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THE TOKYO FINANCIAL MARKETS RESEARCH DATA SERVICES: I. FACTORS DATA FOR EQUITY MARKETS

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University of Tokyo

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THE TOKYO FINANCIAL MARKETS RESEARCH DATA SERVICES: I. FACTORS DATA FOR EQUITY MARKETS[1]

Eiichiro Kazumori[2]

We introduce a general purpose data library developed at the Center for Advanced Research in Finance and the Computing Services at the Faculty of Economics of the University of Tokyo for empirical research of the financial markets in Japan. This data library (located at http://www.carf.e.u-tokyo.ac.jp/english/research/trds/trds_intro_e.html) provides a new internationally comparable equity market factors data for Japanese and US markets up to December 2009.

1. INTRODUCTION

Understanding the behavior of stock prices is one of the most important questions in research, practice, and policy making concerning financial markets. Recent researches in financial economics (Fama and French (1992, 93), for example) identify useful indicators (factors) such as size, BE/ME ratio, the earning yield, the cash flow yield, the dividend yield, the short-term reversal, the long-term reversal, and the momentum that are associated with the average returns of stocks. In the US, these factors data are published in the Ken French data library (http://mba.tuck.dartmouth.edu/pages/faculty/ken.french) and are widely used by researchers and practitioners. Then, it is an important task for researchers of Japanese financial markets to develop a data library of these factors of Japanese markets in a way directly comparable to US data, and make it available for researchers and practitioners.

There have been previous studies that examine these factors in Japanese markets. Chan, Hamao, and Lakonishok (1991) examine the relationship between returns and earnings-

[1]Very preliminary and Incomplete: Comments Welcome.

[2]This draft: February 21, 2010. Email: ekazumori@gmail.com. I gratefully acknowledge supports from Stanford GSB Dissertation Fellowship, the Center for Advanced Research in Finance at the University of Tokyo, the Frontier Project of the Japanese Ministry of Economics, Trade, and Industry (Grant No. 07131), Grants-in-Aid for Scientific Research (Grant No. 208032 and 2053226) from the Japan Society for the Promotion of Science, and the Nomura Foundation for Science and Technology. I would like to express my gratitude to Hisako Tsumura, Makoto Itani, Yasuhi Miwa, Kazuo Yamada, Reiko Ishikawa, Tsukasa Hokimoto, Kyoko Yagi, Eri Asai, Yukiko Kawajiri, Yoko Matsui, and Yuko Nishimura for their administrative supports and hospitalities, and Shunpei Kobayashi, Toshiya Komoda, Haruki Kojima, Hiromi Misaki, Hidekazu Oiwa, Kohta Tajima, and Yasuhiro Yao provided able research assistances. I am very grateful for Andrew Ang (Columbia), Susan Athey (Harvard), Yaakov Belch (Cambridge), Barry Barrios (MIT), Toni Braun, Ken French (Dartmouth), Eugune Fama (Chicago), Yasushi Hamao (USC), Kewei Hou (Ohio State), Hidehiko Ichimura, Katuhito Iwai, Takatoshi Ito, Kazuya Kamiya, Takao Kobayashi, Naoto Kunitomo, Akihiko Matsui, Preston McAfee (Caltech), John McMillan (Stanford), Masataka Nishi (Hitachi), Takashi Obinata, Hiroshi Ohasi, Ken Singleton (Stanford), Akihiko Takahashi, Hitoshi Takehara, Yasuhiro Tsutsumi, Kazuo Ueda, Robert Wilson (Stanford), Yoshihiro Yajima, Noriyuki Yanagawa, Yuxing Yang (WRDS), and Motohiro Yogo (Wharton) for helpful conversatioins and help at the various stages on the project. I am solely responsible for any errors.

to-price, size, book-to-market, and cash flow-to-price. Fama and French (1998) use the MSCI data to test the Fama-French three factor models in twelve industrialized countries, including Japan. Daniel, Titman, and Wei (2001) test the factor model and the characteristics model in Japanese markets. Kubota and Takehara (2007) calculate the Fama French factors for Japanese markets. Recently, Asness, Moskowitz, and Pedersen (2009) use the MSCI data to study value and the momentum effects in the Japanese market.

Without detracting from their crucial contributions, we would like to point out a number of aspects of their results that can be improved and extended.

- Fama and French (1998) and Asness, Moskowitz, and Pedersen (2009) use the MSCI data. Although the MSCI data are widely used for international comparisons, as Fama and French (1998, p. 1997) point out, the MSCI dataset contains only large firms and the dividend information are available only yearly basis. Fama and French (1998) note that these problems in the MSCI data are serious enough that they would not allow precise tests of asset pricing models. [1]
- Kubota and Takeuchi (2007) calculate the Fama and French factors only for the Japanese market. Thus their results are not directly comparable to factors derived for the US markets by Fama and French (1992, 1993) and others.[2] It is important since understanding the similarity and difference of the behavior of these factors in the two markets based on data calculated with comparable algorithms is a necessary step for a comparative study of the two markets. Furthermore, they do not report the estimates of the canonical three factor model of Fama and French (1992, 1993). They only calculate the values of benchmarks and returns and do not study the properties of components portfolios. Finally, they do not cover other indicators such as the earning yield, the cash flow yield, the dividend yield, the short-term reversal, the long-term reversal, and momentum factors.

The goal of this paper is to fill these gaps. Our innovations are:

- We use the Nikkei Financial database developed by Nikkei that includes all the listing companies in Japan and also includes the detailed data on stock dividends. Therefore, our data can address the issues in the MSCI data pointed out by Fama and French (1998).
- We use the common algorithm to derive these factors in the US and the Japanese

[1] "Preliminary tests we have done (but do not show) confirm, however, that a database of large stocks does not allow meaningful tests for a size effect, such as that found by Banz (1981) in U.S. returns, and that suggested by Heston, Rouwenhorst, and Wessels (1995) for international returns." "Calculating returns from the MSCI data presents a problem. Stock prices are available for the end of each month, but information about dividends is limited to the dividend yield, defined as the ratio of the trailing year of dividends to the end-of-month stock price. The dividend yield allows accurate calculation of an annual return (without intrayear reinvestment of dividends). Annual returns suffice for estimating expected returns, but tests of asset pricing models (which also require second moments) are hopelessly imprecise unless returns for shorter intervals are used." (Fama and French (1997) P.1977)

[2] I thank Professor Takao Kobayashi for pointing out the importance of the replication of the US market factors.

markets. We replicate the estimates by Fama and French (1992, 93) with a very high precision; the correlation ratio with the estimates by Fama and French (1992, 93) is higher than 0.98. In addition, our replications are able to reproduce the regression results of the three factor model of Fama and French (1992, 1993). This will allow us to directly compare the behavior of these factors in Japan and US.

- Our datasets cover all the factors developed by the Ken French database. In addition, we offer portfolio components that are not even covered by the Ken French database.

In summary, our data library provides researchers and practitioners for Japanese markets an access to the insight of the recent research in financial economics at the level available for US researchers and investors for the first time.

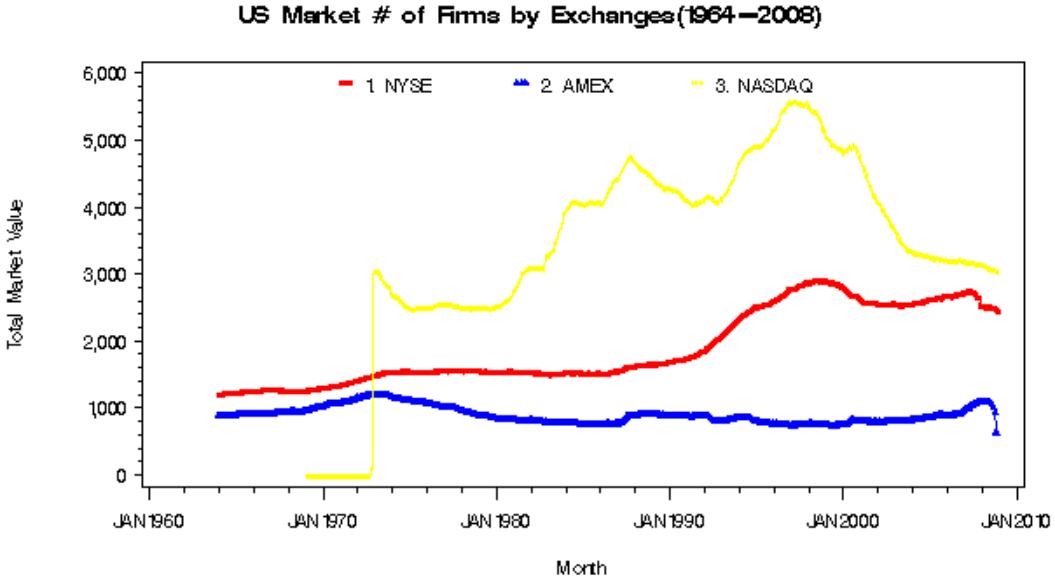
The rest of the paper is organized as follows. Section 2 describes the replication procedure of the monthly US factors. Section 3 replicates the daily US factors. Section 4 will apply the algorithms developed in Section 2 to derive factors for Japanese markets. Section 5 will present daily factors for Japanese markets. Section 6 concludes.

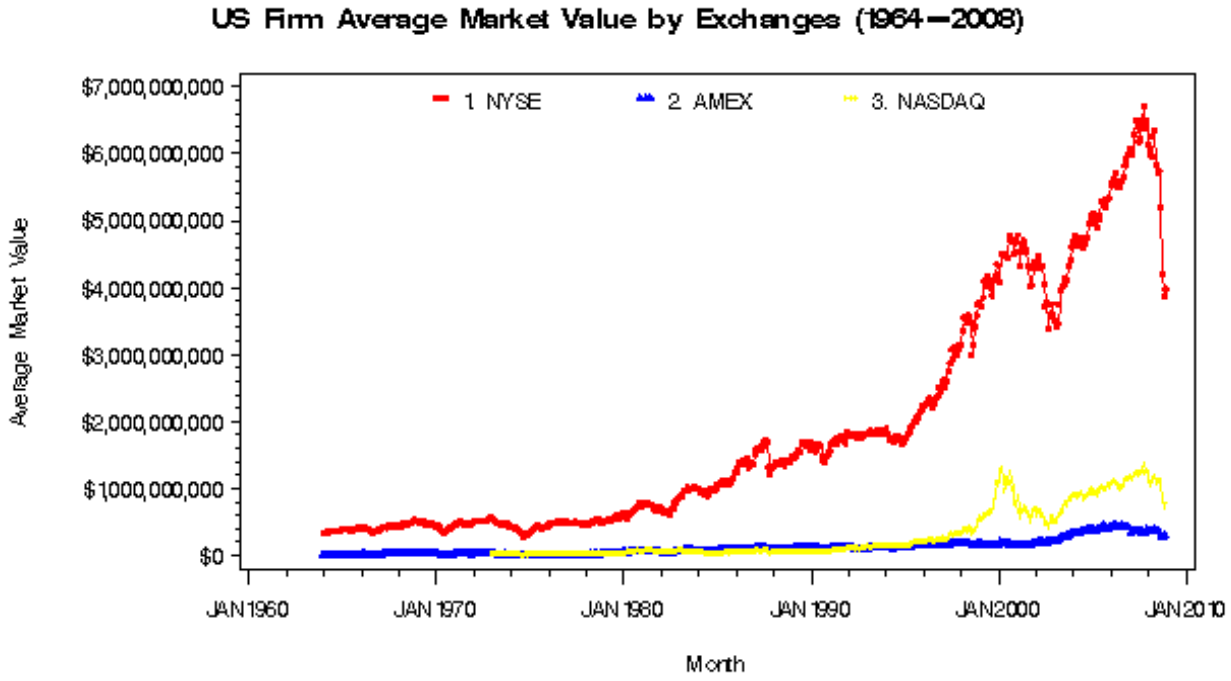
2. TECHNICAL DESCRIPTIONS OF THE US DATA LIBRARY

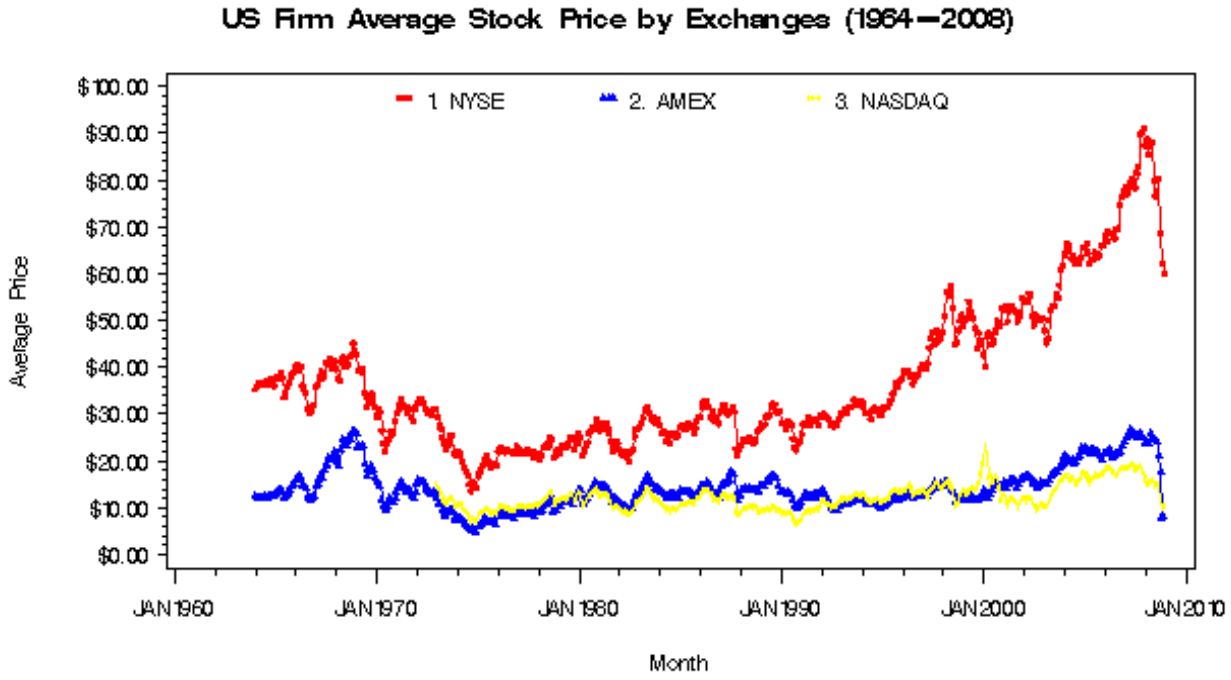
This section describes the details for constructing all benchmarks and portfolios in the US Data Library. We closely follow the methodology of the Ken French data library.

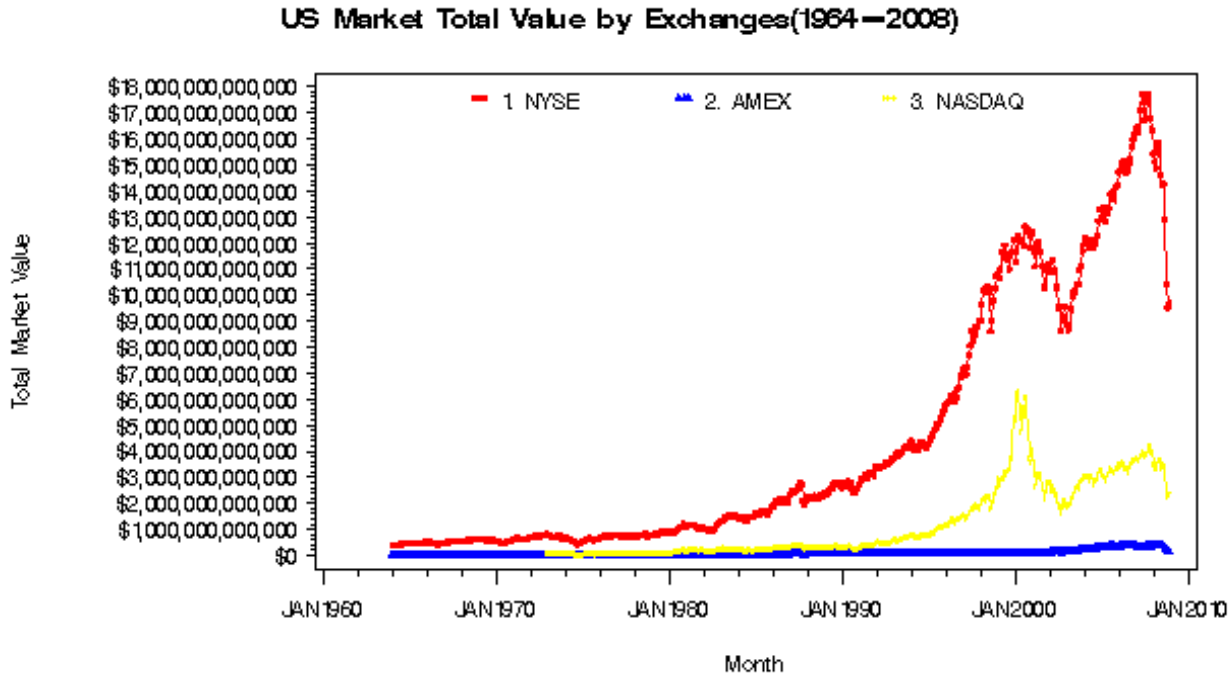
2.1. *Data Source*

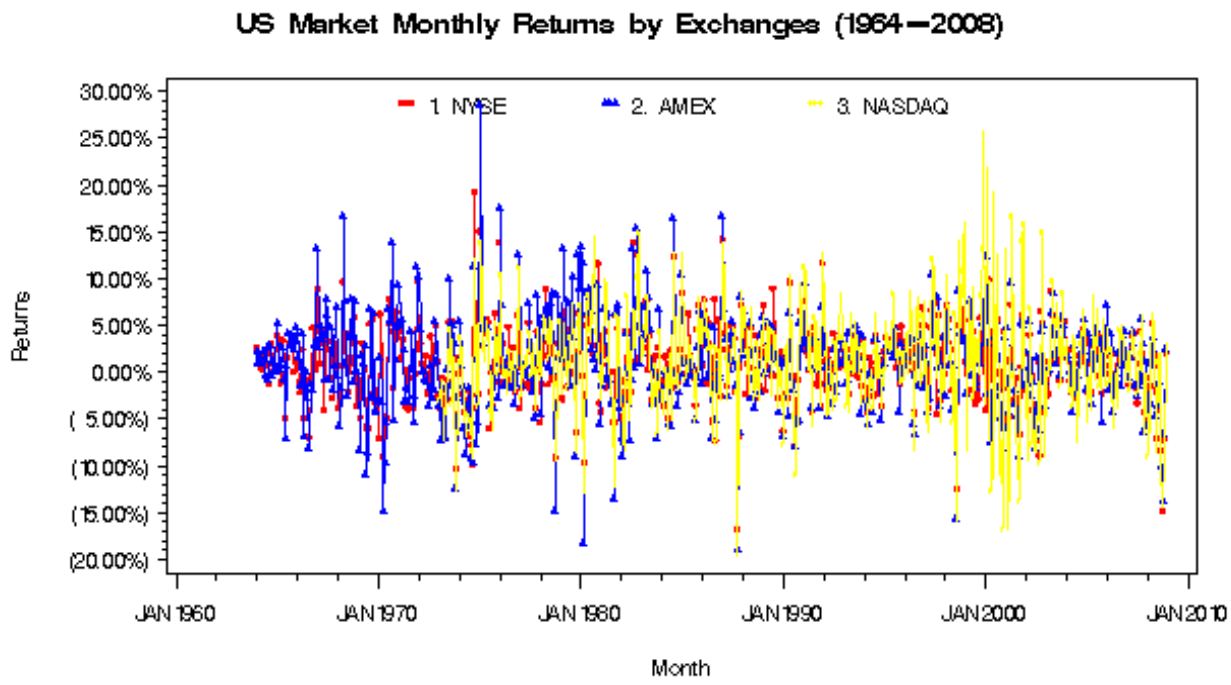
All the data we used are from CRSP and COMPUSTAT available at the Wharton Research Data Services. We use a risk-free instrument like US's 30 days T-Bill available from Ibbotson Associates. We first provide descriptive statistics.

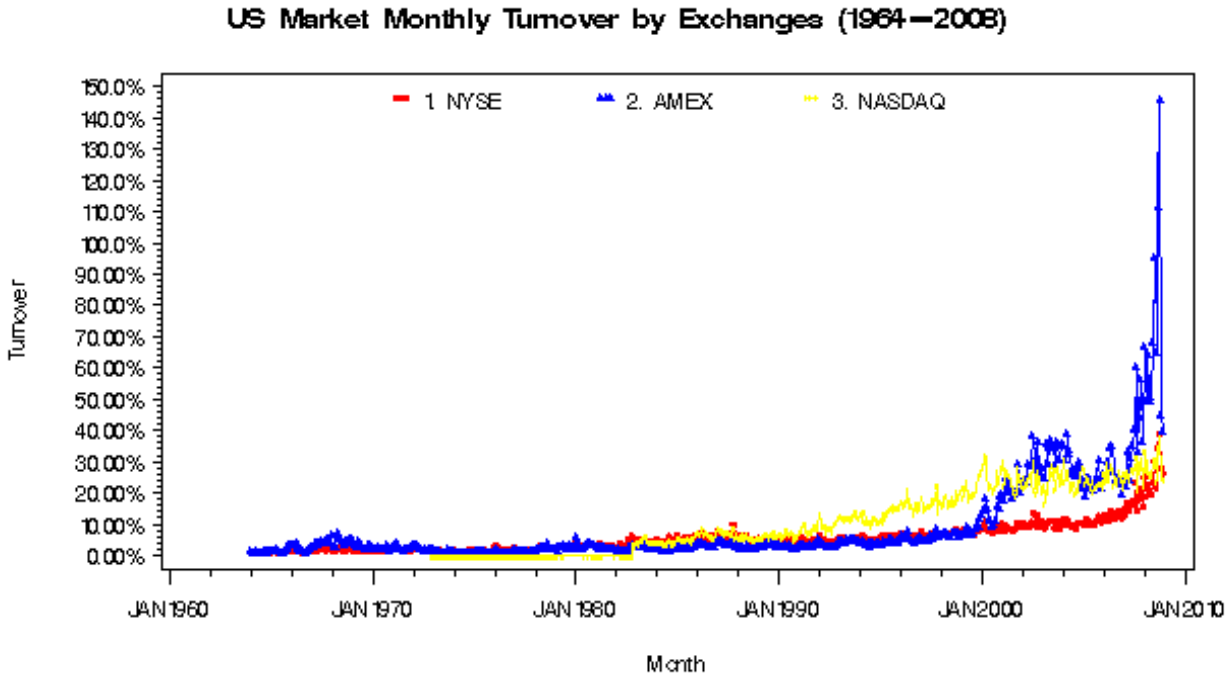


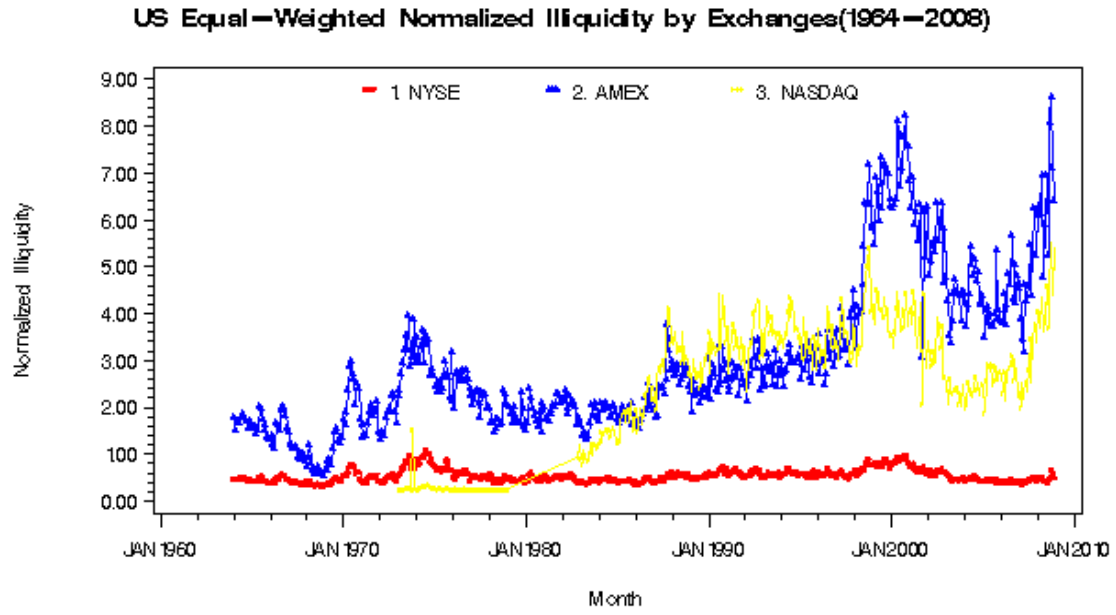

US Firm Average Market Value by Exchanges (1964–2008)
1 NYSE
2 AMEX
3 NASDAQ
$7,000,000,000
$6,000,000,000
$5,000,000,000
$4,000,000,000
$3,000,000,000
$2,000,000,000
$1000,000,000
$0
Average Market Value
JAN1960
JAN1970
JAN1980
JAN1990
JAN2000
JAN2010
Month


US Firm Average Stock Price by Exchanges (1964–2008)
1 NYSE
2 AMEX
3 NASDAQ
$100.00
$90.00
$80.00
$70.00
$60.00
$50.00
$40.00
$30.00
$20.00
$10.00
$0.00
Average Price
JAN1960
JAN1970
JAN1980
JAN1990
JAN2000
JAN2010
Month


US Market Total Value by Exchanges(1964—2008)
1. NYSE
2. AMEX
3. NASDAQ
$18,000,000,000,000
$17,000,000,000,000
$16,000,000,000,000
$15,000,000,000,000
$14,000,000,000,000
$13,000,000,000,000
$12,000,000,000,000
$11,000,000,000,000
$10,000,000,000,000
$9,000,000,000,000
$8,000,000,000,000
$7,000,000,000,000
$6,000,000,000,000
$5,000,000,000,000
$4,000,000,000,000
$3,000,000,000,000
$2,000,000,000,000
$1,000,000,000,000
$0
Total Market Value
JAN1960
JAN1970
JAN1980
JAN1990
JAN2000
JAN2010
Month


US Market Monthly Returns by Exchanges (1964—2008)
1. NYSE
2. AMEX
3. NASDAQ
30.00%
25.00%
20.00%
15.00%
10.00%
5.00%
0.00%
(5.00%)
(10.00%)
(15.00%)
(20.00%)
Returns
JAN1960
JAN1970
JAN1980
JAN1990
JAN2000
JAN2010
Month


US Market Monthly Turnover by Exchanges (1964—2008)
1 NYSE
2. AMEX
3. NASDAQ
Turnover
150.0%
140.0%
130.0%
120.0%
110.0%
100.0%
90.00%
80.00%
70.00%
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
JAN1960
JAN1970
JAN1980
JAN1990
JAN2000
JAN2010
Month


US Equal—Weighted Normalized Illiquidity by Exchanges(1964—2008)
1 NYSE
2. AMEX
3. NASDAQ
Normalized Illiquidity
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
100
0.00
JAN1960
JAN1970
JAN1980
JAN1990
JAN2000
JAN2010
Month

2.2. *The Factors*

We provide 5 factors (monthly and daily): SMB (Size), HML (Value), Momentum, Short-Term Reversal, Long-Term Reversal.

To generate the monthly SMB and HML factors, we first obtain data from the CRSP Monthly Stock File (MSF) and retrieve the following variables: Permno, Price (PRC), Returns (RET), Date, Shares outstanding (SHROUT) and Cumulative Factors to adjust both prices and shares (CFACPR and CFACSHR). We then obtain data from MSEALL, which contains the share codes (SHRCD) and exchange codes (EXCHCD). Shortly after merging these two datasets, we eliminate duplicated entries and adjust the values of selected variables so that each value appear for each observation; in other words, if the number of shares outstanding, share code or exchange code is missing, we replace it with any prior nonmissing value which is pushed into a queue that stores the values of the immediately previous nonmissing values and is set up as first-in/first-out. The queue pops these values only if the permnos that those values were from match with the row that is calling the queue. This push and pop function is done by calling the lag function twice in a do while loop which is pushing values into a queue and overwriting any values if a new value arises when it scrolls down to another row or keeps the same value from the last recorded nonmissing value of the column for each row. This will handle the problem associated with missing values that can arise from CRSP. We then filter this merged dataset by only looking at stocks that have share codes, 10 and 11 (which represent ordinary common shares of securities which have not been further defined or securities which need not be further defined), and exchange codes,1, 2 or 3 (corresponds to NYSE, AMEX or NASDAQ, respectively). We then adjust the price and volume by its cumulative factor and define market equity as the multiplication of its price and volume. We also define lme, the lag of market equity, which will be used as the weight factor to be multiplied on the stocks returns that comprises any one of the six portfolios to create the value weighted returns of that portfolio, i.e. SH, SL, SM, BH, BL, and HM. Now from COMPUSTAT, gvkey, CUSIP Issuer Code (cnum), Exchange Listing & S&P Major Index Code (zlist), Fiscal Yearend Month of Data (fyr), Fiscal Year (yeara), Assets - Total (MM$) (data6) , Preferred stock-liquidating value (data10), Preferred stock-redemption value (data56), Common Equity (data60), Deferred Taxes (Balance Sheet) (MM$) (data74), Preferred stock-carrying value (data130), investment Tax Credit (Balance Sht)(MM$) (data208), Stockholders' Equity - Total (MM$) (data216), Liabilities - Total (MM$) (data181) are used. As it was done in Fama and French (see page 9 of Common Risk factors in stock and bond returns), to avoid the survival bias inherent in the way COMPUSTAT adds firms to its tapes, we do not include firms until they have appeared on COMPUSTAT for two years.

Now we construct the book equity from COMPUSTAT. We define book common equity, BE, as the COMPUSTAT book value of stockholders' equity (data216 or data60 + data130 or data6-data181, (in that order), plus balance-sheet deferred taxes (data74) and investment tax credit (data208) (if available), minus the book value of preferred stock.

Depending on availability, we use the redemption (data56), liquidation (data10), or par (carrying) value (data130) (in that order) to estimate the value of preferred stock. BE/ME, is then Book-to-market equity for the fiscal year ending in t-1, divided by market equity at the end of December of t - 1. We do not use negative BE firms when calculating BE/ME breakpoints or when forming the size- BE/ME portfolios. We do use the negative-BE firms when calculating the market return.

The Fama/French factors are constructed using the 6 value-weight portfolios formed on size and book-to-market. SMB (Small Minus Big) is the average return on the three small portfolios minus the average return on the three big portfolios, SMB =1/3 (Small Value + Small Neutral + Small Growth)- 1/3 (Big Value + Big Neutral + Big Growth). HML (High Minus Low) is the average return on the two value portfolios minus the average return on the two growth portfolios, HML = 1/2 (Small Value + Big Value) - 1/2 (Small Growth + Big Growth).

We use six value-weight portfolios formed on size and prior (2-12) returns to construct the Momentum Factor. The portfolios, which are formed monthly, are the intersections of 2 portfolios formed on size (market equity, ME) and 3 portfolios formed on prior (2-12) return. The monthly size breakpoint is the median NYSE market equity. The monthly prior (2-12) return breakpoints are the 30th and 70th NYSE percentiles. Mom is the average return on the two high prior return portfolios minus the average return on the two low prior return portfolios, Mom =1/2 (Small High + Big High)-1/2(Small Low + Big Low).

We use six value-weight portfolios formed on size and prior (13-60) returns to construct the Long-Term Reversal Factor. The portfolios, which are formed monthly, are the intersections of 2 portfolios formed on size (market equity, ME) and 3 portfolios formed on prior (13-60) return. The monthly size breakpoint is the median NYSE market equity. The monthly prior (13-60) return breakpoints are the 30th and 70th NYSE percentiles. LT_Rev is the average return on the two low prior return portfolios minus the average return on the two high prior return portfolios, LT_Rev =1/2 (Small Low + Big Low) - 1/2(Small High + Big High).

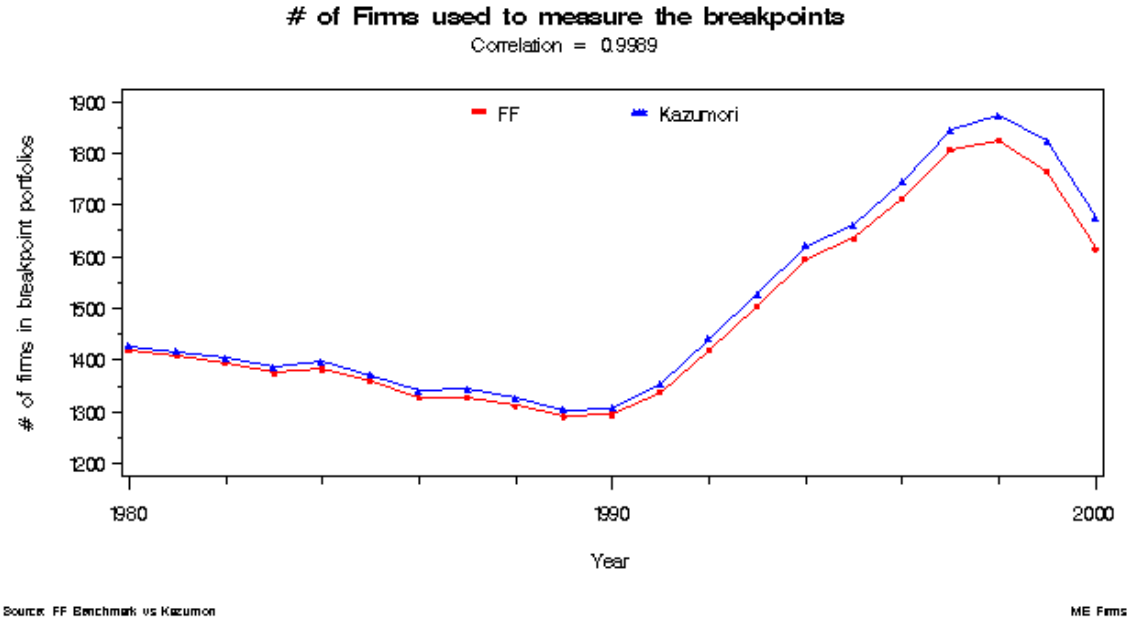
Similarly, we use six value-weight portfolios formed on size and prior (1-1) returns to construct ST_Rev. The portfolios, which are formed monthly, are the intersections of 2 portfolios formed on size (market equity, ME) and 3 portfolios formed on prior (1-1) return. The monthly size breakpoint is the median NYSE market equity. The monthly prior (1-1) return breakpoints are the 30th and 70th NYSE percentiles. ST_Rev is the average return on the two low prior return portfolios minus the average return on the two high prior return portfolios, ST_Rev =1/2 (Small Low + Big Low) - 1/2(Small High + Big High).

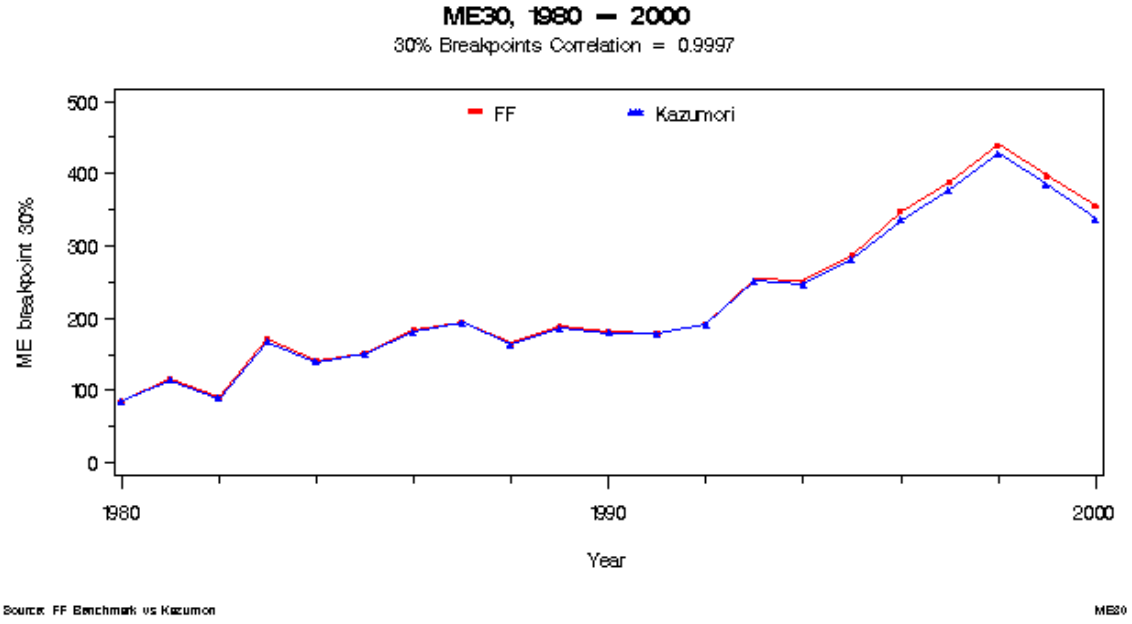
2.3. *The Market Equity Deciles and Portfolios*

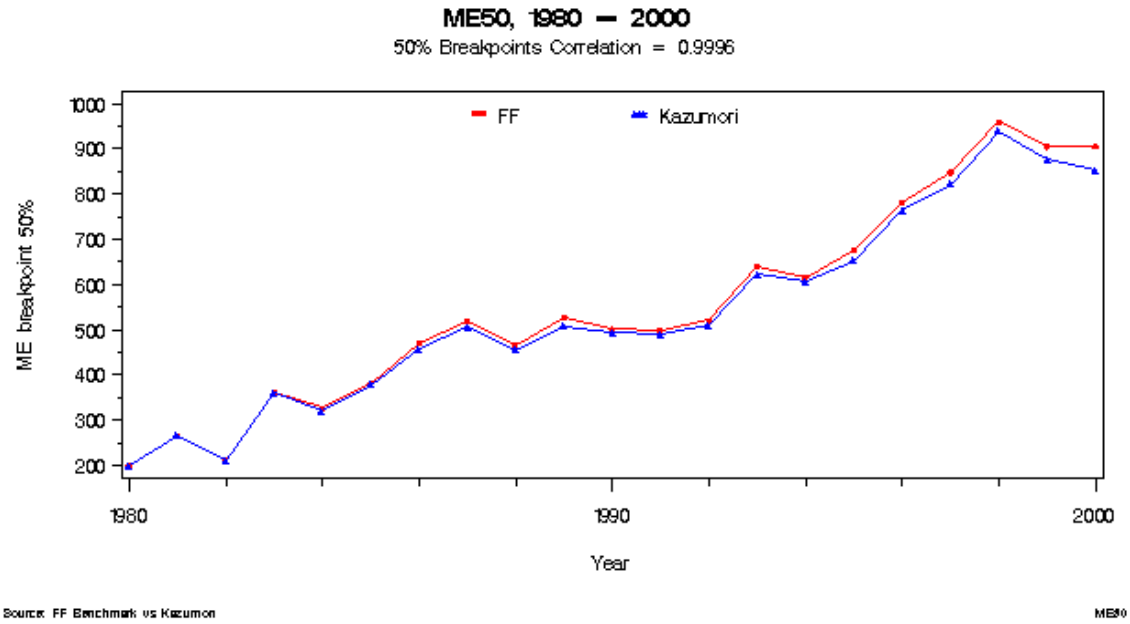
We compute ME breakpoints for each month. ME is price times shares outstanding (divided by 1,000,000) at month end. The breakpoints for month t use all NYSE stocks for which we have market equity. The portfolios are constructed at the end of each June using

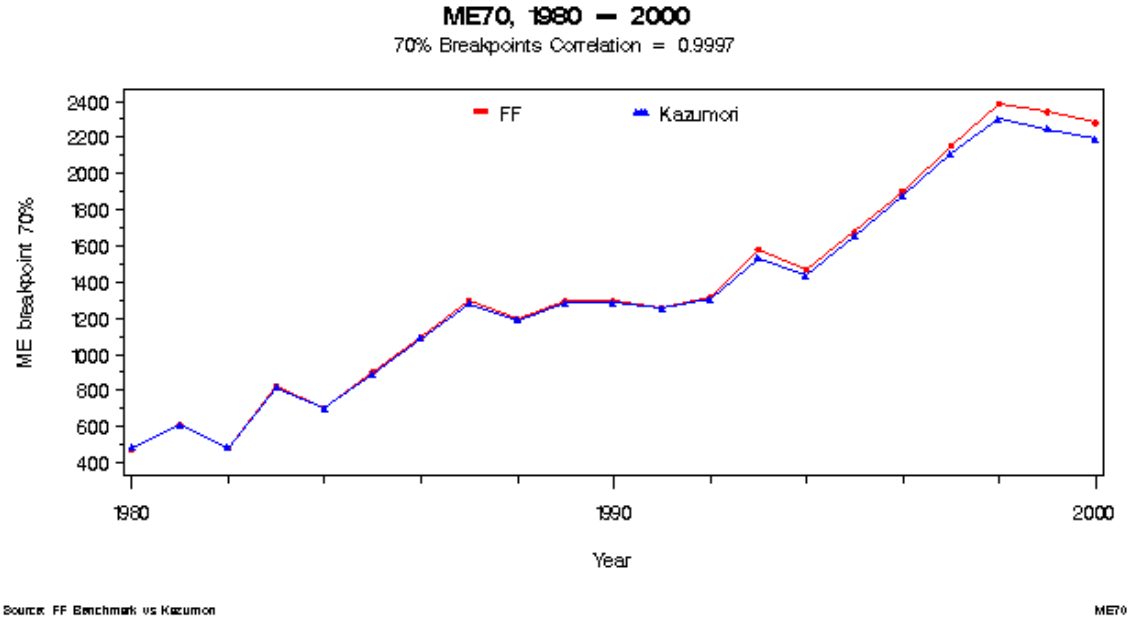
the June market equity and NYSE breakpoints.

2.3.1. *Yearly Breakpoints*

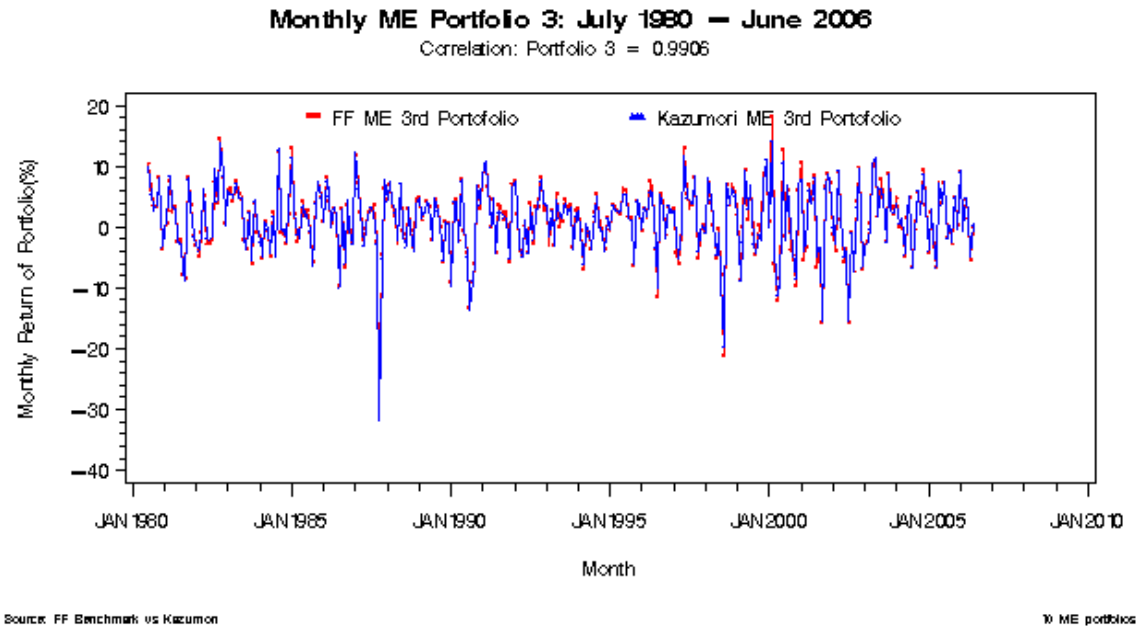


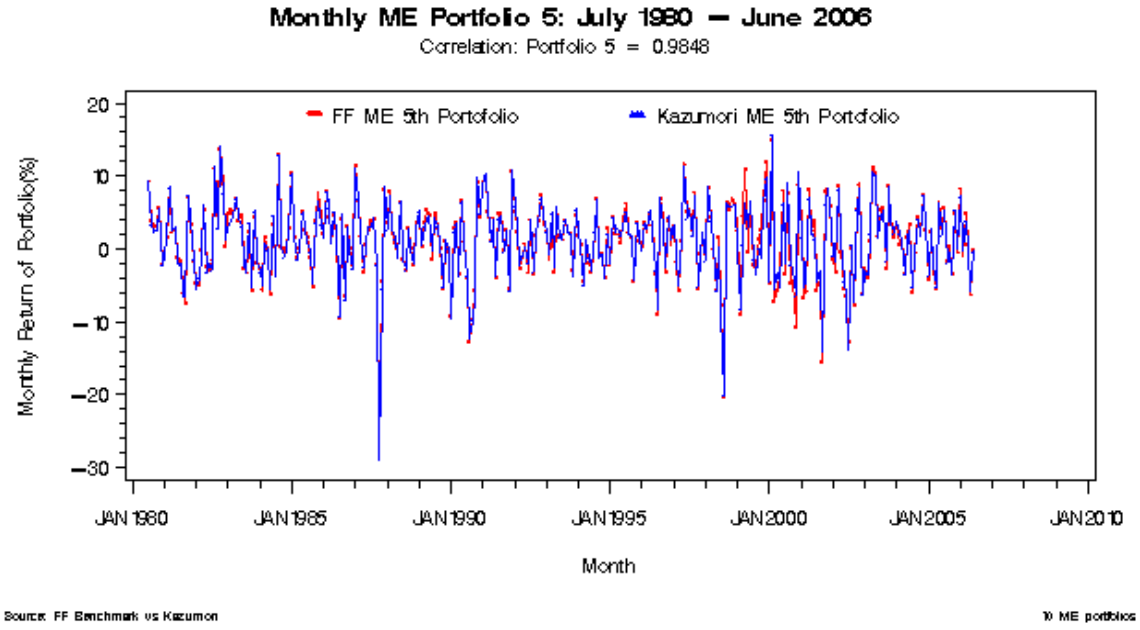


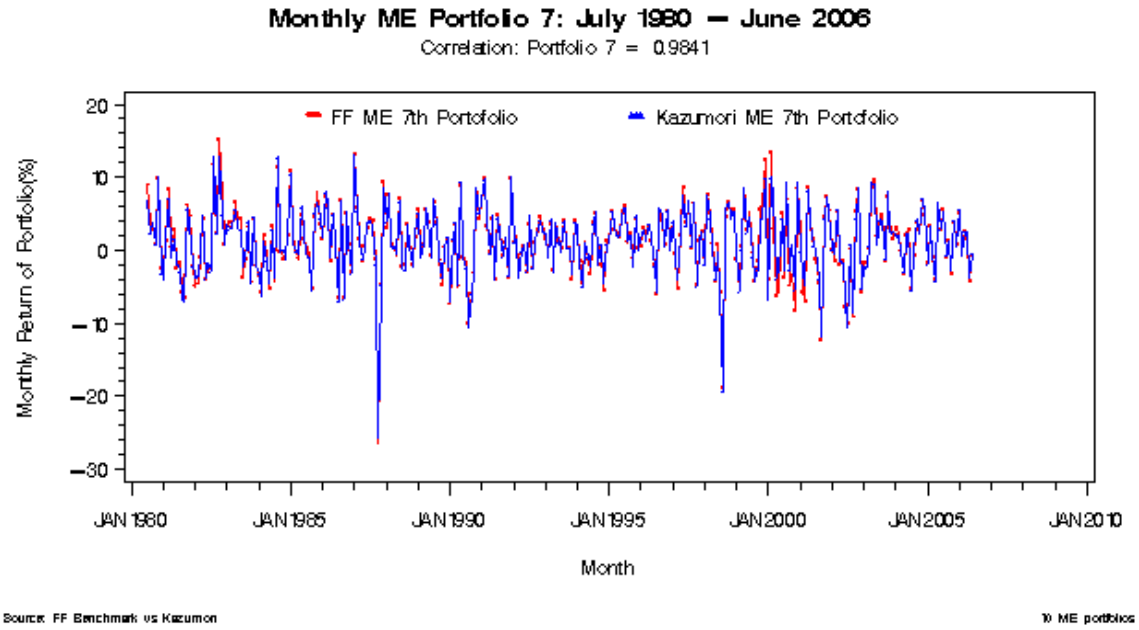

ME50, 1980 – 2000
50% Breakpoints Correlation = 0.9996
FF
Kazumori
ME breakpoint 50%
1000
900
800
700
600
500
400
300
200
1980
1990
2000
Year
Source: FF Benchmark vs Kazumori
ME50


ME70, 1980 – 2000
70% Breakpoints Correlation = 0.9997
FF
Kazumori
ME breakpoint 70%
2400
2200
2000
1800
1600
1400
1200
1000
800
600
400
1980
1990
2000
Year
Source: FF Benchmark vs Kazumori
ME70

2.3.2. *Portfolios*



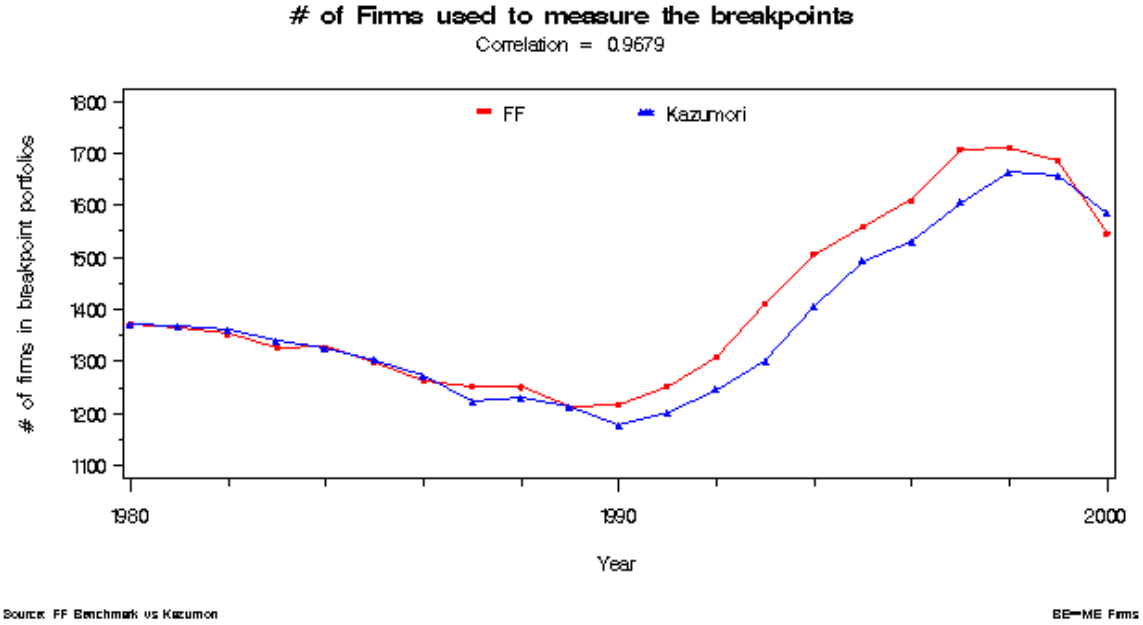




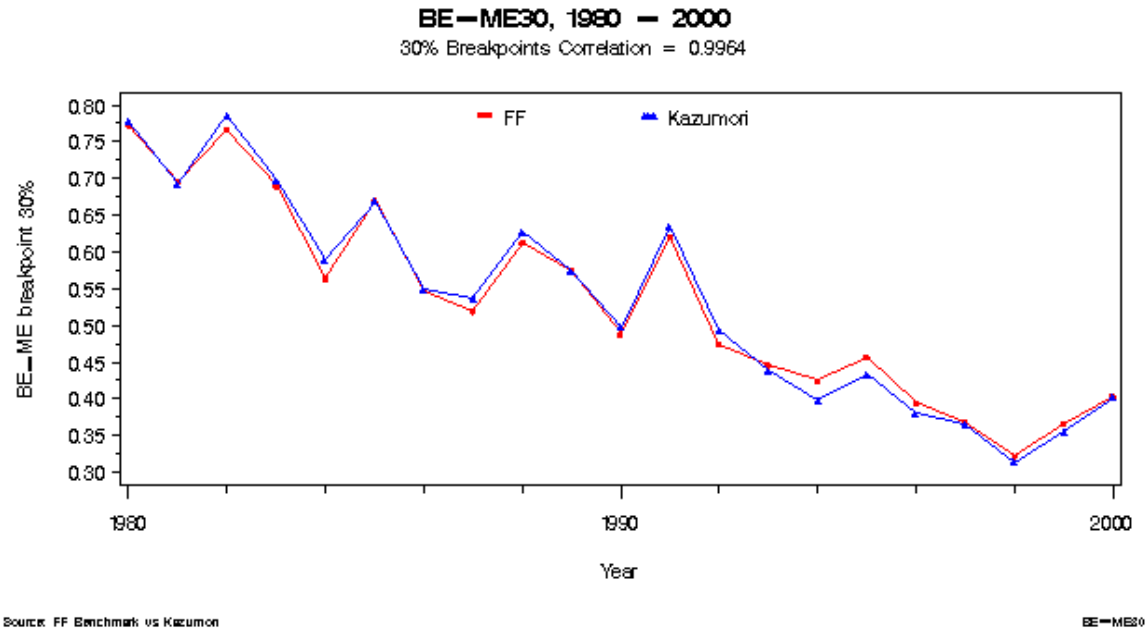
2.4. *The BE/ME Ratio Deciles and Portfolios*

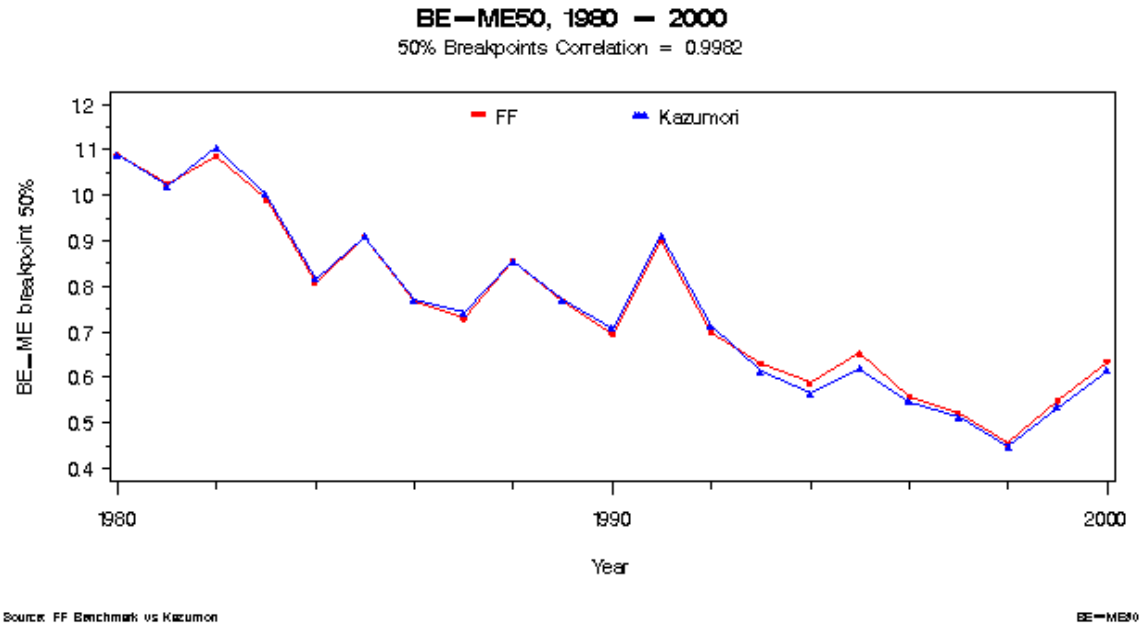
We compute BE/ME breakpoints at the end of each June. The BE used in June of year t is the book equity for the last fiscal year end in t-1. ME is price times shares outstanding at the end of December of t-1. The breakpoints for year t use all NYSE stocks for which we have ME for December of t-1 and (positive) BE for the last fiscal year end in t-1. Portfolios are formed on BE/ME at the end of each June using NYSE breakpoints. All NYSE, AMEX, and NASDAQ stocks for which we have ME for December of t-1 and June of t, and BE for t-1.

