	-0.03	0.08	0.02	-0.01	0.05	-0.17	-0.25
	(0.54)	(0.69)	(-0.45)	(0.21)	(0.62)	(-0.49)	(-0.74)	(-0.13)	(0.59)	(0.08)	(-0.07)	(0.24)	(-1.93)	(-1.22)
3	-0.03	0.09	0.12	0.09	-0.02	-0.20	-0.31***	-0.15	0.06	0.16	0.19*	0.16	-0.13	-0.42**
	(-0.26)	(0.44)	(1.00)	(0.42)	(-0.14)	(-0.99)	(-2.39)	(-0.76)	(0.44)	(0.64)	(1.79)	(0.75)	(-1.40)	(-2.04)

Panel C: Alphas of multifactor model (The unexpected component)

i-Factor	Debt to GDP		GDP Growth		CPI Growth		Export Growth		Import Growth		Industry Growth		Yen Appreciation	
Model	ew	vw	ew	vw	ew	vw	ew	vw	ew	vw	ew	vw	ew	vw
1	0.12	0.03	-0.03	0.03	0.00	0.03	-0.06	-0.02	-0.15	-0.10	0.15	0.24	-0.23	-0.06
	(1.03)	(0.12)	(-0.23)	(0.16)	(-0.03)	(0.14)	(-0.62)	-(0.08)	(-1.28)	(-0.51)	(1.35)	(1.12)	(-1.16)	(-0.24)
3	0.36	0.18	-0.22*	0.03	-0.10	-0.34**	-0.16	-0.02	-0.33***	-0.27	0.34***	0.54***	0.19	-0.01
	(3.24)	(0.84)	(-1.77)	(0.14)	(-1.08)	(-1.96)	(-1.48)	-(0.08)	(-2.92)	(-1.33)	(3.14)	(2.48)	(1.04)	(-0.03)

Table 2: Pricing premium of macroeconomic factors based on the Fama-Macbeth (1973) methodology

This table reports the estimated pricing premiums of macroeconomic factors using the Fama-Macbeth methodology. The betas of economic factors, *MFactor*, are estimated from the following regression using the past five-year data in 1980-2013.

$$R_{i,\tau} = \alpha_{i,t-1} + \beta^{m}_{i,t-1} MKTX_{\tau} + \beta^{h}_{i,t-1} HML_{\tau} + \beta^{s}_{i,t-1} SMB_{\tau} + \beta^{m}_{i,t-1} MFactor_{\tau} + \varepsilon_{i,\tau},\ \tau = t-60,...,t-1, \quad (1)$$

The pricing premiums are estimated using the following regression.

$$R_{i,t} = \alpha + \beta^{m}_{i,t-1}\lambda_{m} + \beta^{h}_{i,t-1}\lambda_{h} + \beta^{s}_{i,t-1}\lambda_{s} + \beta^{mf}_{i,t-1}\lambda_{mf}, \quad t = 0,...,T, \quad (2)$$

The macroeconomic factors are GDP growth, debt-to-GDP growth, inflation rate, industrial production growth, Yen appreciation, export growth, and import growth. We can decompose these factors into the expected component and unexpected component and estimate their pricing premium. The decomposition is as follows.

$$MFactor_{t} = \alpha + \beta * MFactor_{t-1} + \varepsilon_{t} \quad (3)$$

The predicted component is $\alpha + \beta * MFactor_{t-1}$. The table reports the pricing premium of their expected component and unexpected component (residual ε). The t-statistics are in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Pricing Premium of Macroeconomic Factors