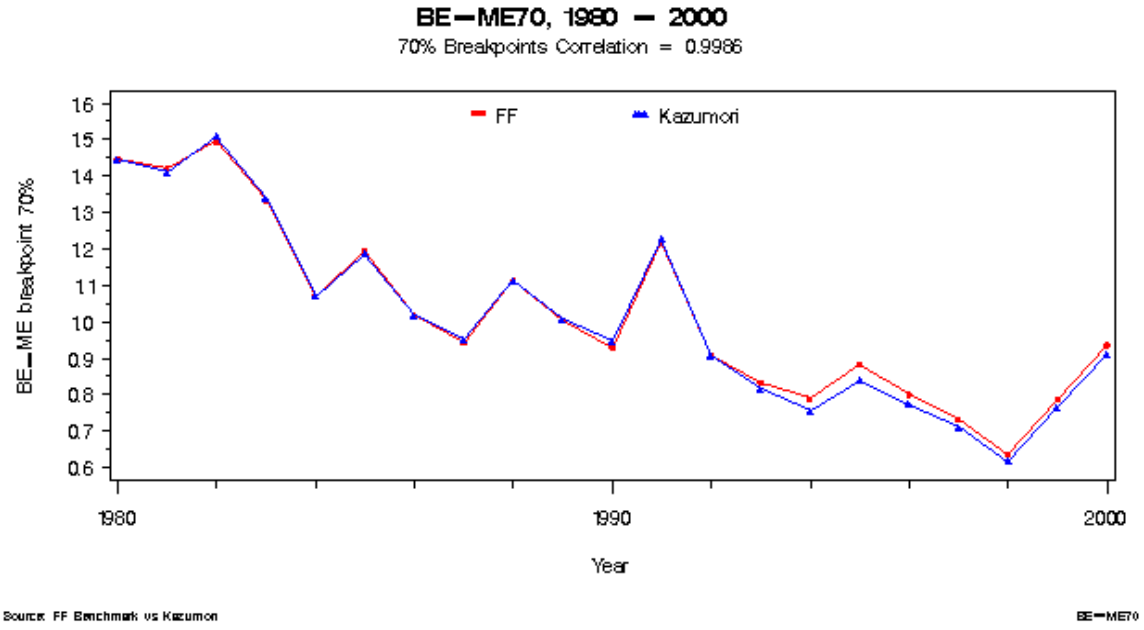
2.4.1. *Yearly Breakpoints*



2.4.2. *Portfolios*





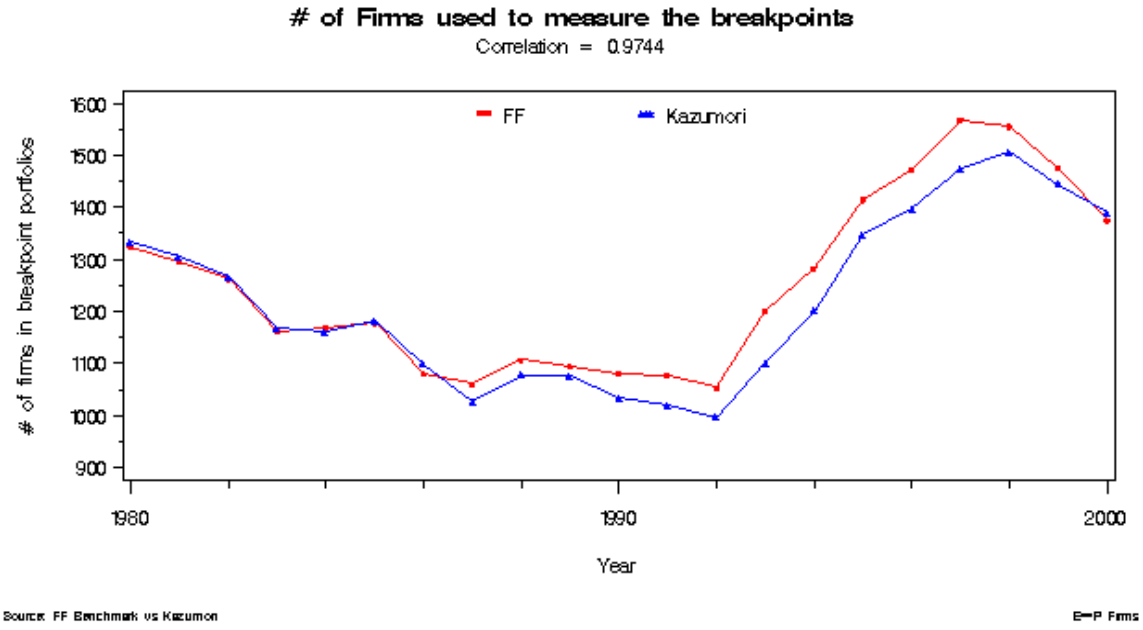


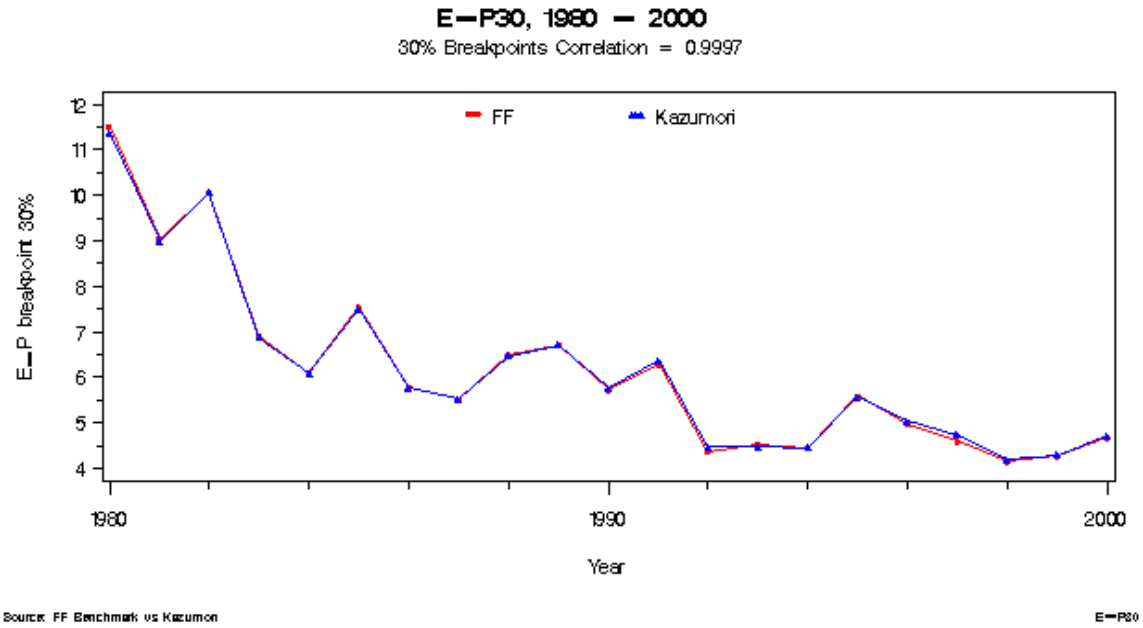
2.5. *The Earning Yield (E/P) Deciles and Portfolios*

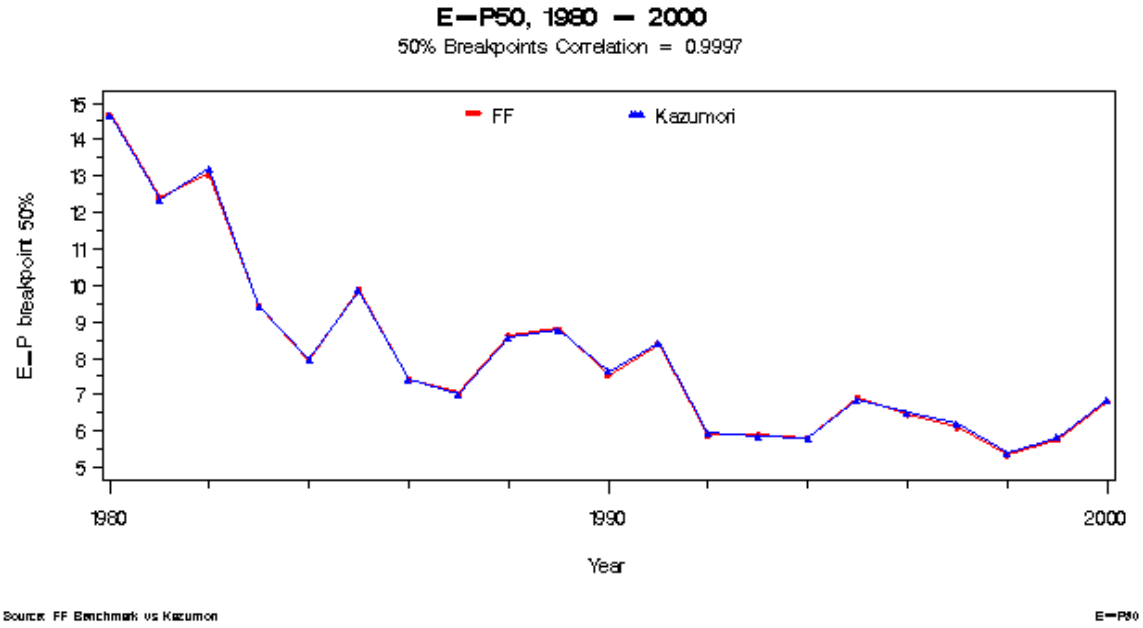
We compute E/P (in percent) breakpoints at the end of each June. The E used in June of year t is the earnings for the last fiscal year end in t-1. P (actually ME) is price times shares outstanding at the end of December of t-1. The breakpoints for year t use all NYSE stocks

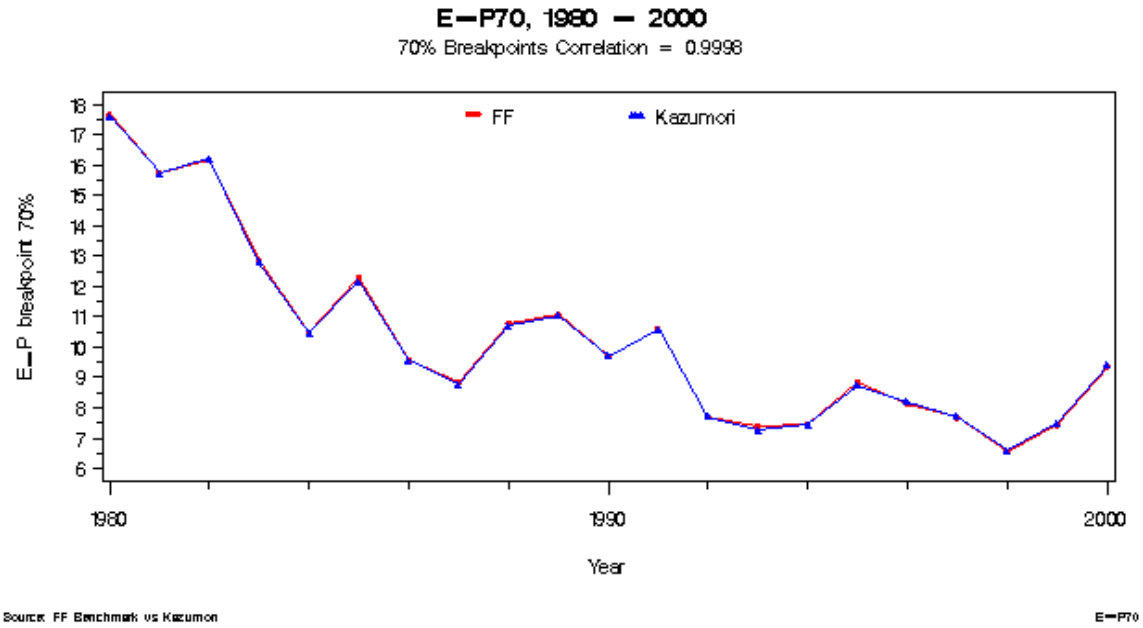
for which we have ME for December of t-1 and (positive) earnings for the last fiscal year end in t-1. Portfolios are formed on E/P at the end of each June using NYSE breakpoints. The earnings used in June of year t are total earnings before extraordinary items for the last fiscal year end in t-1. P (actually ME) is price times shares outstanding at the end of December of t-1. All NYSE, AMEX, and NASDAQ stocks for which we have ME for December of t-1 and June of t, and earnings before extraordinary items for calendar year t-1.

2.5.1. *Yearly Breakpoints*

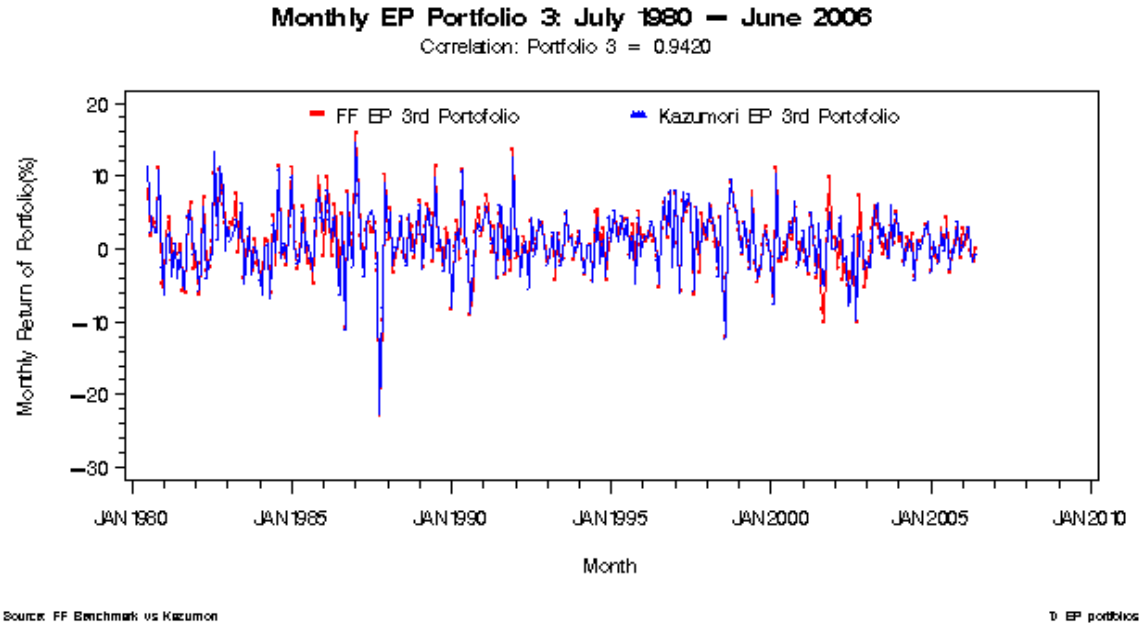


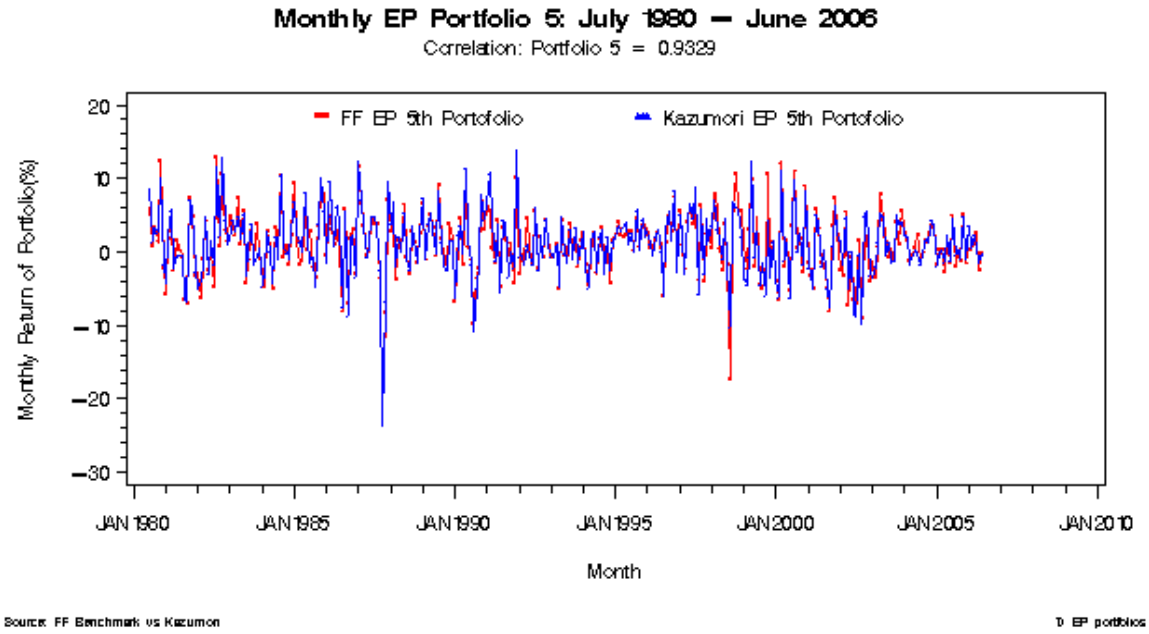

E—P30, 1980 — 2000
30% Breakpoints Correlation = 0.9997
FF
Kazumori
E_P breakpoint 30%
12
11
10
9
8
7
6
5
4
1980
1990
2000
Year
Source: FF Benchmark vs Kazumori
E—P30

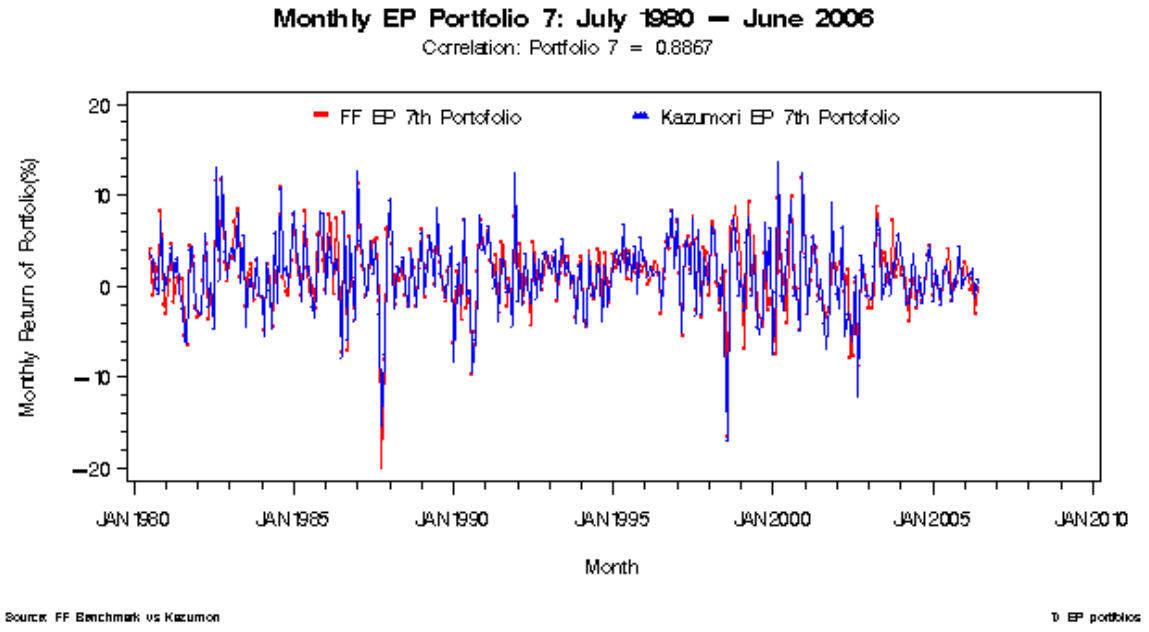

E—P50, 1980 — 2000
50% Breakpoints Correlation = 0.9997
FF
Kazumori
E_P breakpoint 50%
15
14
13
12
11
10
9
8
7
6
5
1980
1990
2000
Year
Source: FF Benchmark vs Kazumori
E—P50



2.5.2. *Portfolios*





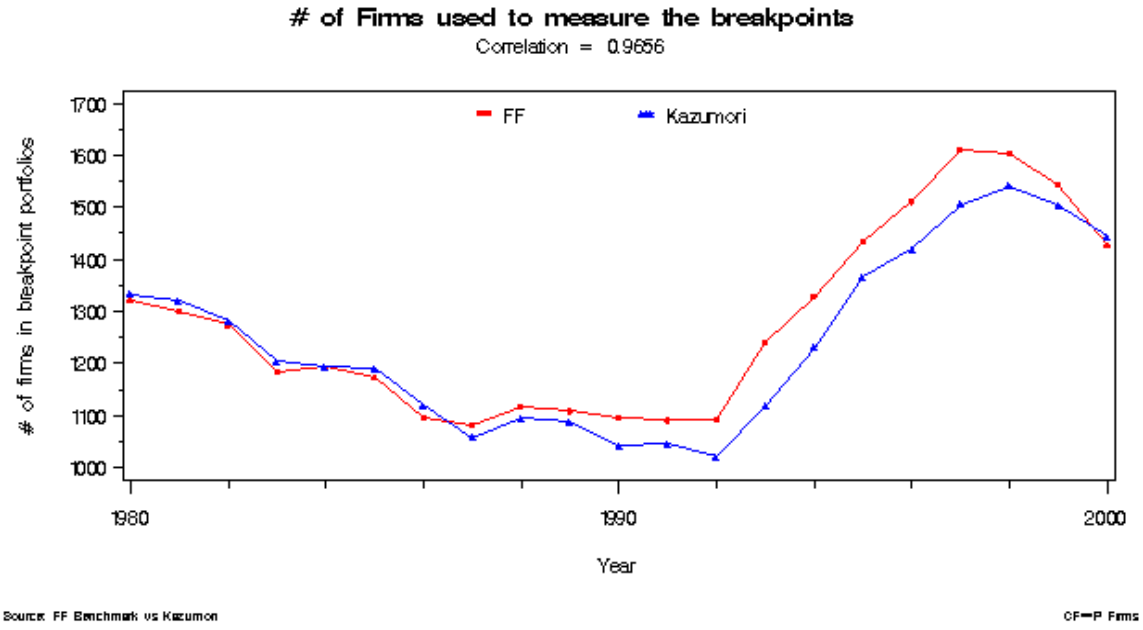


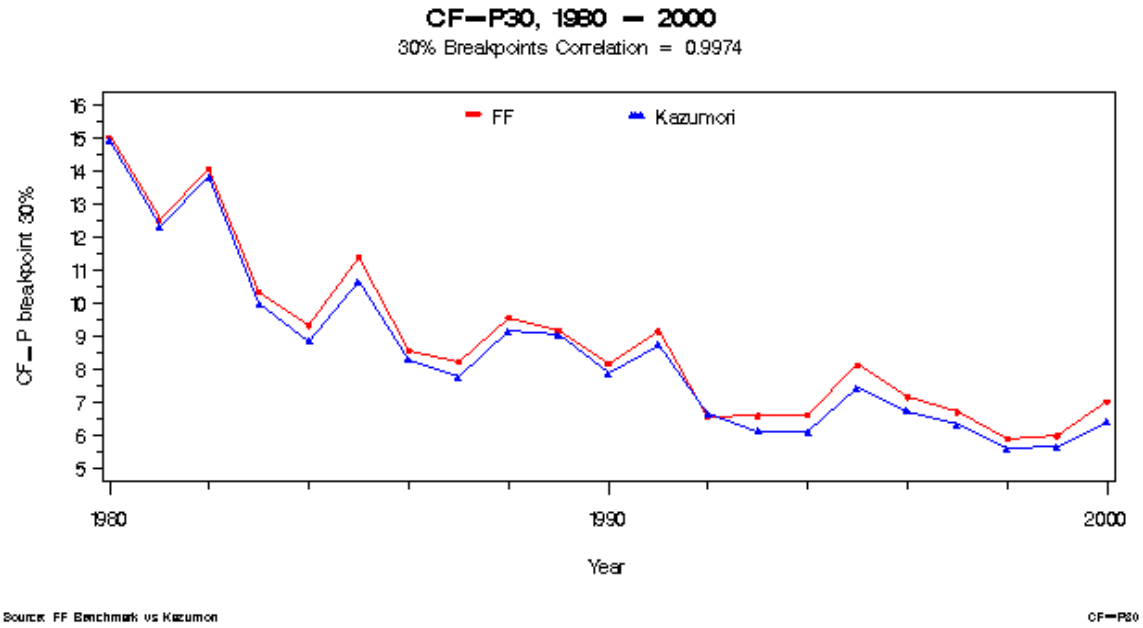
2.6. *The Cash Flow Yield (CF/ME) Deciles and Portfolios*

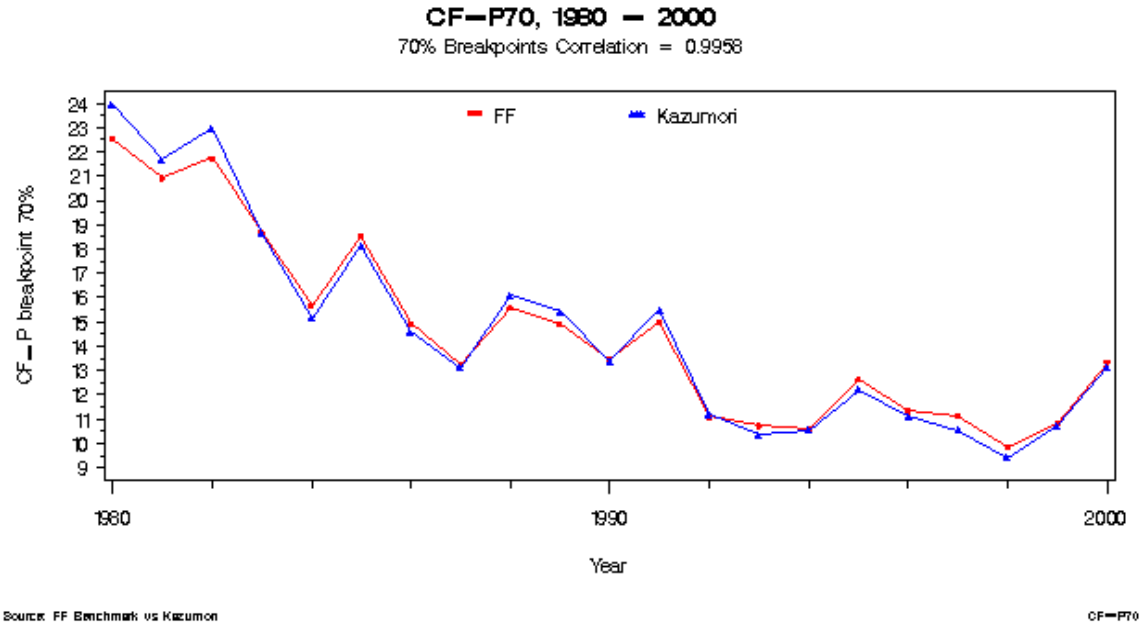
We compute CF/P (in percent) breakpoints at the end of each June. The CF used in June of year t is the cash flow for the last fiscal year end in t-1. P (actually ME) is price

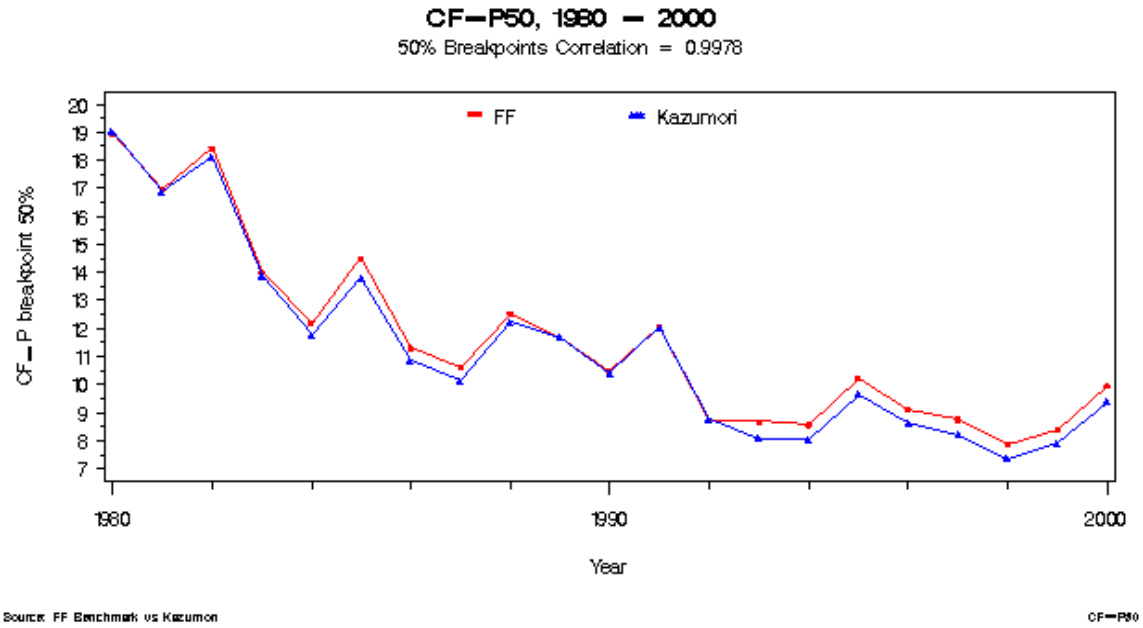
times shares outstanding at the end of December of t-1. The breakpoints for year t use all NYSE stocks for which we have ME for December of t-1 and (positive) cash flow for the last fiscal year end in t-1. Portfolios are formed on CF/P at the end of each June using NYSE breakpoints. The cashflow used in June of year t is total earnings before extraordinary items, plus equity's share of depreciation, plus deferred taxes (if available) for the last fiscal year end in t-1. P (actually ME) is price times shares outstanding at the end of December of t-1. All NYSE, AMEX, and NASDAQ stocks for which we have ME for December of t-1 and June of t, and cashflow for calendar year t-1.

2.6.1. *Yearly Breakpoints*

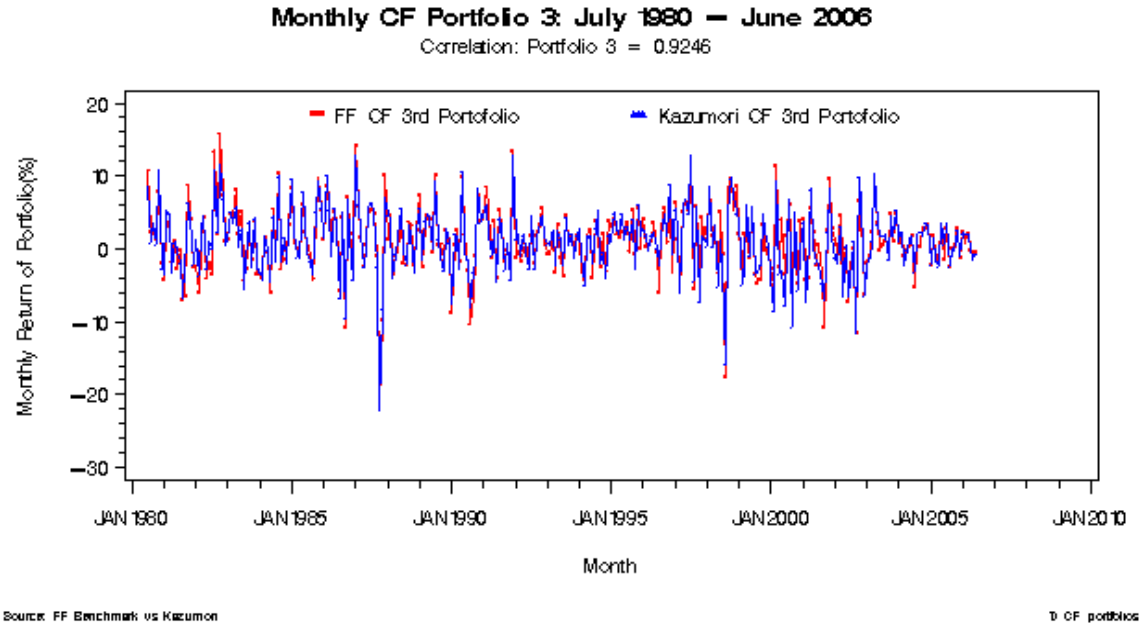


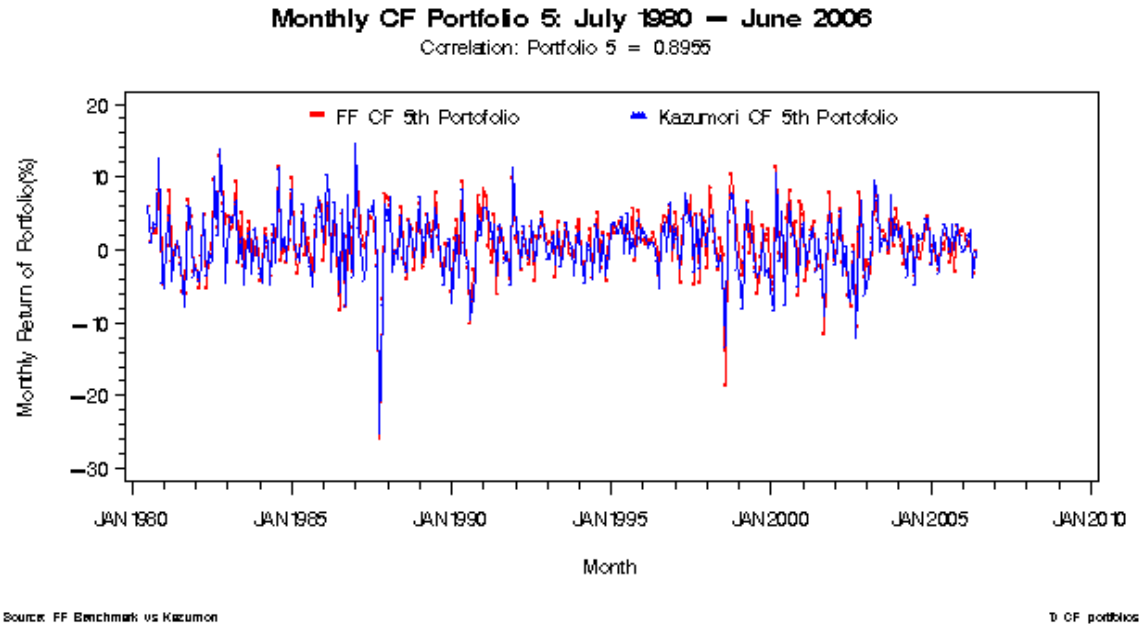

CF—P30, 1980 — 2000
30% Breakpoints Correlation = 0.9974
FF
Kazumori
CF_P breakpoint 30%
16
15
14
13
12
11
10
9
8
7
6
5
1980
1990
2000
Year
Source: FF Benchmark vs Kazumon
CF—P30

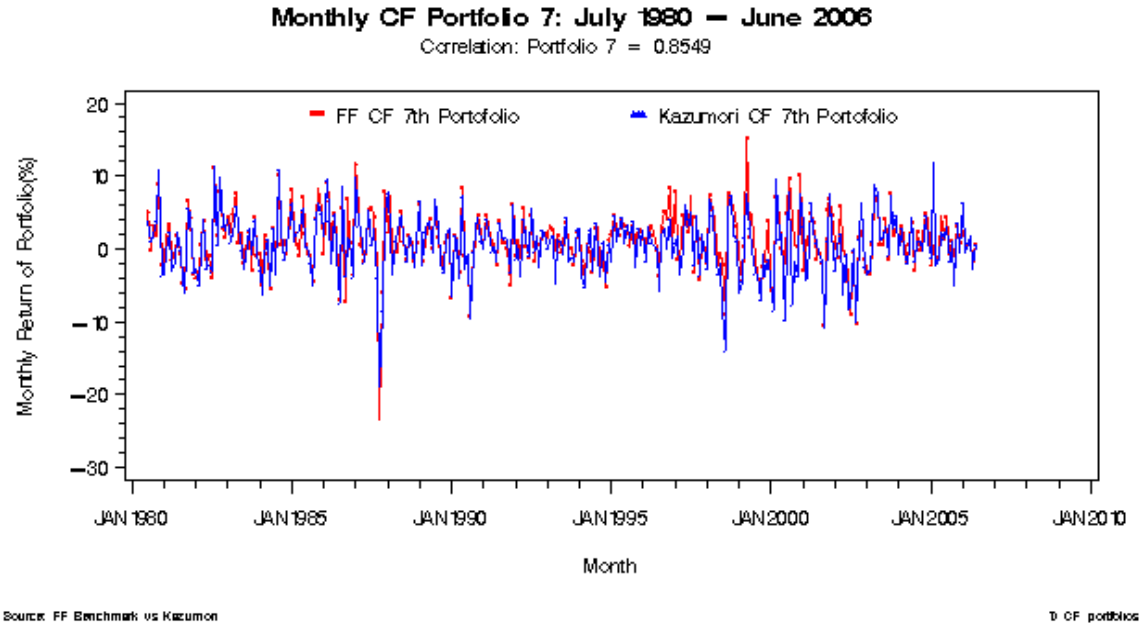

CF—P70, 1980 — 2000
70% Breakpoints Correlation = 0.9958
FF
Kazumori
CF_P breakpoint 70%
24
23
22
21
20
19
18
17
16
15
14
13
12
11
10
9
1980
1990
2000
Year
Source: FF Benchmark vs Kazumon
CF—P70



2.6.2. *Portfolios*





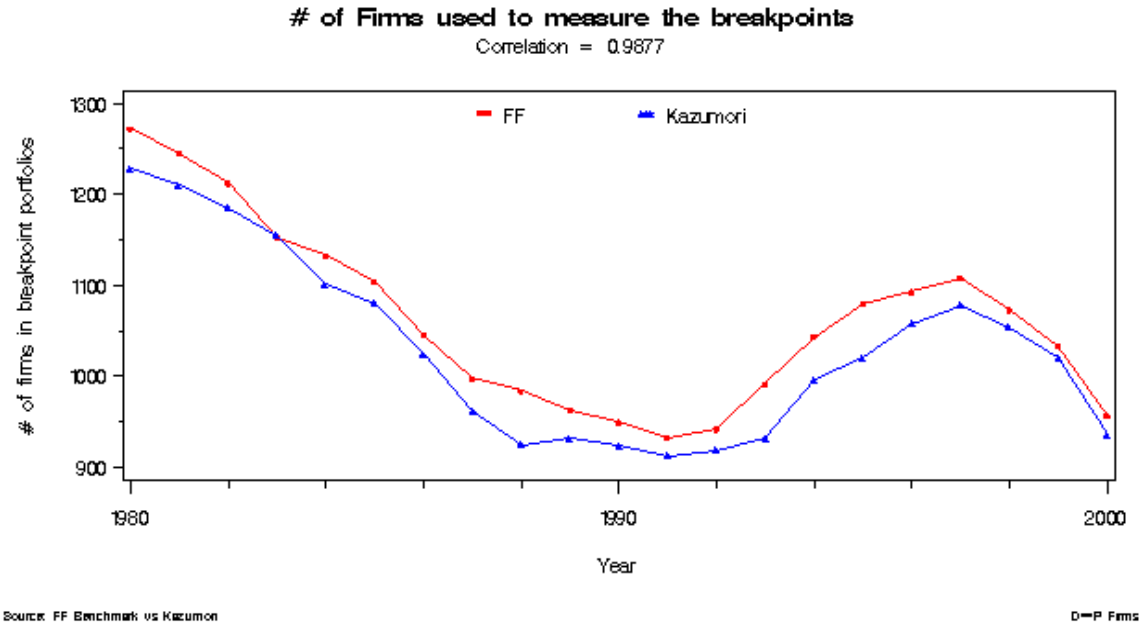


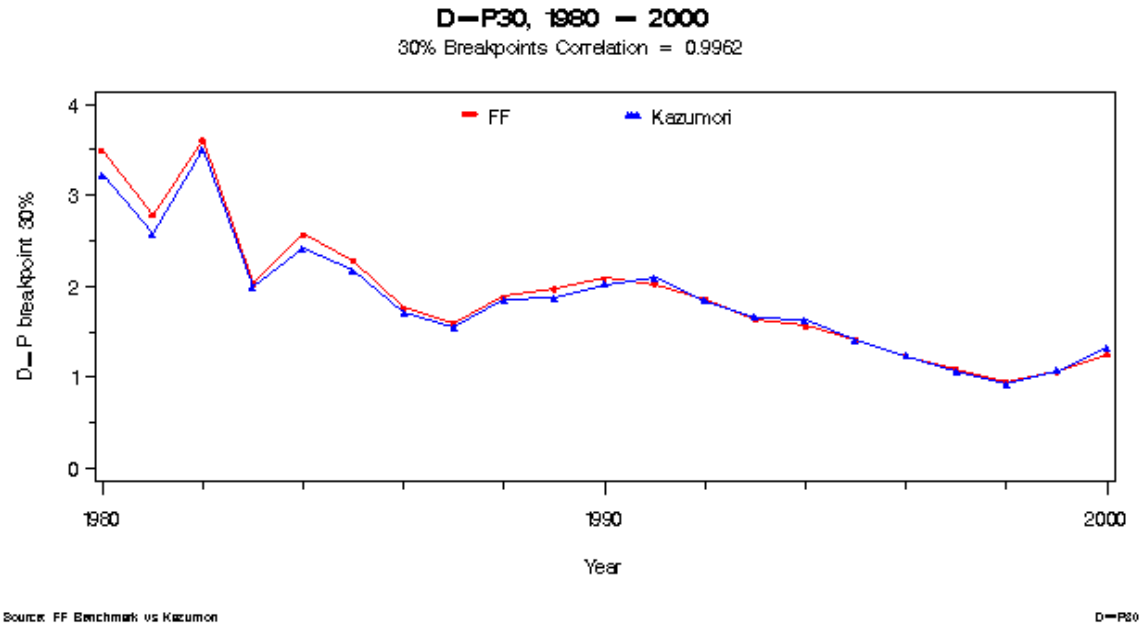
2.7. *The Dividend Yield Deciles and Portfolios*

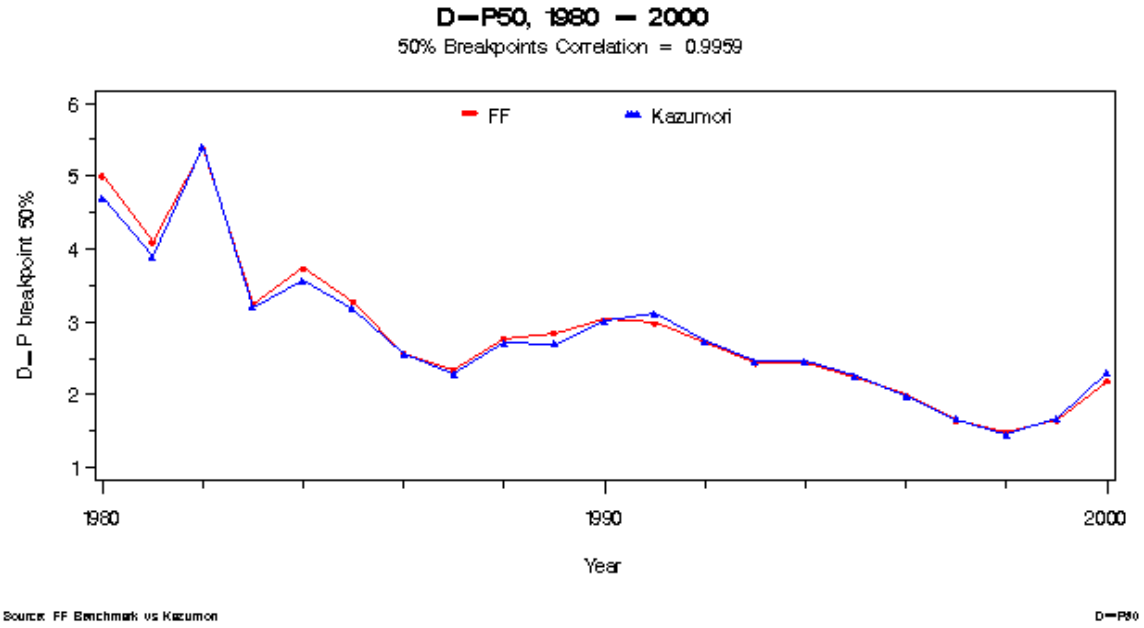
We compute D/P (in percent) breakpoints at the end of each June. The dividend yield in June of year t is the total dividends paid from July of t-1 to June of t per dollar of equity in June of t. The breakpoints for year t use NYSE stocks for which we have at

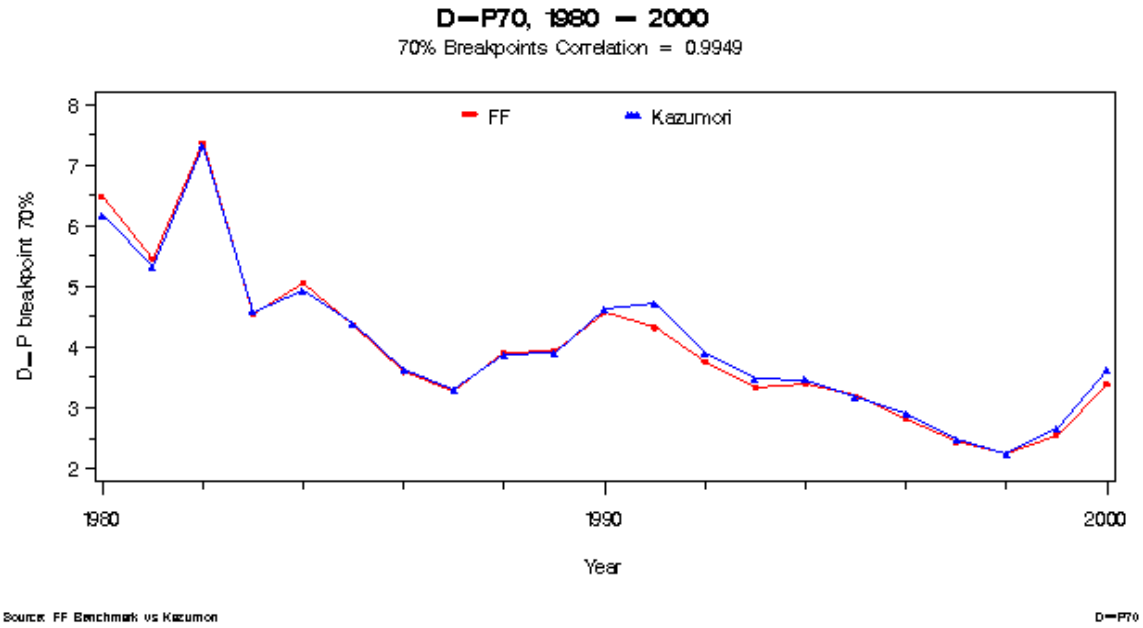
least seven months (to compute the dividend yield) from July of t-1 to June of t. (Only six monthly returns are required in June 1926.) We do not include stocks that pay no dividends from July of t-1 to June of t. Portfolios are formed on D/P at the end of each June using NYSE breakpoints. The dividend yield used to form portfolios in June of year t is the total dividends paid from July of t-1 to June of t per dollar of equity in June of t. All NYSE, AMEX, and NASDAQ stocks for which we have ME for June of year t, and at least 7 monthly returns (to compute the dividend yield) from July of t-1 to June of t.