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
λ^{m}	0.22 (1.05)	0.24 (1.19)	0.23 (1.11)	0.23 (1.02)	0.20 (1.06)	0.21 (1.06)	0.22 (1.07)
λ^{h}	0.28** (2.05)	0.28** (2.09)	0.25* (1.77)	0.20 (1.12)	0.31*** (2.44)	0.28** (2.08)	0.26** (1.98)
λ^{s}	0.29* (1.77)	0.29* (1.79)	0.24 (1.50)	0.16 (0.78)	0.25 (1.60)	0.27* (1.71)	0.27* (1.71)
$\lambda_{predictedDBGDP}$	0.00 (0.01)	-	-	-	-	-	-
$\lambda_{residualDBGDP}$	0.07 (0.78)	-	-	-	-	-	-
$\lambda_{predictedGDP}$	-	0.03 (0.39)	-	-	-	-	-
$\lambda_{residualGDP}$	-	-0.17 (-0.99)	-	-	-	-	-
$\lambda_{predictedCPI}$	-	-	0.00 (1.27)	-	-	-	-
$\lambda_{residualCPI}$	-	-	-0.01 (-0.59)	-	-	-	-
$\lambda_{predictedIP}$	-	-	-	-0.01 (-0.14)	-	-	-
$\lambda_{residualIP}$	-	-	-	0.36** (1.99)	-	-	-
$\lambda_{predictedYEN}$	-	-	-	-	-0.01 (-1.48)	-	-
$\lambda_{residualYEN}$	-	-	-	-	-0.06 (-0.73)	-	-
$\lambda_{predictedEXP}$	-	-	-	-	-	-0.01 (-1.48)	-
$\lambda_{residualEXP}$	-	-	-	-	-	0.00% (0.02)	-
$\lambda_{predictedIMP}$	-	-	-	-	-	-	0.03 (1.12)
$\lambda_{residualIMP}$	-	-	-	-	-	-	-0.10 (-0.92)

Table 3: Alphas of the zero-cost portfolio based on betas of market risk factors

This table reports the multifactor model's alphas of equal- and value-weighted portfolios sorted on the betas of local market risk factors at t-1 in the Japan market in 1980-2013. The betas of local factors are estimated as follows.

$$R_{i,\tau} = \alpha_{i,t-1} + \beta^{m}_{i,t-1} MKTX_{\tau} + \beta^{h}_{i,t-1} HML_{\tau} + \beta^{s}_{i,t-1} SMB_{\tau} + \beta^{l}_{i,t-1} LocalFactor_{\tau} + \varepsilon_{i,\tau}, \ \tau = t-60,\ldots,t-1,$$

Local factors are leverage yield factor (LEVF), dividend yield factor (DYF), earnings-to-price factor (EPF), momentum factor (MOM), cash-flow yield factor (OCFF), and short-term reversal factor (REVF). Panel A reports the alphas of the zero-cost portfolios (5-1) in Fama and French's three-factor model for the 1981-2013 period. The 1-factor model has the market factor MKTX. A 3-factor model has the market (MKTX), value (HML) and size (SBM) factors. Panel A reports the alphas of these models while Panel B reports the market betas of these models. The t-statistics are in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Alphas of MultiFactor Model

i-Factor Model	Leverage Yield ew	Leverage Yield vw	Dividend Yield ew	Dividend Yield vw	Earnings Yield ew	Earnings Yield vw
1	0.09	0.04	-0.01	-0.01	-0.06	0.33
	(0.41)	(0.12)	(-0.03)	(-0.04)	(-0.42)	(1.41)
3	-0.05	-0.01	0.22	0.10	0.26**	0.70***
	(-0.23)	(-0.04)	(0.89)	(0.29)	(2.19)	(3.05)
	Momentum		**Cash-Flow Yield**		**Short-term Reversal**	
1	-0.10	0.17	0.26	0.47	0.10	-0.03
	(-0.55)	(0.56)	(1.69)	(1.83)	(0.68)	(-0.12)
3	0.43***	0.78***	0.62***	0.90***	-0.32***	-0.75***
	(2.64)	(2.77)	(4.44)	(3.70)	(-2.57)	(-3.40)

Panel B: Market Betas of MultiFactor Model

i-Factor Model	Leverage to Price ew	Leverage to Price vw	Dividend Yield ew	Dividend Yield vw	Earnings to Price ew	Earnings to Price vw
1	22.32***	26.92***	6.61*	9.47*	-2.14	-9.60
	(5.97)	(5.12)	(1.73)	(1.78)	(-0.99)	(-2.52)
3	23.98***	27.68***	5.51	9.56*	-4.93**	-12.74***
	(6.45)	(5.22)	(1.45)	(1.79)	(-2.67)	(-3.52)
	Momentum		**Cash Flow Yield**		**Short-term Reversal**	
1	-5.30*	2.28	-10.34***	-11.37***	-0.75	-10.92***
	(-1.79)	(0.48)	(-4.19)	(-2.76)	(-0.33)	(-2.76)
3	-8.50***	-1.51	-13.01***	-15.63***	1.42	-7.81**
	(-3.36)	(-0.34)	(-5.93)	(-4.11)	(0.72)	(-2.27)

Table 4: Pricing premium of market risk factors based on Fama-Macbeth (1973) methodology
This table reports the estimated pricing premiums of market risk factors using Fama-Macbeth methodology in 1980-2013. The betas of market risk factors, *LocalFactor*, are estimated from the following regression using the past five-year data.

$$R_{i,\tau} = \alpha_{i,t-1} + \beta^m_{i,t-1} MKTX_\tau + \beta^h_{i,t-1} HML_\tau + \beta^s_{i,t-1} SMB_\tau + \beta^m_{i,t-1} LocalFactor_\tau + \varepsilon_{i,\tau},\ \tau = t-60,..,t-1, \quad (1)$$

The pricing premiums are estimated using the following regression.

$$R_{i,t} = \alpha + \beta^m_{i,t-1}\lambda_m + \beta^h_{i,t-1}\lambda_h + \beta^s_{i,t-1}\lambda_s + \beta^l_{i,t-1}\lambda_l, \qquad t = 0,...,T, \qquad (2)$$

The local market risk factors are momentum factor (*MOM*), cash-flow yield factor (OCFF), dividend yield factor (DYF), earnings yield factor (EPF), leverage yield factor (LEVF), and return reversal factor (REVF). The t-statistics are in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Pricing Premium of Local Market Risk Factors

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
λ^m	0.37*	0.23	0.32	0.26	0.29	0.26
	(1.86)	(1.20)	(1.57)	(1.32)	(1.41)	(1.25)
λ^h	0.31**	0.31***	0.32**	0.33***	0.33***	0.29**
	(2.30)	(2.51)	(2.38)	(2.73)	(2.62)	(2.21)
λ^s	0.31**	0.28*	0.33**	0.32**	0.22	0.26*
	(2.01)	(1.83)	(2.13)	(2.14)	(1.35)	(1.68)
λ_{OCFF}	0.24**	-	-	-	-	-
	(2.28)					
λ_{DYF}	-	0.22*	-	-	-	-
		(1.72)				
λ_{EPF}	-	-	0.12	-	-	-
			(1.25)			
λ_{LEVF}	-	-	-	0.23	-	-
				(1.28)		
λ_{MOM}	-	-	-	-	-0.04	-
					(-0.20)	
λ_{REV}	-	-	-	-	-	0.01
						(0.08)

Table 5: Returns of Portfolios constructed on a stock's characteristics

All stocks in are Japan are sorted into five portfolios each month based on their book-to-market, dividend yield, earnings yield, cash-flow yield, leverage yield, market value, return reversal (past one-month return), momentum (past six-month return), total volatility, and idiosyncratic volatility in 1980-2013. We calculate the equal- and value-weighted return of each portfolio and construct the zero-cost portfolio (5-1) that longs the highest value of these measures and shorts the lowest value of them. The Newey and West (1987) adjusted t-statistics are in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Returns of Portfolios Constructed on a Stock's Characteristics