2.7.1. *Yearly Breakpoints*

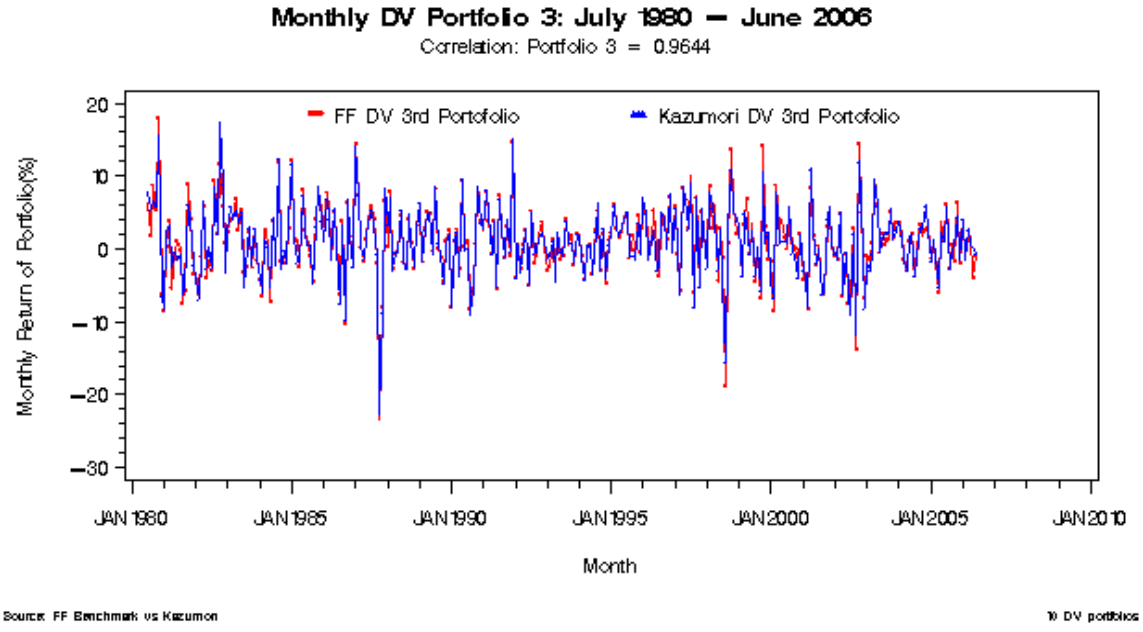


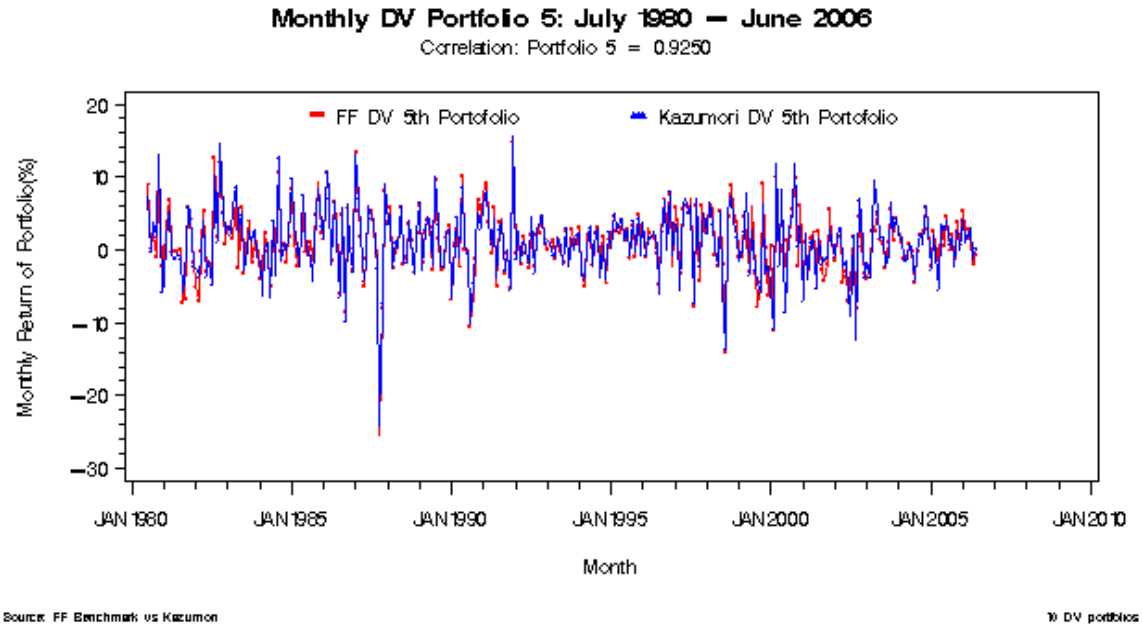

D—P30, 1980 — 2000
30% Breakpoints Correlation = 0.9962
FF
Kazumori
D_P breakpoint 30%
0
1
2
3
4
1980
1990
2000
Year
Source: FF Benchmark vs Kazumori
D—P30

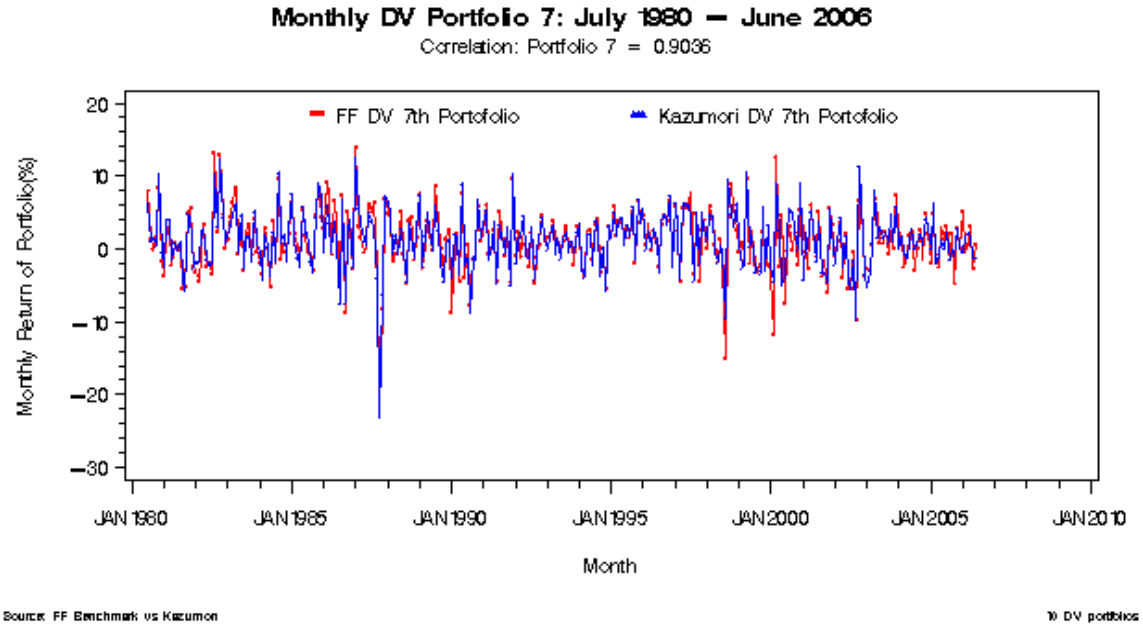

D—P50, 1980 — 2000
50% Breakpoints Correlation = 0.9959
FF
Kazumori
D_P breakpoint 50%
1
2
3
4
5
6
1980
1990
2000
Year
Source: FF Benchmark vs Kazumori
D—P50



2.7.2. *Portfolios*



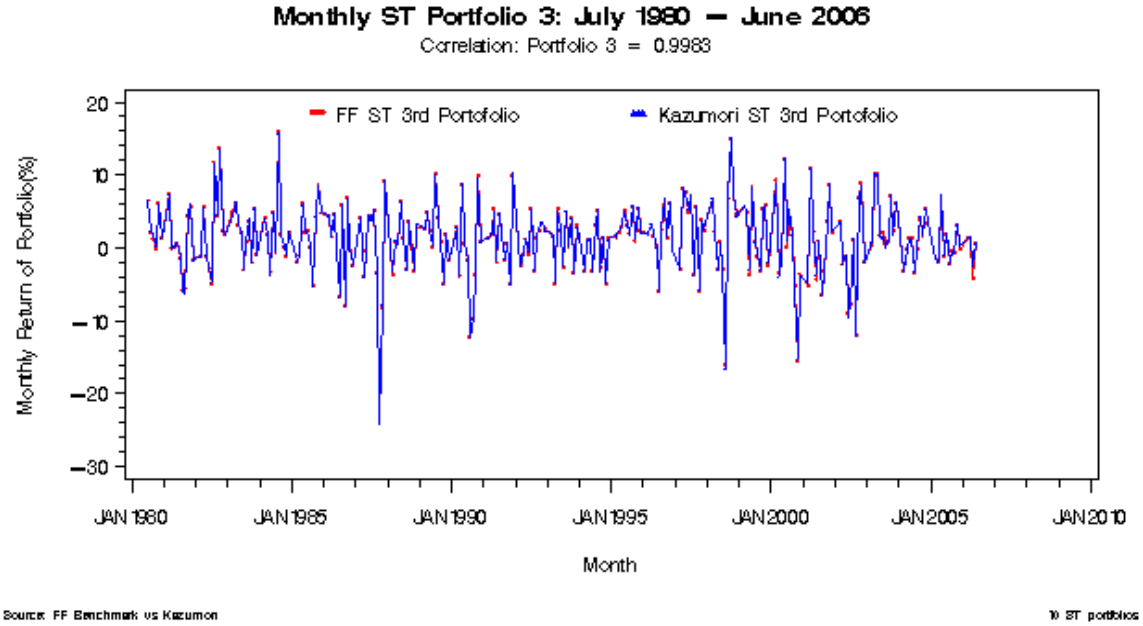


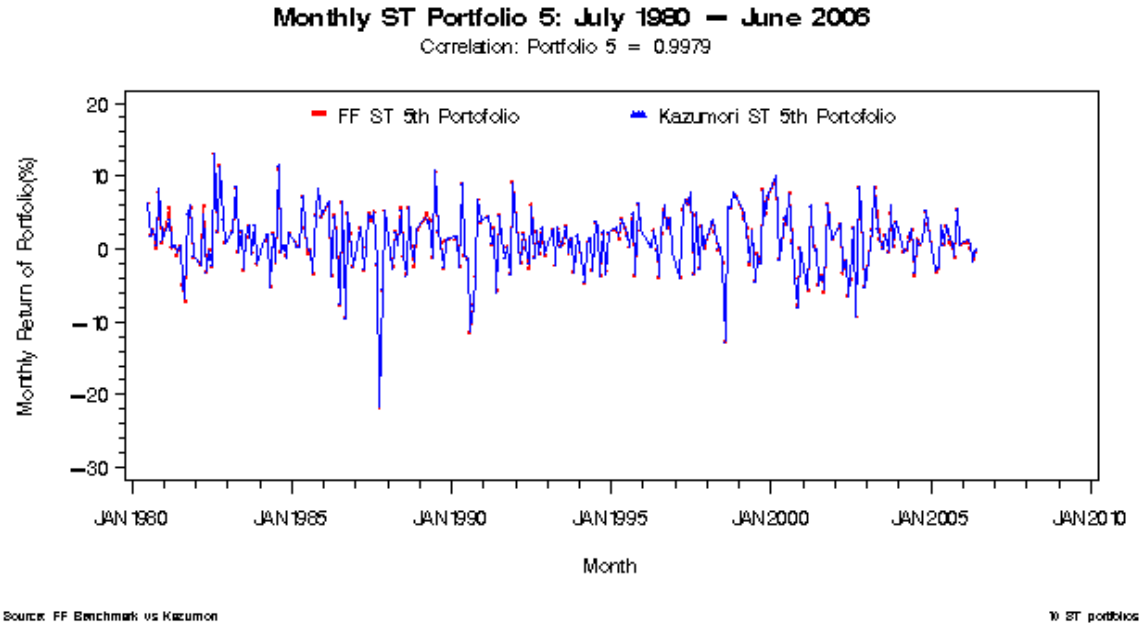


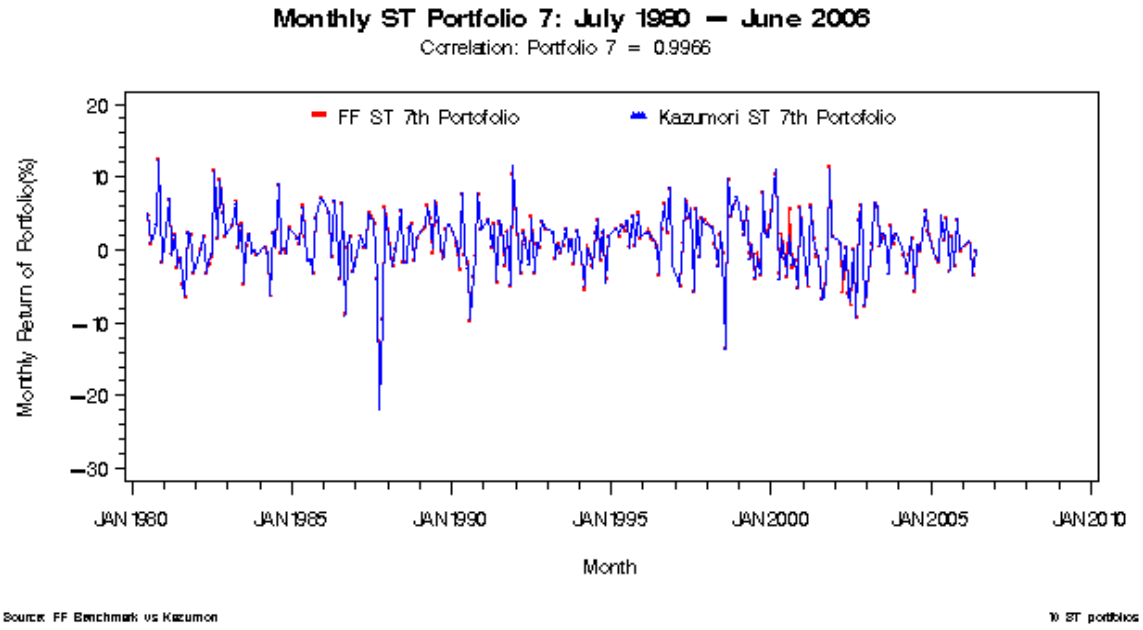
2.8. *The Short-Term Reversal Deciles and Portfolios*

The portfolios are constructed monthly using NYSE prior (1-1) return decile breakpoints. The portfolios constructed each month include NYSE, AMEX, and NASDAQ stocks with prior return data. To be included in a portfolio for month t (formed at the end of the

month t-1), a stock must have a price for the end of month t-2 and a good return for t-1. Each included stock also must have ME for the end of t-1.

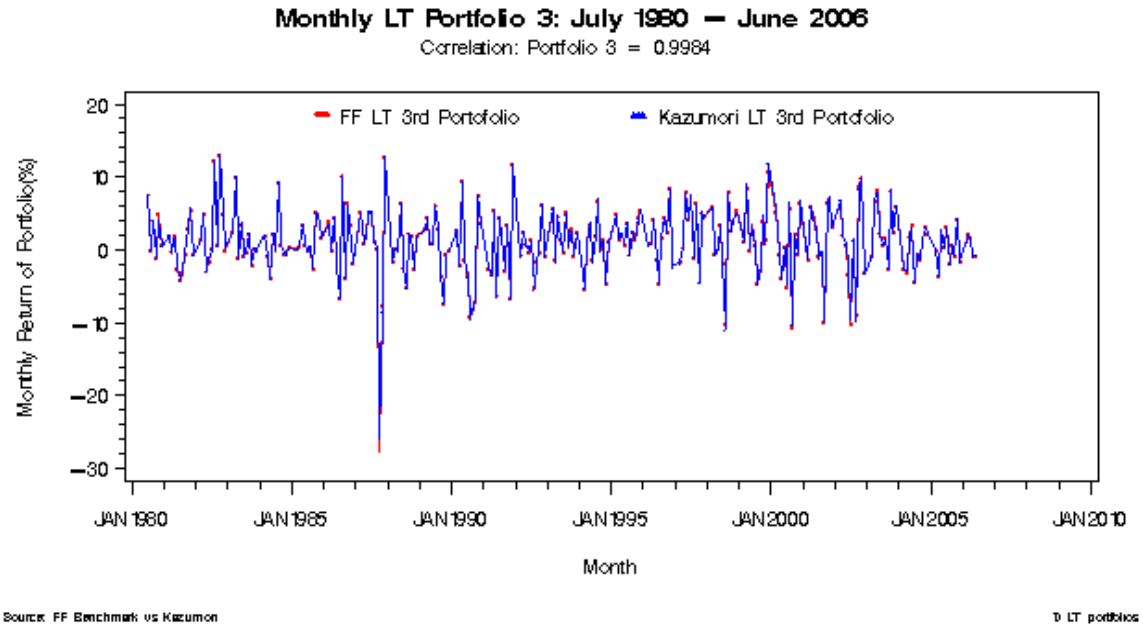




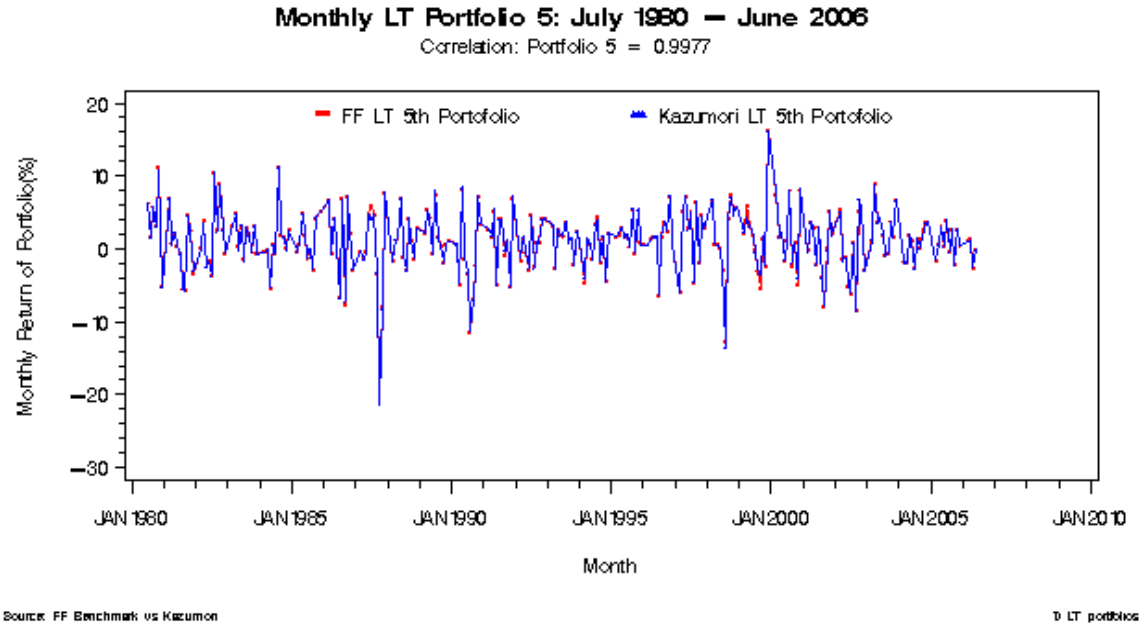


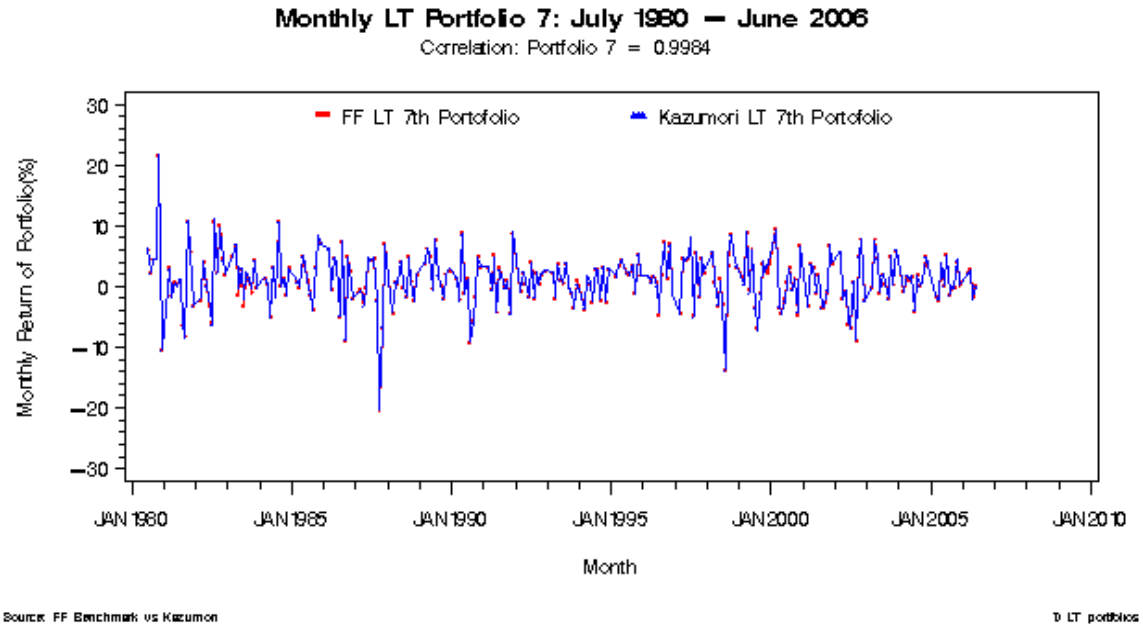
2.9. *The Long-Term Reversal Deciles and Portfolios*

The portfolios are constructed monthly using NYSE prior (13-60) return decile breakpoints. The portfolios constructed each month include NYSE, AMEX, and NASDAQ stocks with prior return data. To be included in a portfolio for month t (formed at the end of the month t-1), a stock must have a price for the end of month t-61 and a good return for t-13. In addition, any missing returns from t-60 to t-14 must be -99.0, CRSP's code for a missing price. Each included stock also must have ME for the end of t-1.



2.9.1. *Portfolios*

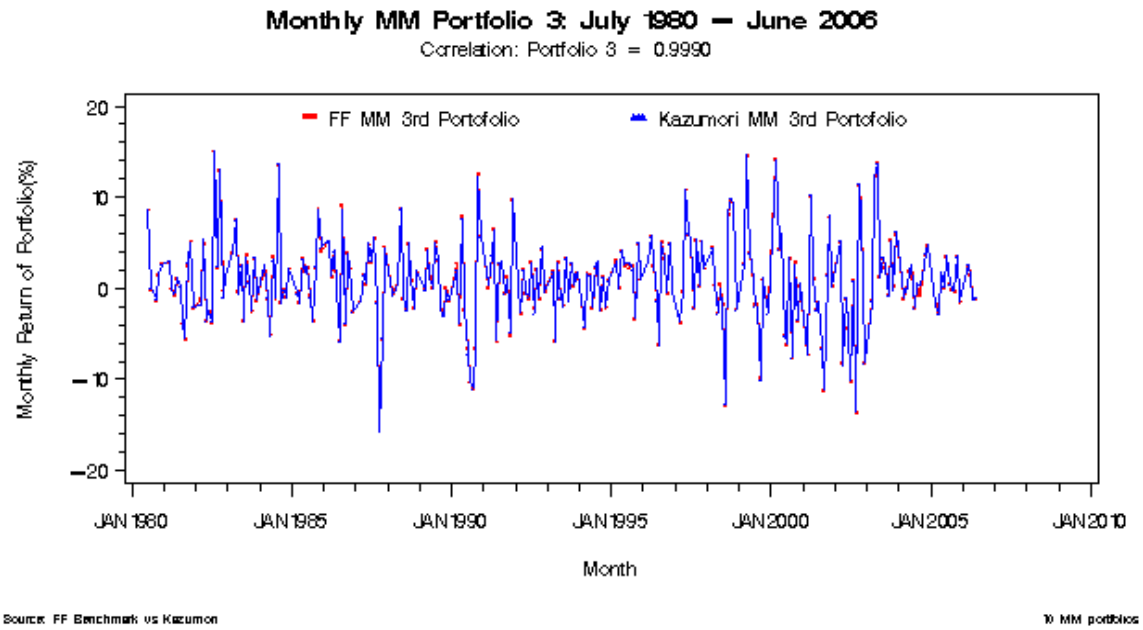


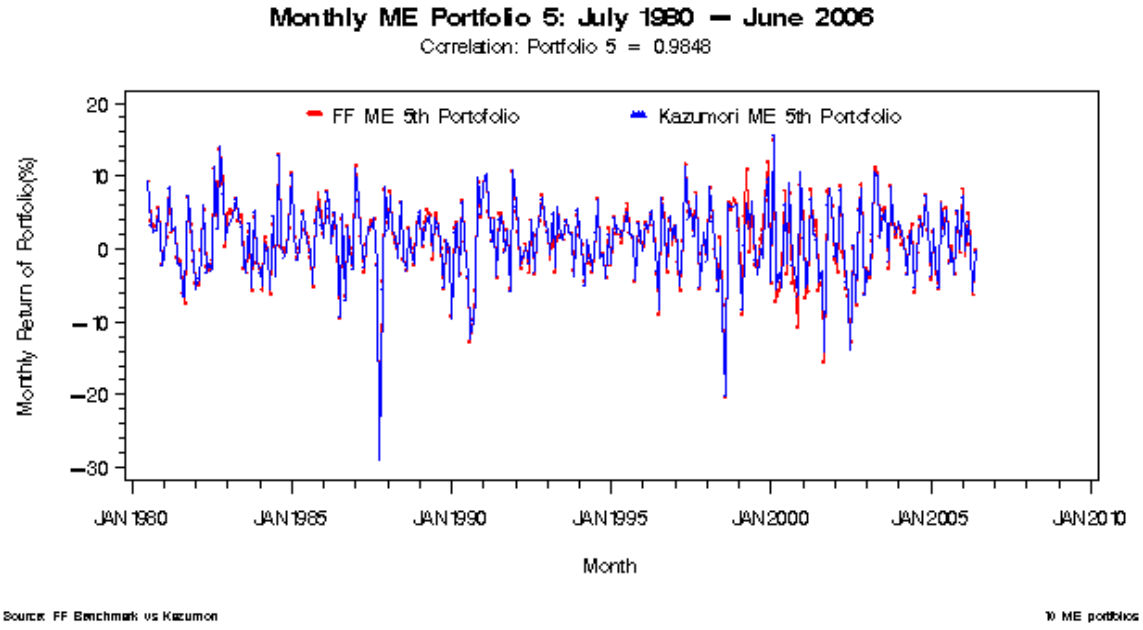


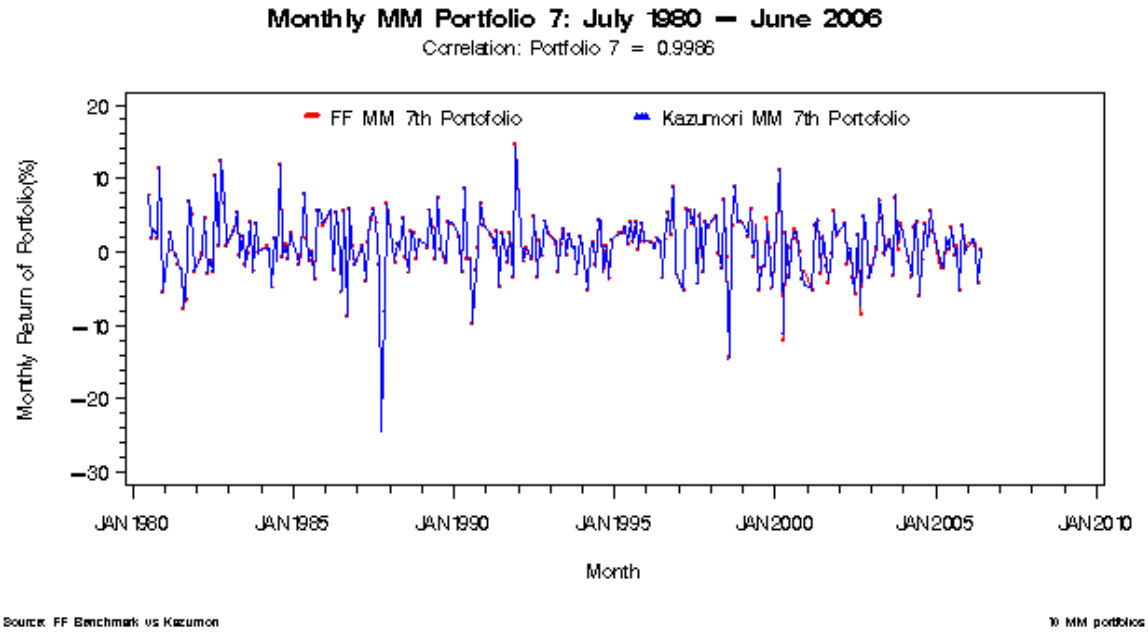
2.10. *The Momentum Deciles and Portfolios*

The portfolios are constructed monthly using NYSE prior (2-12) return decile breakpoints. The portfolios constructed each month include NYSE, AMEX, and NASDAQ stocks with prior return data. To be included in a portfolio for month t (formed at the end of the month t-1), a stock must have a price for the end of month t-13 and a good return for t-2. In addition, any missing returns from t-12 to t-3 must be -99.0, CRSP's code for a missing price. Each included stock also must have ME for the end of t-1.

2.10.1. *Portfolios*

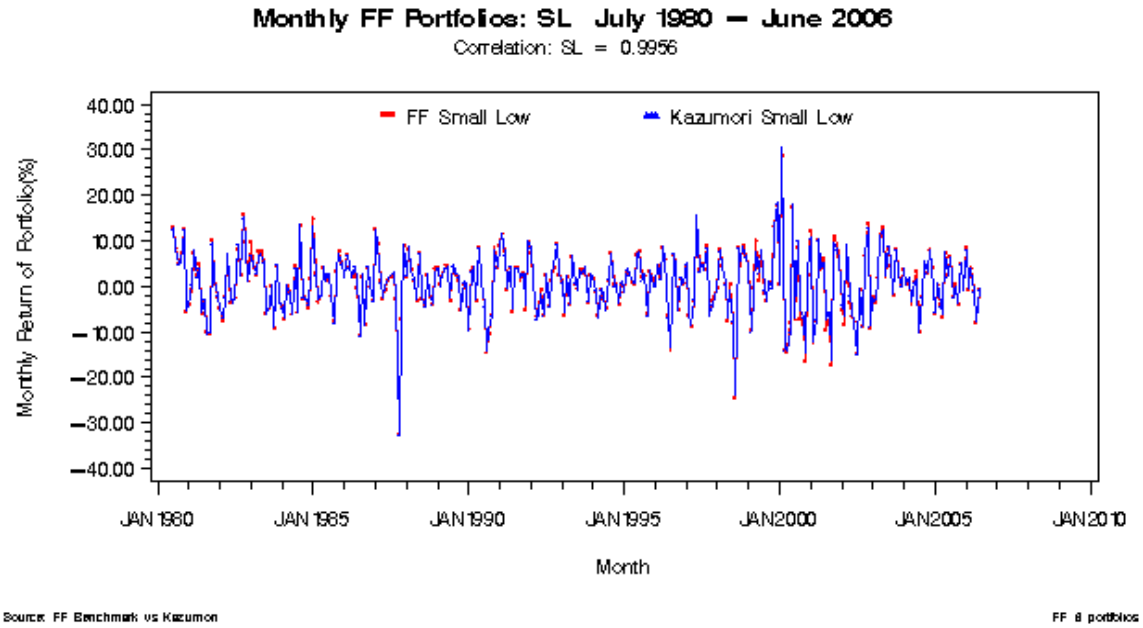


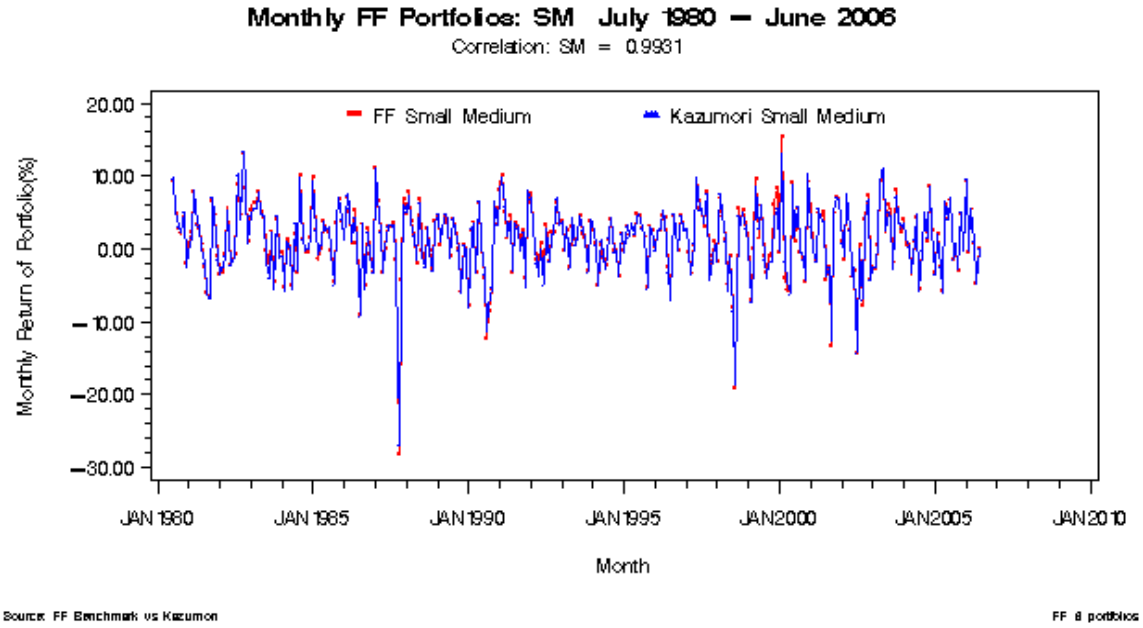


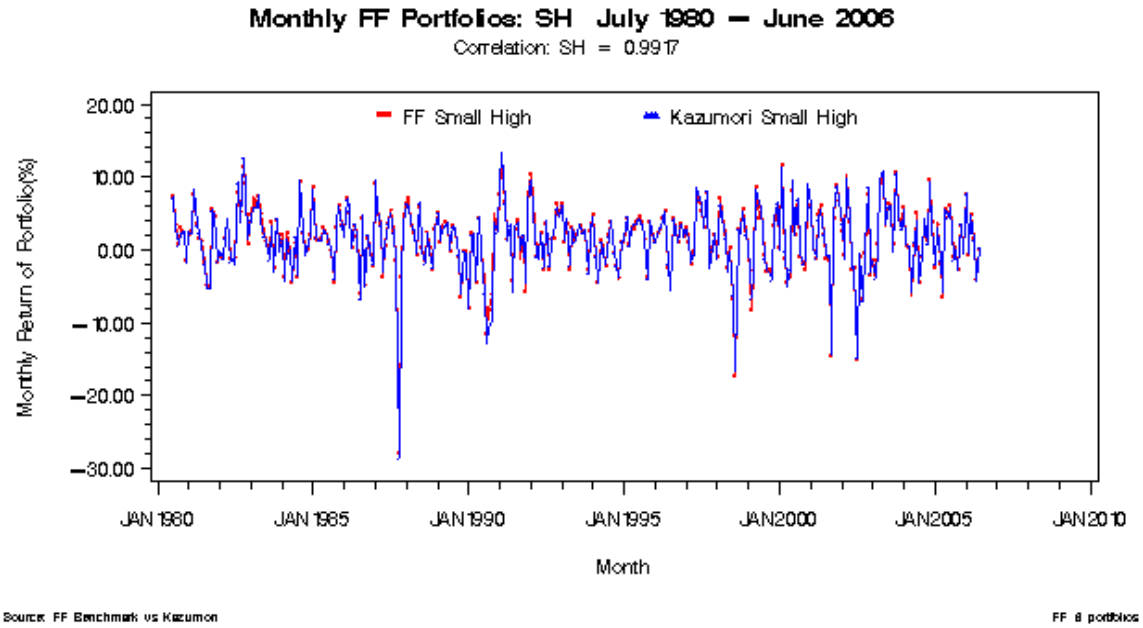


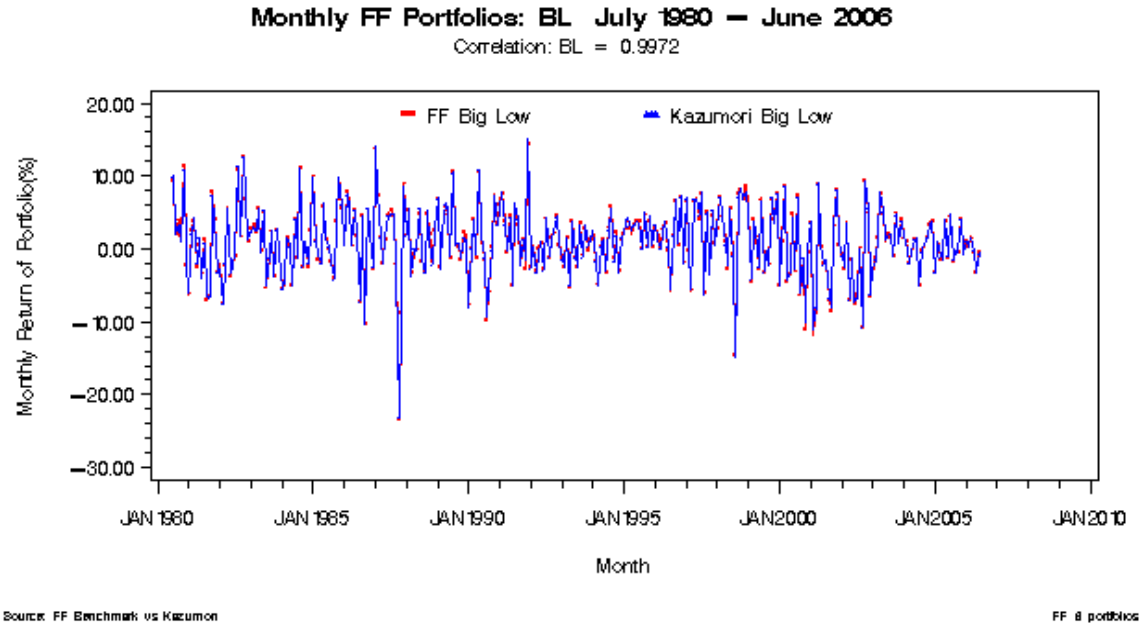
2.11. *The 2×3 Size and Value Portfolios*

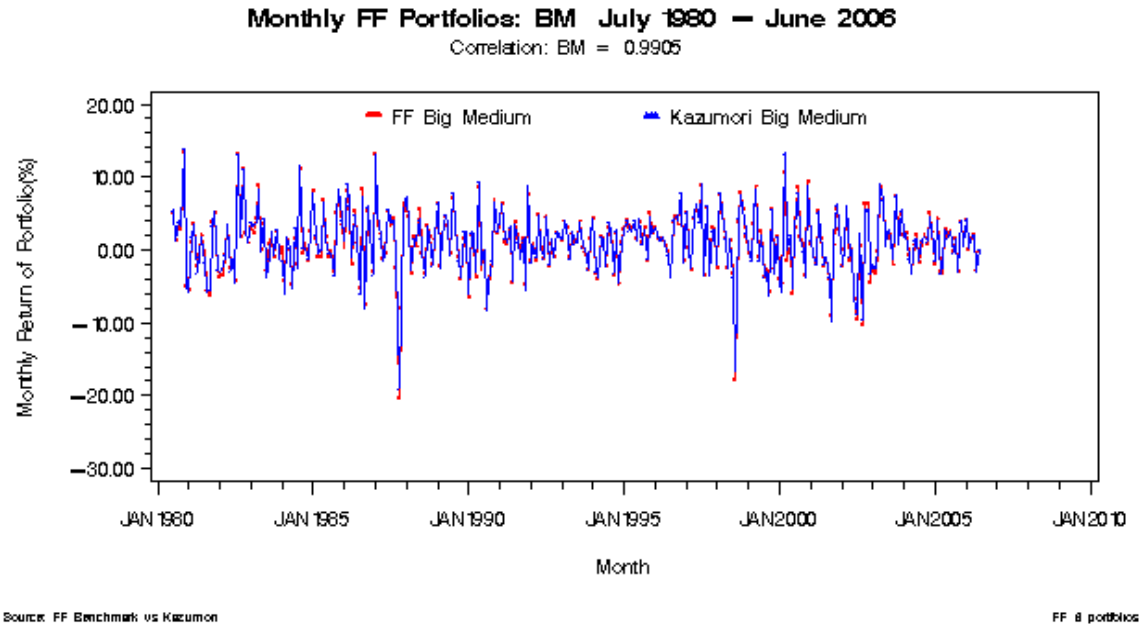
The portfolios, which are constructed at the end of each June, are the intersections of 2 portfolios formed on size (market equity, ME) and 3 portfolios formed on the ratio of book equity to market equity (BE/ME). The size breakpoint for year t is the median NYSE market equity at the end of June of year t. BE/ME for June of year t is the book equity for the last fiscal year end in t-1 divided by ME for December of t-1. The BE/ME breakpoints are the 30th and 70th NYSE percentiles. The portfolios for July of year t to June of t+1 include all NYSE, AMEX, and NASDAQ stocks for which we have market equity data for December of t-1 and June of t, and (positive) book equity data for t-1.

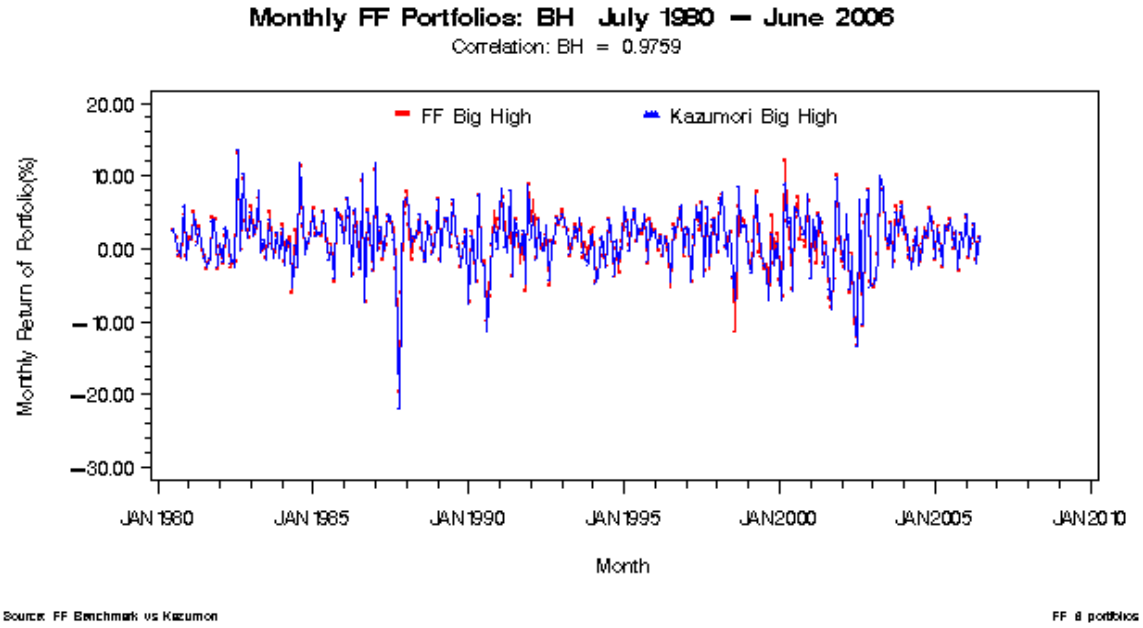

Monthly FF Portfolios: SL July 1980 — June 2006
Correlation: SL = 0.9956
FF Small Low
Kazumori Small Low
Monthly Return of Portfolio(%)
40.00
30.00
20.00
10.00
0.00
−10.00
−20.00
−30.00
−40.00
JAN1980
JAN1985
JAN1990
JAN1995
JAN2000
JAN2005
JAN2010
Month
Source: FF Benchmark vs Kazumori
FF 6 portfolios


Monthly FF Portfolios: SM July 1980 — June 2006
Correlation: SM = 0.9931
FF Small Medium
Kazumori Small Medium
Monthly Return of Portfolio(%)
20.00
10.00
0.00
−10.00
−20.00
−30.00
JAN1980
JAN1985
JAN1990
JAN1995
JAN2000
JAN2005
JAN2010
Month
Source: FF Benchmark vs Kazumori
FF 6 portfolios

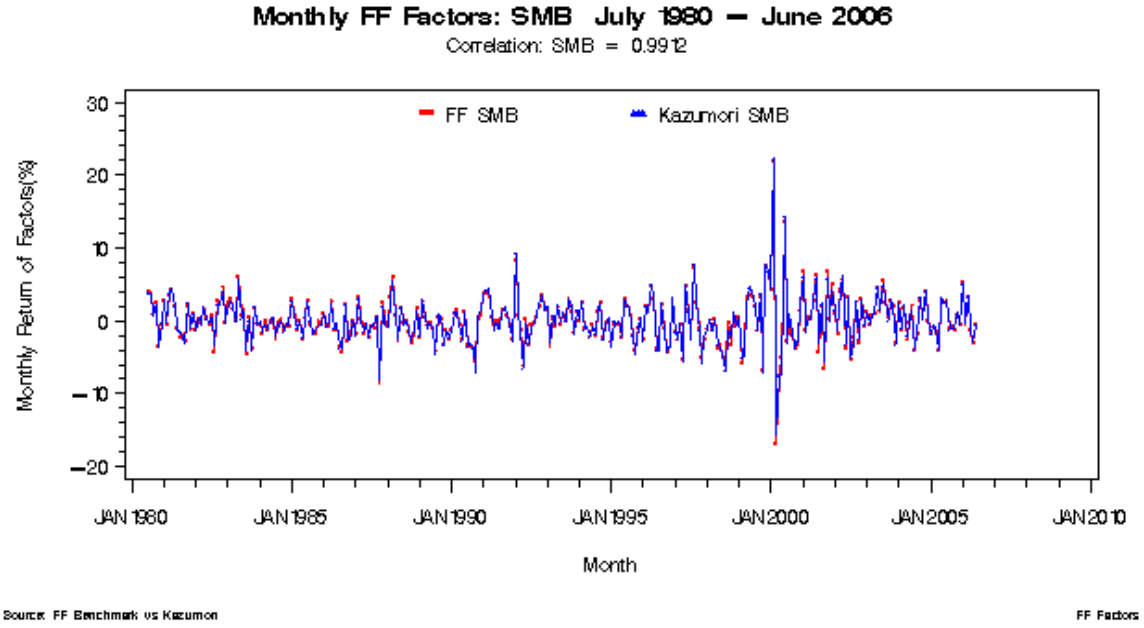

Monthly FF Portfolios: SH July 1980 – June 2006
Correlation: SH = 0.9917
FF Small High
Kazumori Small High
Monthly Return of Portfolio(%)
20.00
10.00
0.00
−10.00
−20.00
−30.00
JAN1980
JAN1985
JAN1990
JAN1995
JAN2000
JAN2005
JAN2010
Month
Source: FF Benchmark vs Kazumori
FF 8 portfolios

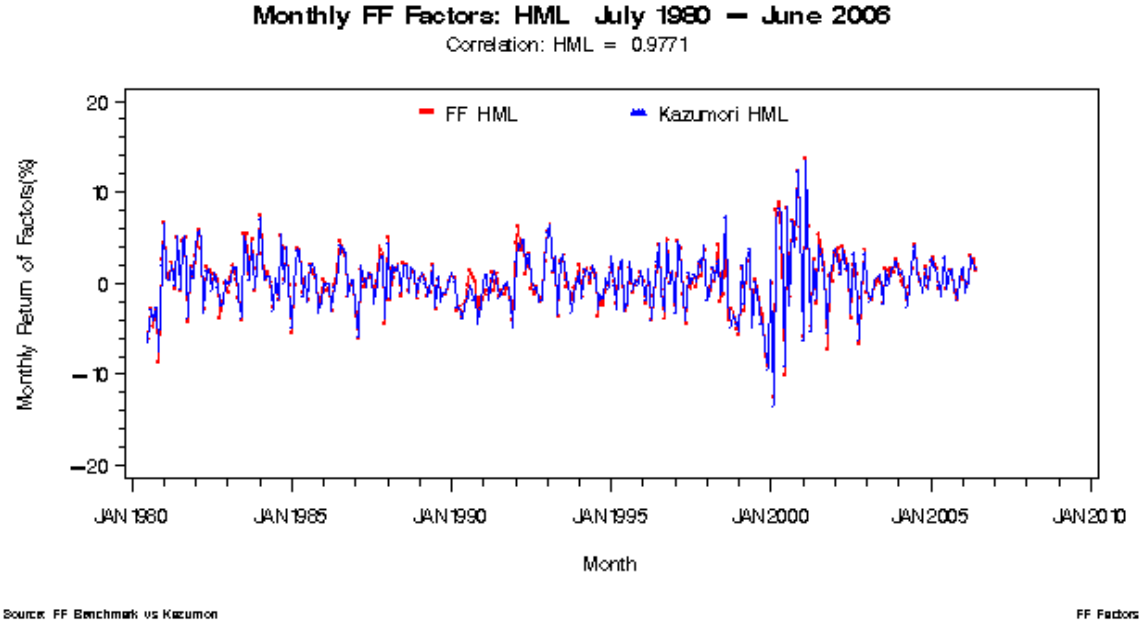

Monthly FF Portfolios: BL July 1980 – June 2006
Correlation: BL = 0.9972
FF Big Low
Kazumori Big Low
Monthly Return of Portfolio(%)
20.00
10.00
0.00
−10.00
−20.00
−30.00
JAN1980
JAN1985
JAN1990
JAN1995
JAN2000
JAN2005
JAN2010
Month
Source: FF Benchmark vs Kazumori
FF 8 portfolios


Monthly FF Portfolios: BM July 1980 – June 2006
Correlation: BM = 0.9905
FF Big Medium
Kazumori Big Medium
Monthly Return of Portfolio(%)
20.00
10.00
0.00
−10.00
−20.00
−30.00
JAN1980
JAN1985
JAN1990
JAN1995
JAN2000
JAN2005
JAN2010
Month
Source: FF Benchmark vs Kazumori
FF 6 portfolios


Monthly FF Portfolios: BH July 1980 – June 2006
Correlation: BH = 0.9759
FF Big High
Kazumori Big High
Monthly Return of Portfolio(%)
20.00
10.00
0.00
−10.00
−20.00
−30.00
JAN1980
JAN1985
JAN1990
JAN1995
JAN2000
JAN2005
JAN2010
Month
Source: FF Benchmark vs Kazumori
FF 6 portfolios

2.11.1. *SMB and HML Factors*





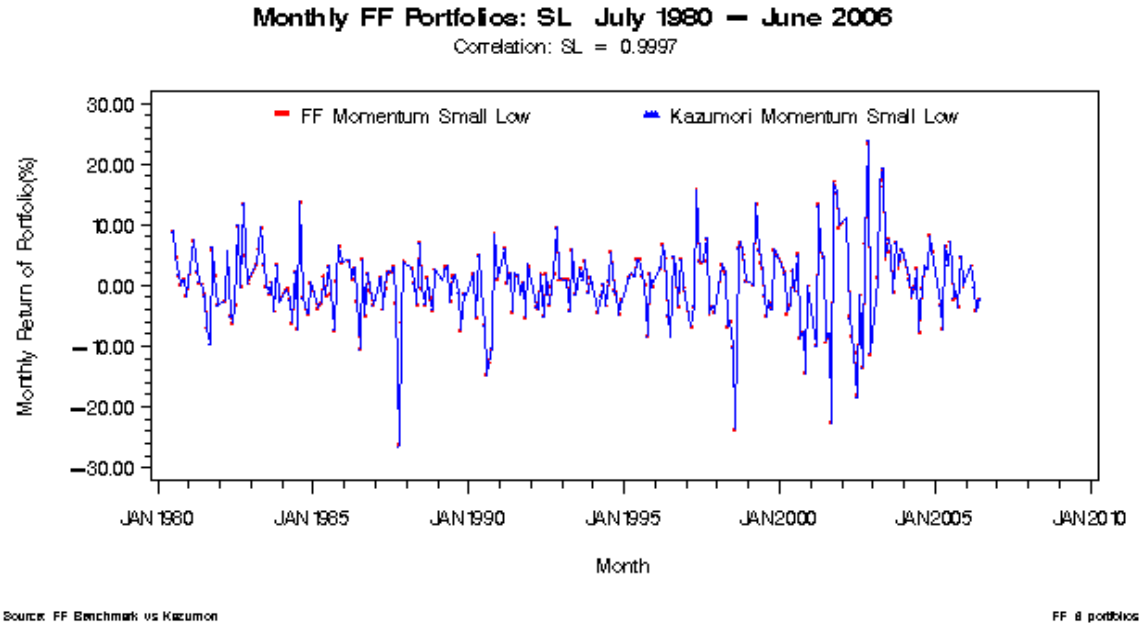
2.12. *The 5×5 Size and Value Portfolios*

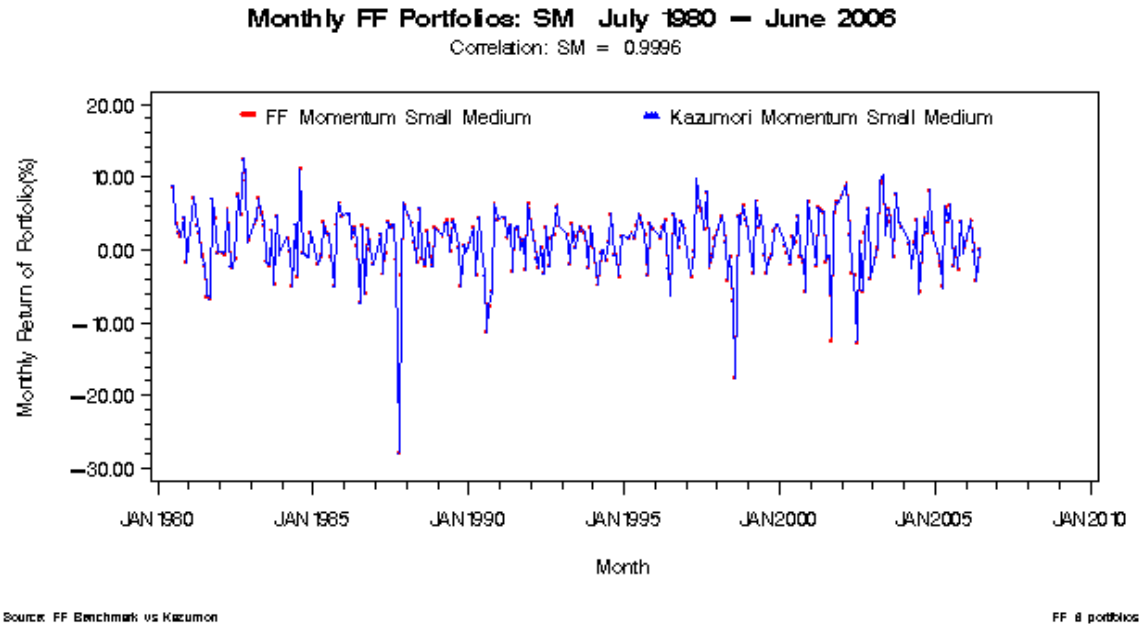
The portfolios, which are constructed at the end of each June, are the intersections of 5 portfolios formed on size (market equity, ME) and 5 portfolios formed on the ratio of book

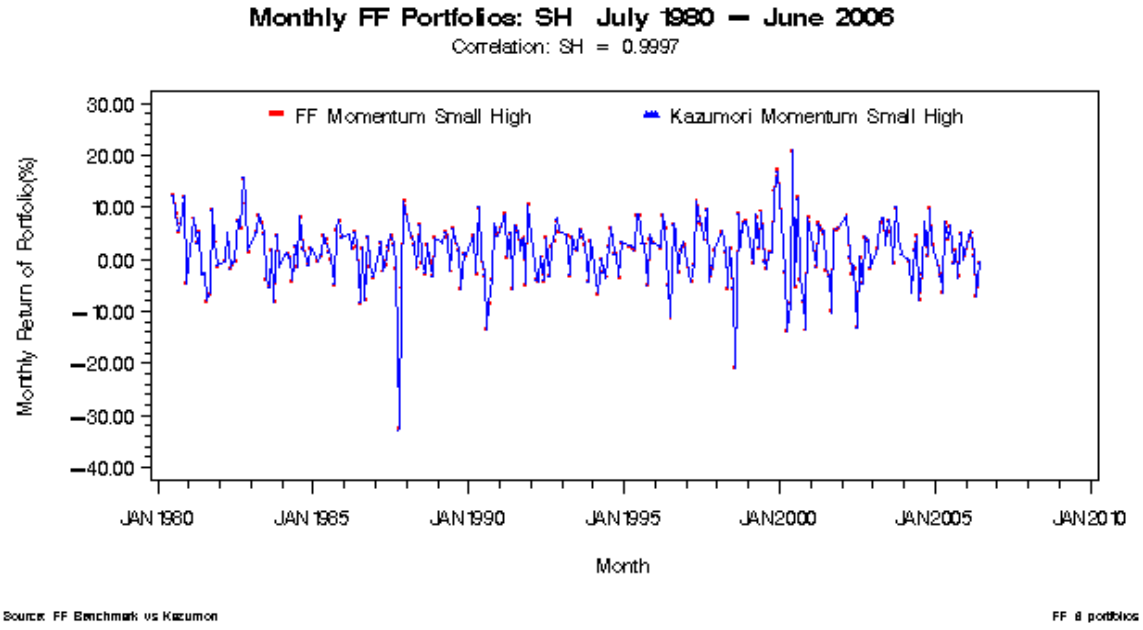
equity to market equity (BE/ME). The size breakpoints for year t are the NYSE market equity quintiles at the end of June of t. BE/ME for June of year t is the book equity for the last fiscal year end in t-1 divided by ME for December of t-1. The BE/ME breakpoints are NYSE quintiles. The portfolios for July of year t to June of t+1 include all NYSE, AMEX, and NASDAQ stocks for which we have market equity data for December of t-1 and June of t, and (positive) book equity data for t-1.