Portfolio	**BM**		**Dividend Yield**		**Earnings yield**		**Cash-flow yield**		**Leverage yield**	
	ew_ret	vw_ret	ew_ret	vw_ret	ew_ret	vw_ret	ew_ret	vw_ret	ew_ret	vw_ret
1	0.12	-0.09	0.80	0.04	0.19	-0.34	-0.19	-0.52	0.84	0.39
2	0.44	0.38	0.43	0.13	0.26	0.06	0.35	0.15	0.61	0.32
3	0.76	0.77	0.44	0.49	0.56	0.38	0.66	0.42	0.63	0.32
4	1.02	1.06	0.91	0.79	1.01	0.92	1.26	0.79	0.82	0.56
5	1.71	1.59	1.49	1.11	2.01	1.51	1.89	1.20	1.14	0.71
5-1	1.59***	1.68***	0.69***	1.07***	1.82***	1.85***	2.08***	1.72***	0.29	0.32
	(8.98)	(5.99)	(3.28)	(3.77)	(11.99)	(8.82)	(13.65)	(6.74)	(1.30)	(1.07)
	Size		**Return reversal**		**Momentum**		**Total Vol.**		**Idiosyncratic Vol.**	
1	1.44	1.24	1.32	0.81	1.22	0.82	0.58	0.39	0.55	0.37
2	0.81	0.80	0.85	0.52	0.91	0.59	0.82	0.50	0.78	0.53
3	0.64	0.62	0.76	0.49	0.71	0.40	0.81	0.39	0.89	0.51
4	0.50	0.49	0.69	0.47	0.56	0.30	0.94	0.55	0.94	0.55
5	0.52	0.40	0.28	0.27	0.48	0.38	0.77	0.35	0.76	0.27
5-1	-0.92***	-0.84***	-1.03***	-0.54*	-0.74***	-0.44	0.20	-0.04	0.21	-0.10
	(-3.79)	(-3.06)	(-4.63)	(-1.84)	(-2.54)	(-1.26)	(0.75)	(-0.14)	(0.88)	(-0.37)

Table 6: Risk-Adjusted Excess Returns (Alphas) of the H-L Portfolios based on a Stock's Characteristics

We sorted all stocks into five portfolios based on their firm-level characteristics that are book-to-market (BM), dividend yield, earnings yield, cash-flow yield, leverage yield, market value (size), return reversal (past one-month return), momentum (past six-month return), total volatility, and idiosyncratic volatility in 1980-2013. We calculate the equal- and value-weighted return of each portfolio and construct the zero-cost portfolio that takes long positions for the highest value of these measures and takes short positions for the lowest value. Panel A reports the alphas of these multifactor models while Panel B reports the market betas of these models.

$$R_{i,\tau} = \alpha_{i,t-1} + \beta^{m}_{i,t-1} MKTX_{\tau} + \beta^{h}_{i,t-1} HML_{\tau} + \beta^{s}_{i,t-1} SMB_{\tau} + \varepsilon_{i,\tau},$$

The 1-factor model includes the market factor *MKTX*. The 3-factor model also includes the Fama-French value factor *HML* and size factor *SMB*. The t-statistics are in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Alphas of MultiFactor Model

i-Factor Model	BM ew	BM vw	Dividend Yield ew	Dividend Yield vw	Earnings Yield ew	Earnings Yield vw	Cash-Flow Yield ew	Cash-Flow Yield vw	Leverage Yield ew	Leverage Yield vw
1	1.62***	1.69***	0.74***	1.14***	1.84***	1.87***	2.11***	1.77***	0.25	0.25
	(9.22)	(6.03)	(3.66)	(4.18)	(12.24)	(8.95)	(13.96)	(7.18)	(1.12)	(0.88)
3	0.96***	0.14	0.94***	1.24***	1.93***	1.75***	1.96***	1.22***	-0.06	-0.17
	(6.89)	(1.63)	(5.38)	(5.07)	(13.51)	(8.37)	(13.55)	(5.54)	(-0.28)	(-0.58)
	Size		**Return Reversal**		**Momentum**		**Total Vol.**		**Idiosyncratic Vol.**	
1	-0.94***	-0.87***	-1.02***	-0.53*	-0.71**	-0.42	0.09	-0.16	0.13	-0.18
	(-3.86)	(-3.17)	(-4.58)	(-1.80)	(-2.44)	(-1.19)	(0.38)	(-0.57)	(0.57)	(-0.67)
3	-0.39***	-0.12***	-0.80***	-0.23	-0.01	0.43	-0.33	-0.47	-0.32*	-0.59**
	(-4.88)	(-3.12)	(-3.56)	(-0.79)	(-0.03)	(1.31)	(-1.56)	(-1.62)	(-1.72)	(-2.40)