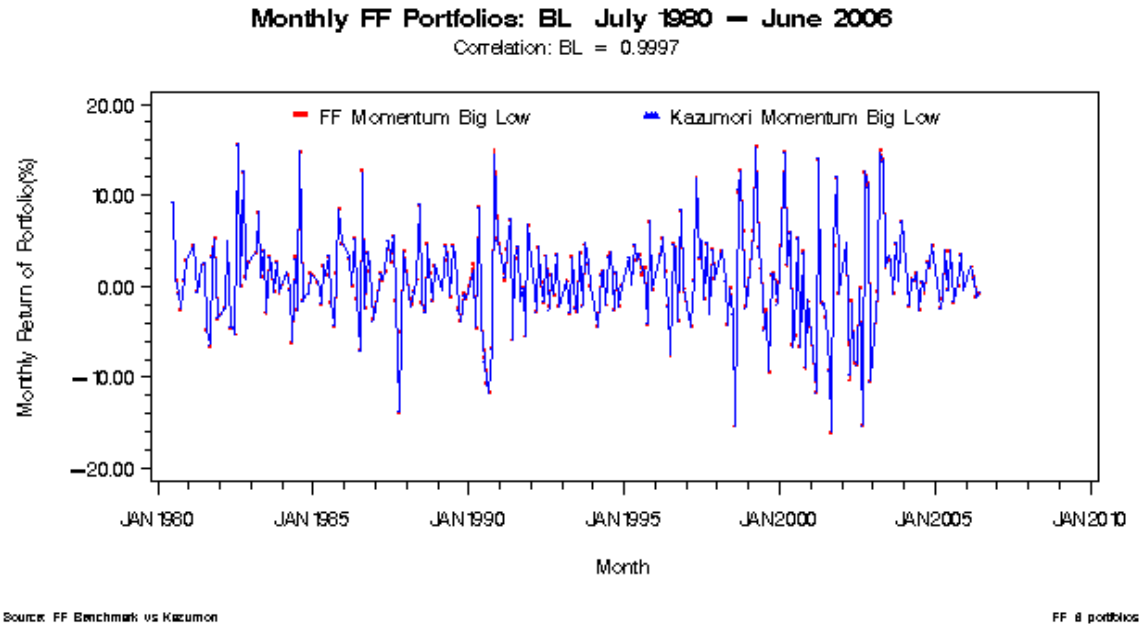
2.13. *The 2×3 Size and Momentum Portfolios*

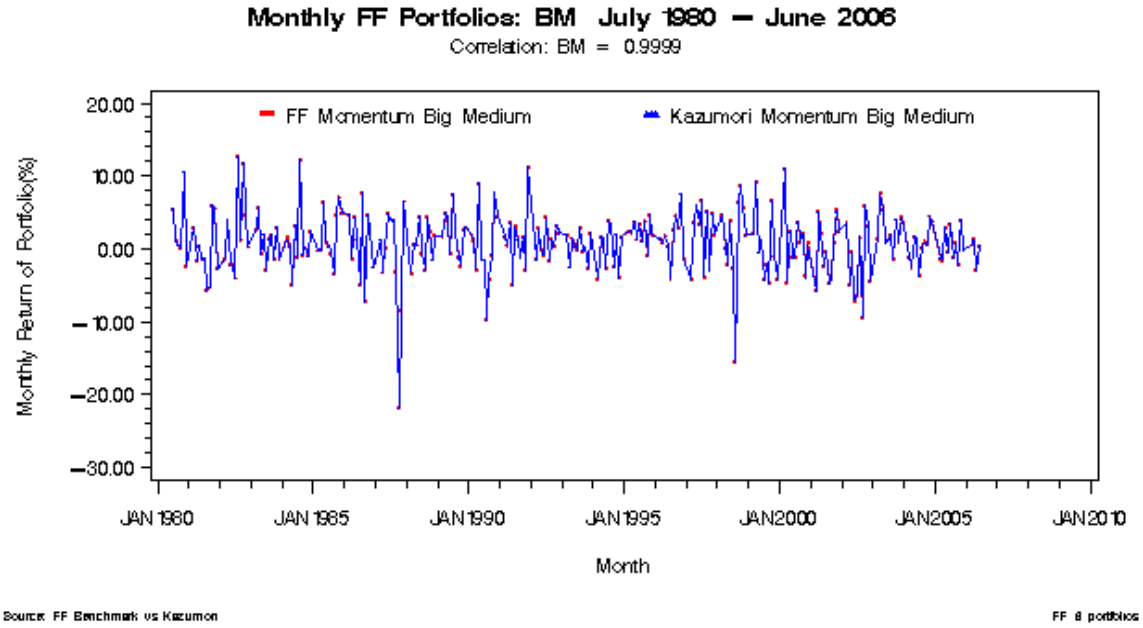
The portfolios, which are constructed monthly, are the intersections of 2 portfolios formed on size (market equity, ME) and 3 portfolios formed on prior (2-12) return. The monthly size breakpoint is the median NYSE market equity. The monthly prior (2-12) return breakpoints are 30th and 70th NYSE percentiles. The six portfolios constructed each month include NYSE, AMEX, and NASDAQ stocks with prior return data. The six portfolios constructed each month include NYSE, AMEX, and NASDAQ stocks with prior return data. To be included in a portfolio for month t (formed at the end of the month t-1), a stock must have a price for the end of month t-13 and a good return for t-2. In addition, any missing returns from t-12 to t-3 must be -99.0, CRSP's code for a missing price. Each included stock also must have ME for the end of t-1.

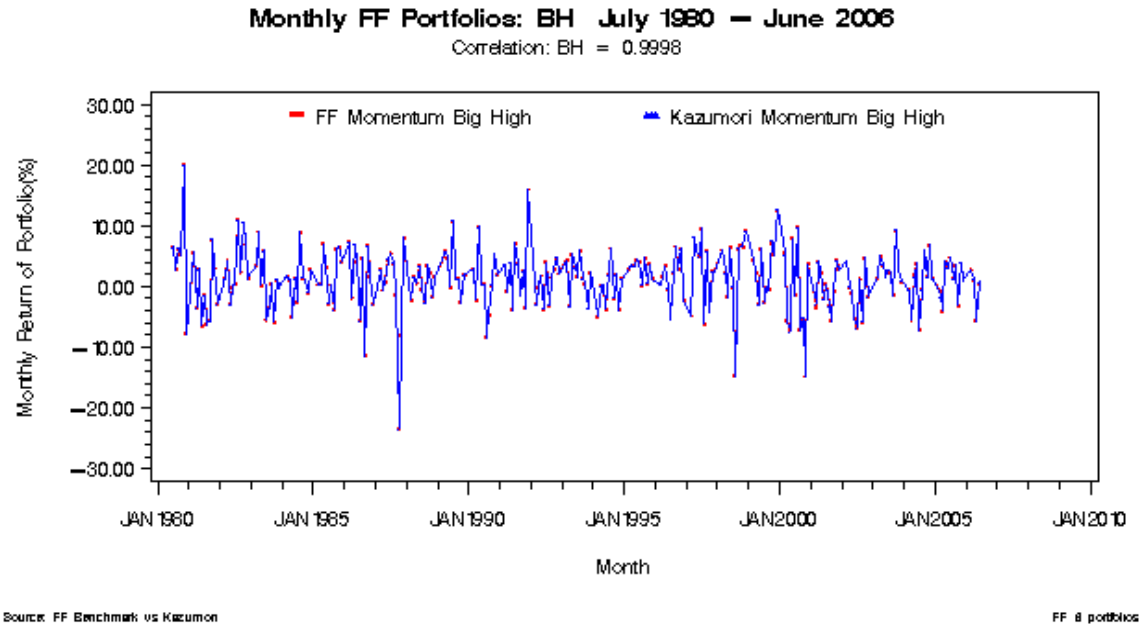



Monthly FF Portfolios: SM July 1980 – June 2006
Correlation: SM = 0.9996
FF Momentum Small Medium
Kazumori Momentum Small Medium
Monthly Return of Portfolio(%)
20.00
10.00
0.00
−10.00
−20.00
−30.00
JAN1980
JAN1985
JAN1990
JAN1995
JAN2000
JAN2005
JAN2010
Month
Source: FF Benchmark vs Kazumon
FF 8 portfolios


Monthly FF Portfolios: SH July 1980 – June 2006
Correlation: SH = 0.9997
FF Momentum Small High
Kazumori Momentum Small High
Monthly Return of Portfolio(%)
30.00
20.00
10.00
0.00
−10.00
−20.00
−30.00
−40.00
JAN1980
JAN1985
JAN1990
JAN1995
JAN2000
JAN2005
JAN2010
Month
Source: FF Benchmark vs Kazumon
FF 8 portfolios


Monthly FF Portfolios: BL July 1980 — June 2006
Correlation: BL = 0.9997
FF Momentum Big Low
Kazumori Momentum Big Low
Monthly Return of Portfolio(%)
20.00
10.00
0.00
−10.00
−20.00
JAN1980
JAN1985
JAN1990
JAN1995
JAN2000
JAN2005
JAN2010
Month
Source: FF Benchmark vs Kazumon
FF 6 portfolios

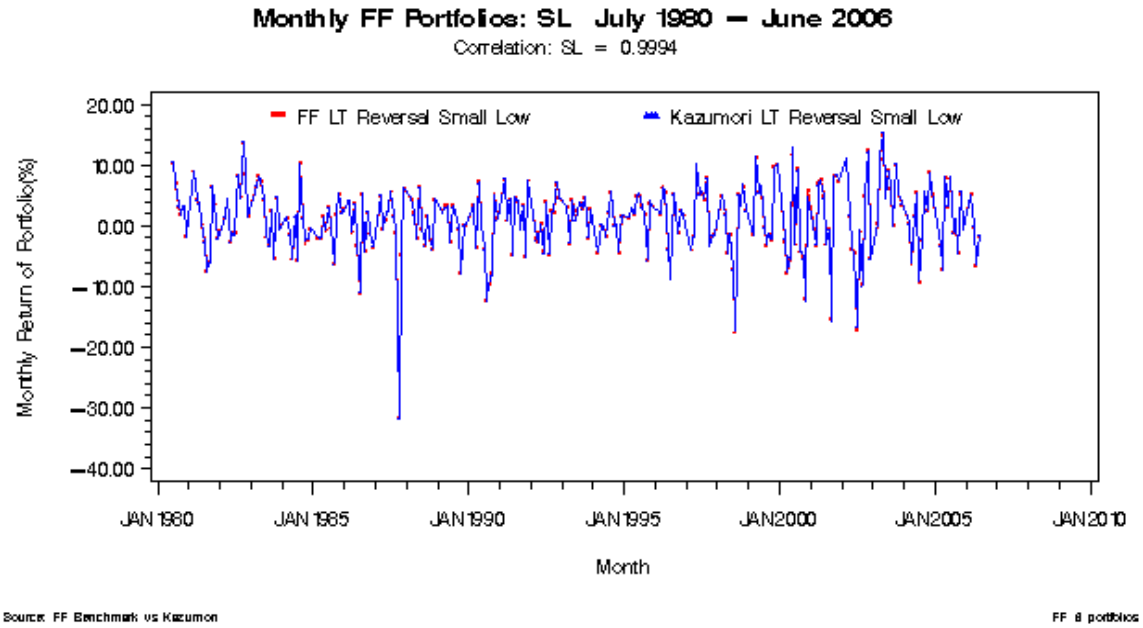

Monthly FF Portfolios: BM July 1980 — June 2006
Correlation: BM = 0.9999
FF Momentum Big Medium
Kazumori Momentum Big Medium
Monthly Return of Portfolio(%)
20.00
10.00
0.00
−10.00
−20.00
−30.00
JAN1980
JAN1985
JAN1990
JAN1995
JAN2000
JAN2005
JAN2010
Month
Source: FF Benchmark vs Kazumon
FF 6 portfolios

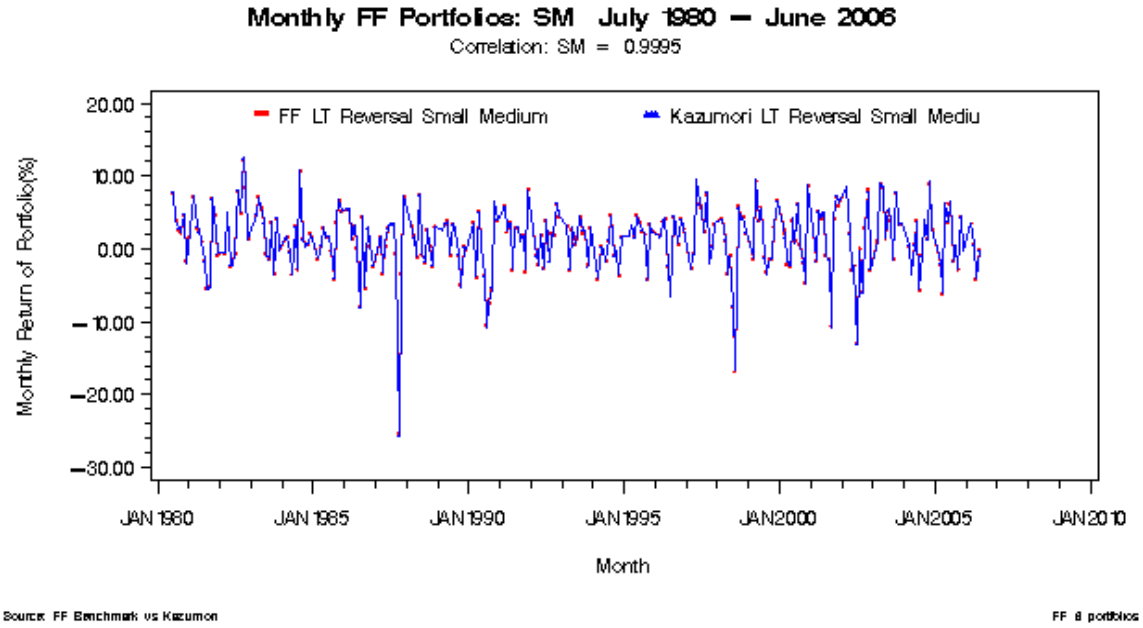


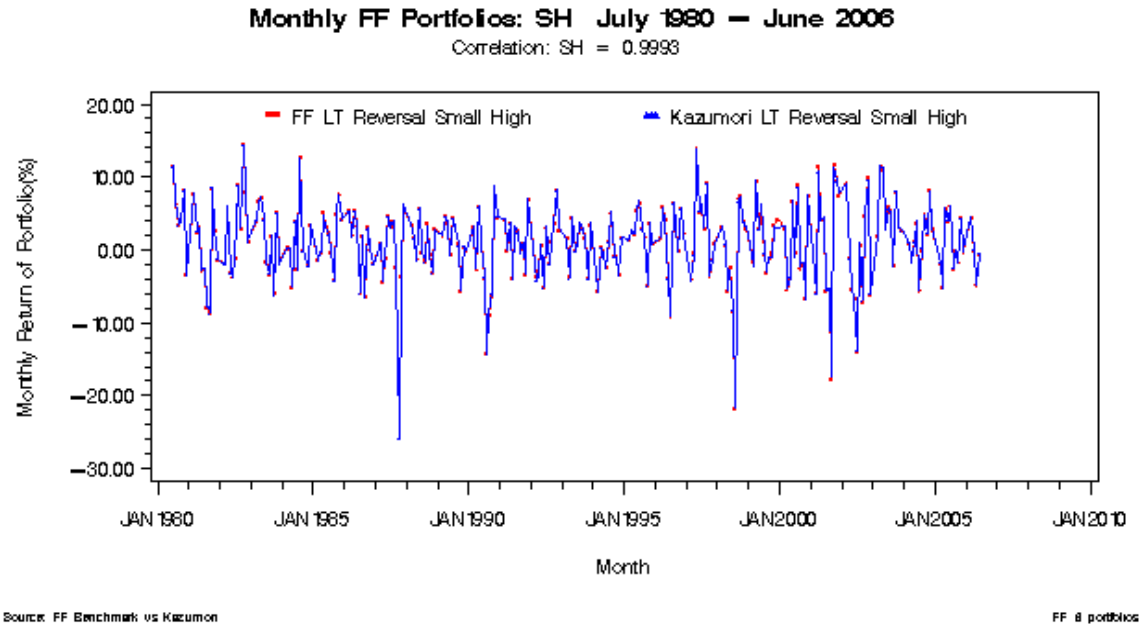
2.14. *The 2×3 Size and Long-Term Reversal Portfolios*

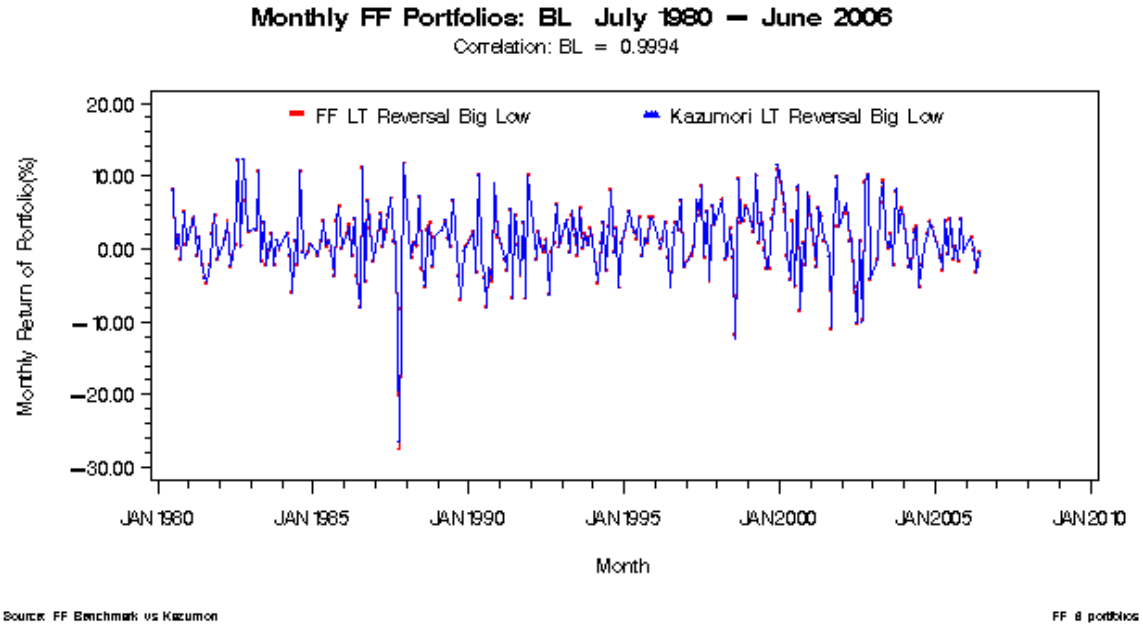
We use six value-weight portfolios formed on size and prior (13-60) returns to construct LT_Rev. The portfolios, which are formed monthly, are the intersections of 2 portfolios formed on size (market equity, ME) and 3 portfolios formed on prior (13-60) return. The monthly size breakpoint is the median NYSE market equity. The monthly prior (13-60) return breakpoints are the 30th and 70th NYSE percentiles.

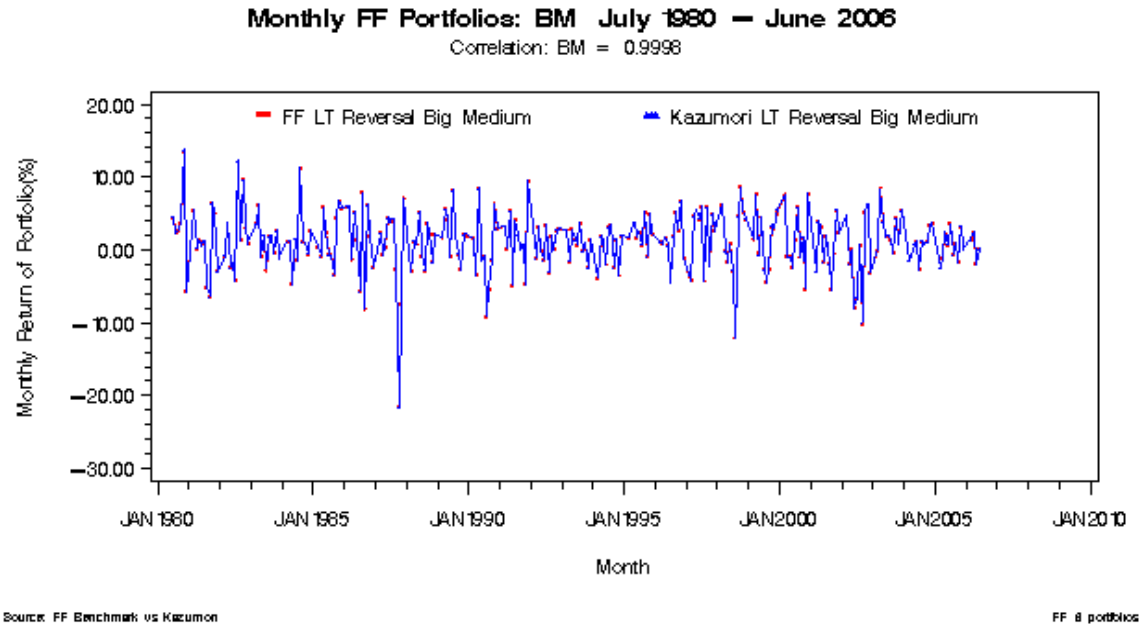
LT_Rev is the average return on the two low prior return portfolios minus the average return on the two high prior return portfolios, LT_Rev = 1/2 (Small Low + Big Low) - 1/2(Small High + Big High). The six portfolios used to construct LT_Rev each month include NYSE, AMEX, and NASDAQ stocks with prior return data. To be included in a portfolio for month t (formed at the end of the month t-1), a stock must have a price for the end of month t-61 and a good return for t-13. In addition, any missing returns from t-60 to t-14 must be -99.0, CRSP's code for a missing price. Each included stock also must have ME for the end of t-1.

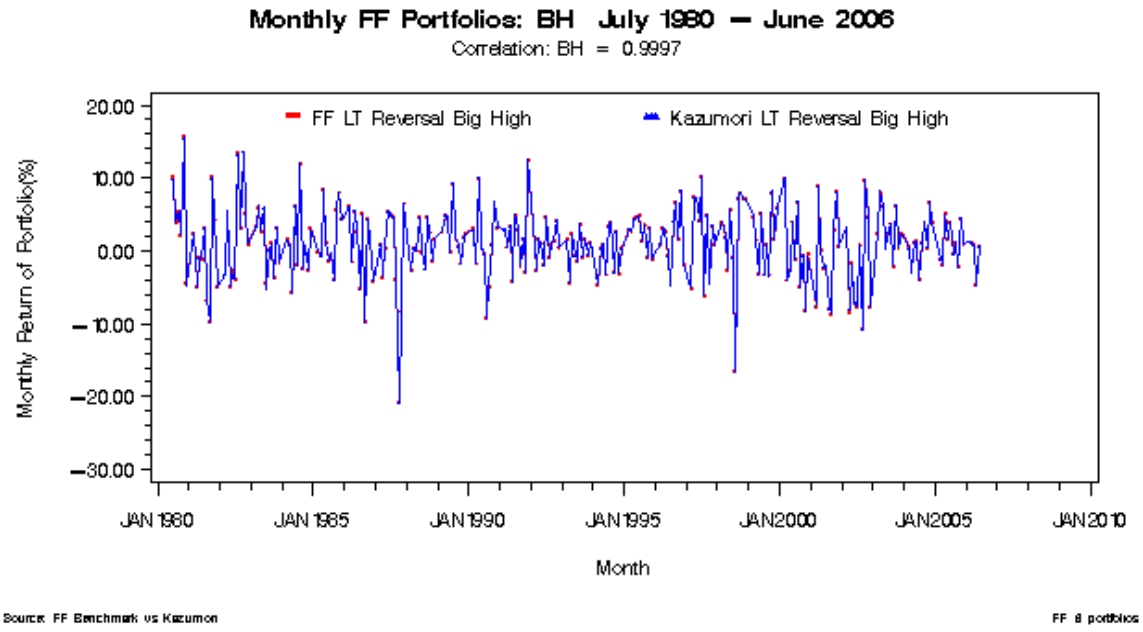

Monthly FF Portfolios: SL July 1980 — June 2006
Correlation: SL = 0.9994
FF LT Reversal Small Low
Kazumori LT Reversal Small Low
Monthly Return of Portfolio(%)
20.00
10.00
0.00
−10.00
−20.00
−30.00
−40.00
JAN1980
JAN1985
JAN1990
JAN1995
JAN2000
JAN2005
JAN2010
Month
Source: FF Benchmark vs Kazumori
FF 6 portfolios


Monthly FF Portfolios: SM July 1980 — June 2006
Correlation: SM = 0.9995
FF LT Reversal Small Medium
Kazumori LT Reversal Small Mediu
Monthly Return of Portfolio(%)
20.00
10.00
0.00
−10.00
−20.00
−30.00
JAN1980
JAN1985
JAN1990
JAN1995
JAN2000
JAN2005
JAN2010
Month
Source: FF Benchmark vs Kazumori
FF 6 portfolios


Monthly FF Portfolios: SH July 1980 – June 2006
Correlation: SH = 0.9993
FF LT Reversal Small High
Kazumori LT Reversal Small High
Monthly Return of Portfolio(%)
20.00
10.00
0.00
−10.00
−20.00
−30.00
JAN1980
JAN1985
JAN1990
JAN1995
JAN2000
JAN2005
JAN2010
Month
Source: FF Benchmark vs Kazumon
FF 8 portfolios


Monthly FF Portfolios: BL July 1980 – June 2006
Correlation: BL = 0.9994
FF LT Reversal Big Low
Kazumori LT Reversal Big Low
Monthly Return of Portfolio(%)
20.00
10.00
0.00
−10.00
−20.00
−30.00
JAN1980
JAN1985
JAN1990
JAN1995
JAN2000
JAN2005
JAN2010
Month
Source: FF Benchmark vs Kazumon
FF 8 portfolios





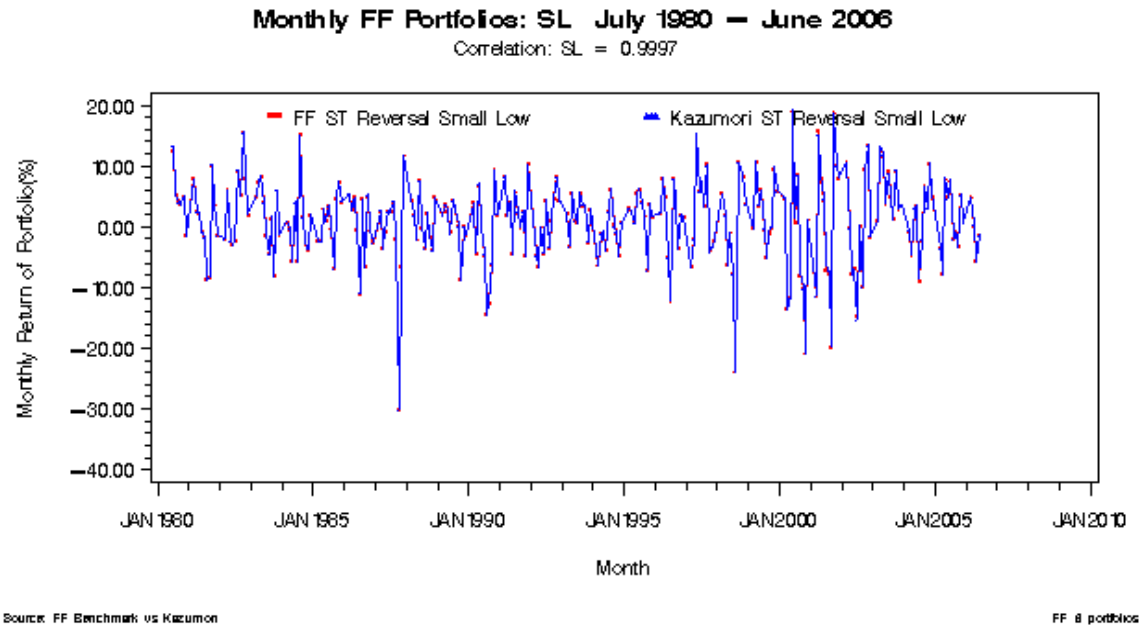
2.15. *The 2×3 Size and Short-Term Reversal Portfolios*

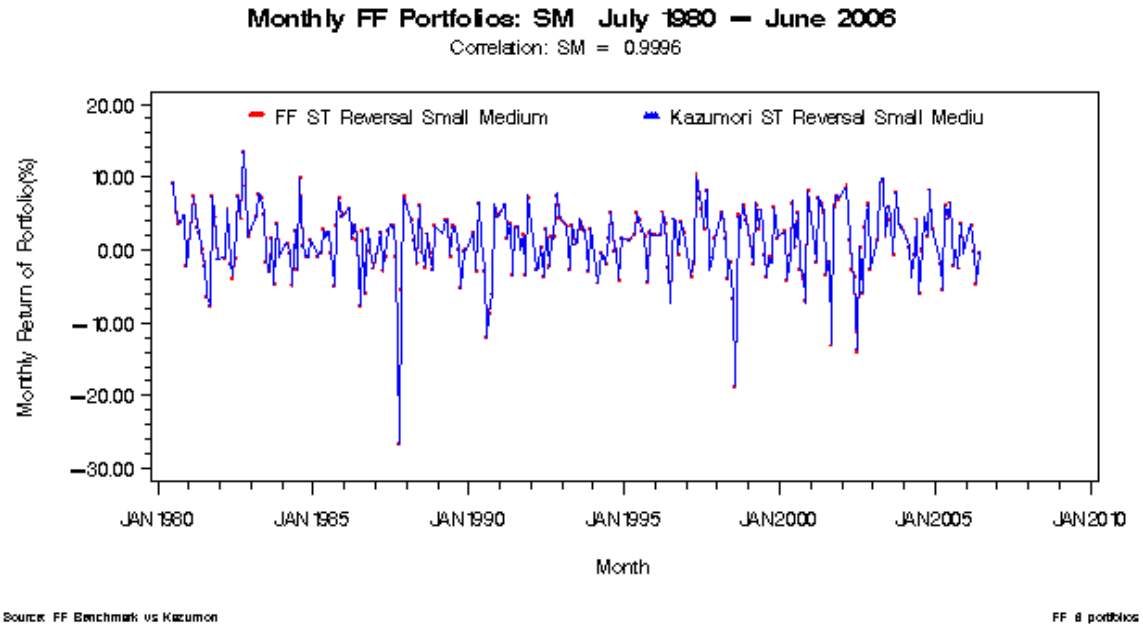
We use six value-weight portfolios formed on size and prior (1-1) returns to construct ST_Rev. The portfolios, which are formed monthly, are the intersections of 2 portfolios formed on size (market equity, ME) and 3 portfolios formed on prior (1-1) return. The

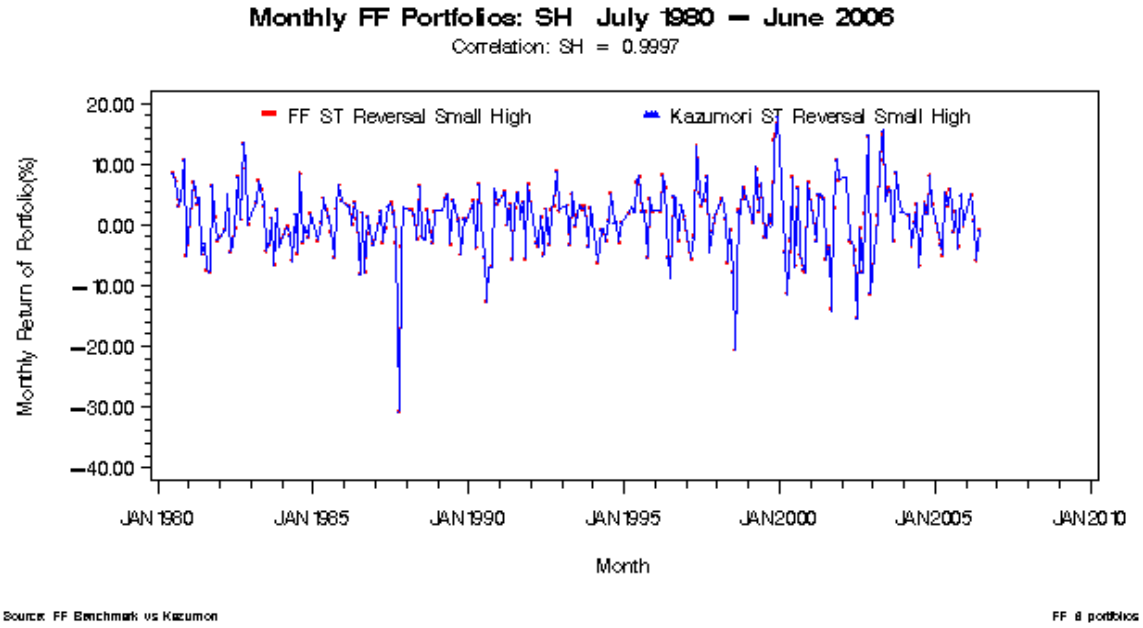
monthly size breakpoint is the median NYSE market equity. The monthly prior (1-1) return breakpoints are the 30th and 70th NYSE percentiles.

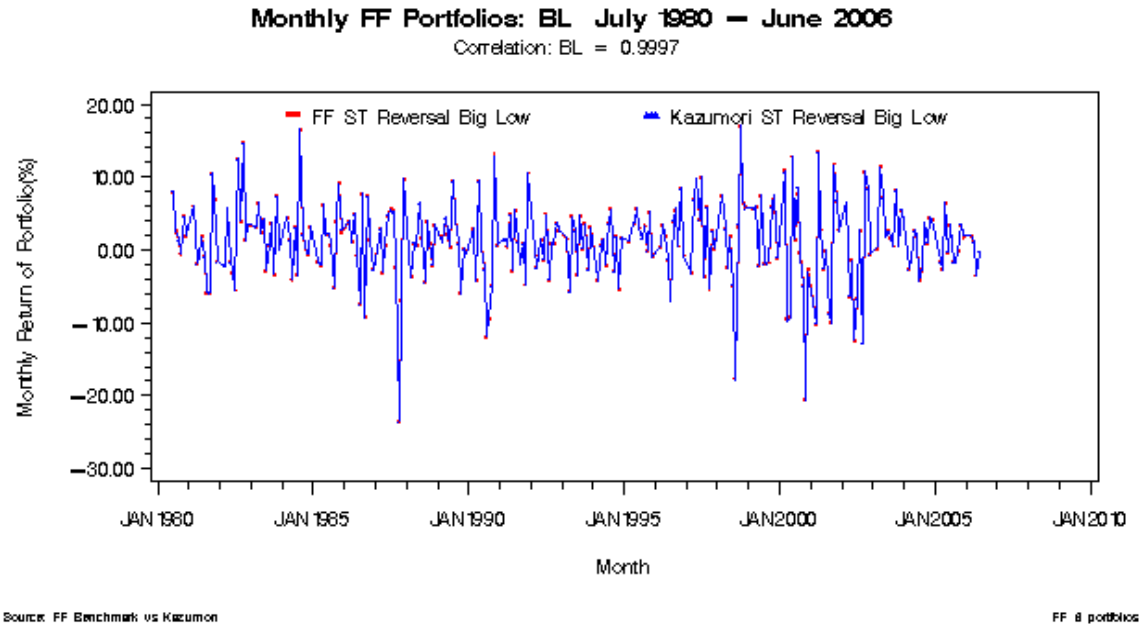
ST_Rev is the average return on the two low prior return portfolios minus the average return on the two high prior return portfolios, ST_Rev = 1/2 (Small Low + Big Low) - 1/2(Small High + Big High). The six portfolios used to construct ST_Rev each month include NYSE, AMEX, and NASDAQ stocks with prior return data. To be included in a portfolio for month t (formed at the end of the month t-1), a stock must have a price for the end of month t-2 and a good return for t-1. Each included stock also must have ME for the end of t-1.

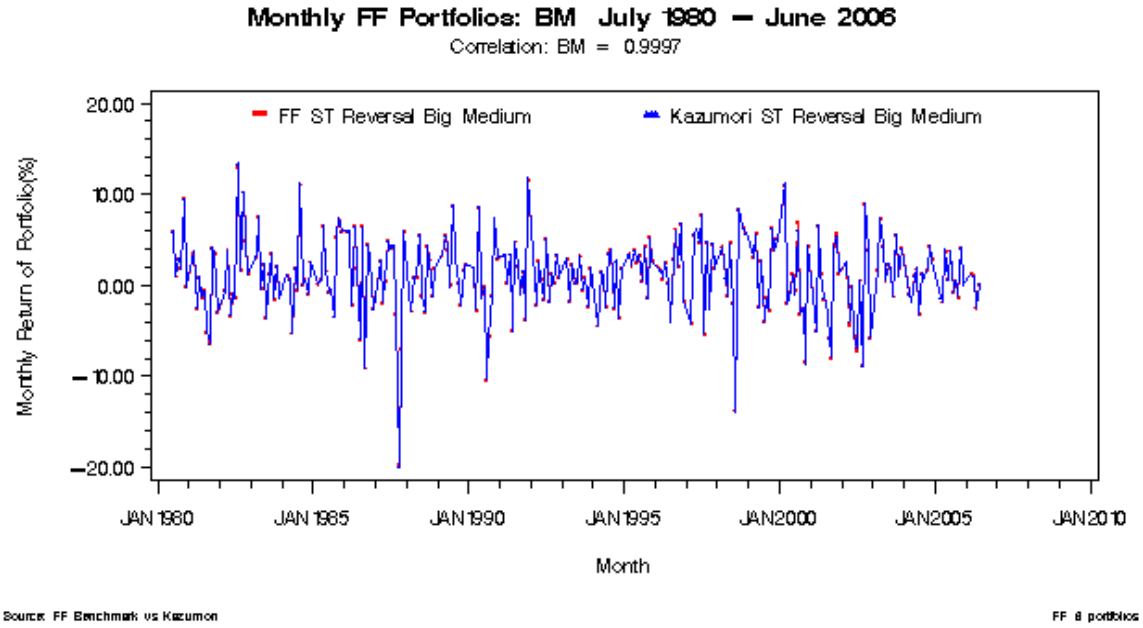
2.15.1. *Portfolios*

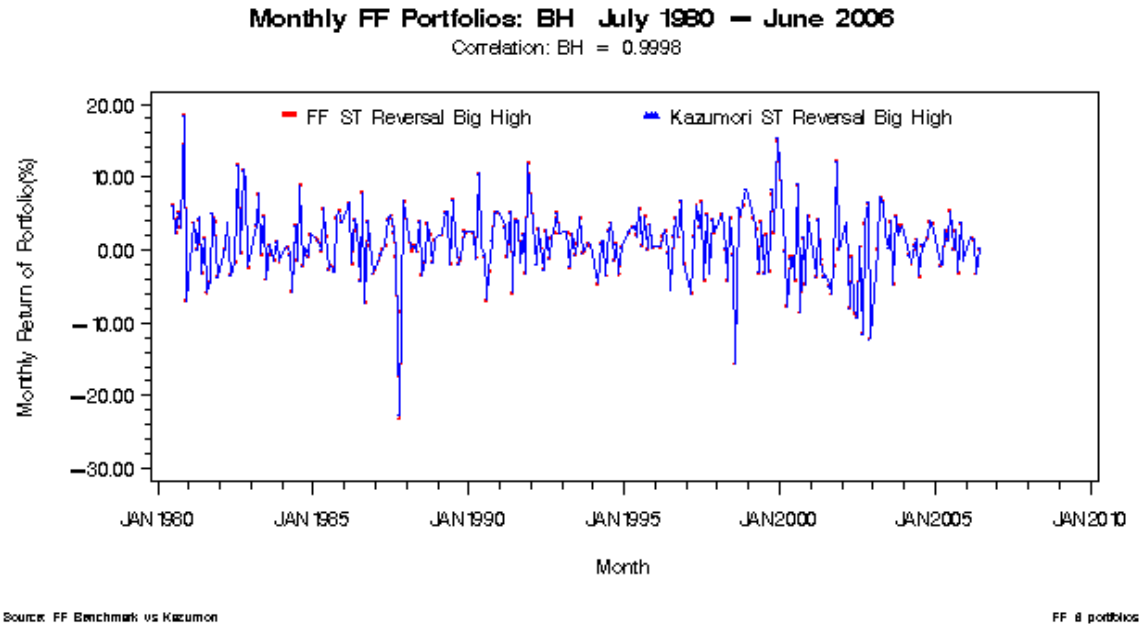



Monthly FF Portfolios: SM July 1980 – June 2006
Correlation: SM = 0.9996
FF ST Reversal Small Medium
Kazumori ST Reversal Small Mediu
Monthly Return of Portfolio(%)
20.00
10.00
0.00
−10.00
−20.00
−30.00
JAN1980
JAN1985
JAN1990
JAN1995
JAN2000
JAN2005
JAN2010
Month
Source: FF Benchmark vs Kazumori
FF 6 portfolios


Monthly FF Portfolios: SH July 1980 – June 2006
Correlation: SH = 0.9997
FF ST Reversal Small High
Kazumori ST Reversal Small High
Monthly Return of Portfolio(%)
20.00
10.00
0.00
−10.00
−20.00
−30.00
−40.00
JAN1980
JAN1985
JAN1990
JAN1995
JAN2000
JAN2005
JAN2010
Month
Source: FF Benchmark vs Kazumori
FF 6 portfolios


Monthly FF Portfolios: BL July 1980 — June 2006
Correlation: BL = 0.9997
FF ST Reversal Big Low
Kazumori ST Reversal Big Low
Monthly Return of Portfolio(%)
20.00
10.00
0.00
−10.00
−20.00
−30.00
JAN1980
JAN1985
JAN1990
JAN1995
JAN2000
JAN2005
JAN2010
Month
Source: FF Benchmark vs Kazumon
FF 8 portfolios


Monthly FF Portfolios: BM July 1980 — June 2006
Correlation: BM = 0.9997
FF ST Reversal Big Medium
Kazumori ST Reversal Big Medium
Monthly Return of Portfolio(%)
20.00
10.00
0.00
−10.00
−20.00
JAN1980
JAN1985
JAN1990
JAN1995
JAN2000
JAN2005
JAN2010
Month
Source: FF Benchmark vs Kazumon
FF 8 portfolios

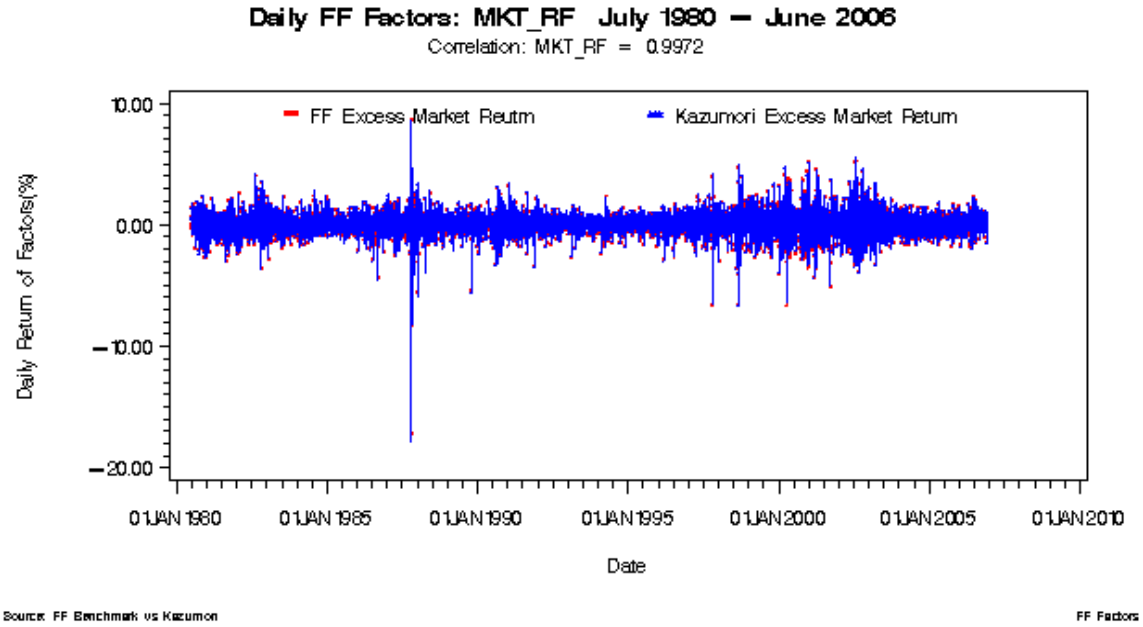


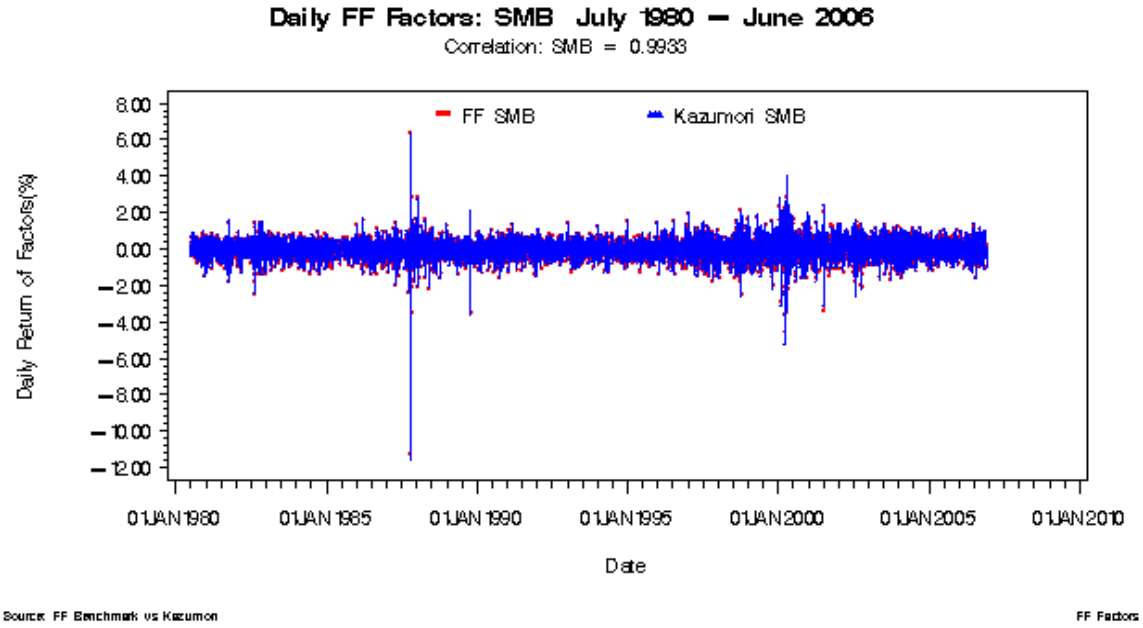
2.16. *Daily Factors*

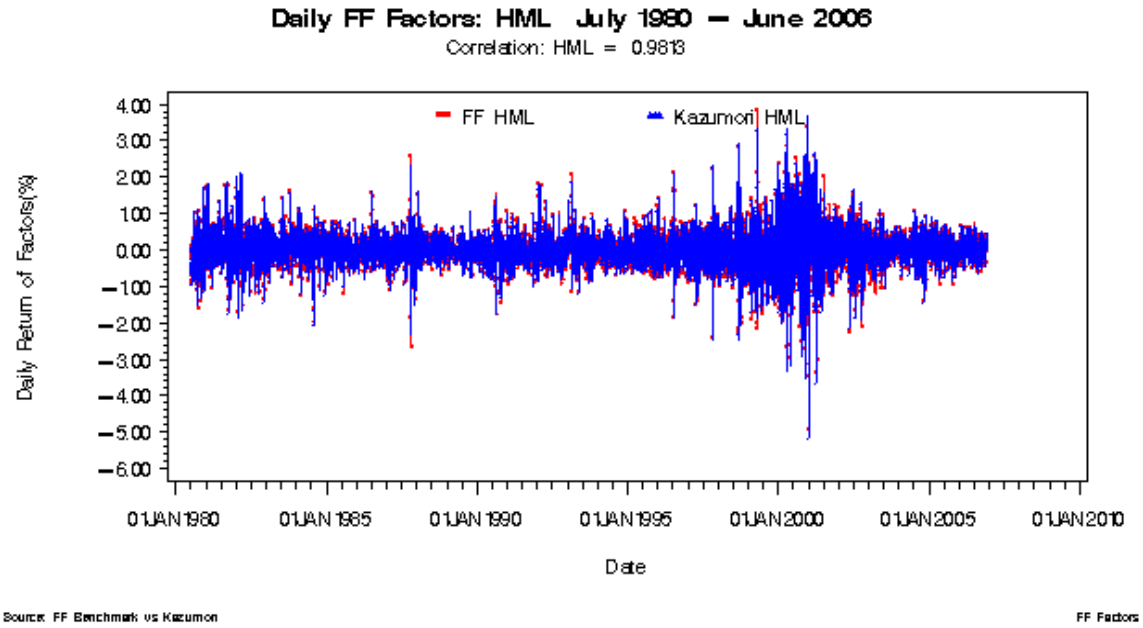
We calculated the daily factors for US data including:

- SMB (Size), HML (Value) and Excess Market Returns: The 2×3 portfolios used to calculate these 3 factors are formed once a YEAR, i.e., the same portfolios we used to calculate the monthly factors.
- ST/LT Reversals and Momentum: the 2×3 portfolios used to calculate these are formed each DAY based on previous days market equity and prior cumulative returns. This is different from the calculation of monthly factors. The monthly factors' portfolios were formed each month and the calculation of prior cumulative returns are also different.
  - For Short-term reversal, the cumulative prior returns are between prior day 20 to prior day 1 (The Monthly portfolios is prior month 1)
  - For Momentum, the cumulative prior returns are between prior day 250 to prior day 21 (The Monthly portfolios were prior month 12 to prior month 2)
  - For Long-term reversal, the cumulative prior returns are between prior day 1250 to prior day 251 (The Monthly portfolios were prior month 60 to prior month 13)

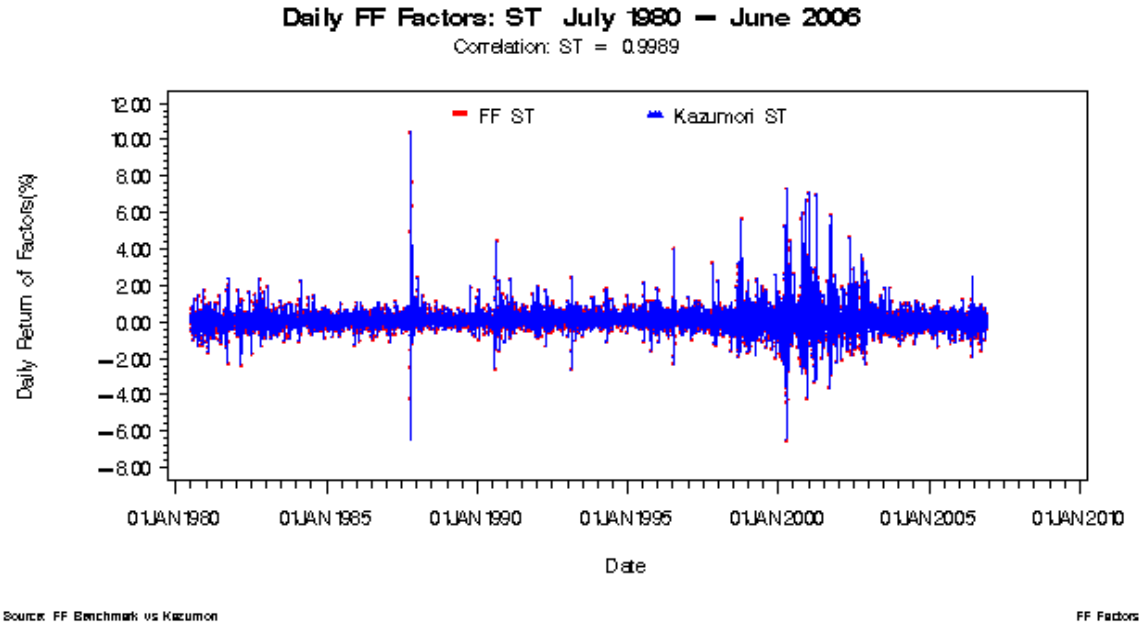
2.16.1. *SMB, HML, and Excess Market Returns*

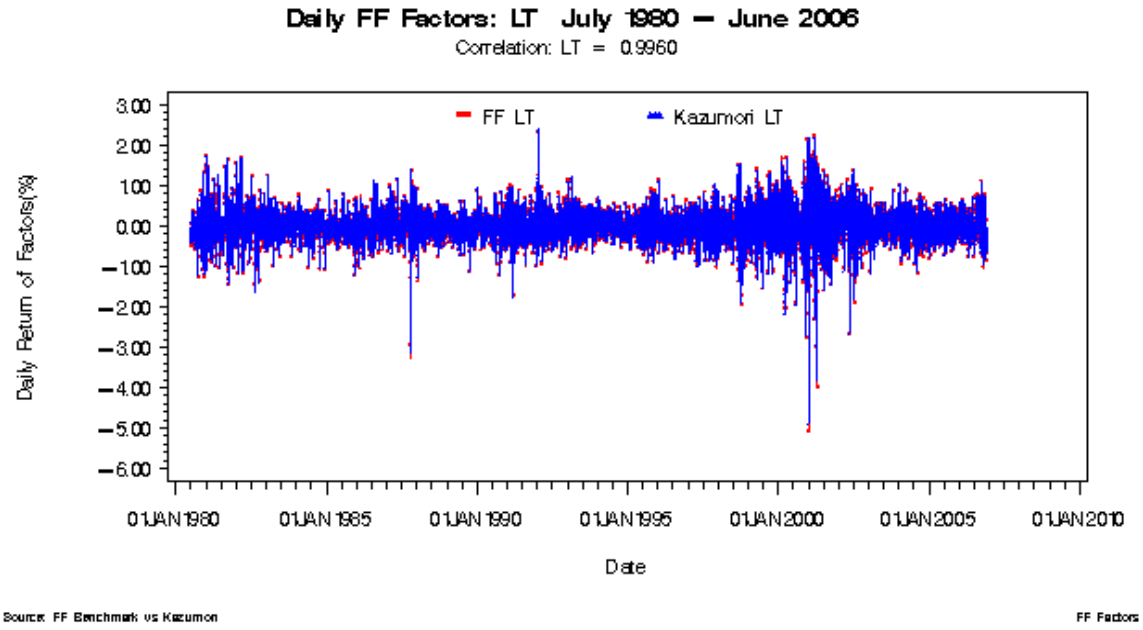


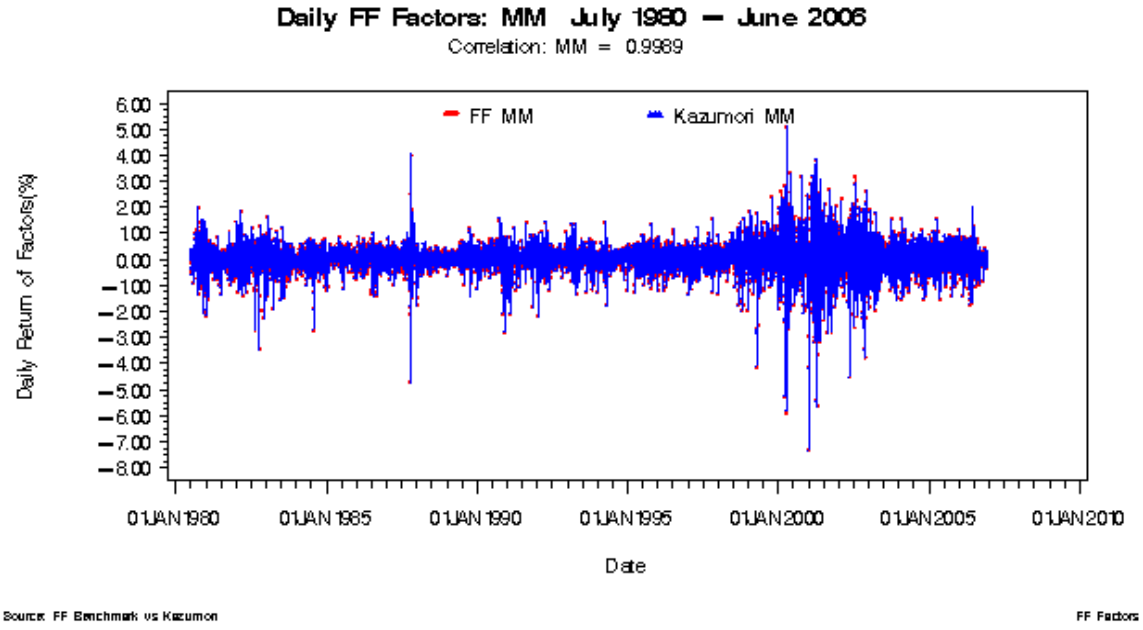




2.16.2. *S/T, L/T Reversals and Momentum*







2.17. *Replication of the US Three Factor Model by Fama and French (1992)*

In this section, we offer another validation of our methodology by showing that we can reproduce the canonical regression results of Fama and French (1992, 1993) with high precision.

2.17.1. *Fama and French (1992), Table 1b*

Table I—*Continued*

	All	Low-β	β-2	β-3	β-4	β-5	β-6	β-7	β-8	β-9	High-β
Panel B: Post-Ranking βs											
All		0.87	0.99	1.09	1.16	1.26	1.29	1.35	1.45	1.52	1.72
Small-ME	1.44	1.05	1.18	1.28	1.32	1.40	1.40	1.49	1.61	1.64	1.79
ME-2	1.39	0.91	1.15	1.17	1.24	1.36	1.41	1.43	1.50	1.66	1.76
ME-3	1.35	0.97	1.13	1.13	1.21	1.26	1.28	1.39	1.50	1.51	1.75
ME-4	1.34	0.78	1.03	1.17	1.16	1.29	1.37	1.46	1.51	1.64	1.71
ME-5	1.25	0.66	0.85	1.12	1.15	1.16	1.26	1.30	1.43	1.59	1.68
ME-6	1.23	0.61	0.78	1.05	1.16	1.22	1.28	1.36	1.46	1.49	1.70
ME-7	1.17	0.57	0.92	1.01	1.11	1.14	1.26	1.24	1.39	1.34	1.60
ME-8	1.09	0.53	0.74	0.94	1.02	1.13	1.12	1.18	1.26	1.35	1.52
ME-9	1.03	0.58	0.74	0.80	0.95	1.06	1.15	1.14	1.21	1.22	1.42
Large-ME	0.92	0.57	0.71	0.78	0.89	0.95	0.92	1.02	1.01	1.11	1.32

Table I Part 2: Post-Ranking Beta

	Beta										
Size	All	Low-beta	beta-2	beta-3	beta-4	beta-5	beta-6	beta-7	beta-8	beta-9	beta-10
All	1.36	1.04	1.11	1.20	1.30	1.31	1.38	1.42	1.50	1.59	1.73
Small-ME	1.47	1.16	1.24	1.33	1.43	1.46	1.53	1.55	1.64	1.77	1.81
ME-2	1.43	1.04	1.21	1.22	1.30	1.40	1.45	1.45	1.64	1.70	1.77
ME-3	1.39	1.02	1.14	1.23	1.29	1.35	1.42	1.49	1.43	1.55	1.80
ME-4	1.38	0.93	1.11	1.24	1.26	1.31	1.38	1.52	1.49	1.60	1.81
ME-5	1.34	0.87	1.08	1.15	1.34	1.26	1.37	1.40	1.57	1.58	1.66
ME-6	1.28	0.82	0.99	1.09	1.34	1.25	1.26	1.34	1.44	1.50	1.73
ME-7	1.23	0.91	0.95	1.19	1.18	1.20	1.21	1.27	1.28	1.37	1.67
ME-8	1.17	0.76	0.87	1.04	1.09	1.13	1.20	1.26	1.25	1.33	1.62
ME-9	1.11	0.71	0.83	1.04	1.10	1.06	1.08	1.22	1.29	1.33	1.35
Large-ME	0.96	0.64	0.81	0.82	0.99	0.93	0.95	0.96	1.08	1.05	1.35

2.17.2. *Fama and French (1992), Table 1c*

Panel C: Average Size (ln(ME))

All	4.11	3.86	4.26	4.33	4.41	4.27	4.32	4.26	4.19	4.03	3.77
Small-ME	2.24	2.12	2.27	2.30	2.30	2.28	2.29	2.30	2.32	2.25	2.15
ME-2	3.63	3.65	3.68	3.70	3.72	3.69	3.70	3.69	3.69	3.70	3.68
ME-3	4.10	4.14	4.18	4.12	4.15	4.16	4.16	4.18	4.14	4.15	4.15
ME-4	4.50	4.53	4.53	4.57	4.54	4.56	4.55	4.52	4.58	4.52	4.56
ME-5	4.89	4.91	4.91	4.93	4.95	4.93	4.92	4.93	4.92	4.92	4.95
ME-6	5.30	5.30	5.33	5.34	5.34	5.33	5.33	5.33	5.33	5.34	5.36
ME-7	5.73	5.73	5.75	5.77	5.76	5.73	5.77	5.77	5.76	5.72	5.76
ME-8	6.24	6.26	6.27	6.26	6.24	6.24	6.27	6.24	6.24	6.24	6.26
ME-9	6.82	6.82	6.84	6.82	6.82	6.81	6.81	6.81	6.81	6.80	6.83
Large-ME	7.93	7.94	8.04	8.10	8.04	8.02	8.02	7.94	7.80	7.75	7.62

Table I Part 3: Size

					Beta						
Size	All	Low-beta	beta-2	beta-3	beta-4	beta-5	beta-6	beta-7	beta-8	beta-9	beta-10
All	4.02	3.43	4.13	4.22	4.26	4.31	4.16	4.20	4.18	4.17	3.98
Small-ME	2.27	2.09	2.28	2.30	2.32	2.34	2.35	2.39	2.37	2.40	2.31
ME-2	3.71	3.71	3.70	3.71	3.70	3.70	3.70	3.71	3.72	3.71	3.72
ME-3	4.18	4.19	4.18	4.19	4.19	4.19	4.18	4.18	4.19	4.18	4.18
ME-4	4.60	4.60	4.61	4.60	4.61	4.60	4.60	4.59	4.59	4.59	4.61
ME-5	5.02	5.01	5.03	5.01	5.04	5.03	5.02	5.02	5.01	5.00	5.00
ME-6	5.44	5.44	5.45	5.45	5.46	5.44	5.44	5.42	5.44	5.43	5.45
ME-7	5.88	5.89	5.89	5.88	5.88	5.89	5.88	5.86	5.88	5.89	5.87
ME-8	6.38	6.40	6.38	6.39	6.37	6.38	6.40	6.37	6.38	6.37	6.38
ME-9	6.95	6.94	6.95	6.95	6.98	6.96	6.95	6.93	6.94	6.92	6.93
Large-ME	8.10	8.22	8.25	8.30	8.27	8.16	8.15	8.04	7.94	7.89	7.79

2.17.3. *Fama and French (1992), Table 2a*

	1A	1B	2	3	4	5	6	7	8	9	10A	10B
						Panel A: Portfolios Formed on Size						
Return	1.64	1.16	1.29	1.24	1.25	1.29	1.17	1.07	1.10	0.95	0.88	0.90
β	1.44	1.44	1.39	1.34	1.33	1.24	1.22	1.16	1.08	1.02	0.95	0.90
ln(ME)	1.98	3.18	3.63	4.10	4.50	4.89	5.30	5.73	6.24	6.82	7.39	8.44
ln(BE/ME)	−0.01	−0.21	−0.23	−0.26	−0.32	−0.36	−0.36	−0.44	−0.40	−0.42	−0.51	−0.65
ln(A/ME)	0.73	0.50	0.46	0.43	0.37	0.32	0.32	0.24	0.29	0.27	0.17	−0.03
ln(A/BE)	0.75	0.71	0.69	0.69	0.68	0.67	0.68	0.67	0.69	0.70	0.68	0.62
E/P dummy	0.26	0.14	0.11	0.09	0.06	0.04	0.04	0.03	0.03	0.02	0.02	0.01
E(+)/P	0.09	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.09	0.09
Firms	772	189	236	170	144	140	128	125	119	114	60	64

FF92 Table II a, Size

Variables	1A	1B	2	3	4	5	6	7	8	9	10A	10B
1. Return	1.62	1.19	1.13	1.17	1.22	1.20	1.13	1.10	1.09	0.90	0.90	0.87
2. Beta	1.47	1.49	1.43	1.39	1.38	1.34	1.28	1.23	1.17	1.11	0.98	0.95
3. ln(ME)	2.03	3.24	3.71	4.18	4.60	5.02	5.44	5.88	6.38	6.95	7.54	8.65
4. ln(BE/ME)	-0.01	-0.23	-0.24	-0.28	-0.33	-0.38	-0.39	-0.47	-0.46	-0.49	-0.55	-0.73
5. ln(A/ME)	0.74	0.49	0.46	0.42	0.35	0.29	0.26	0.17	0.17	0.15	0.08	-0.14
6. ln(A/BE)	0.75	0.72	0.70	0.69	0.68	0.66	0.65	0.63	0.63	0.64	0.63	0.59
7. E/P Dummy	0.26	0.15	0.12	0.08	0.06	0.04	0.04	0.03	0.03	0.02	0.02	0.01
8. E(+)/P	0.09	0.10	0.10	0.10	0.10	0.10	0.10	0.09	0.10	0.10	0.09	0.09
9. Firms	776.12	170.77	212.14	149.26	131.21	114.75	103.89	97.45	91.72	87.52	42.92	42.67

2.17.4. *Fama and French (1992) Table 2b*

	1A	1B	2	3	4	5	6	7	8	9	10A	10B
Panel B: Portfolios Formed on Pre-Ranking β												
Return	1.20	1.20	1.32	1.26	1.31	1.30	1.30	1.23	1.23	1.33	1.34	1.18
β	0.81	0.79	0.92	1.04	1.13	1.19	1.26	1.32	1.41	1.52	1.63	1.73
ln(ME)	4.21	4.86	4.75	4.68	4.59	4.48	4.36	4.25	3.97	3.78	3.52	3.15
ln(BE/ME)	−0.18	−0.13	−0.22	−0.21	−0.23	−0.22	−0.22	−0.25	−0.23	−0.27	−0.31	−0.50
ln(A/ME)	0.60	0.66	0.49	0.45	0.42	0.42	0.45	0.42	0.47	0.46	0.46	0.31
ln(A/BE)	0.78	0.79	0.71	0.66	0.64	0.65	0.67	0.67	0.70	0.73	0.77	0.81
E/P dummy	0.12	0.06	0.09	0.09	0.08	0.09	0.10	0.12	0.12	0.14	0.17	0.23
E(+)/P	0.11	0.12	0.10	0.10	0.10	0.10	0.10	0.09	0.10	0.09	0.09	0.08
Firms	116	80	185	181	179	182	185	205	227	267	165	291

FF92 Table II b, Pre-ranking beta

Variables	1A	1B	2	3	4	5	6	7	8	9	10A	10B
1. Return	1.45	1.34	1.32	1.28	1.34	1.26	1.25	1.18	1.14	1.13	1.24	1.09
2. Beta	1.04	1.02	1.09	1.17	1.24	1.30	1.35	1.41	1.48	1.59	1.71	1.77
3. ln(ME)	3.35	4.17	4.32	4.41	4.37	4.40	4.30	4.21	4.07	3.89	3.71	3.37
4. ln(BE/ME)	-0.17	-0.09	-0.18	-0.21	-0.22	-0.24	-0.26	-0.26	-0.27	-0.33	-0.43	-0.55
5. ln(A/ME)	0.48	0.55	0.45	0.44	0.44	0.43	0.42	0.45	0.47	0.42	0.35	0.28
6. ln(A/BE)	0.65	0.64	0.63	0.65	0.66	0.66	0.68	0.71	0.73	0.75	0.77	0.82
7. E/P Dummy	0.16	0.11	0.10	0.11	0.11	0.10	0.11	0.13	0.14	0.16	0.17	0.24
8. E(+)/P	0.10	0.11	0.10	0.10	0.10	0.10	0.10	0.09	0.09	0.09	0.08	0.08
9. Firms	196.35	97.50	193.10	172.25	166.52	162.92	169.75	175.64	181.15	208.78	121.61	174.86

2.17.5. *Fama and French (1992) Table 3*

β	ln(ME)	ln(BE/ME)	ln(A/ME)	ln(A/BE)	E/P Dummy	E(+)/P
0.15 (0.46)						
	−0.15 (−2.58)					
−0.37 (−1.21)	−0.17 (−3.41)					
		0.50 (5.71)				
			0.50 (5.69)	−0.57 (−5.34)		
					0.57 (2.28)	4.72 (4.57)
	−0.11 (−1.99)	0.35 (4.44)				
	−0.11 (−2.06)		0.35 (4.32)	−0.50 (−4.56)		
	−0.16 (−3.06)				0.06 (0.38)	2.99 (3.04)
	−0.13 (−2.47)	0.33 (4.46)			−0.14 (−0.90)	0.87 (1.23)
	−0.13 (−2.47)		0.32 (4.28)	−0.46 (−4.45)	−0.08 (−0.56)	1.15 (1.57)

Model	_STAT_	Beta	ln(ME)	ln(BE/ME)	ln(A/ME)	ln(A/BE)	E/P Dummy	E(+)/P
1	MEAN	0.03	.	.	.	.	.	.
	T	0.09	.	.	.	.	.	.
2	MEAN	.	-0.15	.	.	.	.	.
	T	.	-2.77	.	.	.	.	.
3	MEAN	-0.55	-0.19	.	.	.	.	.
	T	-1.73	-3.59	.	.	.	.	.
4	MEAN	.	.	0.43	.	.	.	.
	T	.	.	4.99	.	.	.	.
5	MEAN	.	.	.	0.43	-0.28	.	.
	T	.	.	.	5.03	-2.24	.	.
6	MEAN	.	.	.	.	.	0.54	3.71
	T	.	.	.	.	.	2.38	4.40
7	MEAN	.	-0.12	0.29	.	.	.	.
	T	.	-2.19	3.69	.	.	.	.
8	MEAN	.	-0.12	.	0.29	-0.27	.	.
	T	.	-2.20	.	3.72	-2.13	.	.
9	MEAN	.	-0.16	.	.	.	0.10	2.46
	T	.	-3.10	.	.	.	0.68	3.02
10	MEAN	.	-0.13	0.26	.	.	-0.04	0.96
	T	.	-2.55	3.43	.	.	-0.31	1.63
11	MEAN	.	-0.13	.	0.27	-0.23	-0.07	1.01
	T	.	-2.52	.	3.53	-1.94	-0.49	1.64

2.17.6. *Fama and French (1992) Table 4a*

Portfolio	0	1A	1B	2	3	4	5	6	7	8	9	10A	10B
Panel A: Stocks Sorted on Book-to-Market Equity (BE/ME)													
Return		0.30	0.67	0.87	0.97	1.04	1.17	1.30	1.44	1.50	1.59	1.92	1.83
β		1.36	1.34	1.32	1.30	1.28	1.27	1.27	1.27	1.27	1.29	1.33	1.35
ln(ME)		4.53	4.67	4.69	4.56	4.47	4.38	4.23	4.06	3.85	3.51	3.06	2.65
ln(BE/ME)		−2.22	−1.51	−1.09	−0.75	−0.51	−0.32	−0.14	0.03	0.21	0.42	0.66	1.02
ln(A/ME)		−1.24	−0.79	−0.40	−0.05	0.20	0.40	0.56	0.71	0.91	1.12	1.35	1.75
ln(A/BE)		0.94	0.71	0.68	0.70	0.71	0.71	0.70	0.68	0.70	0.70	0.70	0.73
E/P dummy		0.29	0.15	0.10	0.08	0.08	0.08	0.09	0.09	0.11	0.15	0.22	0.36
E(+)/P		0.03	0.04	0.06	0.08	0.09	0.10	0.11	0.11	0.12	0.12	0.11	0.10
Firms		89	98	209	222	226	230	235	237	239	239	120	117

FF92 Table IV a, BE/ME

Variables	1A	1B	2	3	4	5	6	7	8	9	10A	10B
1. Return	0.69	0.78	0.88	1.02	1.08	1.18	1.29	1.44	1.46	1.56	1.71	1.84
2. Beta	1.39	1.39	1.36	1.36	1.34	1.35	1.34	1.34	1.34	1.36	1.38	1.39
3. ln(ME)	4.37	4.61	4.70	4.53	4.41	4.22	4.12	3.92	3.69	3.36	2.91	2.57
4. ln(BE/ME)	-2.34	-1.52	-1.07	-0.72	-0.48	-0.28	-0.10	0.07	0.24	0.46	0.70	1.11
5. ln(A/ME)	-0.96	-0.81	-0.40	-0.04	0.21	0.41	0.57	0.74	0.94	1.15	1.41	1.85
6. ln(A/BE)	1.01	0.72	0.67	0.68	0.69	0.69	0.67	0.67	0.70	0.70	0.71	0.74
7. E/P Dummy	0.34	0.18	0.11	0.08	0.08	0.09	0.09	0.09	0.12	0.17	0.26	0.35
8. E(+)/P	0.03	0.04	0.06	0.08	0.09	0.10	0.11	0.12	0.12	0.12	0.11	0.12
9. Firms	100.41	101.03	202.27	202.13	202.10	202.29	202.12	201.85	202.17	201.91	100.91	101.25

2.17.7. *Fama and French (1992) Table 4b*

Table IV—*Continued*

Portfolio	0	1A	1B	2	3	4	5	6	7	8	9	10A	10B
Panel B: Stocks Sorted on Earnings-Price Ratio (E/P)													
Return	1.46	1.04	0.93	0.94	1.03	1.18	1.22	1.33	1.42	1.46	1.57	1.74	1.72
β	1.47	1.40	1.35	1.31	1.28	1.26	1.25	1.26	1.24	1.23	1.24	1.28	1.31
ln(ME)	2.48	3.64	4.33	4.61	4.64	4.63	4.58	4.49	4.37	4.28	4.07	3.82	3.52
ln(BE/ME)	−0.10	−0.76	−0.91	−0.79	−0.61	−0.47	−0.33	−0.21	−0.08	0.02	0.15	0.26	0.40
ln(A/ME)	0.90	−0.05	−0.27	−0.16	0.03	0.18	0.31	0.44	0.58	0.70	0.85	1.01	1.25
ln(A/BE)	0.99	0.70	0.63	0.63	0.64	0.65	0.64	0.65	0.66	0.68	0.71	0.75	0.86
E/P dummy	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
E(+)/P	0.00	0.01	0.03	0.05	0.06	0.08	0.09	0.11	0.12	0.14	0.16	0.20	0.28
Firms	355	88	90	182	190	193	196	194	197	195	195	95	91

FF92 Table IV b, E/P

Variables	0	1A	1B	2	3	4	5	6	7	8	9	10A	10B
1. Return	1.54	0.91	0.88	0.95	1.08	1.13	1.25	1.26	1.34	1.35	1.58	1.64	1.68
2. Beta	1.49	1.44	1.37	1.36	1.35	1.32	1.32	1.31	1.30	1.31	1.32	1.35	1.39
3. ln(ME)	2.51	3.52	4.38	4.56	4.58	4.58	4.55	4.40	4.36	4.20	3.95	3.74	3.29
4. ln(BE/ME)	-0.11	-0.79	-0.95	-0.78	-0.61	-0.45	-0.31	-0.19	-0.09	0.03	0.16	0.25	0.46
5. ln(A/ME)	0.86	-0.09	-0.31	-0.16	-0.00	0.17	0.32	0.44	0.56	0.69	0.86	1.03	1.34
6. ln(A/BE)	0.98	0.69	0.64	0.61	0.60	0.62	0.63	0.63	0.65	0.67	0.70	0.77	0.88
7. E/P Dummy	0.99	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8. E(+)/P	0.00	0.01	0.03	0.05	0.06	0.08	0.09	0.11	0.12	0.14	0.16	0.20	0.31
9. Firms	350.13	83.02	83.56	167.06	166.93	167.26	167.12	166.91	167.01	167.05	166.97	83.47	83.94

2.17.8. *Fama and French (1992) Table 5*

	Book-to-Market Portfolios										
	All	Low	2	3	4	5	6	7	8	9	High
All	1.23	0.64	0.98	1.06	1.17	1.24	1.26	1.39	1.40	1.50	1.63
Small-ME	1.47	0.70	1.14	1.20	1.43	1.56	1.51	1.70	1.71	1.82	1.92
ME-2	1.22	0.43	1.05	0.96	1.19	1.33	1.19	1.58	1.28	1.43	1.79
ME-3	1.22	0.56	0.88	1.23	0.95	1.36	1.30	1.30	1.40	1.54	1.60
ME-4	1.19	0.39	0.72	1.06	1.36	1.13	1.21	1.34	1.59	1.51	1.47
ME-5	1.24	0.88	0.65	1.08	1.47	1.13	1.43	1.44	1.26	1.52	1.49
ME-6	1.15	0.70	0.98	1.14	1.23	0.94	1.27	1.19	1.19	1.24	1.50
ME-7	1.07	0.95	1.00	0.99	0.83	0.99	1.13	0.99	1.16	1.10	1.47
ME-8	1.08	0.66	1.13	0.91	0.95	0.99	1.01	1.15	1.05	1.29	1.55
ME-9	0.95	0.44	0.89	0.92	1.00	1.05	0.93	0.82	1.11	1.04	1.22
Large-ME	0.89	0.93	0.88	0.84	0.71	0.79	0.83	0.81	0.96	0.97	1.18

Table V: Portfolio Returns

	Book-to-Market										
Size	All	Low	2	3	4	5	6	7	8	9	High
All	1.24	0.89	1.01	1.08	1.10	1.22	1.29	1.33	1.42	1.48	1.58
Small-ME	1.53	1.31	1.35	1.35	1.36	1.37	1.38	1.40	1.41	1.44	1.41
ME-2	1.13	0.98	0.99	1.01	1.11	1.06	1.09	1.11	1.12	1.12	1.18
ME-3	1.17	0.93	0.92	0.99	1.01	1.08	1.19	1.12	1.23	1.28	1.23
ME-4	1.22	1.07	1.02	1.20	1.12	1.18	1.16	1.26	1.27	1.27	1.26
ME-5	1.20	0.98	1.19	1.09	1.12	1.31	1.21	1.19	1.26	1.39	1.24
ME-6	1.13	0.92	1.11	1.10	1.23	1.17	1.20	1.20	1.25	1.35	1.29
ME-7	1.10	1.06	1.00	1.11	1.09	0.99	1.09	1.16	1.09	1.13	1.16
ME-8	1.09	1.00	1.03	1.07	1.16	1.01	1.13	1.12	1.13	1.18	1.18
ME-9	0.90	0.75	0.88	0.89	0.95	1.07	0.99	0.90	0.98	1.00	1.00
Large-ME	0.89	0.86	0.97	0.84	0.85	0.89	0.91	0.95	0.93	0.94	0.99

2.17.9. *Fama and French (1992) Table 6*

Variable	7/63–12/90 (330 Mos.) Mean	Std	t(Mn)	7/63–12/76 (162 Mos.) Mean	Std	t(Mn)	1/77–12/90 (168 Mos.) Mean	Std	t(Mn)
NYSE Value-Weighted (VW) and Equal-Weighted (EW) Portfolio Returns									
VW	0.81	4.47	3.27	0.56	4.26	1.67	1.04	4.66	2.89
EW	0.97	5.49	3.19	0.77	5.70	1.72	1.15	5.28	2.82
$R_{it} = a + b_{2t}\ln(ME_{it}) + b_{3t}\ln(BE/ME_{it}) + e_{it}$									
a	1.77	8.51	3.77	1.86	10.10	2.33	1.69	6.67	3.27
b_2	−0.11	1.02	−1.99	−0.16	1.25	−1.62	−0.07	0.73	−1.16
b_3	0.35	1.45	4.43	0.36	1.53	2.96	0.35	1.37	3.30
$R_{it} = a + b_{1t}\beta_{it} + b_{2t}\ln(ME_{it}) + b_{3t}\ln(BE/ME_{it}) + e_{it}$									
a	2.07	5.75	6.55	1.73	6.22	3.54	2.40	5.25	5.92
b_1	−0.17	5.12	−0.62	0.10	5.33	0.25	−0.44	4.91	−1.17
b_2	−0.12	0.89	−2.52	−0.15	1.03	−1.91	−0.09	0.74	−1.64
b_3	0.33	1.24	4.80	0.34	1.36	3.17	0.31	1.10	3.67

Table VI a: NYSE VW and EW Portfolio Returns

	Period								
	1. 7/63 - 12/90(330 Mos.)			2. 7/63 - 12/76(162 Mos.)			3. 1/77 - 12/90(168 Mos.)		
Variable									
VW	0.91	4.50	3.66	0.65	4.33	1.91	1.16	4.65	3.22
EW	1.18	6.03	3.56	1.05	6.63	2.02	1.31	5.41	3.14

Table VI b/c: 2 Models

		Period								
		1. 7/63 - 12/90(330 Mos.)			2. 7/63 - 12/76(162 Mos.)			3. 1/77 - 12/90(168 Mos.)		
Model	Variable									
ME+BEME	a	1.78	8.50	3.80	1.76	10.09	2.22	1.79	6.65	3.49
	b2	-0.12	1.00	-2.19	-0.14	1.22	-1.46	-0.10	0.74	-1.80
	b3	0.29	1.43	3.69	0.29	1.52	2.43	0.29	1.35	2.81
Beta+ME+BEME	a	2.45	6.66	6.69	1.99	7.37	3.44	2.90	5.88	6.39
	b1	-0.40	5.45	-1.35	-0.10	5.70	-0.23	-0.69	5.20	-1.73
	b2	-0.15	0.94	-2.86	-0.16	1.10	-1.84	-0.14	0.76	-2.35
	b3	0.26	1.28	3.68	0.27	1.42	2.46	0.25	1.14	2.79

3. TECHNICAL DESCRIPTIONS OF THE JAPAN DATA LIBRARY

This section describes the details for constructing all portfolios in the Japan Data Library. We apply the algorithm used in the data library for US markets to the Japanese data.

3.1. *Data Source*

All the data we used are from Nikkei Database (daily). Nikkei data covered more firms than MSCI Index. As of September 2008, the # of firms in Nikkei was 3,956 while MSCI covered 1,168. Traditionally, Japanese firms reported Non-consolidated financial reports only but there are a increasing # of firms reporting Consolidated financial reports due to the accounting reforms in early 2000s.

Japan markets do not have a risk-free instrument like US's 30 days T-Bill. So we used the overnight collateralized REPO rate (MAC_ID="CMBEMTU" in table MACMD) as the proxy for the Japan Risk-Free rate.

Japan stocks' fiscal year usually end at March of each year instead of December for US companies. As a result, the yearly portfolios for SMB (Size) and HML (Value) factors are rebalanced at the end of September each year instead of June for US market.

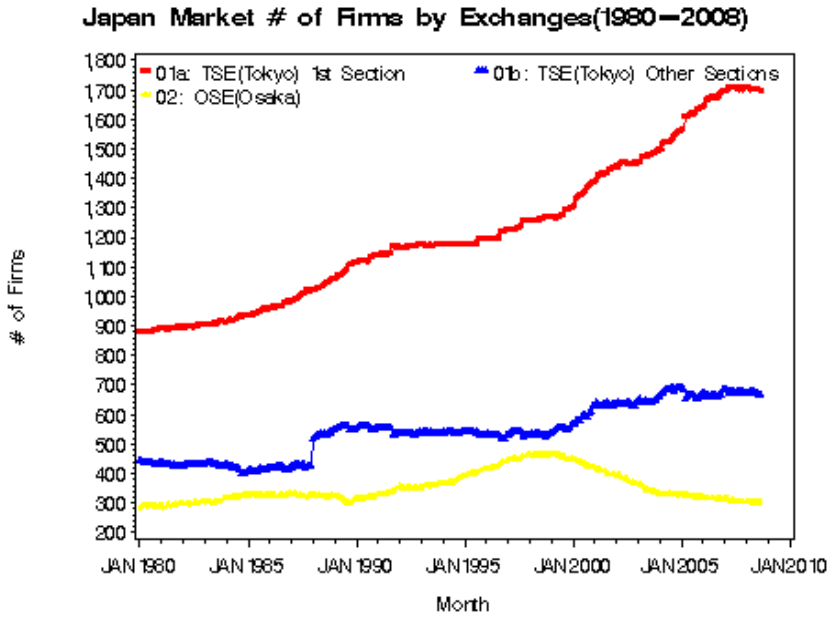
Since these Nikkei tables are updated daily, for earnings, cash flow, dividend and book equity, we can use the available data at the end of September directly for Japanese data instead of going through the convoluted merge process in US data.

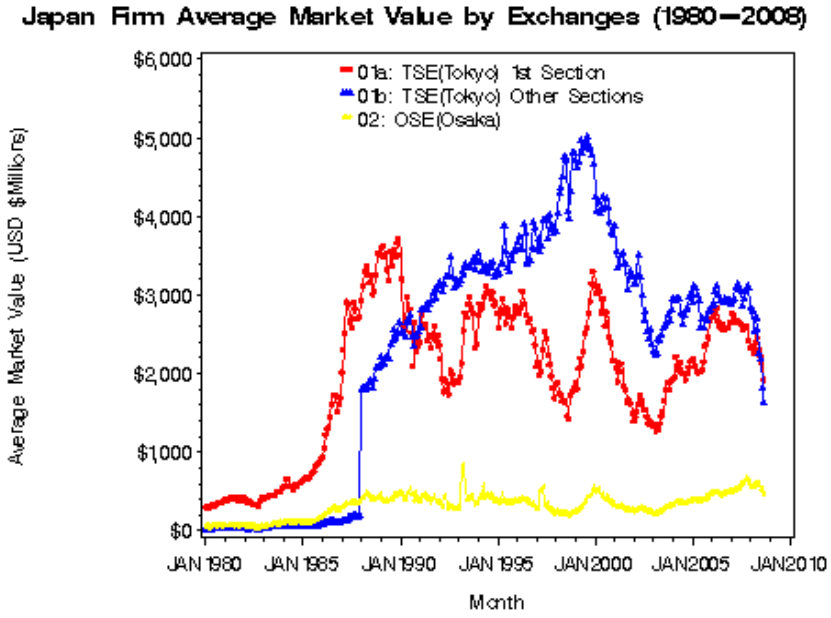
For the returns, Nikkei table DRET only provides the daily return (Return with dividends is the item RTN_INDIV in table DRET). As a result, we have to roll-up the daily returns into a monthly return.

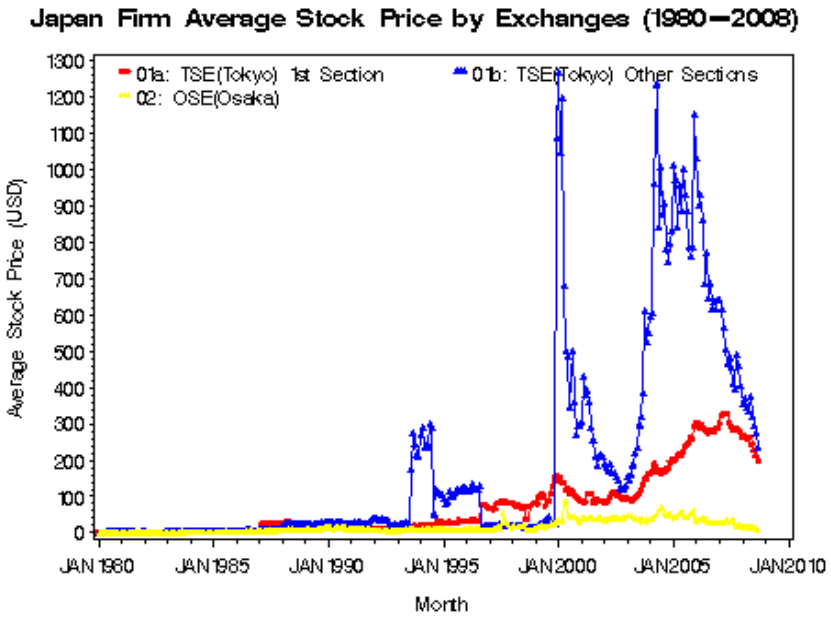
The Nikkei tables we used included the following:

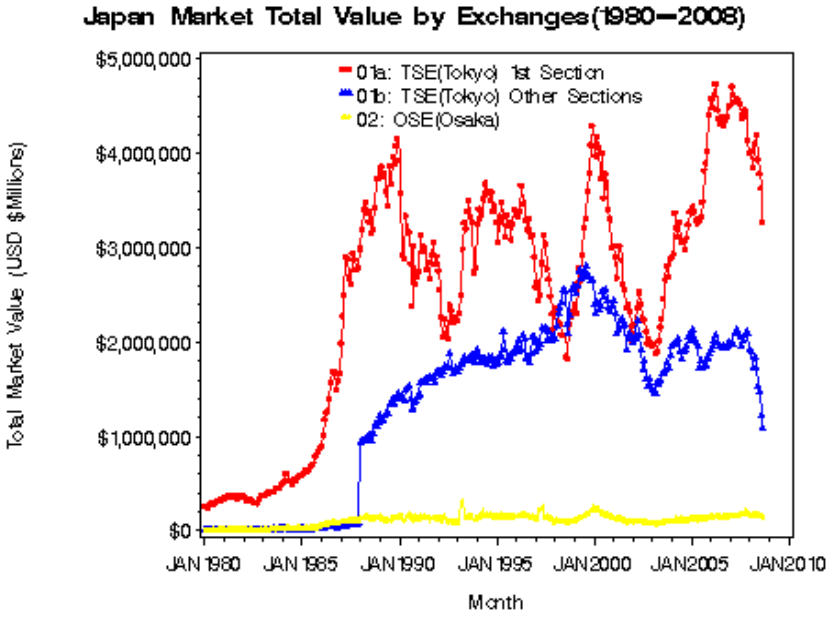
- DRET: Prices, returns, and other market data of each asset are recorded on a daily basis. Data are estimated in accordance with Nikkei's rule based on the pension fund rule. All listed stocks and OTC stocks data, except ETF are available.
- DFSC1: Financial results of the latest fiscal year, which are available as of the date you specify. (Consolidated results)
- DFSP1: Financial results of the latest fiscal year are available as of the date you specify. (Unconsolidated results)
- DFSC5: Financial results of the last 5 fiscal years, which are available as of the date you specify. (Consolidated results)
- DFSP5: Financial results of the last 5 fiscal years, which are available as of the date you specify. (Unconsolidated results)
- ATTR: Stocks' attribute data concerning markets. (e.g. industry classifications, listing market sections, trading units, etc.)
- Index Data - INDXDT: Daily Index Data.
- Macroeconomics Data (Monthly) - MACMD Monthly Macroeconomics Data.
- Macroeconomics Data (Daily) - MACDD Daily Macroeconomics Data.

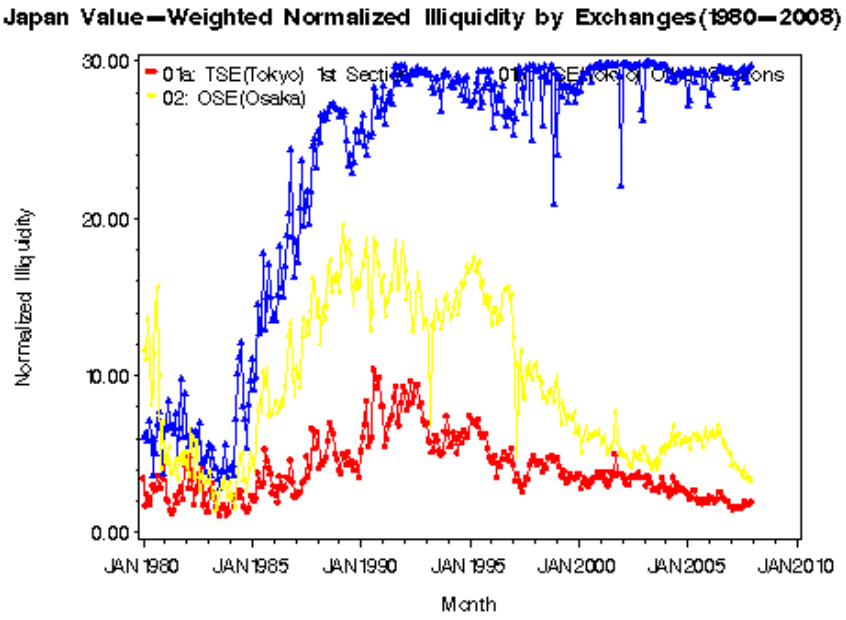
3.2. *Descriptive Statistics*






Japan Firm Average Stock Price by Exchanges (1980–2008)
01a: TSE(Tokyo) 1st Section
01b: TSE(Tokyo) Other Sections
02: OSE(Osaka)
Average Stock Price (USD)
1300
1200
1100
1000
900
800
700
600
500
400
300
200
100
0
JAN 1980
JAN 1985
JAN 1990
JAN 1995
JAN 2000
JAN 2005
JAN 2010
Month


Japan Market Total Value by Exchanges (1980–2008)
01a: TSE(Tokyo) 1st Section
01b: TSE(Tokyo) Other Sections
02: OSE(Osaka)
Total Market Value (USD $Millions)
$5,000,000
$4,000,000
$3,000,000
$2,000,000
$1,000,000
$0
JAN 1980
JAN 1985
JAN 1990
JAN 1995
JAN 2000
JAN 2005
JAN 2010
Month



3.3. *The Factors*

We provided 5 factors (monthly and daily): SMB (Size), HML (Value), Momentum, Short-Term Reversal, Long-Term Reversal. For SMB and HML factors, the portfolios are rebalanced once a year (each September, 6 months after the common fiscal year ending month for Japanese companies), regardless of monthly or daily factors. For Momentum, ST and LT Reversals, the portfolios are rebalanced each month (for monthly factors) and day (for daily factors). All the breakpoints (Medians, 30% and 70%) we used are based on stocks in the 1st Section (TSHO_MKT_SCTN=1 in Table DRET) in Tokyo Stock Exchange (PEN_MKT="01" in Table DRET). Due to the relatively short history of Consolidated Financial Reporting, we only listed the HML factor for Unconsolidated Financial Reporting.

The SMB and HML factors are constructed using 6 value-weighted portfolios sorted on size (item MKTV in Nikkei table DRET) and book equity/market equity ratio (BE/ME – BE is the item TOEQ_1 in table DFSP5 (for Non-Consolidated Reporting) while ME is the item MKTV in table DRET). In September of each year t, all common stocks traded in all Japanese stock markets (TSE - Tokyo, OSE – Osaka, Jasdaq and other exchanges) are sorted into two groups based on the market equity (size) from September using TSE 1st section median size. We also sort these stocks with positive BE/ME ratio into 3 groups, the low 30%, middle 40% and high 30% based on the BE/ME ratio (BE is the most recent available at the end of September while ME is the end of March of year t), using the breakpoints from TSE 1set section. We form 6 portfolios from the intersection of the two size and three BE/ME groups. Value-weighted returns on the 6 portfolios are calculated from October of year t to September of t+1 (monthly or daily), and the 6 portfolios are

rebalanced at the end of September of t+1. Return with dividends is the item RTN_INDIV in table DRET.

SMB is the difference of (Small-minus-Big) between the simple average of the returns on the 3 Small size portfolios and the simple average of the returns on the 3 Big size portfolios, i.e., SMB = 1/3 (Small Value + Small Neutral + Small Growth) - 1/3 (Big Value + Big Neutral + Big Growth). HML is the difference of (High-minus-Low) between the simple average of the returns on the 2 High BE/ME portfolios and the simple average of the returns on the 2 Low BE/ME portfolios, i.e., HML = 1/2 (Small Value + Big Value) - 1/2 (Small Growth + Big Growth). These 6 portfolios can be monthly or daily, depends on the frequency of the factors.

Momentum (MOM) is constructed using 6 value-weighted portfolios sorted on Size and Prior Cumulative Returns (Prior Months 2-12 for monthly factor and Prior Trading Days 21-250 for daily factor). These portfolios are rebalanced monthly (for monthly factor) or daily (for daily factor), are the intersections of 2 portfolios (Big and Small) formed on size (item MKTV in Table DRET) using TSE 1st section median size as the breakpoint and 3 portfolios (Low 30%, Middle 40%, High 30%) formed on prior cumulative returns using the 30th and 70th percentiles of prior cumulative returns of TSE 1st section as the breakpoints. MOM is the difference of the average returns of 2 High portfolios and the simple average of the returns of the 2 Low portfolios, i.e., MOM = 1/2 (Small High + Big High) - 1/2 (Small Low + Big Low).

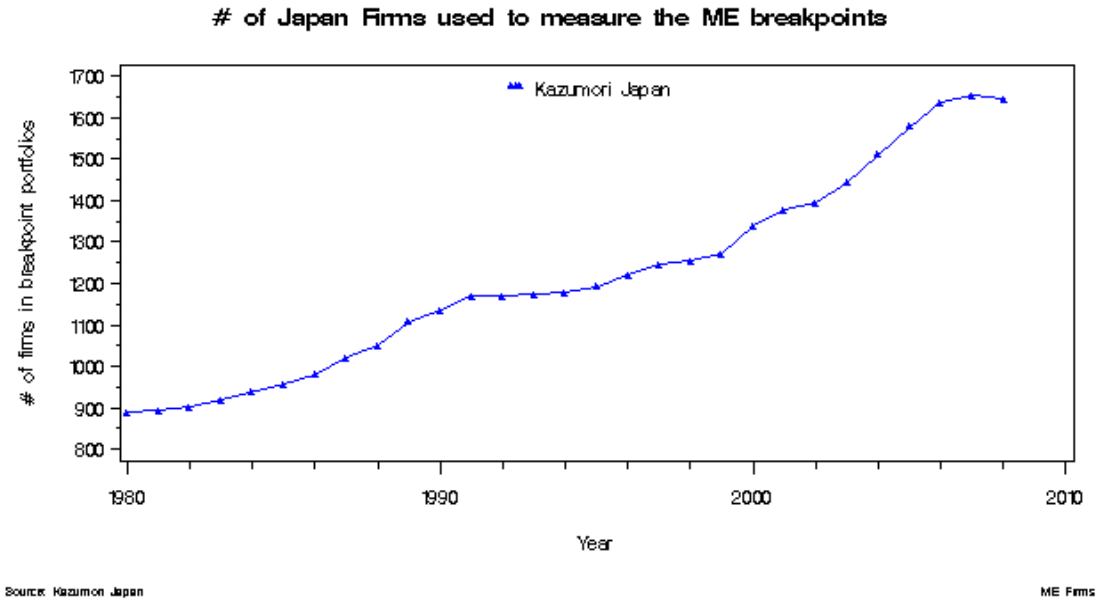
Long-Term Reversal (LTR) is constructed using 6 value-weighted portfolios sorted on Size and Prior Cumulative Returns (Prior Months 13-60 for monthly factor and Prior Trading Days 251-1250 for daily factor). These portfolios are rebalanced monthly (for monthly factor) or daily (for daily factor), are the intersections of 2 portfolios (Big and Small) formed on size (item MKTV in Table DRET) using TSE 1st section median size as the breakpoint and 3 portfolios (Low 30%, Middle 40%, High 30%) formed on prior cumulative returns using the 30th and 70th percentiles of prior cumulative returns of TSE 1st section as the breakpoints. LTR is the difference of the average returns of 2 Low portfolios and the simple average of the returns of the 2 High portfolios, i.e., LTR = 1/2 (Small Low + Big Low) - 1/2 (Small High + Big High).

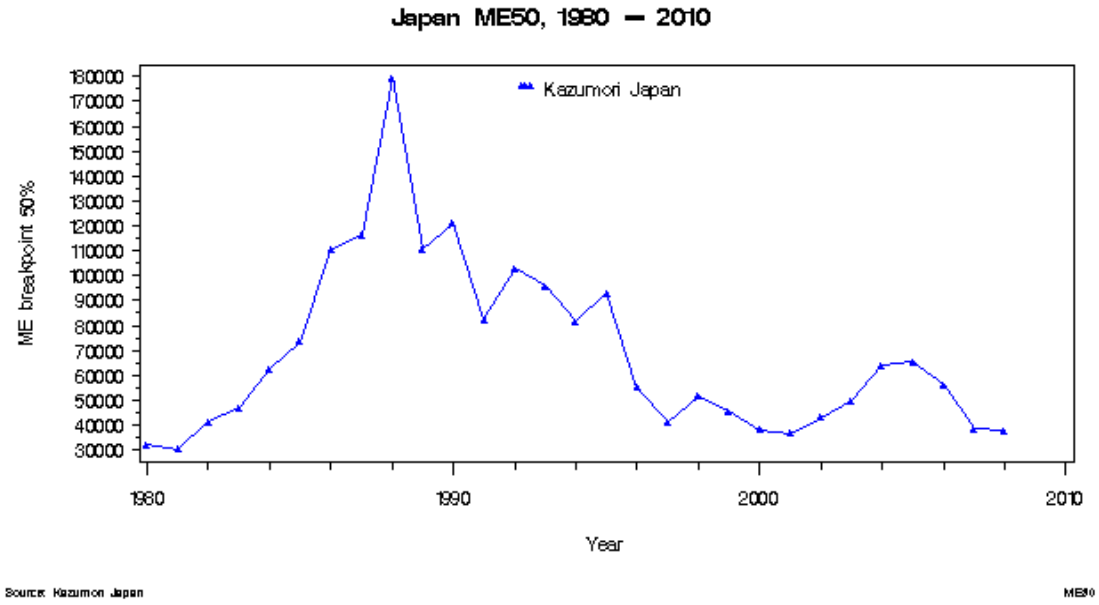
Similarly, Short-Term Reversal (STR) is constructed using 6 value-weighted portfolios sorted on Size and Prior Returns (Prior Months 1 for monthly factor and Prior Trading Day 1 for daily factor). These portfolios are rebalanced monthly (for monthly factor) or daily (for daily factor), are the intersections of 2 portfolios (Big and Small) formed on size (item MKTV in Table DRET) using TSE 1st section median size as the breakpoint and 3 portfolios (Low 30%, Middle 40%, High 30%) formed on prior returns using the 30th and 70th percentiles of prior cumulative returns of TSE 1st section as the breakpoints. STR is the difference of the average returns of 2 Low portfolios and the simple average of the returns of the 2 High portfolios, i.e., STR = 1/2 (Small Low + Big Low) - 1/2 (Small High + Big High).

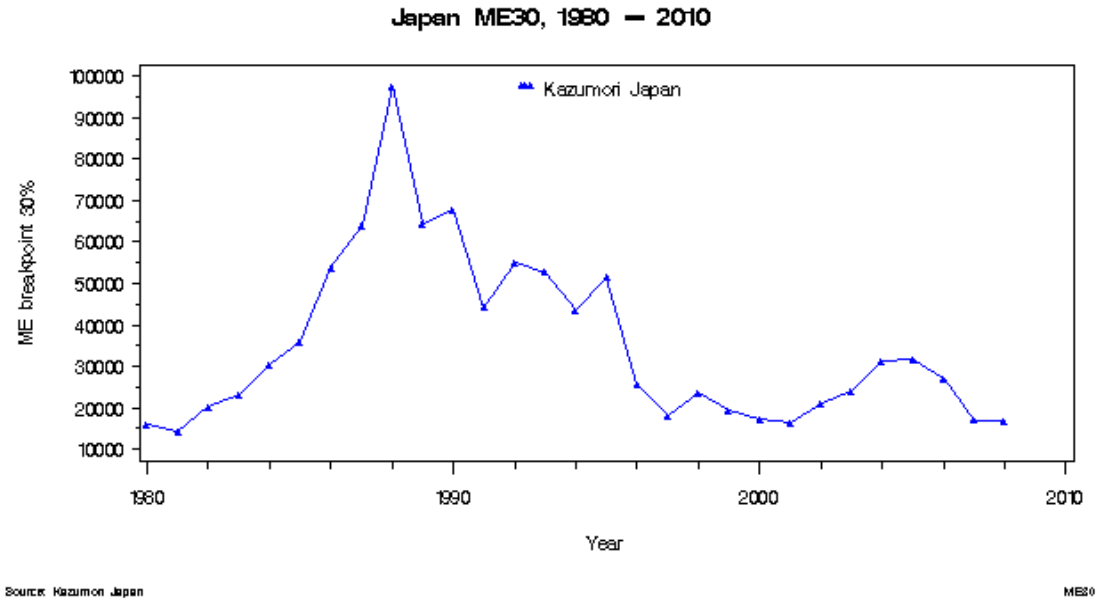
3.4. *The Market Equity Deciles and Portfolios*

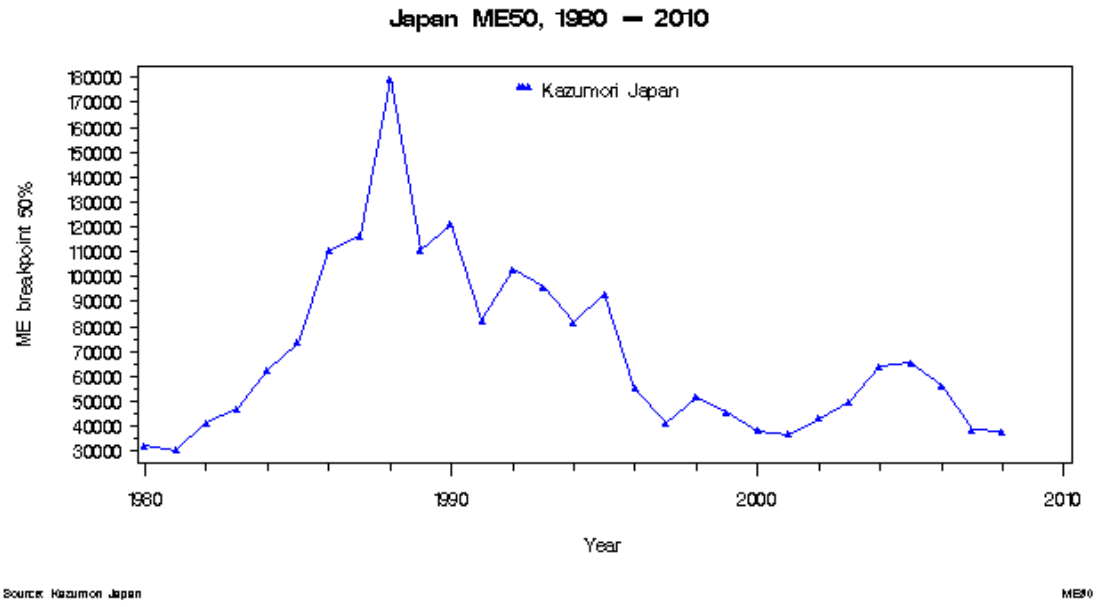
At the end of September in each year t, we sorted all Japanese common stocks into 10 deciles based on the market equity (size, i.e., the item MKTV in Table DRET). The size breakpoints are based on the TSE 1st section's common stocks. Value-weighted returns for the portfolios (monthly) between October of t and September of t+1 are calculated and the portfolios are rebalanced yearly at the end of each September.