Panel B: Market Betas of MultiFactor Model

i-Factor Model	Book to Market ew	Book to Market vw	Dividend Yield ew	Dividend Yield vw	Earnings Yield ew	Earnings Yield vw	Cash-Flow Yield ew	Cash-Flow Yield vw	Leverage Yield ew	Leverage Yield vw
1	-9.85***	-5.02	-19.10***	-26.45***	-7.93***	-7.96**	-8.60***	-21.94***	20.44***	27.47***
	(-3.45)	(-1.10)	(-5.79)	(-5.98)	(-3.24)	(-2.34)	(-3.51)	(-5.46)	(5.75)	(5.94)
3	-7.66***	0.82	-23.56***	-31.51***	-10.29***	-9.37***	-9.90***	-22.85***	23.12***	30.01***
	(-3.47)	(0.61)	(-8.56)	(-8.14)	(-4.57)	(-2.84)	(-4.33)	(-6.57)	(6.81)	(6.69)
	Market Value		**Return Reversal**		**Momentum**		**Total Vol.**		**Idiosyncratic Vol.**	
1	6.74*	10.36**	-8.14	-6.01	-10.28**	-6.59	40.84***	45.25***	31.35	26.90***
	(1.70)	(2.32)	(-2.25)	(-1.25)	(-2.17)	(-1.15)	(10.83)	(9.80)	(8.72)	(6.34)
3	-2.36*	-0.44	-10.36***	-9.03*	-14.44***	-11.34**	45.01***	47.59***	36.52	31.18***
	(-1.87)	(-0.72)	(-2.93)	(-1.93)	(-3.39)	(-2.19)	(13.34)	(10.48)	(12.46)	(8.02)

Table 7: The pricing premiums of a stock's characteristics by Fama-Macbeth (1973) regressions

The betas of local market risk factors, *LocalFactor*, are estimated from the following regression using past five-year data in 1980-2013.

$$R_{i,\tau} = \alpha_{i,t-1} + \beta^{m}_{i,t-1} MKTX_{\tau} + \beta^{h}_{i,t-1} HML_{\tau} + \beta^{s}_{i,t-1} SMB_{\tau} + \beta^{m}_{i,t-1} OCF_{\tau} + \varepsilon_{i,\tau},\ \tau = t-60,..,t-1, \quad (1)$$

The pricing premiums are estimated in the following regression.

$$R_{i,t} = \alpha + \beta^{m}_{i,t-1}\lambda_{m} + \beta^{h}_{i,t-1}\lambda_{h} + \beta^{s}_{i,t-1}\lambda_{s} + \beta^{OCF}_{i,t-1}\lambda_{OCF} + \beta^{ch}_{i,j,t-1} Ch_{i,j,t-1} \quad t = 1, \ldots, T \quad (2)$$

The market risk factors are market factor (*MKTX),* book-to-market factor (*HML*), size factor (*SMB*), and cash-flow yield factor (*OCFF*). In Panel B, we replace the cash-flow yield factor with dividend yield factor (DYF) in the four-factor model. *Ch* is one of a stock's characteristics that are market capitalization (MV), book-to-market ratio (*BM*), cash-flow yield (*OCF*), short-term reversal (*REV*), dividend yield (*DY*), earnings yield (*EP*), idiosyncratic volatility (*IDVOL*), total volatility (*TVOL*), leverage yield (*LEV*). The t-statistics are in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Pricing premium controlling for market, value, size and cash flow factors