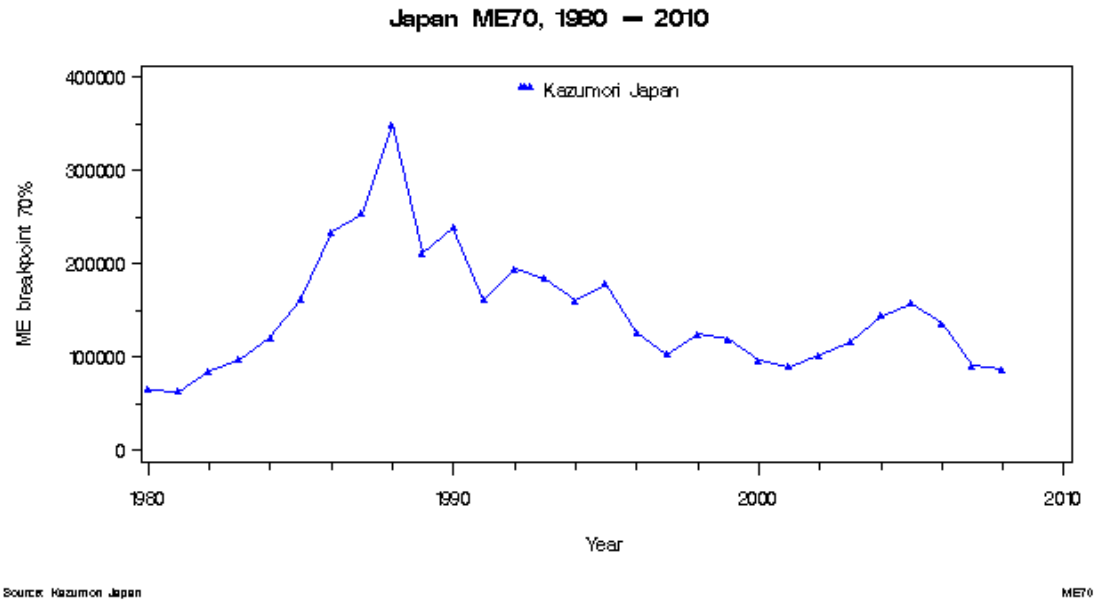
3.4.1. *Yearly Breakpoints*



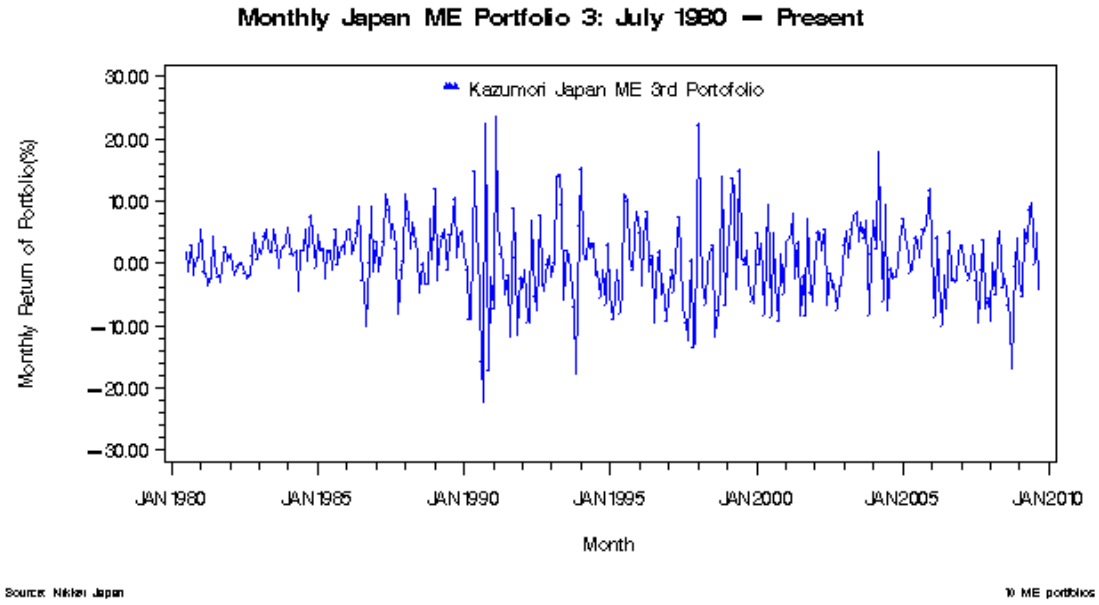

Japan ME50, 1980 – 2010
Kazumori Japan
ME breakpoint 50%
180000
170000
160000
150000
140000
130000
120000
110000
100000
90000
80000
70000
60000
50000
40000
30000
1980
1990
2000
2010
Year
Source: Kazumori Japan
ME50

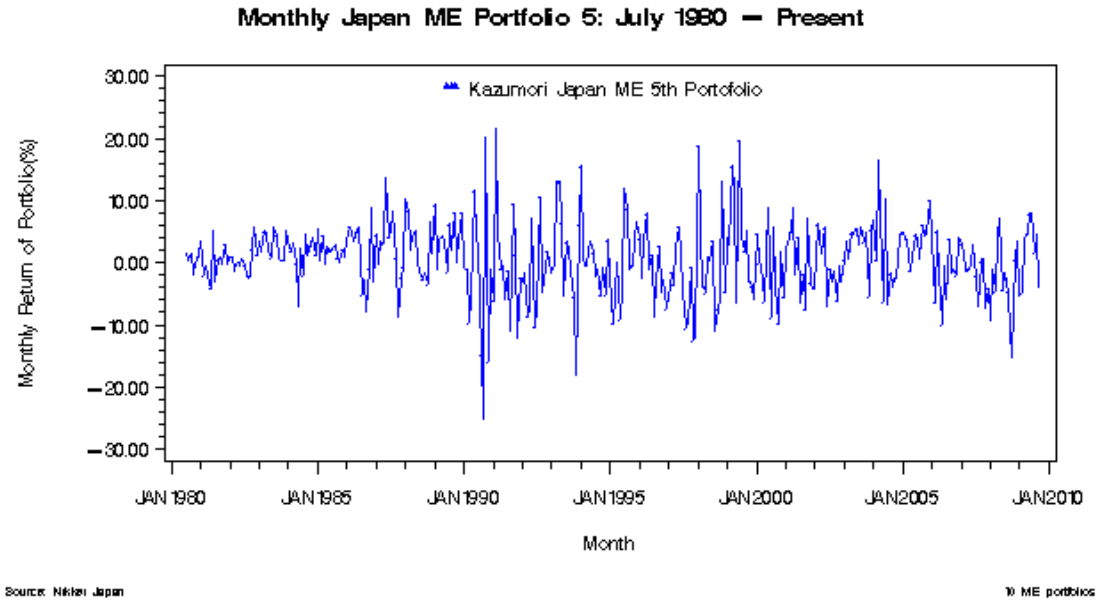

Japan ME30, 1980 – 2010
Kazumori Japan
ME breakpoint 30%
100000
90000
80000
70000
60000
50000
40000
30000
20000
10000
1980
1990
2000
2010
Year
Source: Kazumori Japan
ME30

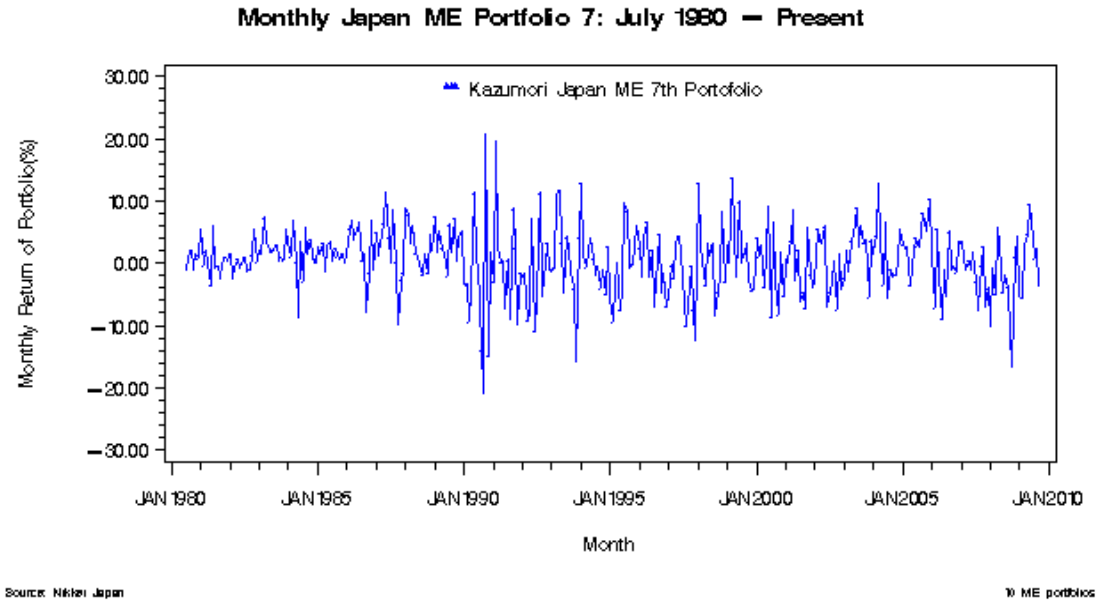

Japan ME50, 1980 – 2010
Kazumori Japan
ME breakpoint 50%
180000
170000
160000
150000
140000
130000
120000
110000
100000
90000
80000
70000
60000
50000
40000
30000
1980
1990
2000
2010
Year
Source: Kazumori Japan
ME50


Japan ME70, 1980 – 2010
Kazumori Japan
ME breakpoint 70%
400000
300000
200000
100000
0
1980
1990
2000
2010
Year
Source: Kazumori Japan
ME70

3.4.2. *Portfolios*



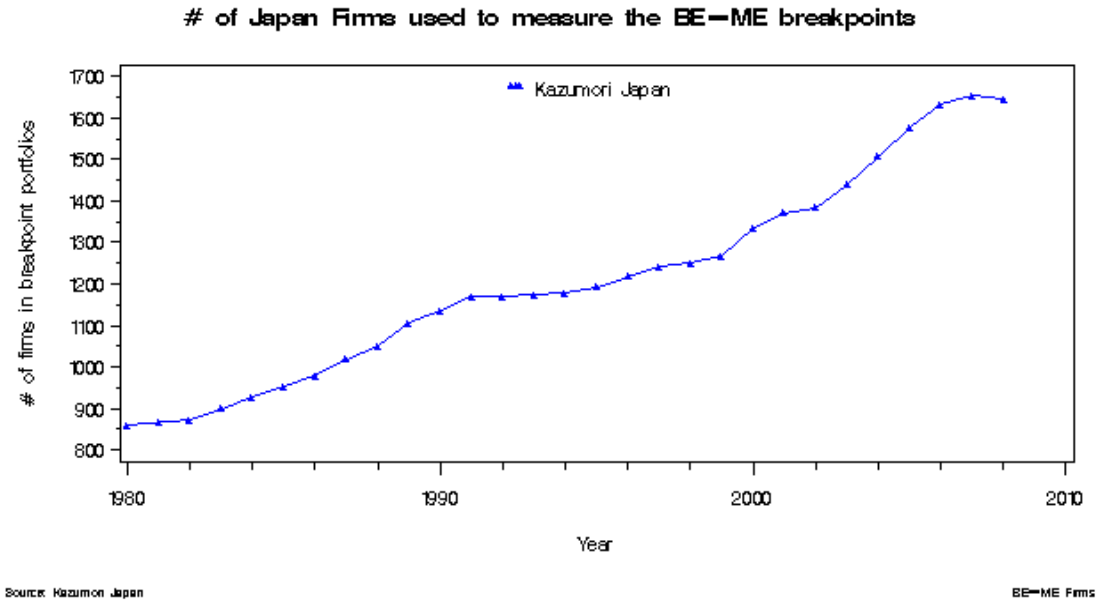


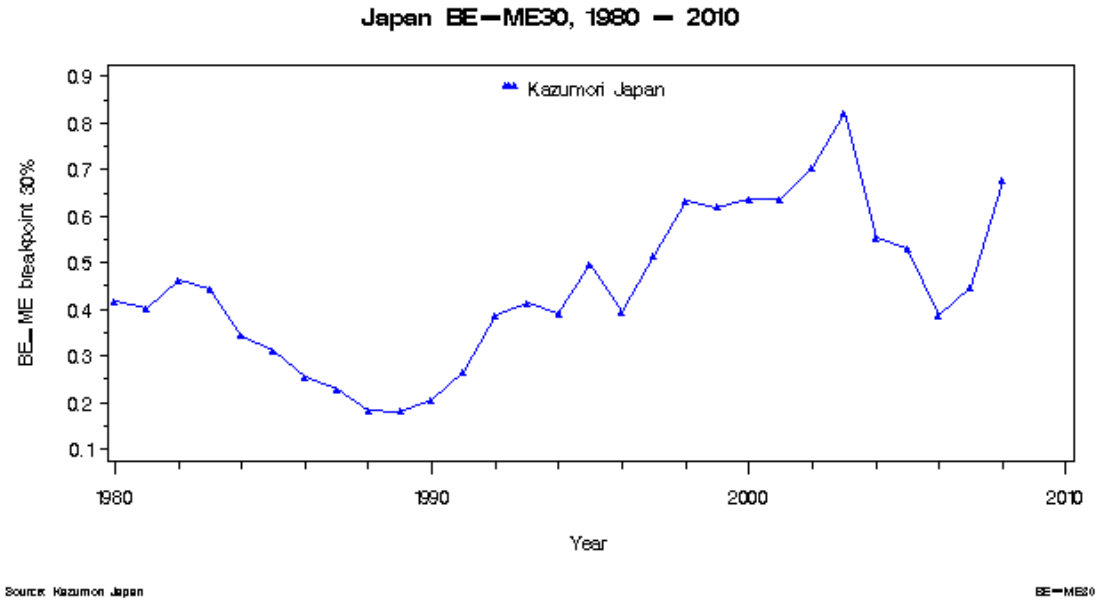


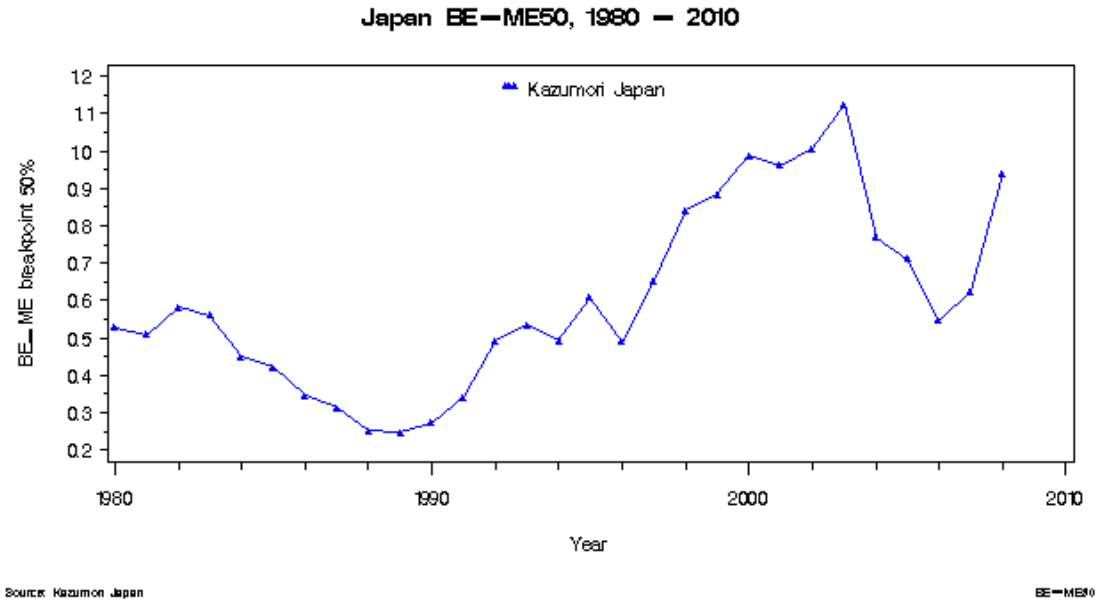
3.5. *The BE/ME ratio Deciles and Portfolios*

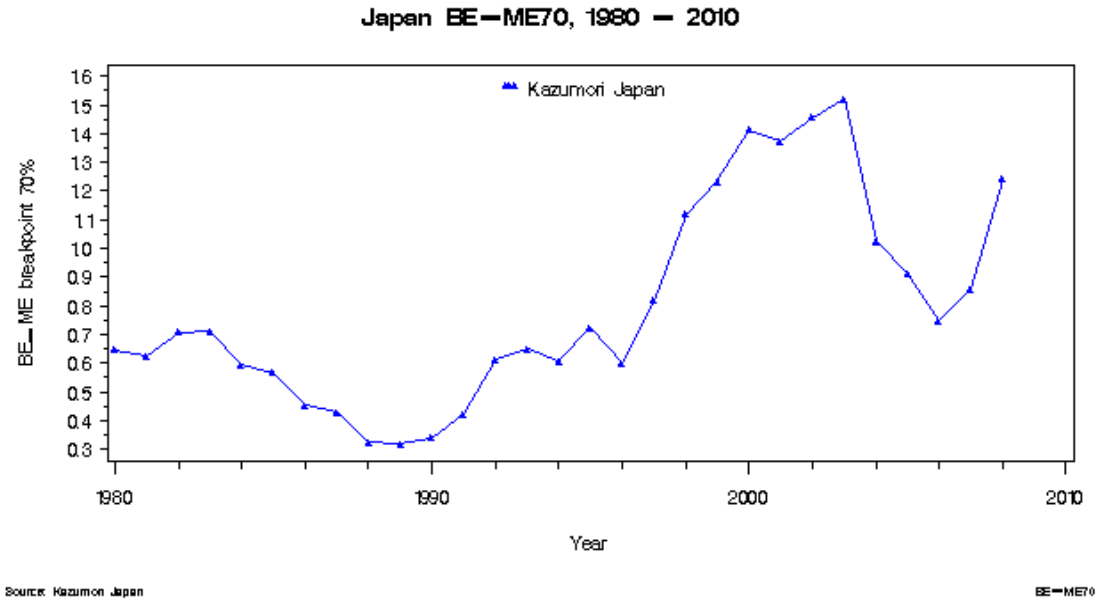
At the end of September in each year t, we sorted all Japanese common stocks with positive Book Equity/Market Equity ratio into 10 deciles based on the ratio (Book Equity is the item TOEQ_1, i.e., the unconsolidated book equity from Table DFSP5; Market Equity: the item MKTV in Table DRET). The ratio used the market equity at March of t and the most recent available book equity at September of t. The ratio breakpoints are based on the TSE 1st section's common stocks with positive ratio. Value-weighted returns for the portfolios (monthly) between October of t and September of t+1 are calculated and the portfolios are rebalanced yearly at the end of each September.

3.5.1. *Yearly Breakpoints*

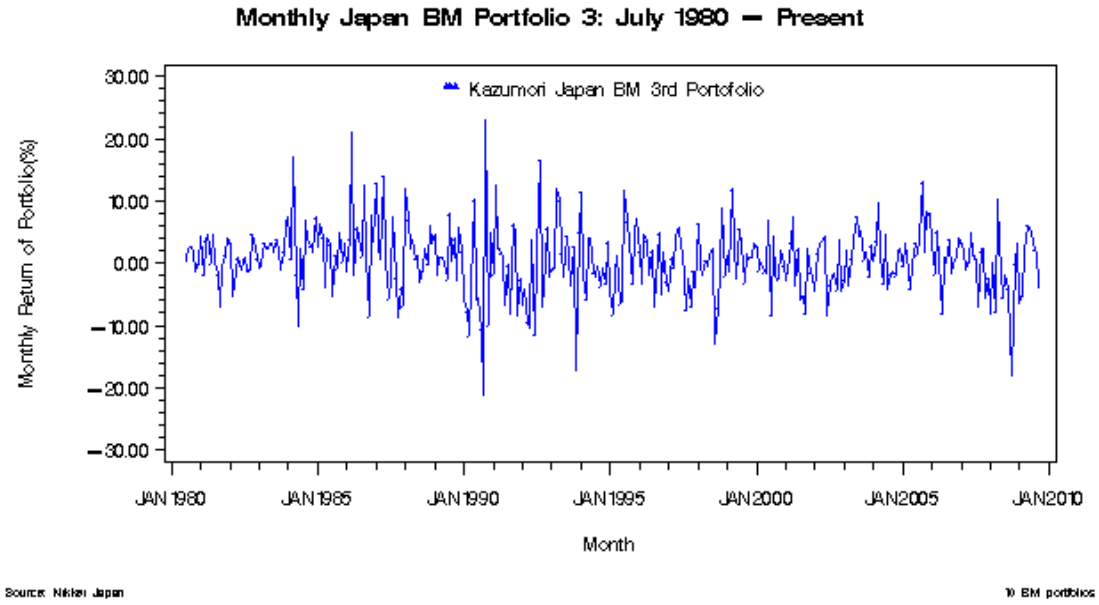


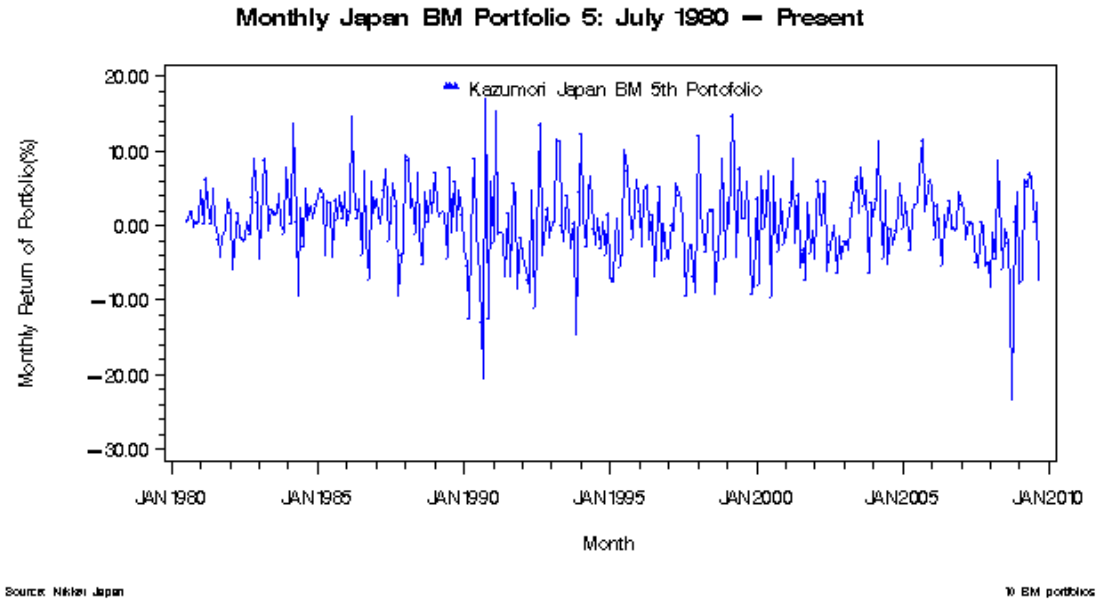


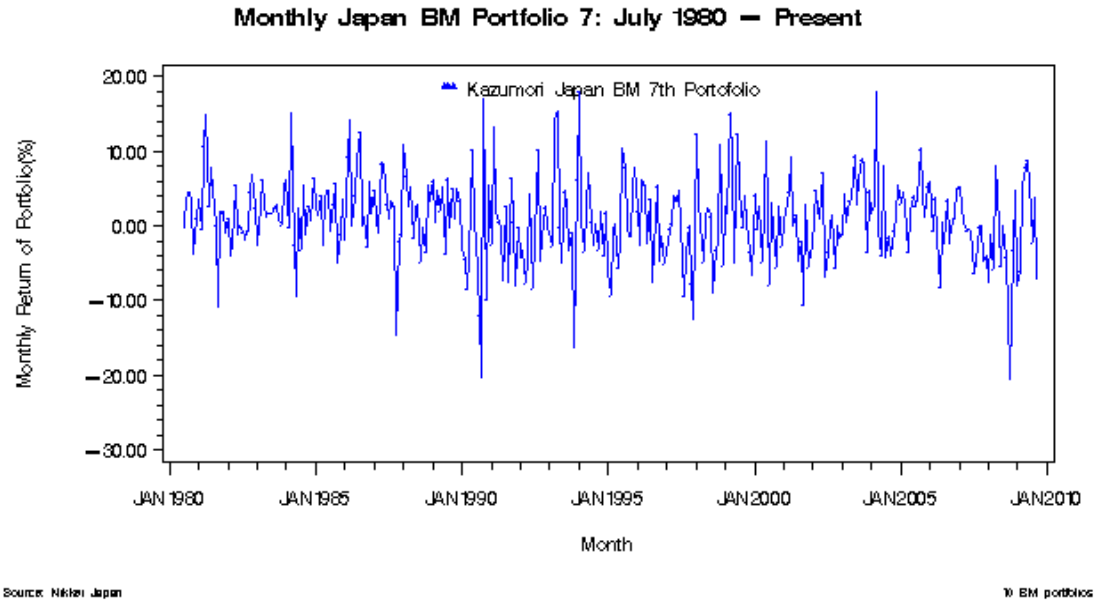

Japan BE—ME50, 1980 — 2010
Kazumori Japan
BE_ME breakpoint 50%
12
11
10
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
1980
1990
2000
2010
Year
Source: Kazumori Japan
BE—ME50


Japan BE—ME70, 1980 — 2010
Kazumori Japan
BE_ME breakpoint 70%
16
15
14
13
12
11
10
0.9
0.8
0.7
0.6
0.5
0.4
0.3
1980
1990
2000
2010
Year
Source: Kazumori Japan
BE—ME70

3.5.2. *Portfolio*



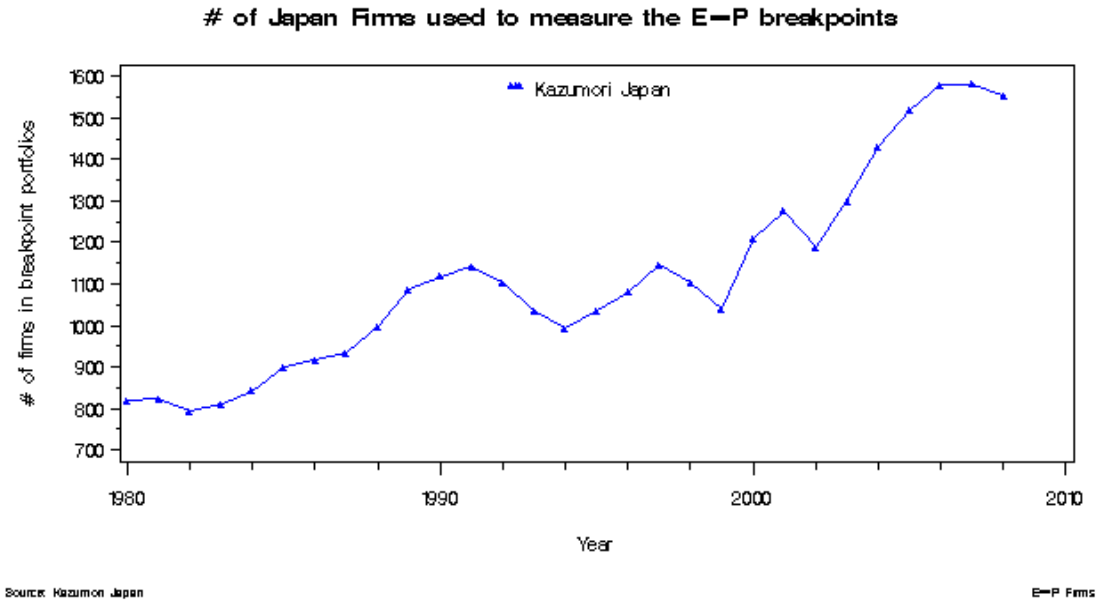


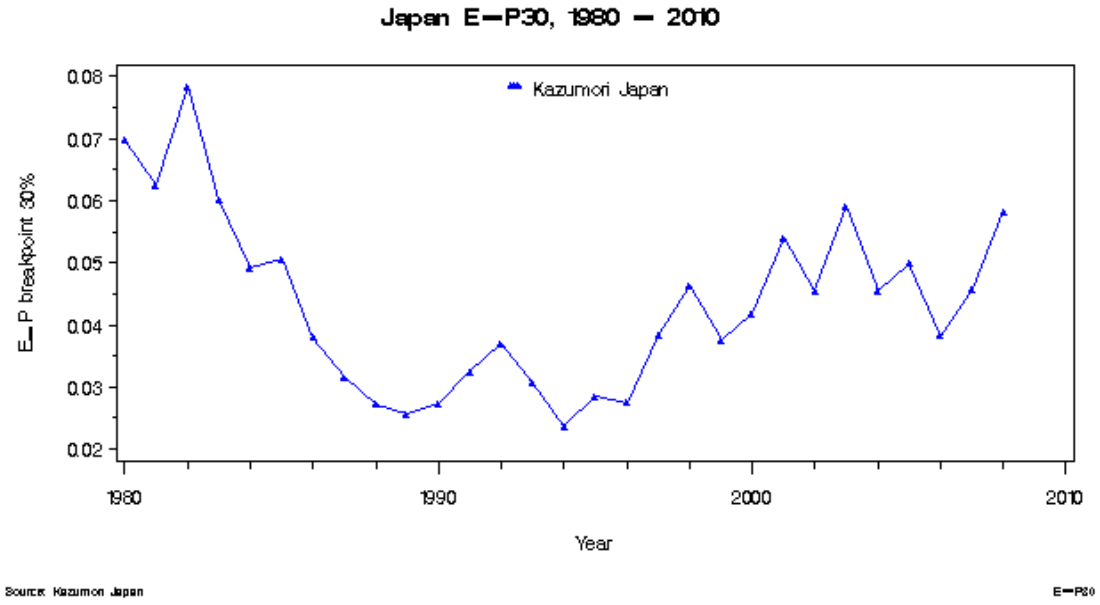


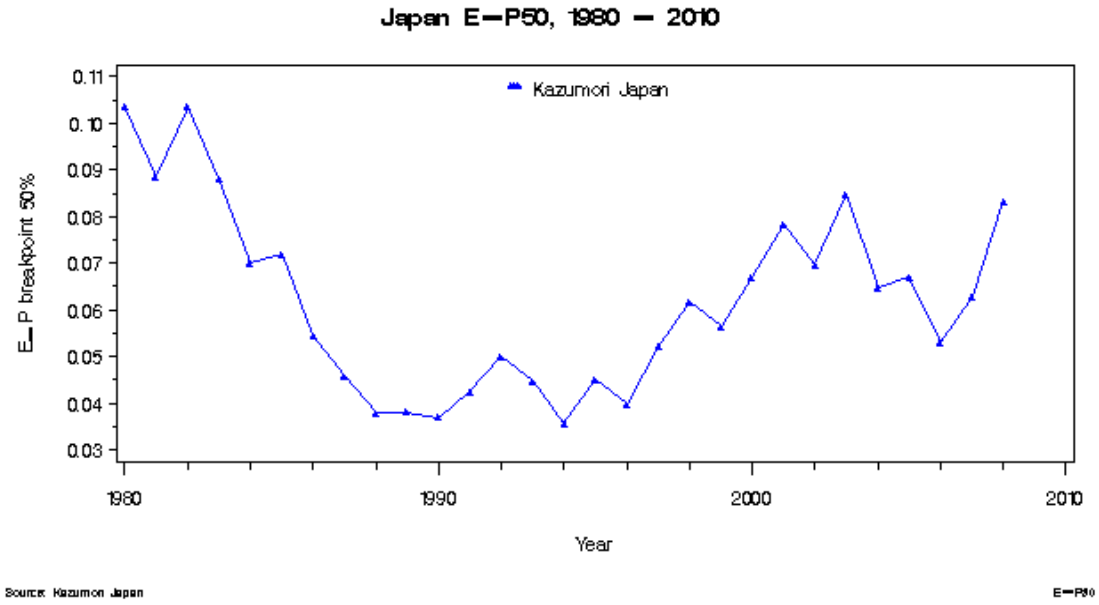
3.6. *The Earning Yield (E/P) Deciles and Portfolios*

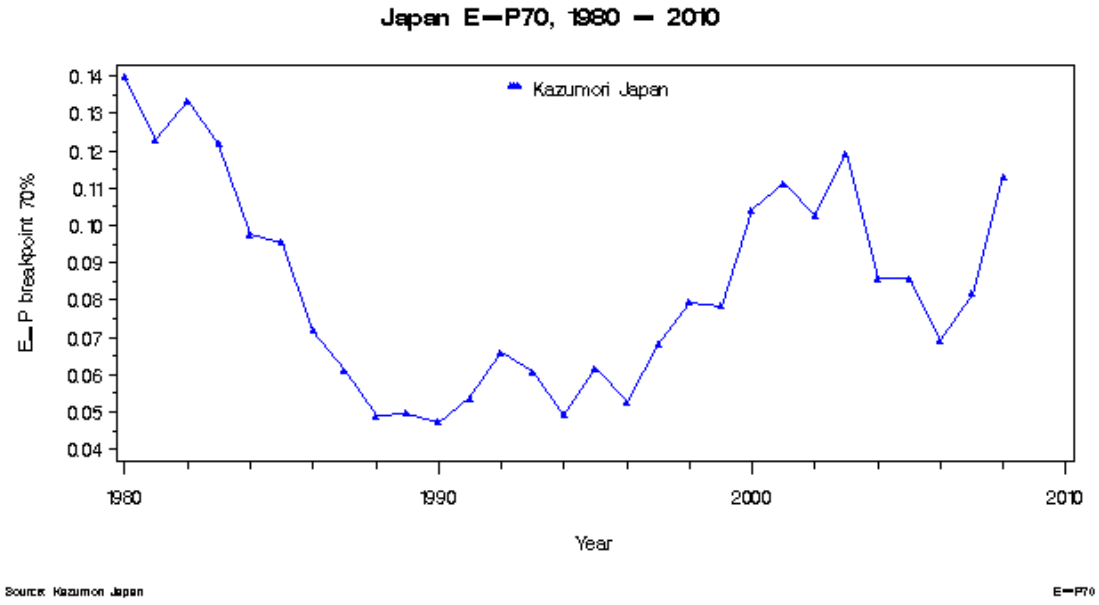
At the end of September in each year t, we sorted all Japanese common stocks with positive Earning Yield (Total Earning/Price) into 10 deciles based on the ratio (Earning: the item RECICM_1 (Ordinary Income) from Table DFSP5; Price: Market Equity - the item MKTV in Table DRET). The ratio used the market equity at March of t and the most recent available Earning at September of t. The ratio breakpoints are based on the TSE 1st section's common stocks with positive earning yield. Value-weighted returns for the portfolios (monthly) between October of t and September of t+1 are calculated and the portfolios are rebalanced yearly at the end of each September.

3.6.1. *Yearly Breakpoints*

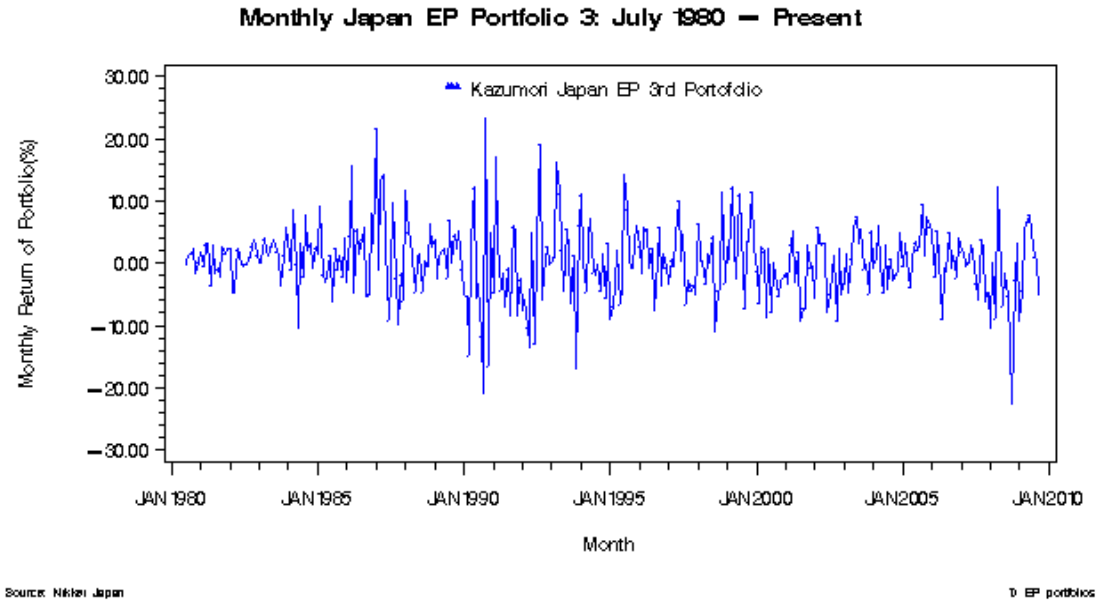


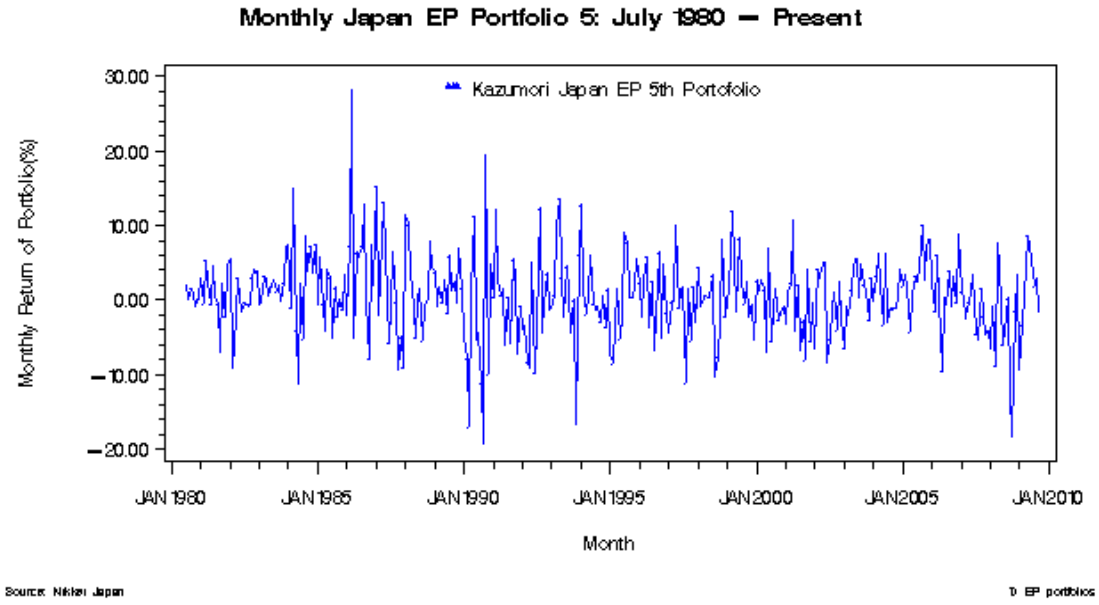


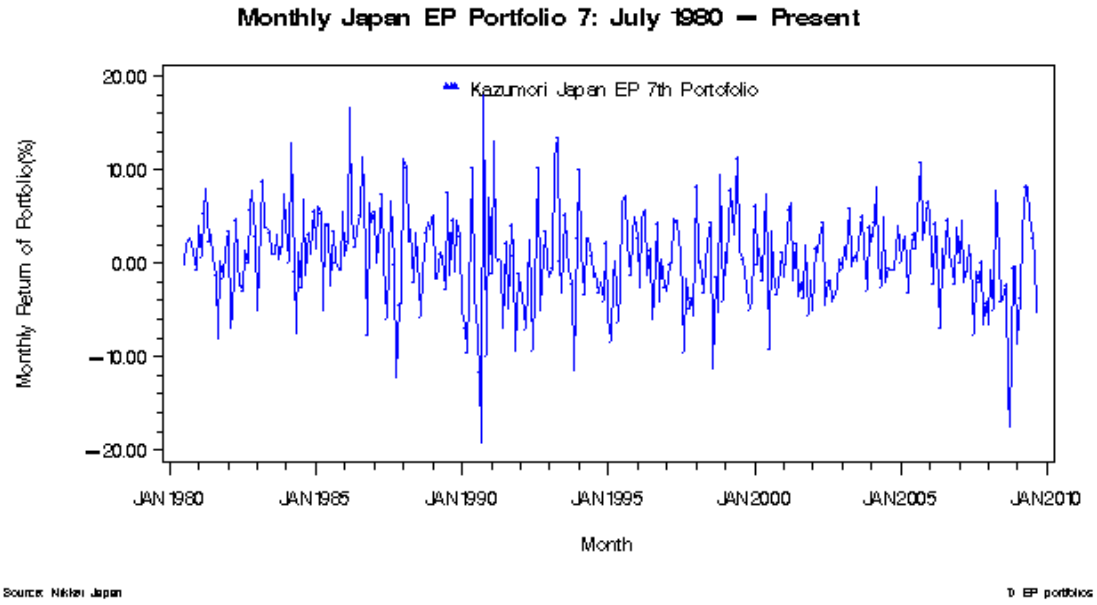

Japan E—P50, 1980 — 2010
Kazumori Japan
E_P breakpoint 50%
0.11
0.10
0.09
0.08
0.07
0.06
0.05
0.04
0.03
1980
1990
2000
2010
Year
Source: Kazumori Japan
E—P50


Japan E—P70, 1980 — 2010
Kazumori Japan
E_P breakpoint 70%
0.14
0.13
0.12
0.11
0.10
0.09
0.08
0.07
0.06
0.05
0.04
1980
1990
2000
2010
Year
Source: Kazumori Japan
E—P70

3.6.2. *Portfolios*



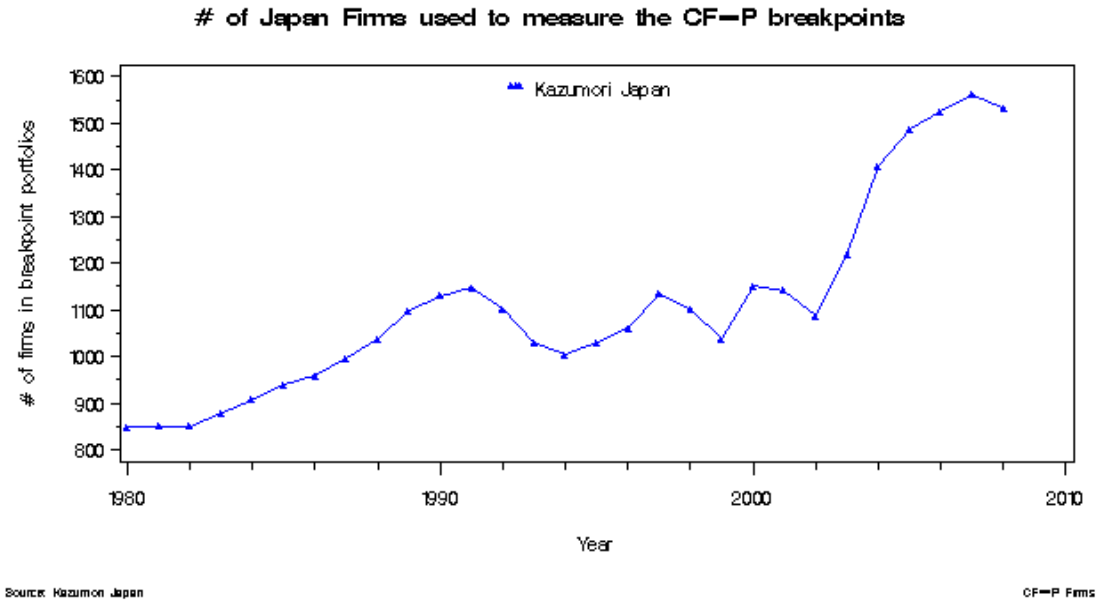


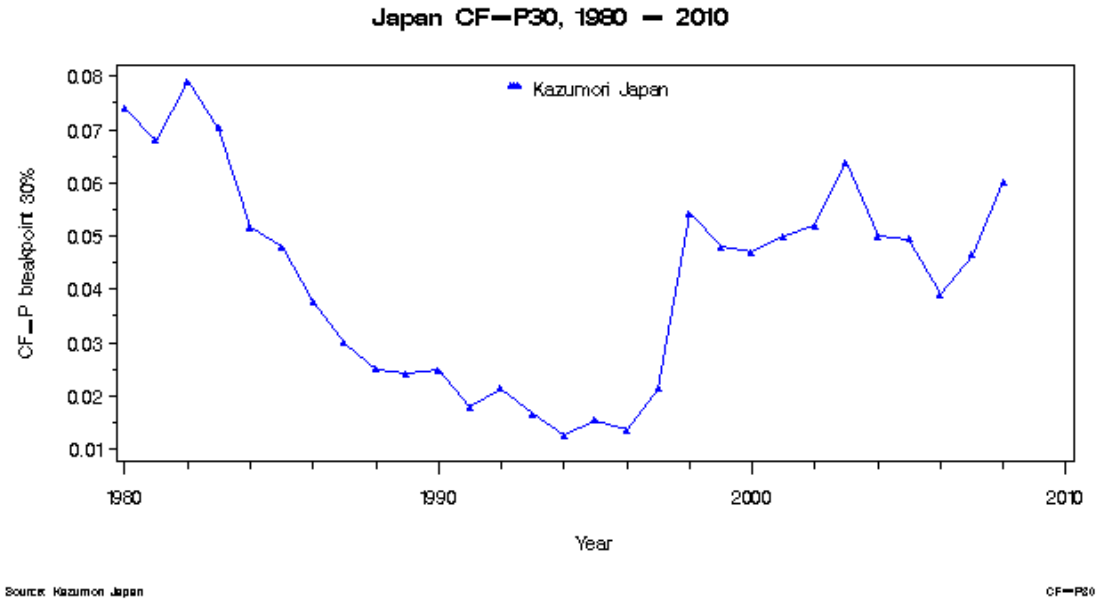


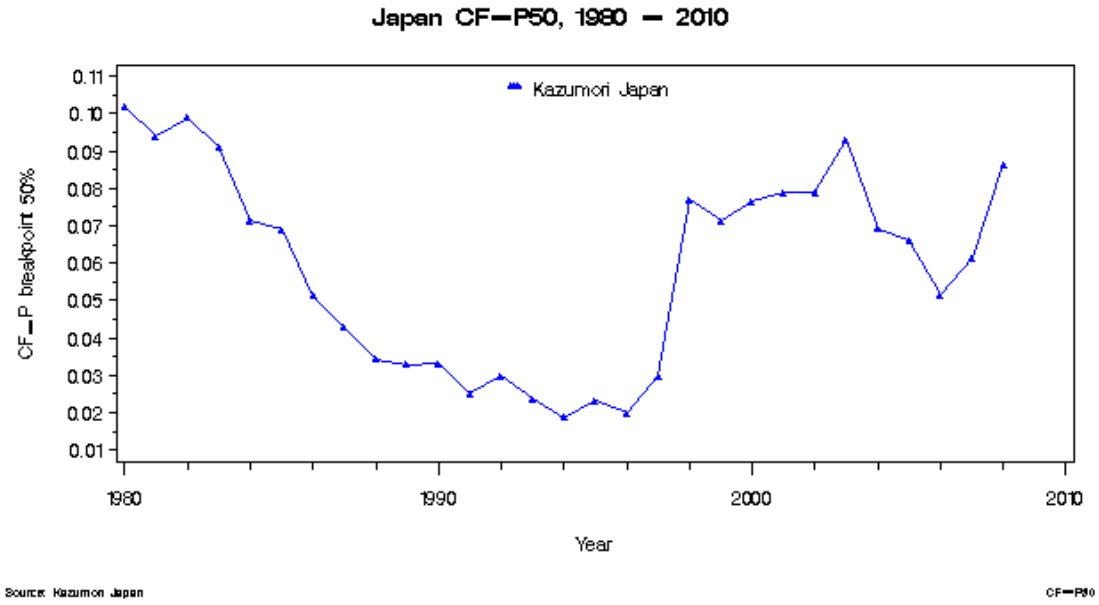
3.7. *The Cash Flow Yield (CF/ME) Deciles and Portfolios*

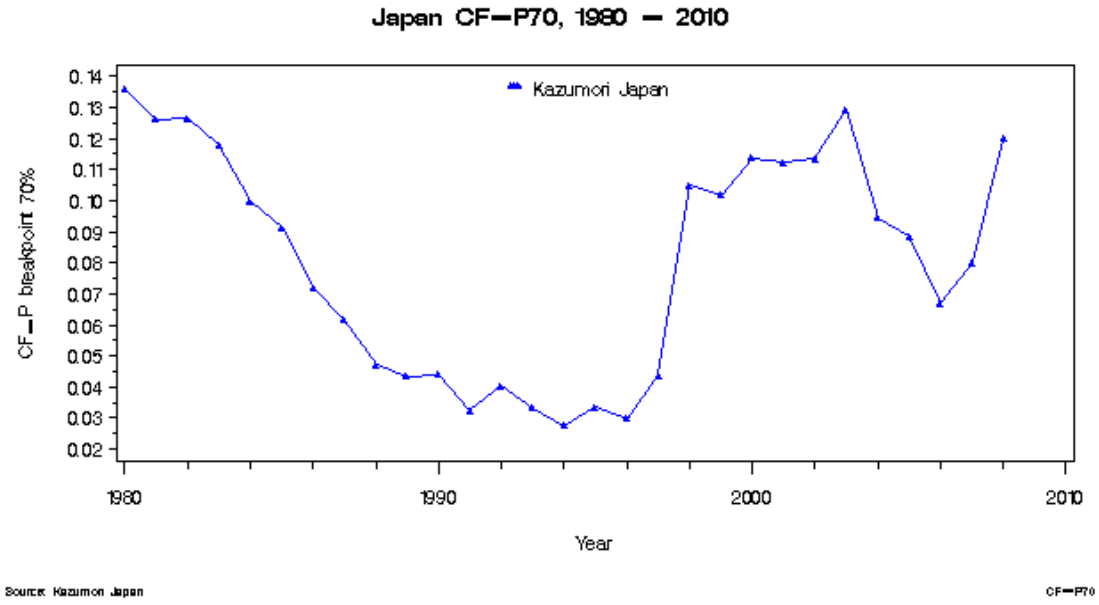
At the end of September in each year t, we sorted all Japanese common stocks with positive Cash Flow Yield (Cash Flow/Market Equity) into 10 deciles based on the ratio (Cash Flow: the sum of items NETICM_1 (Net Income) and DEPR_1 (Depreciation) from Table DFSP5; Market Equity: the item MKTV in Table DRET). The ratio used the market equity at March of t and the most recent available Cash Flow at September of t. The ratio breakpoints are based on the TSE 1st section's common stocks with positive cash flow yield. Value-weighted returns for the portfolios (monthly) between October of t and September of t+1 are calculated and the portfolios are rebalanced yearly at the end of each September.

3.7.1. *Yearly Breakpoints*

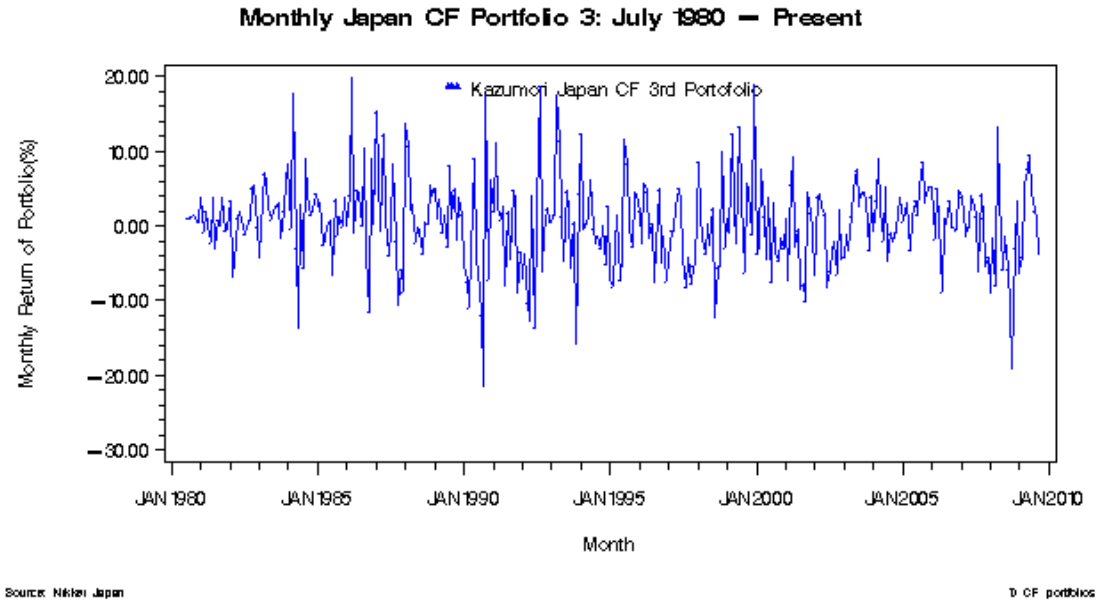


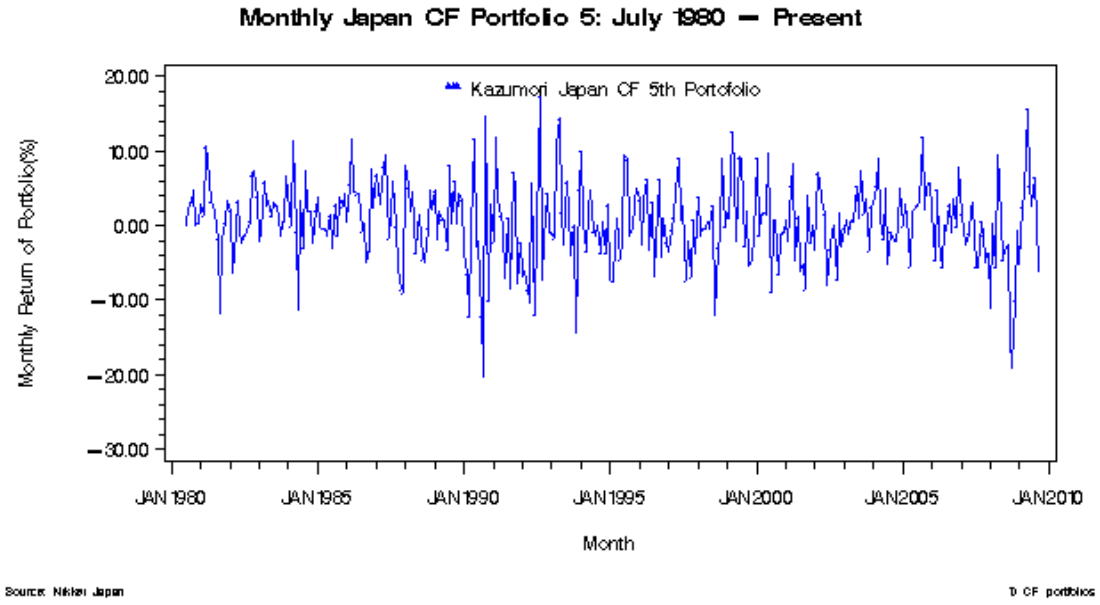


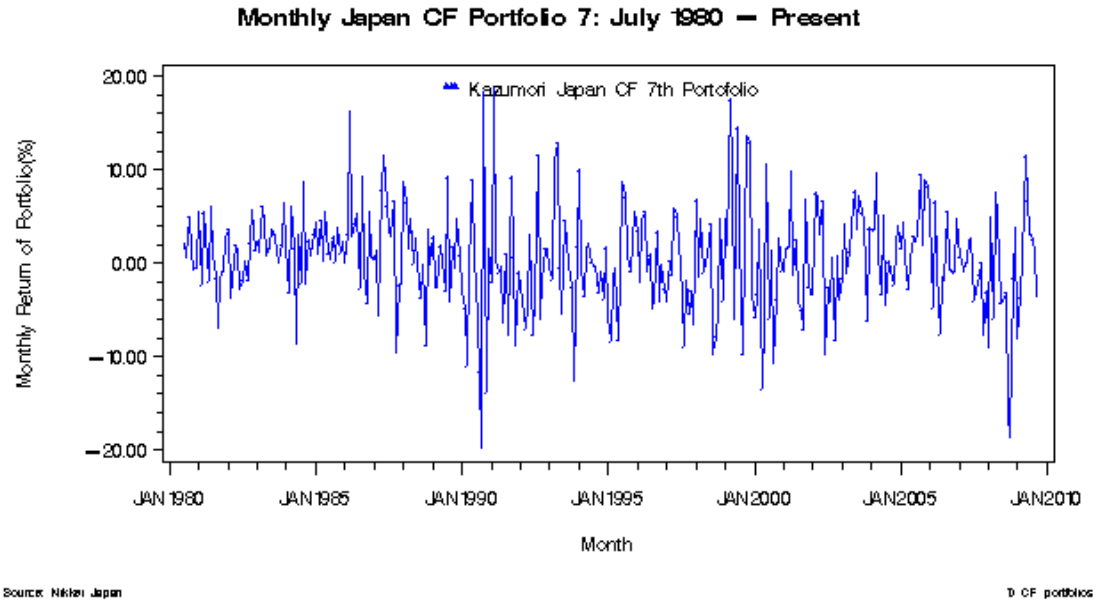

Japan CF—P50, 1980 — 2010
Kazumori Japan
CF—P breakpoint 50%
0.11
0.10
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
1980
1990
2000
2010
Year
Source: Kazumori Japan
CF—P50


Japan CF—P70, 1980 — 2010
Kazumori Japan
CF—P breakpoint 70%
0.14
0.13
0.12
0.11
0.10
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
1980
1990
2000
2010
Year
Source: Kazumori Japan
CF—P70

3.7.2. *Portfolios*



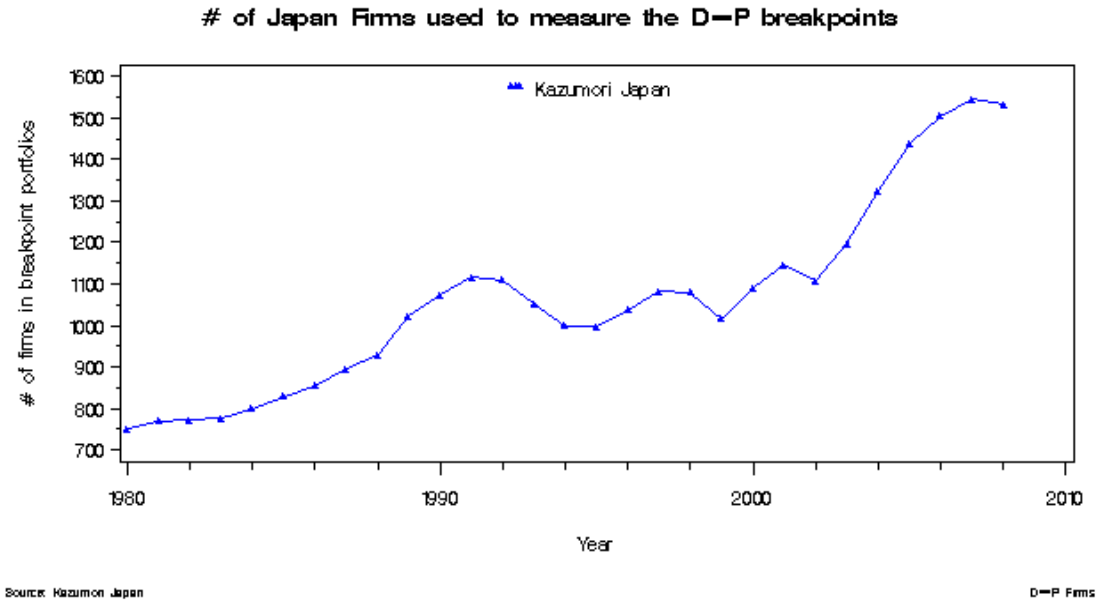


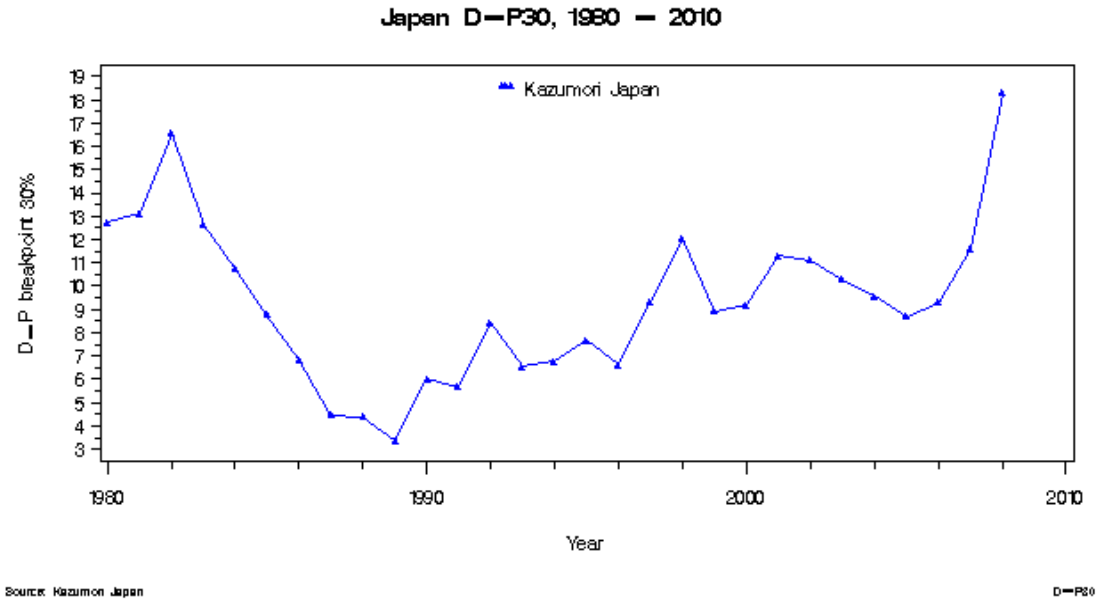


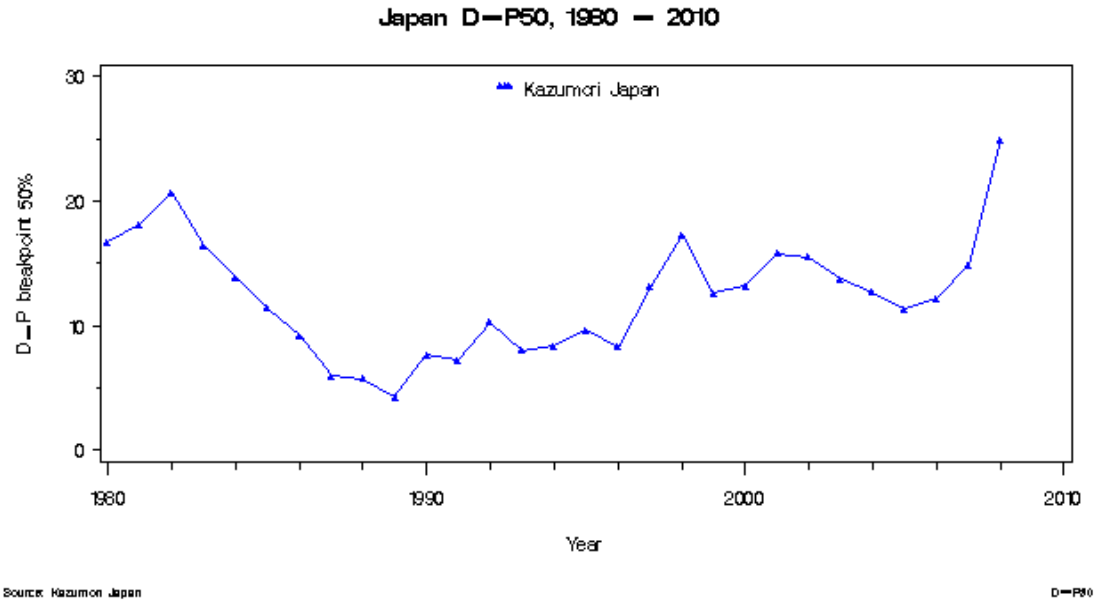
3.8. *The Dividend Yield Deciles and Portfolios*

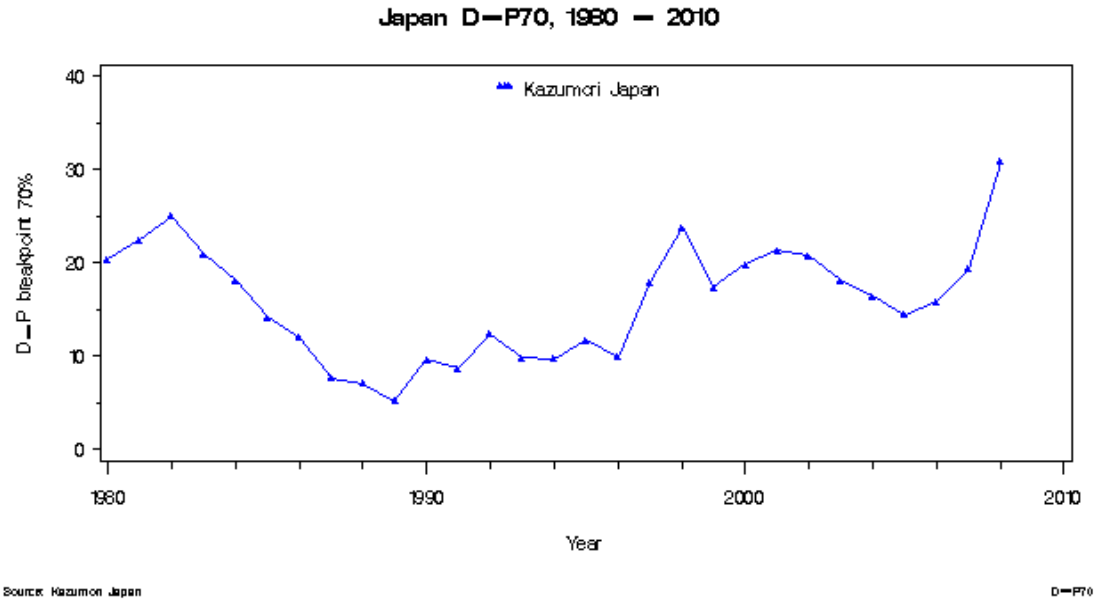
At the end of September in each year t, we sorted all Japanese common stocks with positive Dividend Yield (Total Dividend/Market Equity) into 10 deciles based on the ratio (Dividend: the sum of items RECICM_1 and DEPR_1 from Table DFSP5; Market Equity: the item MKTV in Table DRET). The ratio used the market equity at March of t and the most recent available Dividend at September of t. The ratio breakpoints are based on the TSE 1st section's common stocks with positive dividend yield. Value-weighted returns for the portfolios (monthly) between October of t and September of t+1 are calculated and the portfolios are rebalanced yearly at the end of each September.

3.8.1. *Yearly Breakpoints*

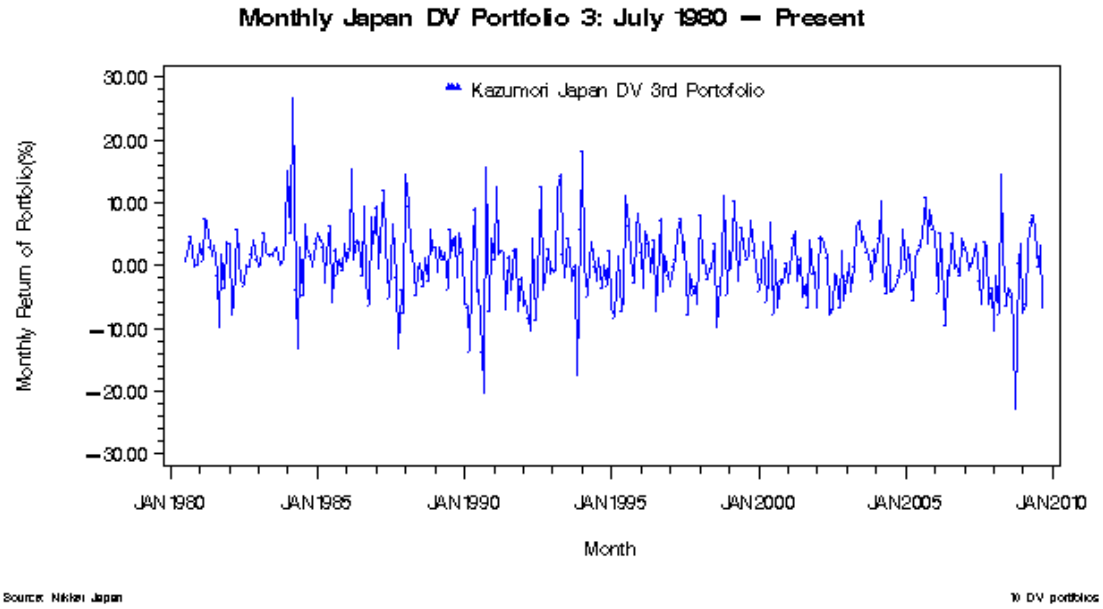


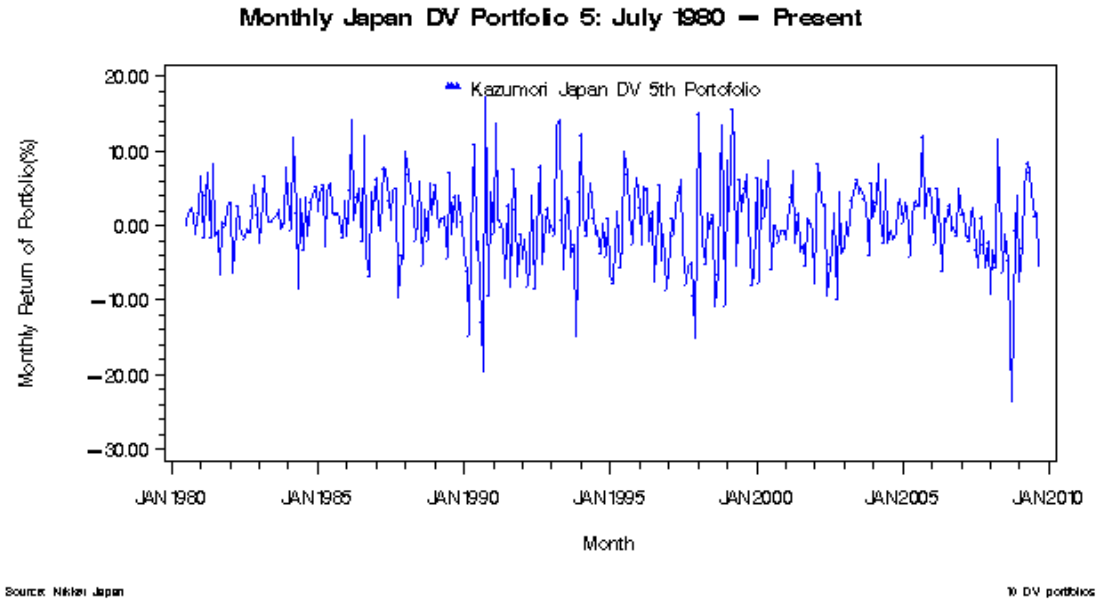


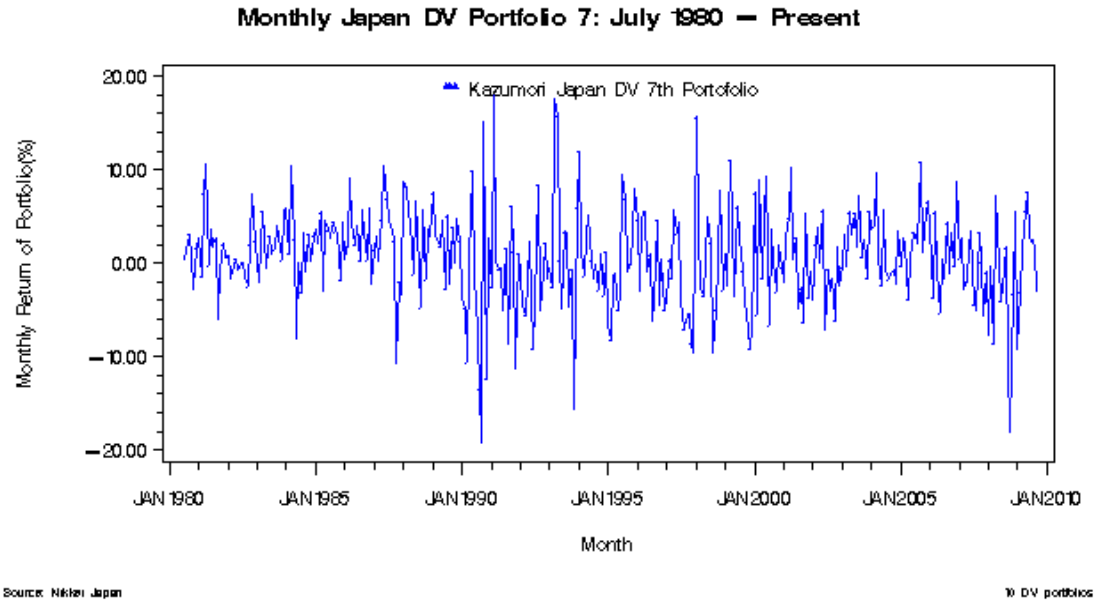

Japan D—P50, 1980 — 2010
Kazumori Japan
D_P breakpoint 50%
30
20
10
0
1980
1990
2000
2010
Year
Source: Kazumori Japan
D—P50


Japan D—P70, 1980 — 2010
Kazumori Japan
D_P breakpoint 70%
40
30
20
10
0
1980
1990
2000
2010
Year
Source: Kazumori Japan
D—P70

3.8.2. *Portfolios*



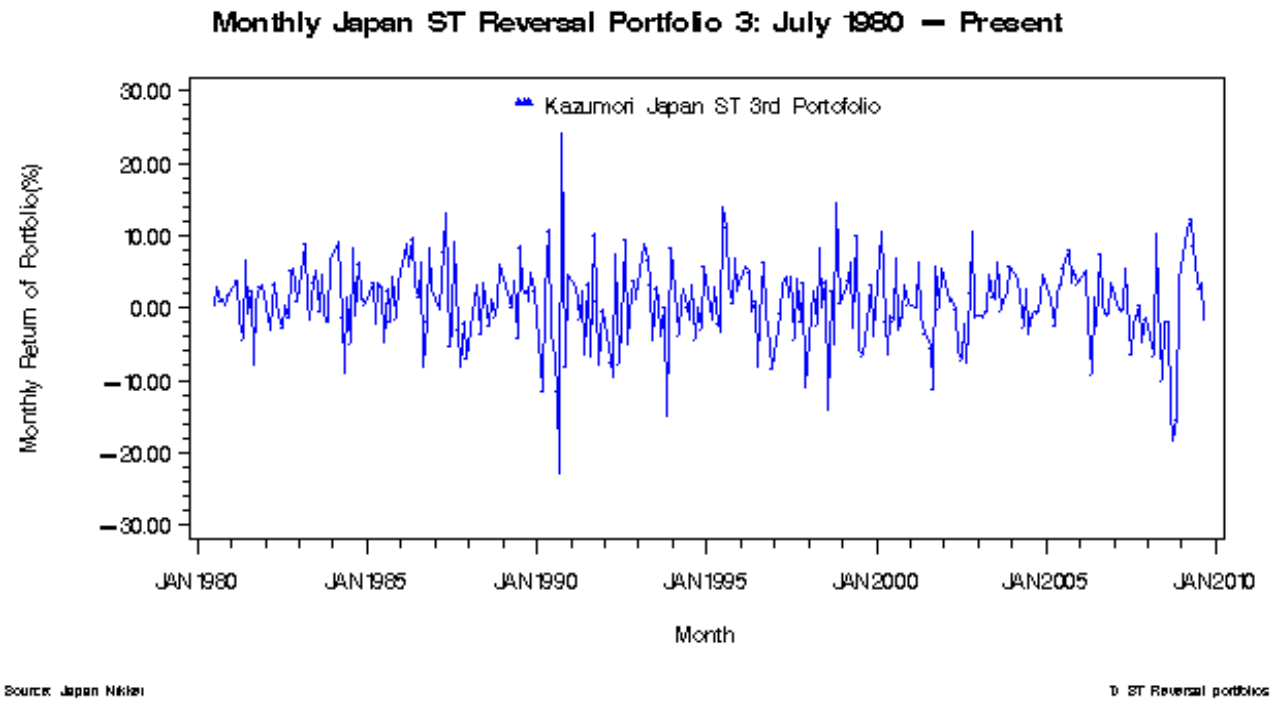


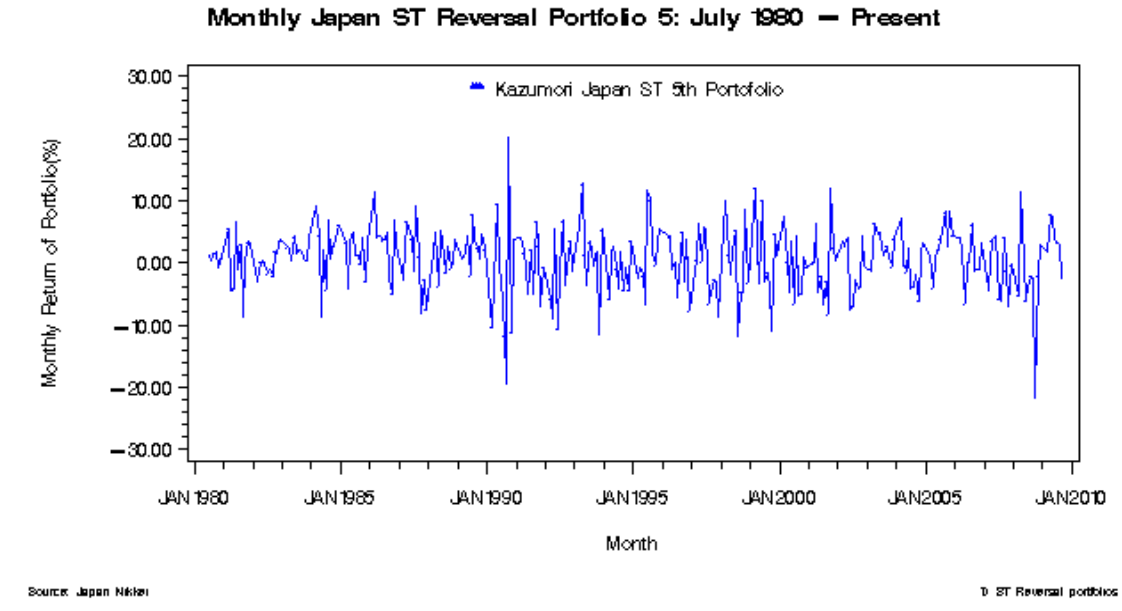


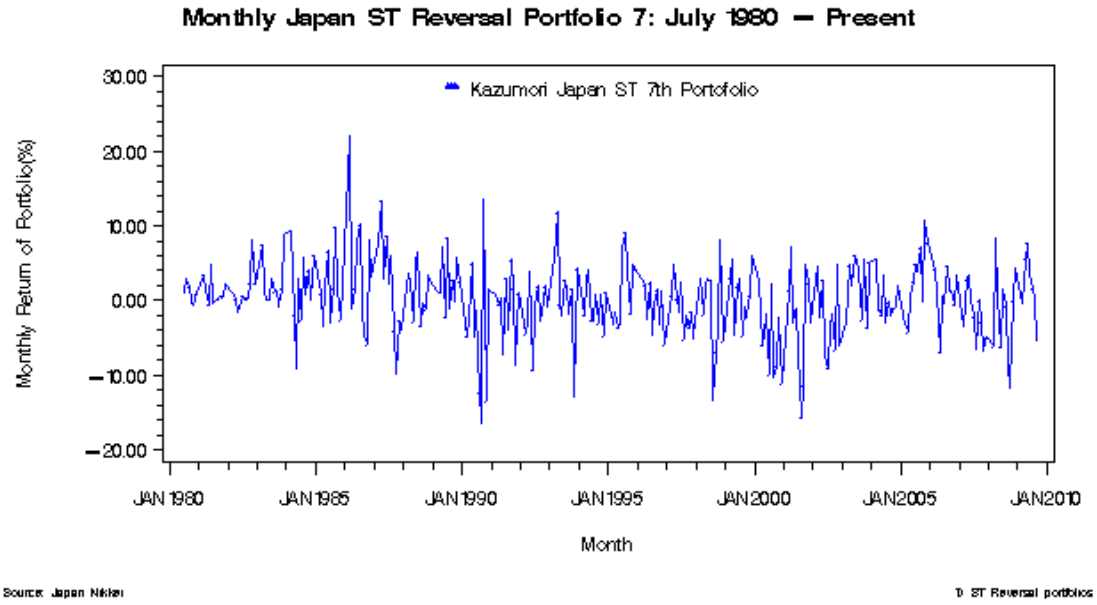
3.9. *The Short-Term Reversal Deciles and Portfolios*

The short-term reversal at the end of month t is the return of month t-1(i.e., the return of the previous month). At the end of each month t, we sorted all Japanese common stocks with non-missing return in month t-1 and non-missing stock price at the end of month t-2. The breakpoints used the 1st section of TSE stocks. Value-weighted returns for the portfolios (monthly) are calculated and the portfolios are rebalanced monthly at the end of each month.

3.9.1. *10 Short-term Reversal Portfolios*



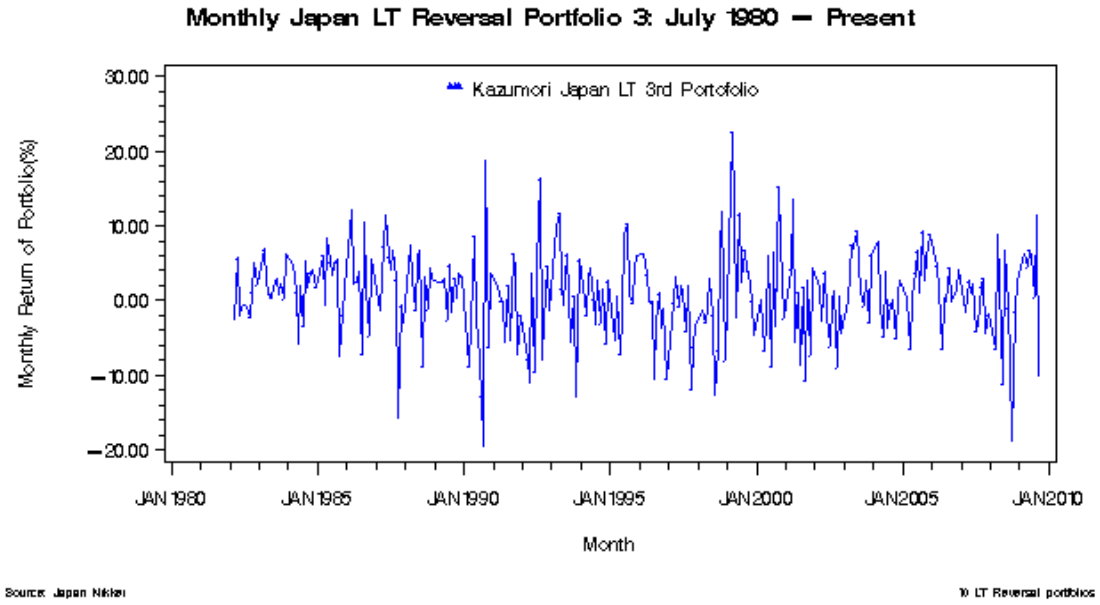


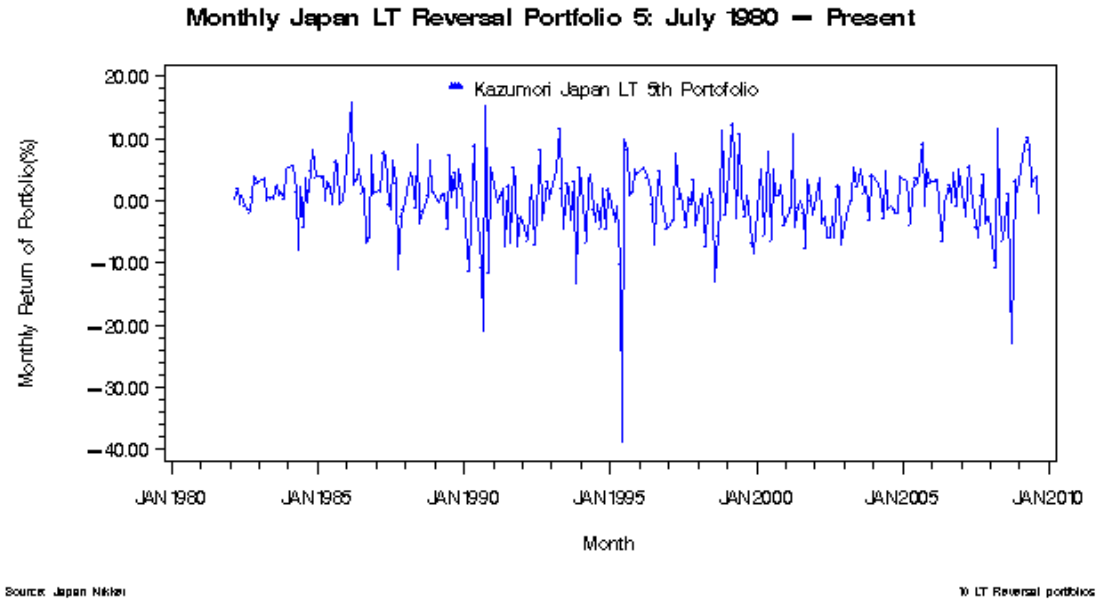


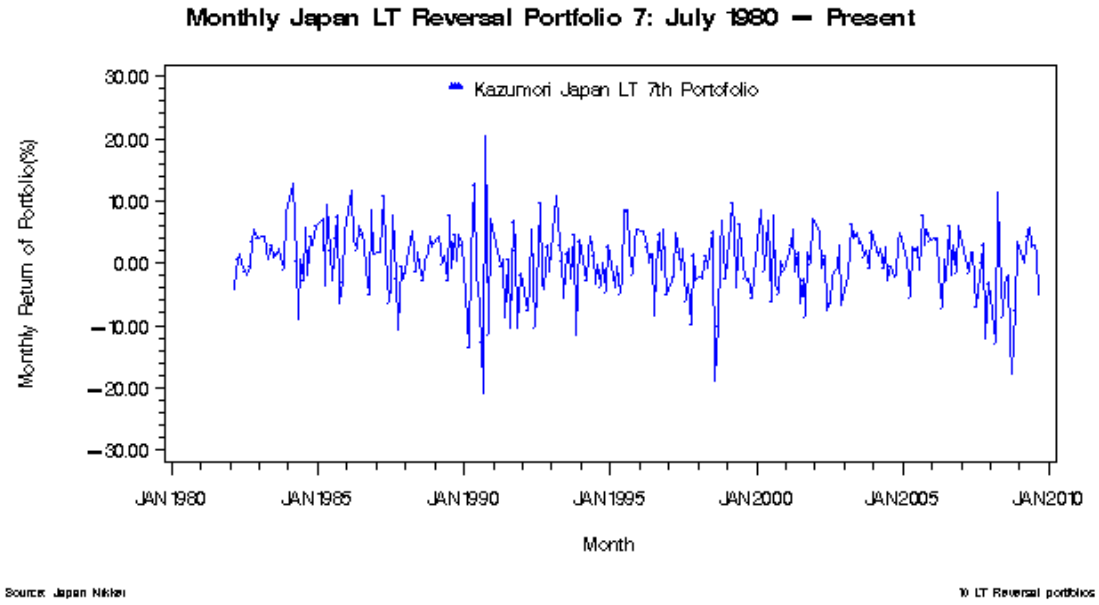
3.10. *The Long-Term Reversal Deciles and Portfolios*

The long-term reversal at the end of month t is the cumulative return of month t-60 to month t-13. At the end of each month t, we sorted all Japanese common stocks with non-missing return in month t-13 and non-missing stock price at the end of month t-61. The breakpoints used the 1st section of TSE stocks. Value-weighted returns for the portfolios (monthly) are calculated and the portfolios are rebalanced monthly at the end of each month.

3.10.1. *10 Portfolios*



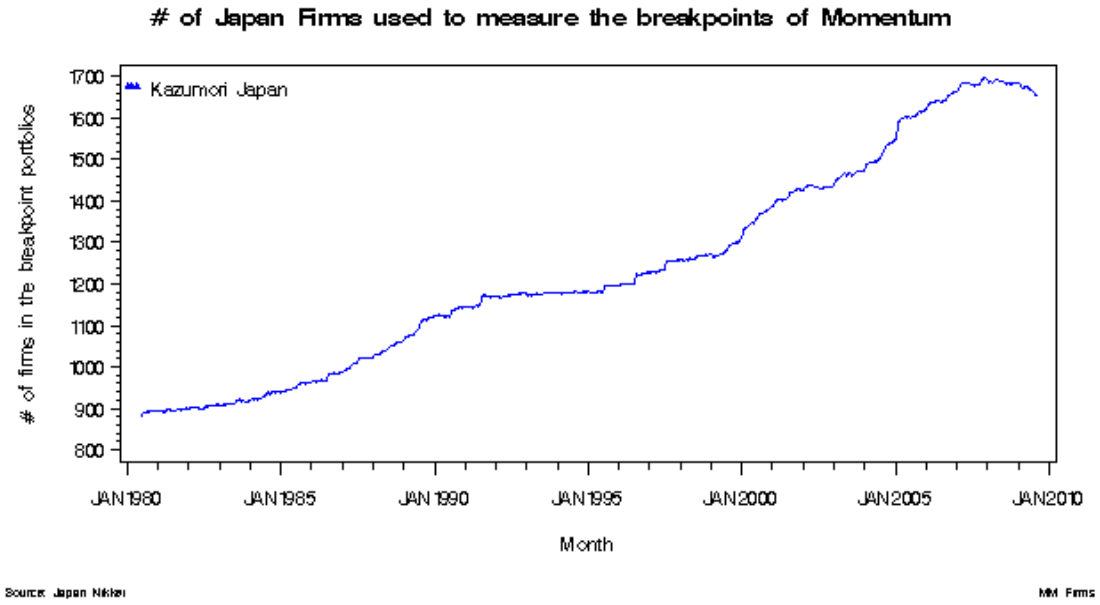


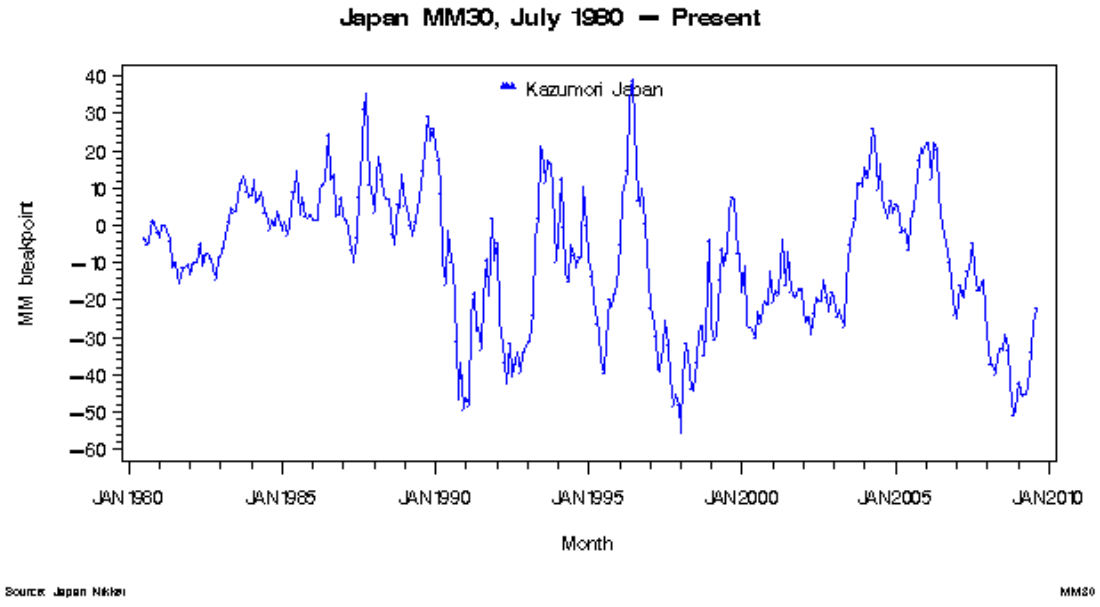


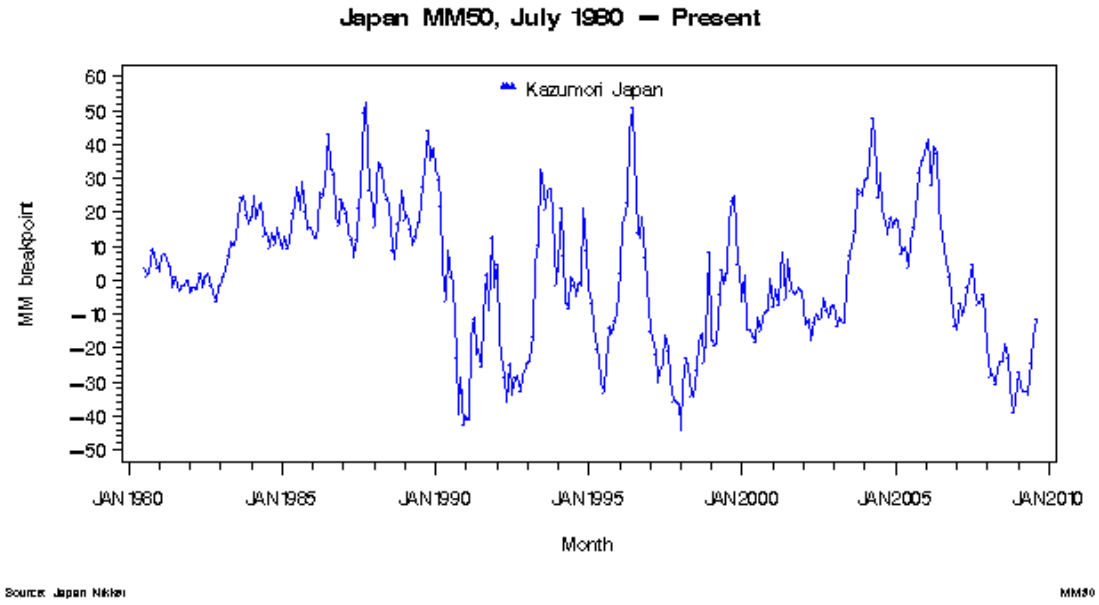
3.11. *The Momentum Deciles and Portfolios*

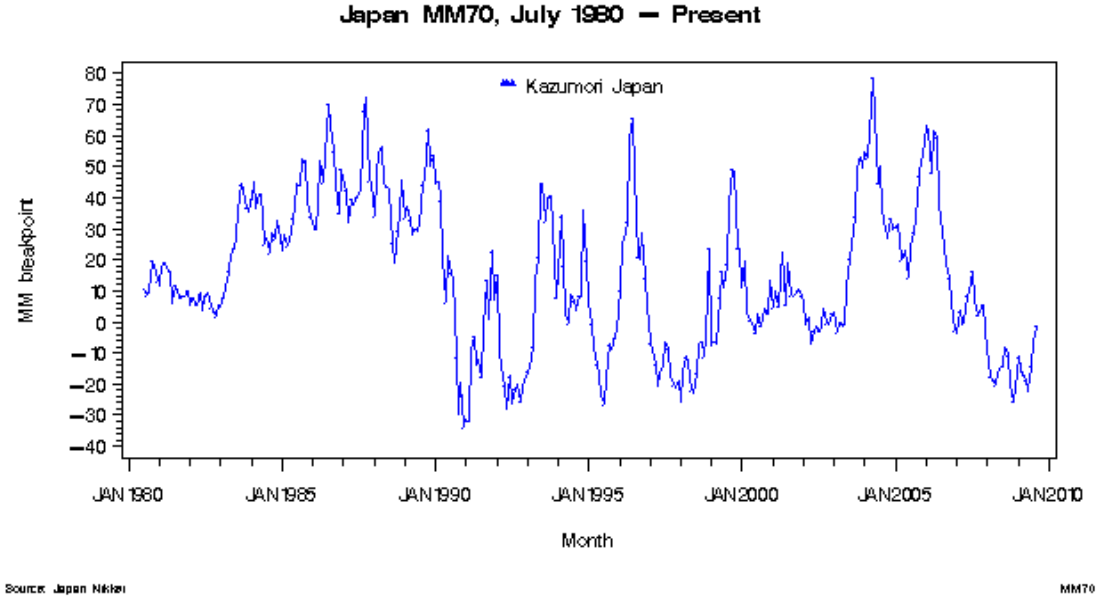
The momentum at the end of month t is the cumulative return of month t-12 to month t-2. At the end of each month t, we sorted all Japanese common stocks with non-missing return in month t-2 and non-missing stock price at the end of month t-13. The breakpoints used the 1st section of TSE stocks. Value-weighted returns for the portfolios (monthly) are calculated and the portfolios are rebalanced monthly at the end of each month.

3.11.1. *Yearly Breakpoints*

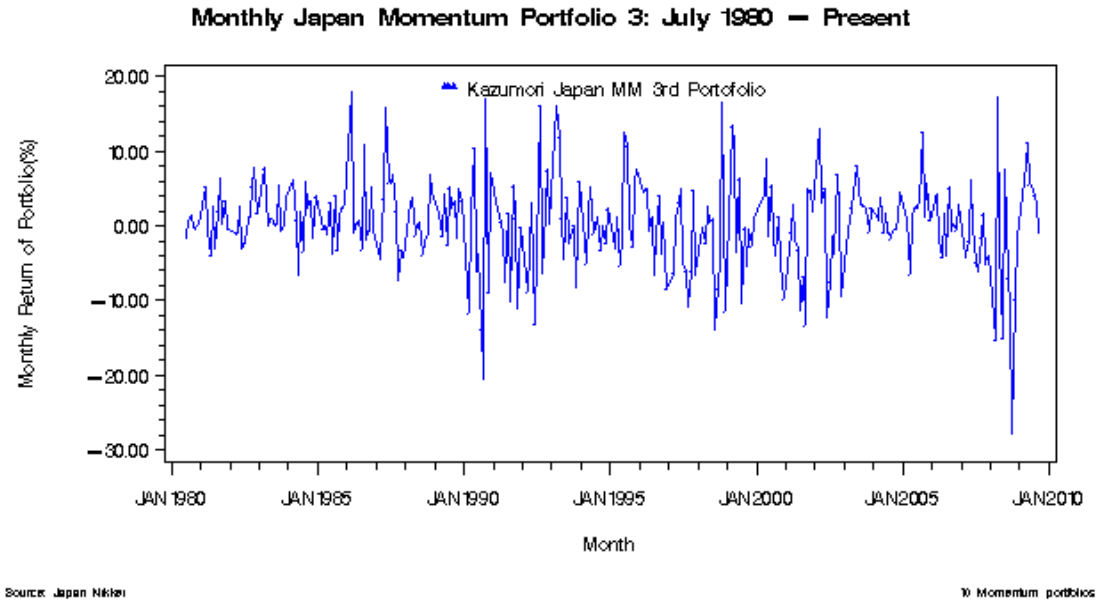


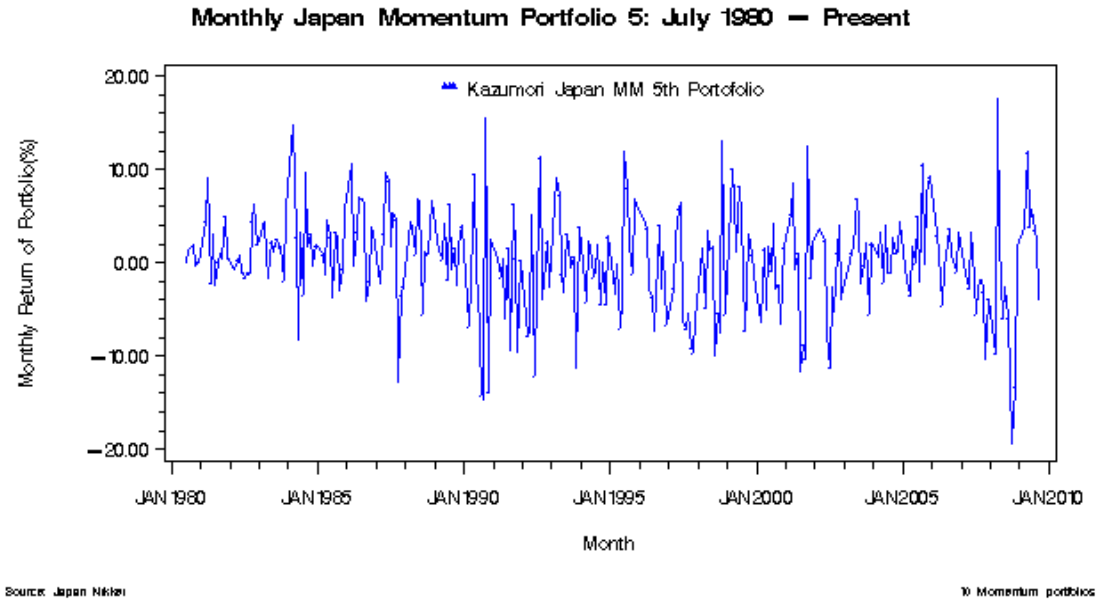


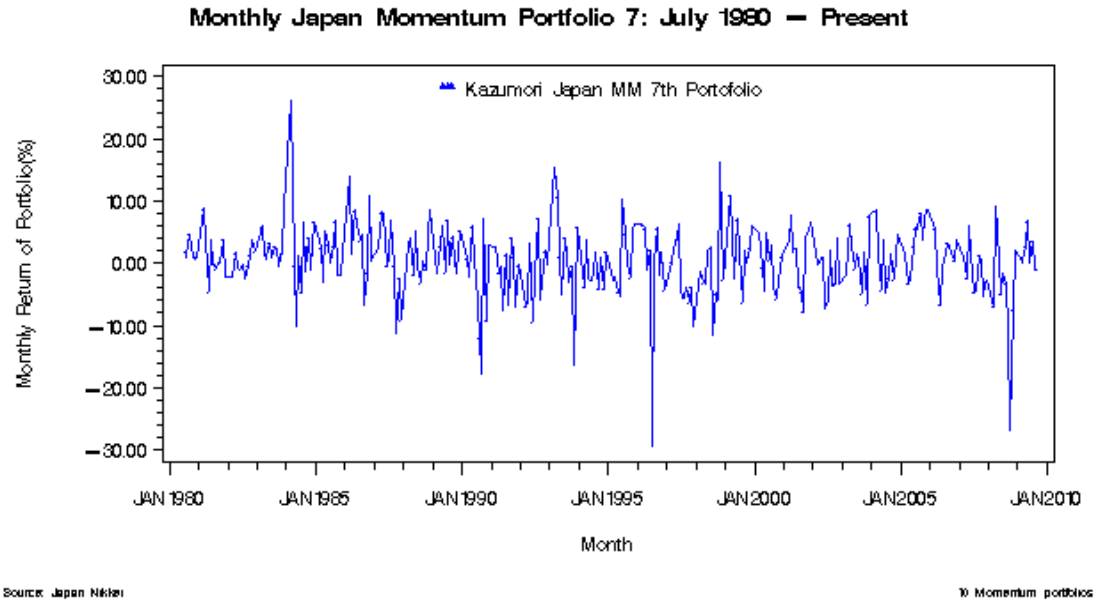

Japan MM50, July 1980 — Present
Kazumori Japan
MM breakpoint
60
50
40
30
20
10
0
−10
−20
−30
−40
−50
JAN1980
JAN1985
JAN1990
JAN1995
JAN2000
JAN2005
JAN2010
Month
Source: Japan Nikkei
MM50


Japan MM70, July 1980 — Present
Kazumori Japan
MM breakpoint
80
70
60
50
40
30
20
10
0
−10
−20
−30
−40
JAN1980
JAN1985
JAN1990
JAN1995
JAN2000
JAN2005
JAN2010
Month
Source: Japan Nikkei
MM70

3.11.2. *Portfolios*



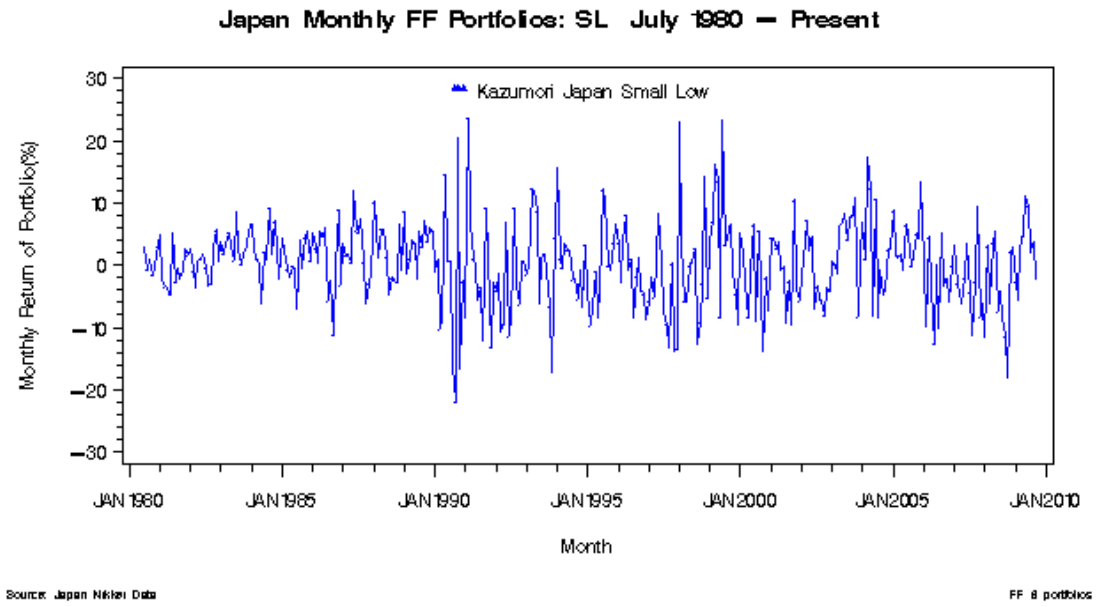


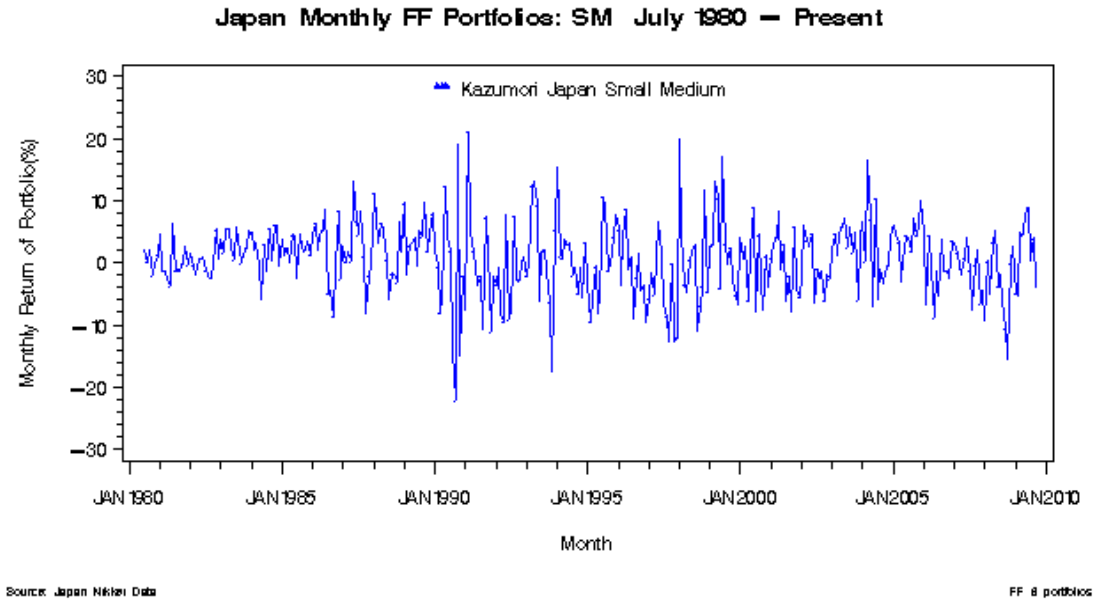


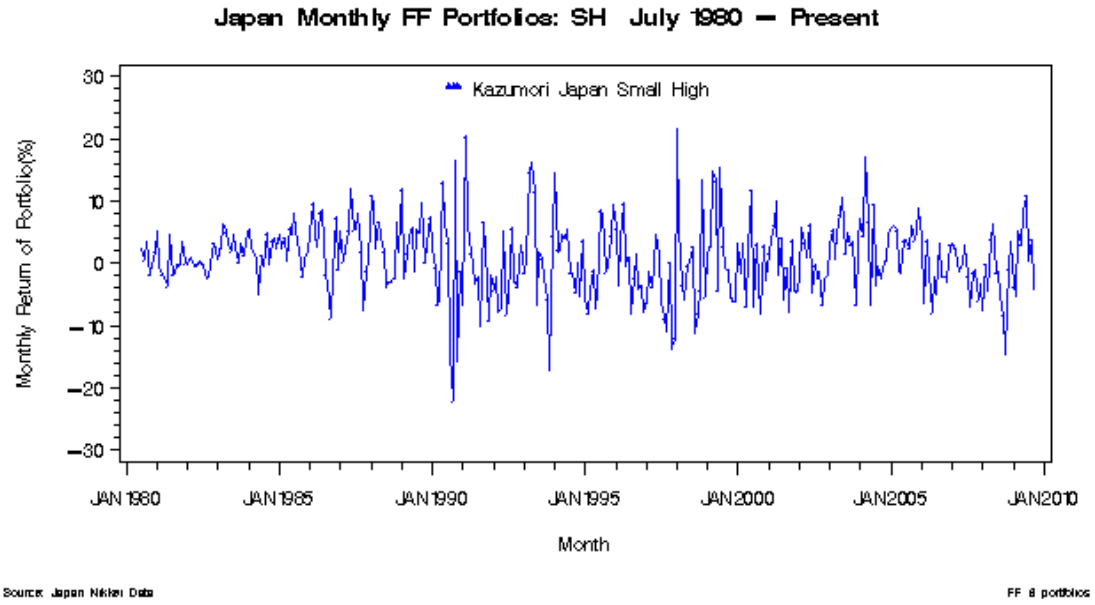
3.12. *The 2×3 Size and Value Portfolios*

The SMB and HML factors are constructed using 6 value-weighted portfolios sorted on size (item MKTV in Nikkei table DRET) and book equity/market equity ratio (BE/ME – BE is the item TOEQ_1 in table DFSP5 (for Non-Consolidated Reporting) while ME is the item MKTV in table DRET). In September of each year t, all common stocks traded in all Japanese stock markets (TSE - Tokyo, OSE – Osaka, Jasdaq and other exchanges) are sorted into two groups based on the market equity (size) from September using TSE 1st section median size. We also sort these stocks with positive BE/ME ratio into 3 groups, the low 30%, middle 40% and high 30% based on the BE/ME ratio (BE is the most recent available at the end of September while ME is the end of March of year t), using the breakpoints from TSE 1set section. We form 6 portfolios from the intersection of the two size and three BE/ME groups. Only stocks with positive BE/ME are included. Value-weighted returns on the 6 portfolios are calculated from October of year t to September of t+1, and the 6 portfolios are rebalanced at the end of September of t+1. Return with dividends is the item RTN_INDIV in table DRET.