Model	1	2	3	4	5	6	7	8	9
λ^{m}	0.38*	0.40**	0.40*	0.34*	0.38*	0.35*	0.35*	0.34*	0.36*
	(1.92)	(2.02)	(1.92)	(1.81)	(1.93)	(1.77)	(1.80)	(1.89)	(1.85)
λ^{h}	0.28**	0.27**	0.29*	0.30**	0.30**	0.30**	0.29**	0.28**	0.30
	(2.17)	(2.01)	(1.80)	(2.36)	(2.28)	(2.28)	(2.27)	(2.25)	(2.29)
λ^{s}	0.29*	0.30*	0.41**	0.24	0.32**	0.33**	0.35***	0.34**	0.31**
	(1.97)	(1.96)	(2.36)	(1.59)	(2.08)	(2.09)	(2.46)	(2.36)	(1.96)
λ^{ocff}	0.23**	0.21**	0.24*	0.28***	0.23**	0.23**	0.23**	0.23**	0.23**
	(2.23)	(2.01)	(1.99)	(2.74)	(2.13)	(2.15)	(2.28)	(2.33)	(2.21)
λ_{MV}	0.00	-	-	-	-	-	-	-	-
	(-0.11)								
λ_{BM}	-	0.61***	-	-	-	-	-	-	-
		(5.72)							
λ_{OCF}	-	-	3.20***	-	-	-	-	-	-
			(5.51)						
λ_{Rev}	-	-	-	-5.18***	-	-	-	-	-
				(-7.70)					
λ_{DY}	-	-	-	-	7.05***	-	-	-	-
					(4.71)				
λ_{EP}	-	-	-	-	-	1.22***	-	-	-
						(5.98)			
λ_{IDVOL}	-	-	-	-	-	-	-14.14***	-	-
							(-2.74)		
λ_{TDVOL}	-	-	-	-	-	-	-	-12.52**	-
								(-2.36)	
λ_{Lev}	-	-	-	-	-	-	-	-	-0.80
									(-0.17)

Table 7 continues …

Panel B: Pricing premium controlling for market, value, size and dividend yield factors

Model	1	2	3	4	5	6	7	8	9
λ^{m}	0.25	0.26	0.28	0.22	0.25	0.22	0.22	0.22	0.23
	(1.31)	(1.33)	(1.37)	(1.20)	(1.30)	(1.13)	(1.21)	(1.28)	(1.18)
λ^{h}	0.28**	0.27**	0.30**	0.31***	0.29**	0.29**	0.29***	0.28***	0.30***
	(2.32)	(2.24)	(2.01)	(2.55)	(2.43)	(2.41)	(2.52)	(2.50)	(2.47)
λ^{s}	0.25*	0.27*	0.33**	0.22	0.28*	0.29*	0.31**	0.30**	0.28*
	(1.73)	(1.77)	(2.02)	(1.48)	(1.84)	(1.87)	(2.26)	(2.15)	(1.80)
λ^{dyf}	0.20	0.21*	0.21	0.23*	0.20	0.21	0.20*	0.20	0.20*
	(1.59)	(1.66)	(1.40)	(1.87)	(1.60)	(1.63)	(1.65)	(1.61)	(1.64)
λ_{MV}	0.00 (-0.35)	-	-	-	-	-	-	-	-
λ_{BM}	-	0.59*** (5.91)	-	-	-	-	-	-	-
λ_{OCF}	-	-	3.28*** (5.88)	-	-	-	-	-	-
λ_{Rev}	-	-	-	-5.40*** (-8.45)	-	-	-	-	-
λ_{DY}	-	-	-	-	6.84*** (4.72)	-	-	-	-
λ_{EP}	-	-	-	-	-	1.23*** (5.95)	-	-	-
λ_{IDVOL}	-	-	-	-	-	-	-14.45*** (-2.83)	-	-
λ_{TDVOL}	-	-	-	-	-	-	-	-13.01*** (-2.49)	-
λ_{Lev}	-	-	-	-	-	-	-	-	0.66 (0.15)