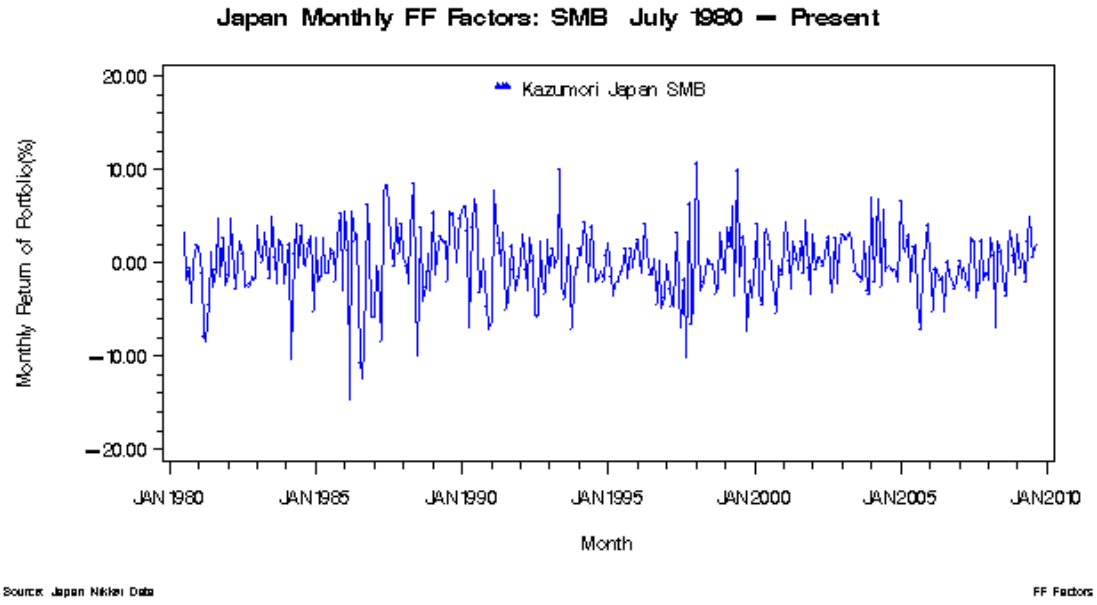
3.12.1. *6 Fama French Portfolios*

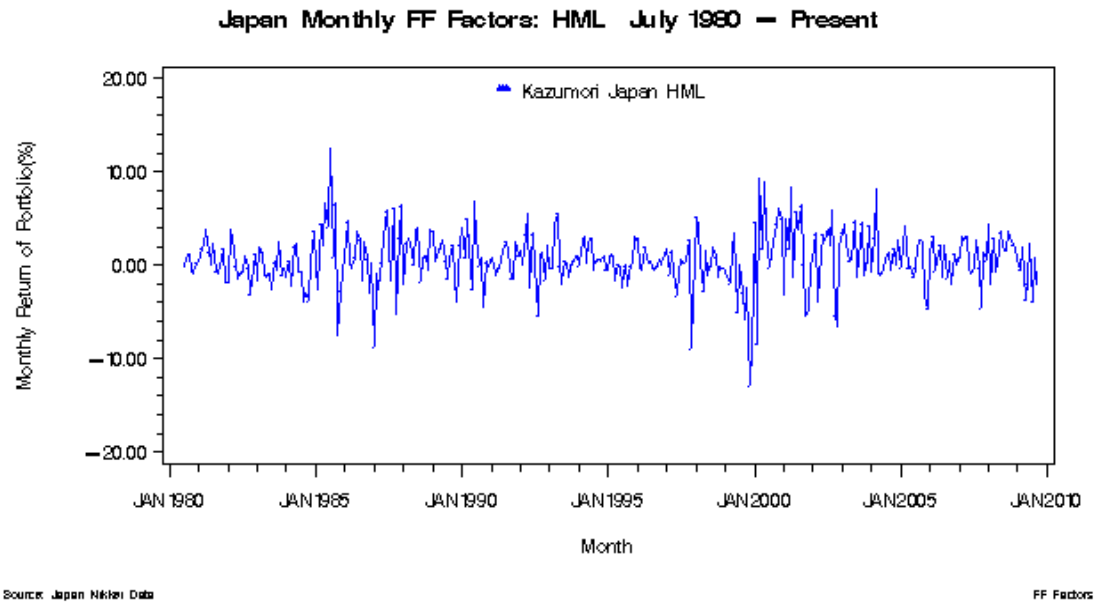






3.12.2. *Japan Fama French Size Factor - Small vs. Big (Monthly)*



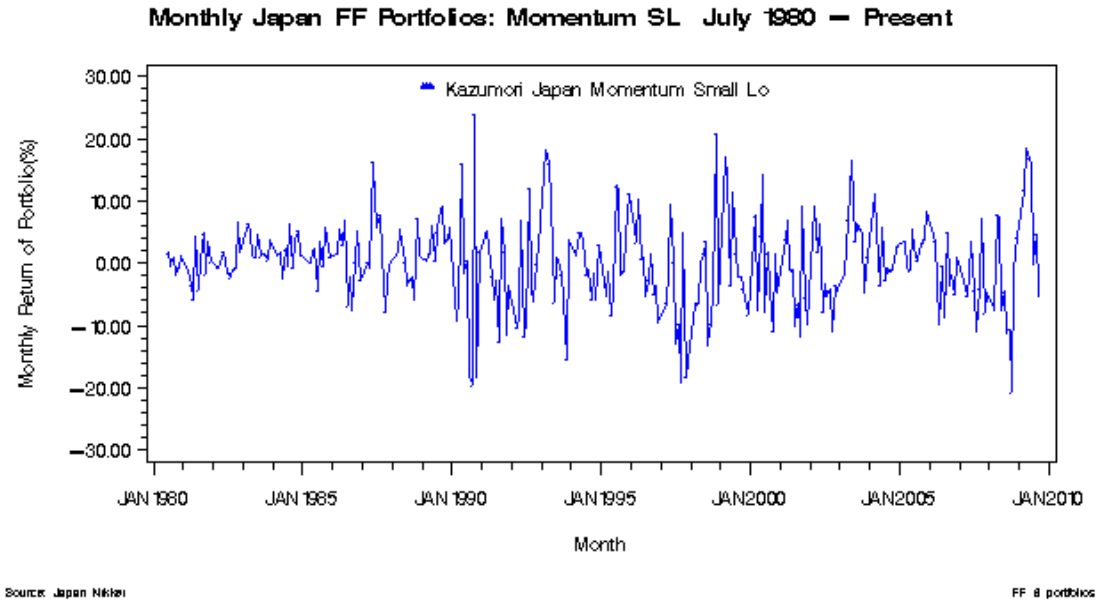


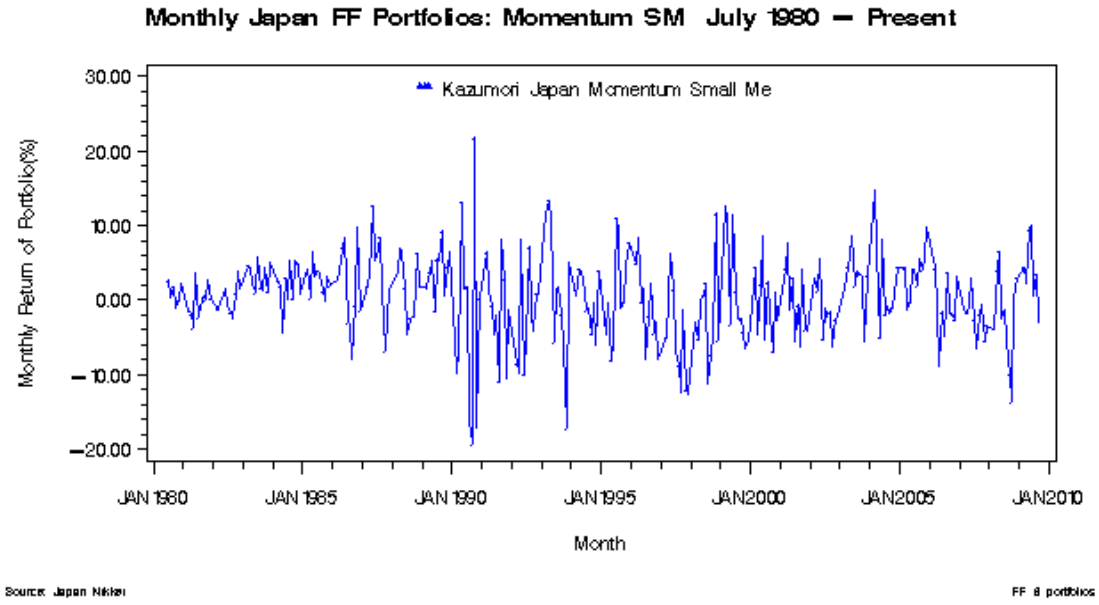
3.13. *The 5×5 Size and Value Portfolios*

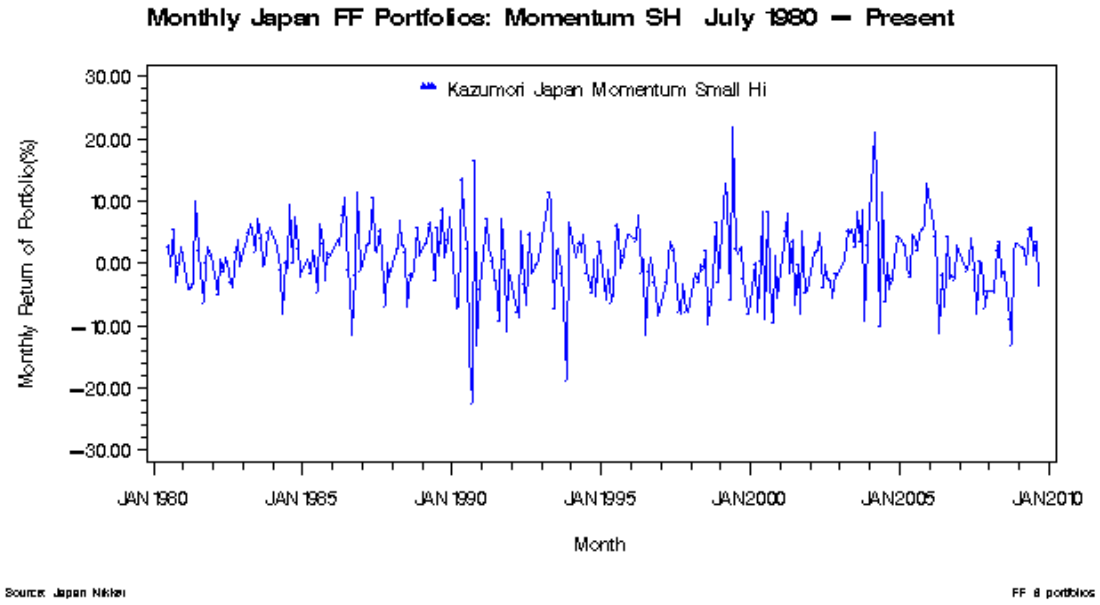
Similarly to 1.11, we constructed the 5×5 Size and Value portfolios using the breakpoints of TSE 1st section. We sort all Japanese stocks into 5 quintiles based on Size and BE/ME, separately. Then we form 25 portfolios from the intersection of the 5 Size groups and 5 BE/ME groups. Only stocks with positive BE/ME are included. Value-weighted returns on the 25 portfolios are calculated from October of year t to September of t+1, and the 25 portfolios are rebalanced at the end of September of t+1.

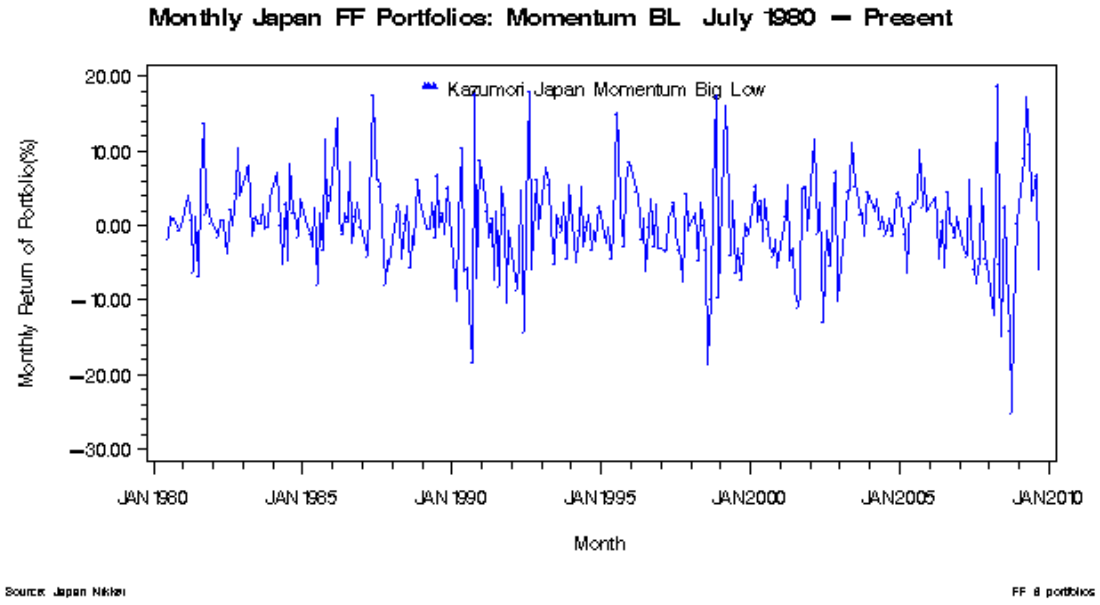
3.14. *The 2×3 Size and Momentum Portfolios*

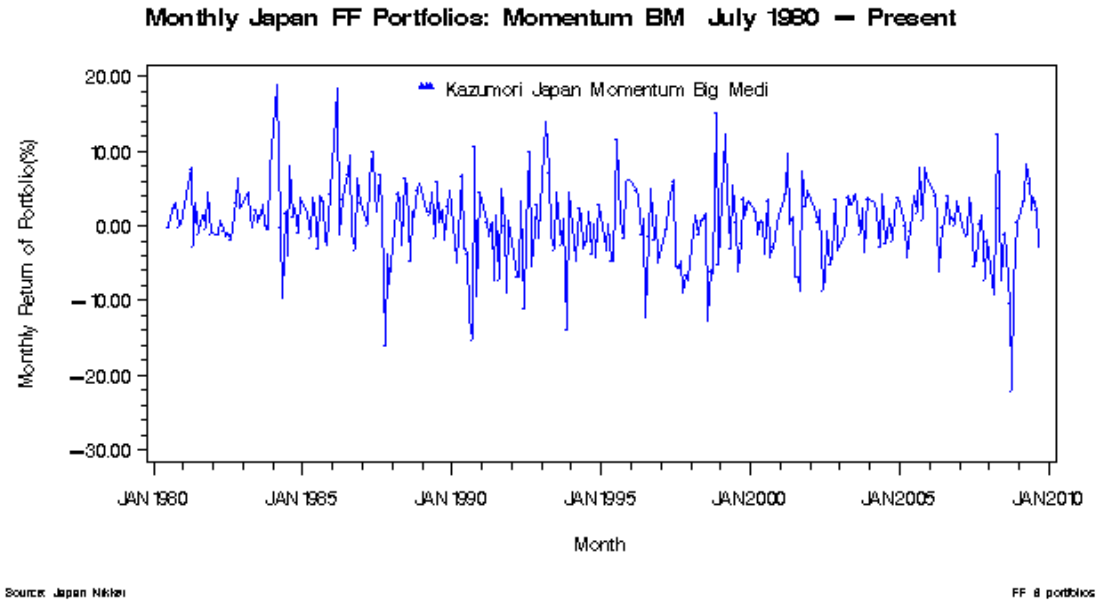
Momentum (MOM) is constructed using 6 value-weighted portfolios sorted on Size and Prior Cumulative Returns (Prior Months 2-12 for monthly factor and Prior Trading Days 21-250 for daily factor). These portfolios are rebalanced monthly (form monthly factors) are the intersections of 2 portfolios (Big and Small) formed on size (item MKTV in Table DRET) using TSE 1st section median size as the breakpoint and 3 portfolios (Low 30%, Middle 40%, High 30%) formed on prior cumulative returns using the 30th and 70th percentiles of prior cumulative returns of TSE 1st section as the breakpoints.

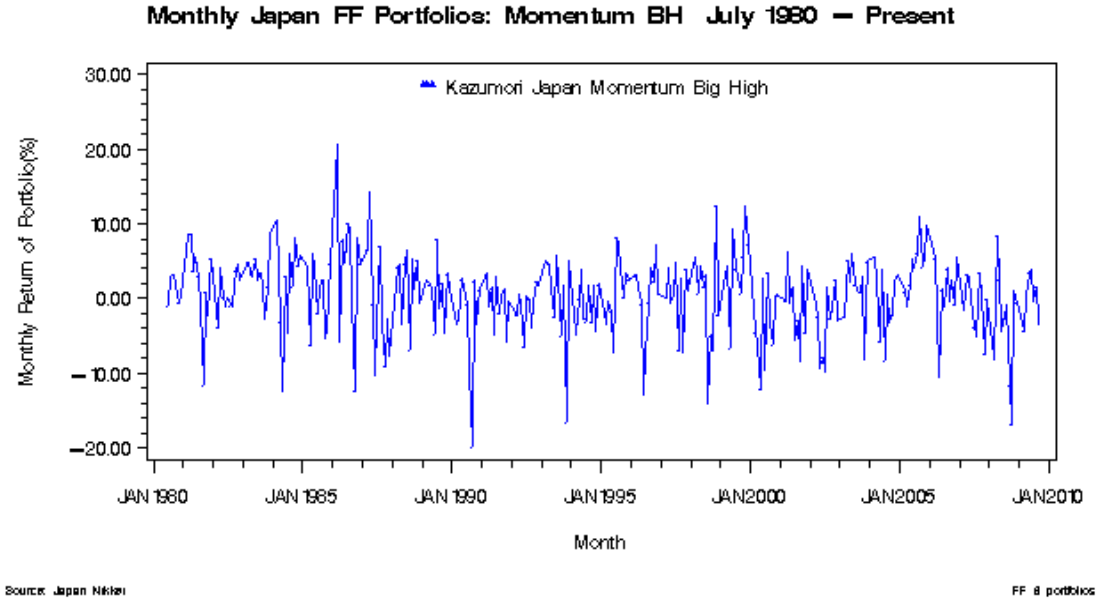

Monthly Japan FF Portfolios: Momentum SL July 1980 — Present
Kazumori Japan Momentum Small Lo
Monthly Return of Portfolio(%)
30.00
20.00
10.00
0.00
−10.00
−20.00
−30.00
JAN1980
JAN1985
JAN1990
JAN1995
JAN2000
JAN2005
JAN2010
Month
Source: Japan Nikkei
FF 6 portfolios


Monthly Japan FF Portfolios: Momentum SM July 1980 — Present
Kazumori Japan Momentum Small Me
Monthly Return of Portfolio(%)
30.00
20.00
10.00
0.00
−10.00
−20.00
JAN1980
JAN1985
JAN1990
JAN1995
JAN2000
JAN2005
JAN2010
Month
Source: Japan Nikkei
FF 6 portfolios


Monthly Japan FF Portfolios: Momentum SH July 1980 – Present
Kazumori Japan Momentum Small Hi
Monthly Return of Portfolio(%)
30.00
20.00
10.00
0.00
–10.00
–20.00
–30.00
JAN 1980
JAN 1985
JAN 1990
JAN 1995
JAN2000
JAN2005
JAN2010
Month
Source: Japan Nikkei
FF 6 portfolios


Monthly Japan FF Portfolios: Momentum BL July 1980 – Present
Kazumori Japan Momentum Big Low
Monthly Return of Portfolio(%)
20.00
10.00
0.00
–10.00
–20.00
–30.00
JAN 1980
JAN 1985
JAN 1990
JAN 1995
JAN2000
JAN2005
JAN2010
Month
Source: Japan Nikkei
FF 6 portfolios

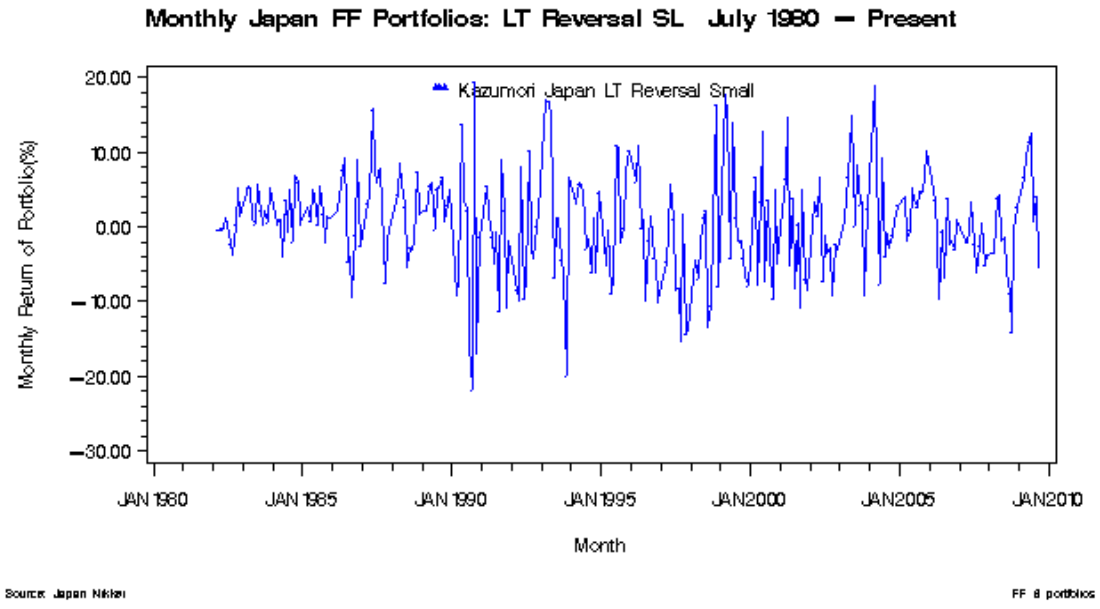


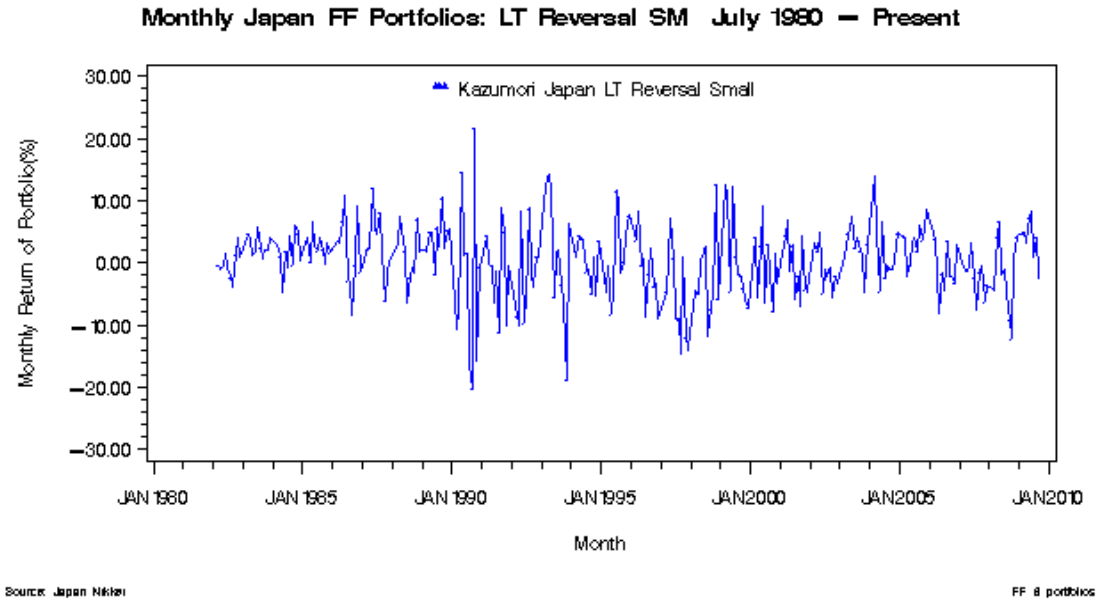


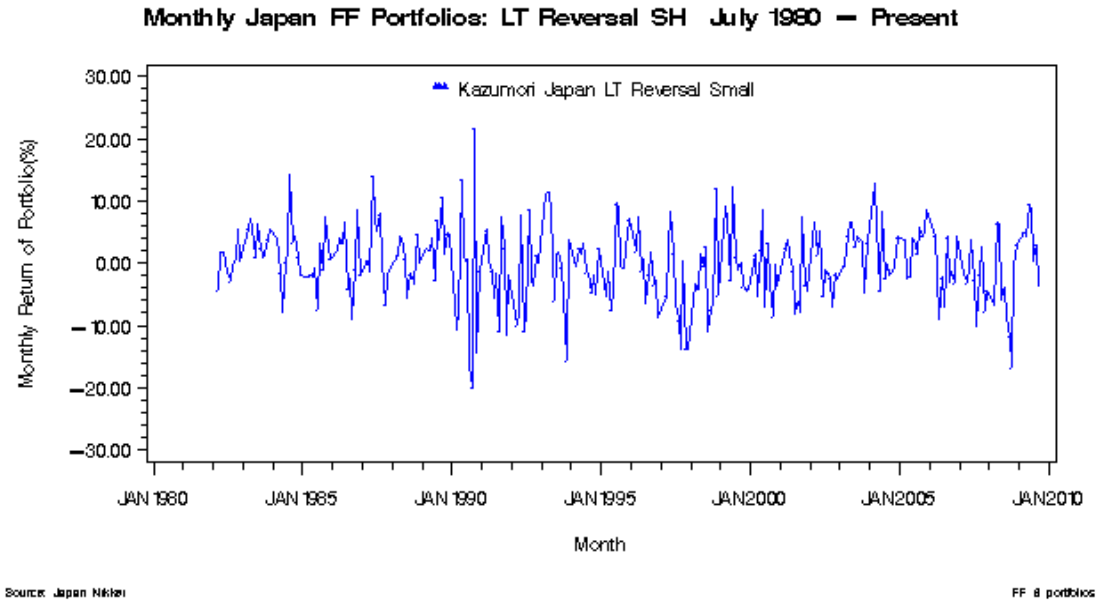
3.15. *The 2×3 Size and Long-Term Reversal Portfolios*

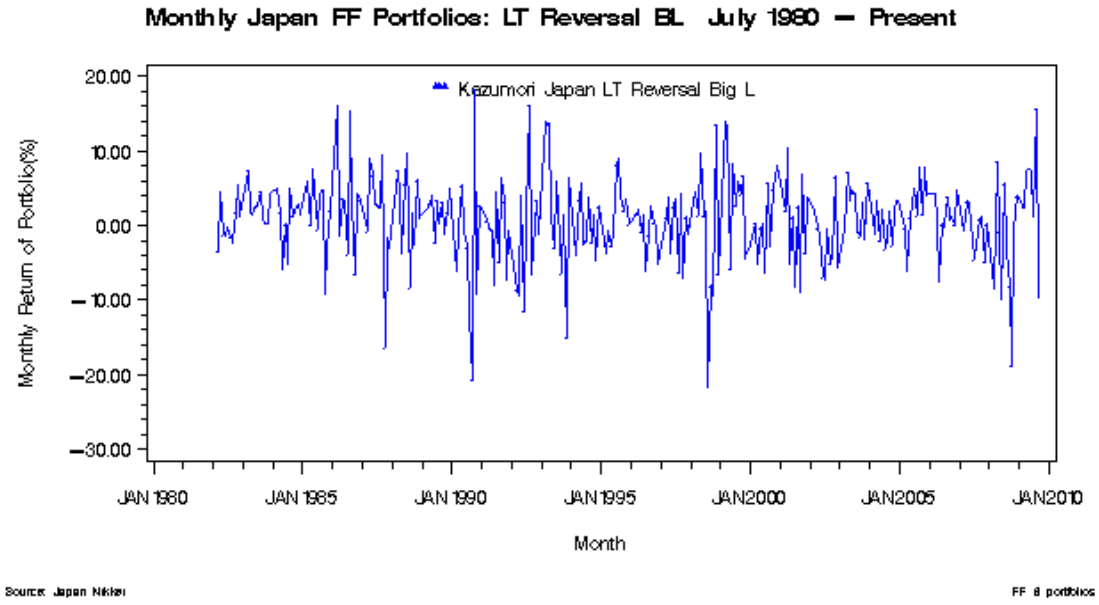
Long-Term Reversal (LTR) is constructed using 6 value-weighted portfolios sorted on Size and Prior Cumulative Returns (Prior Months 13-60 for monthly factor and Prior Trading Days 251-1250 for daily factor). These portfolios are rebalanced monthly (for monthly factor) or daily (for daily factor), are the intersections of 2 portfolios (Big and Small)

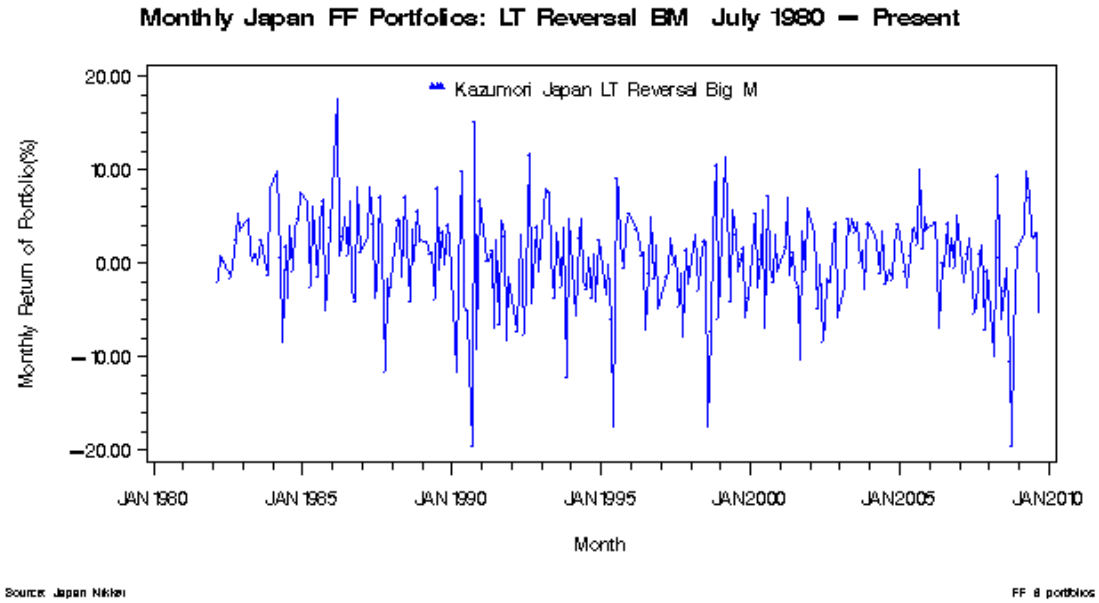
formed on size (item MKTV in Table DRET) using TSE 1st section median size as the breakpoint and 3 portfolios (Low 30%, Middle 40%, High 30%) formed on prior cumulative returns using the 30th and 70th percentiles of prior cumulative returns of TSE 1st section as the breakpoints.

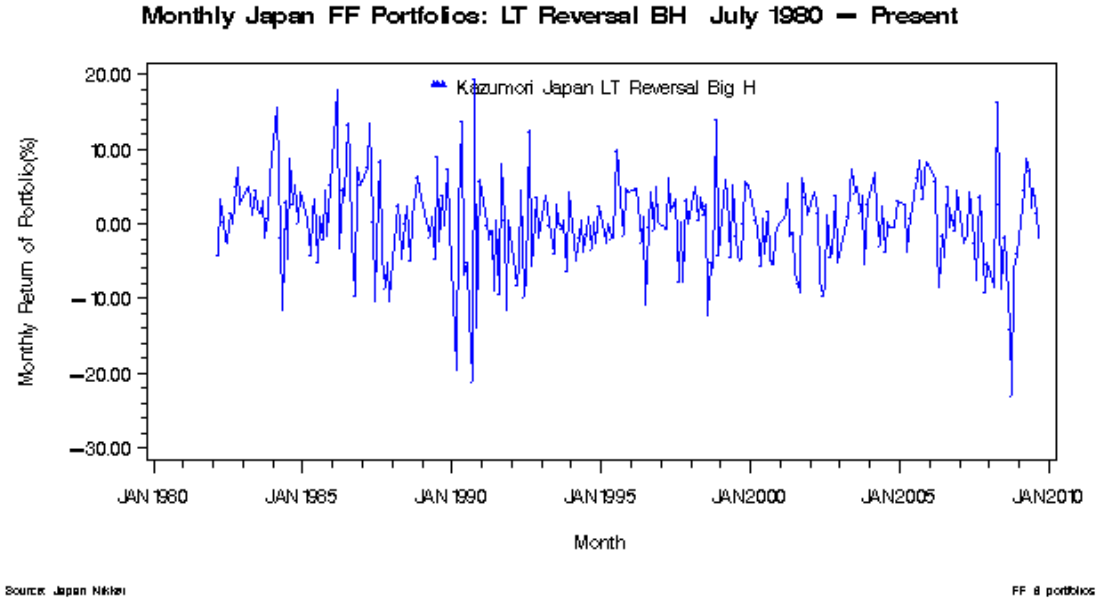





Monthly Japan FF Portfolios: LT Reversal SH July 1980 — Present
Kazumori Japan LT Reversal Small
Monthly Return of Portfolio(%)
30.00
20.00
10.00
0.00
−10.00
−20.00
−30.00
JAN 1980
JAN 1985
JAN 1990
JAN 1995
JAN2000
JAN2005
JAN2010
Month
Source: Japan Nikkei
FF 6 portfolios


Monthly Japan FF Portfolios: LT Reversal BL July 1980 — Present
Kazumori Japan LT Reversal Big L
Monthly Return of Portfolio(%)
20.00
10.00
0.00
−10.00
−20.00
−30.00
JAN 1980
JAN 1985
JAN 1990
JAN 1995
JAN2000
JAN2005
JAN2010
Month
Source: Japan Nikkei
FF 6 portfolios

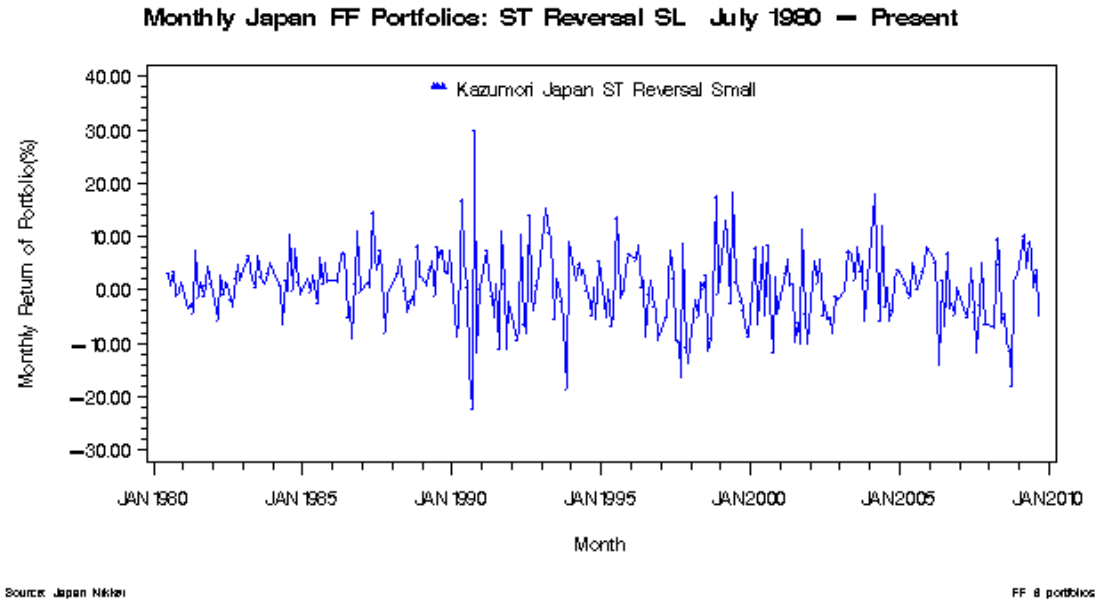


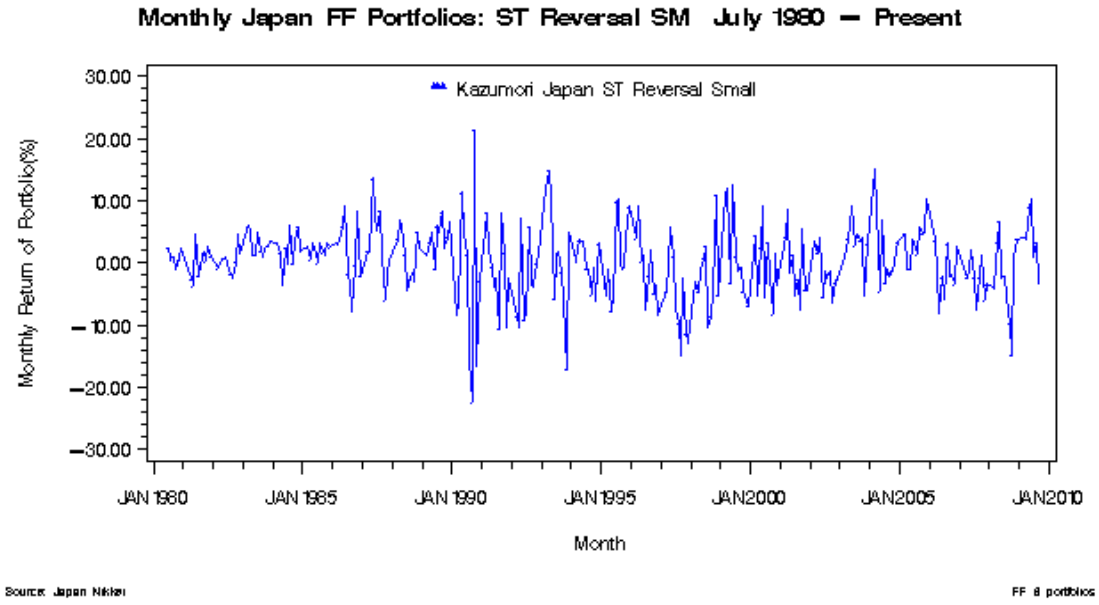


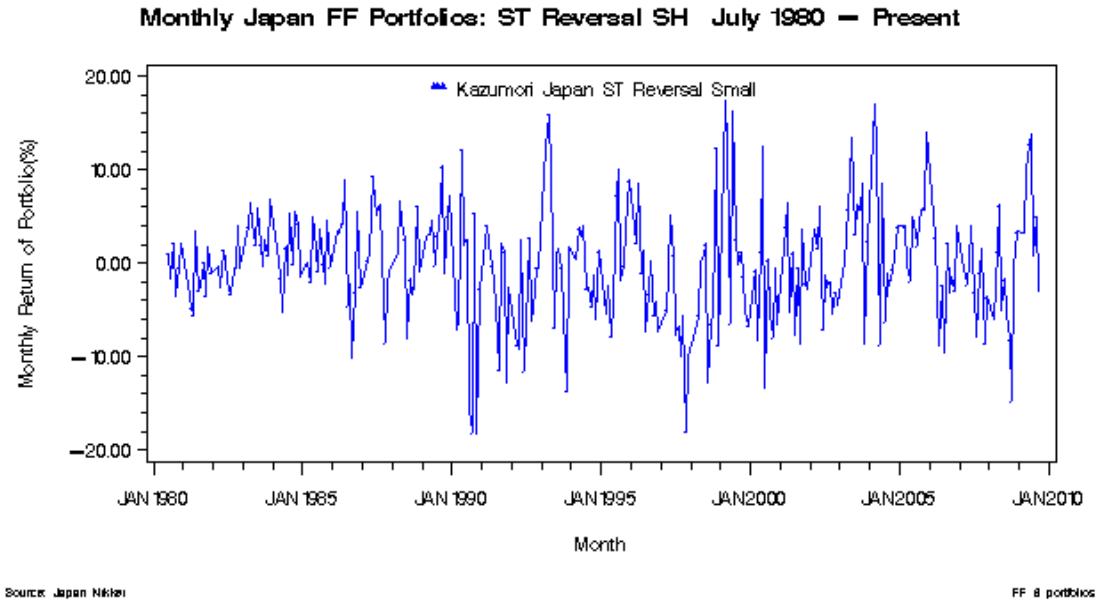
3.16. *The 2×3 Size and Short-Term Reversal Portfolios*

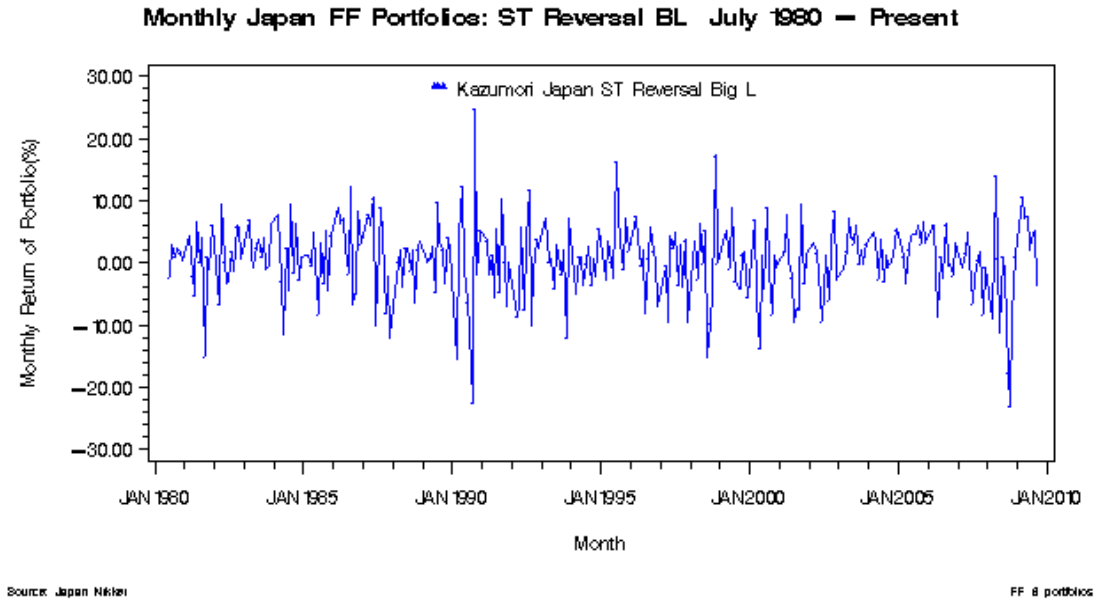
Similarly, Short-Term Reversal (STR) is constructed using 6 value-weighted portfolios sorted on Size and Prior Returns (Prior Months 1 for monthly factor and Prior Trading Day 1 for daily factor). These portfolios are rebalanced monthly (for monthly factor) or daily (for daily factor), are the intersections of 2 portfolios (Big and Small) formed on size

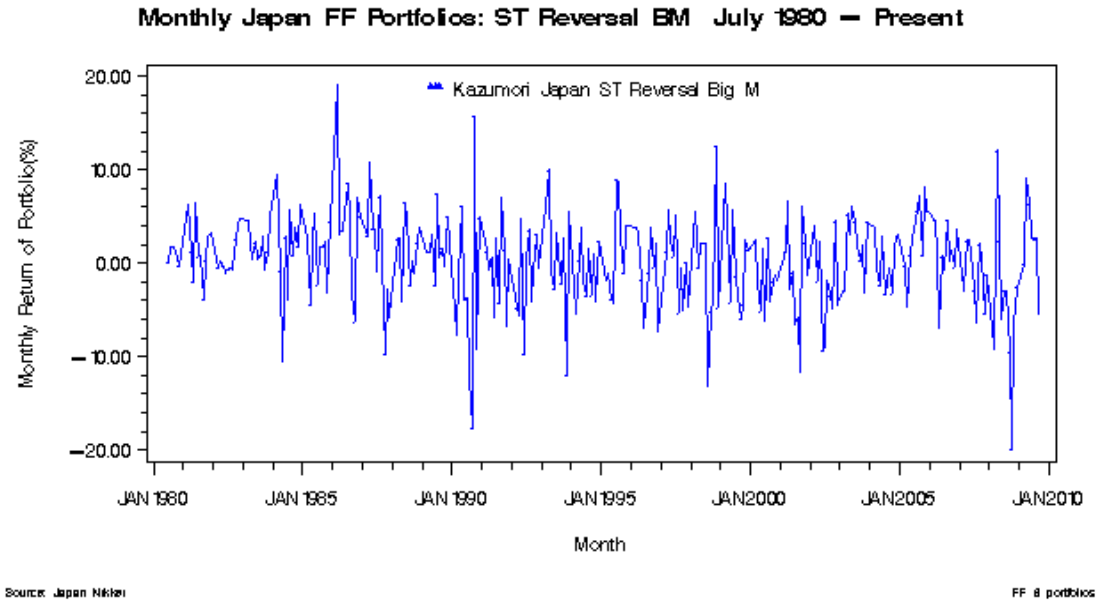
(item MKTV in Table DRET) using TSE 1st section median size as the breakpoint and 3 portfolios (Low 30%, Middle 40%, High 30%) formed on prior returns using the 30th and 70th percentiles of prior cumulative returns of TSE 1st section as the breakpoints.

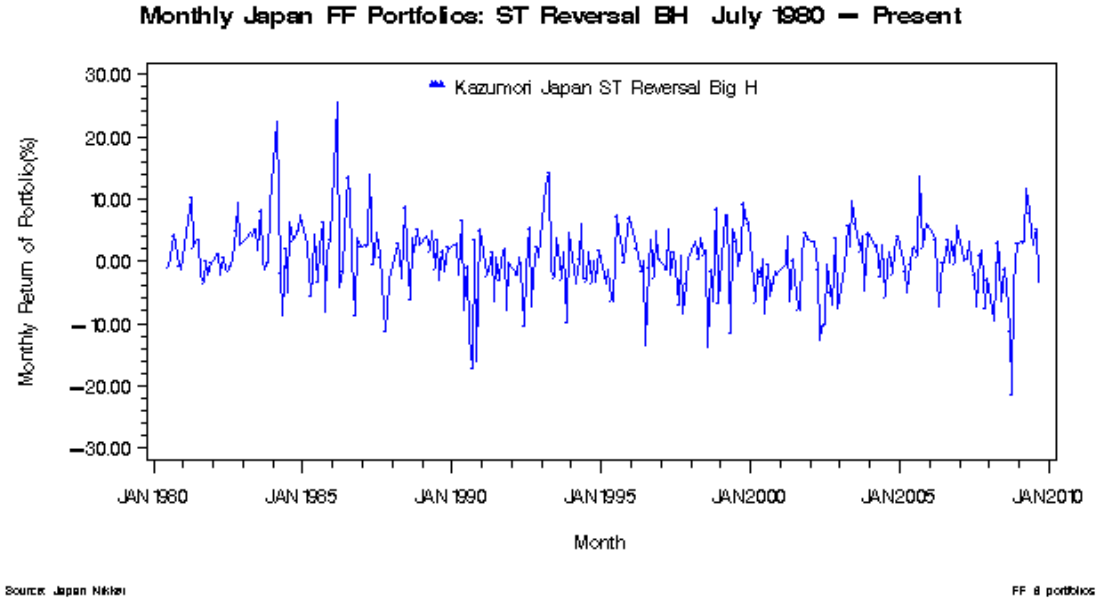





Monthly Japan FF Portfolios: ST Reversal SH July 1980 – Present
Kazumori Japan ST Reversal Small
Monthly Return of Portfolio(%)
20.00
10.00
0.00
–10.00
–20.00
JAN 1980
JAN 1985
JAN 1990
JAN 1995
JAN2000
JAN2005
JAN2010
Month
Source: Japan Nikkei
FF 8 portfolios


Monthly Japan FF Portfolios: ST Reversal BL July 1980 – Present
Kazumori Japan ST Reversal Big L
Monthly Return of Portfolio(%)
30.00
20.00
10.00
0.00
–10.00
–20.00
–30.00
JAN 1980
JAN 1985
JAN 1990
JAN 1995
JAN2000
JAN2005
JAN2010
Month
Source: Japan Nikkei
FF 8 portfolios





3.17. *Japan Daily Factors*

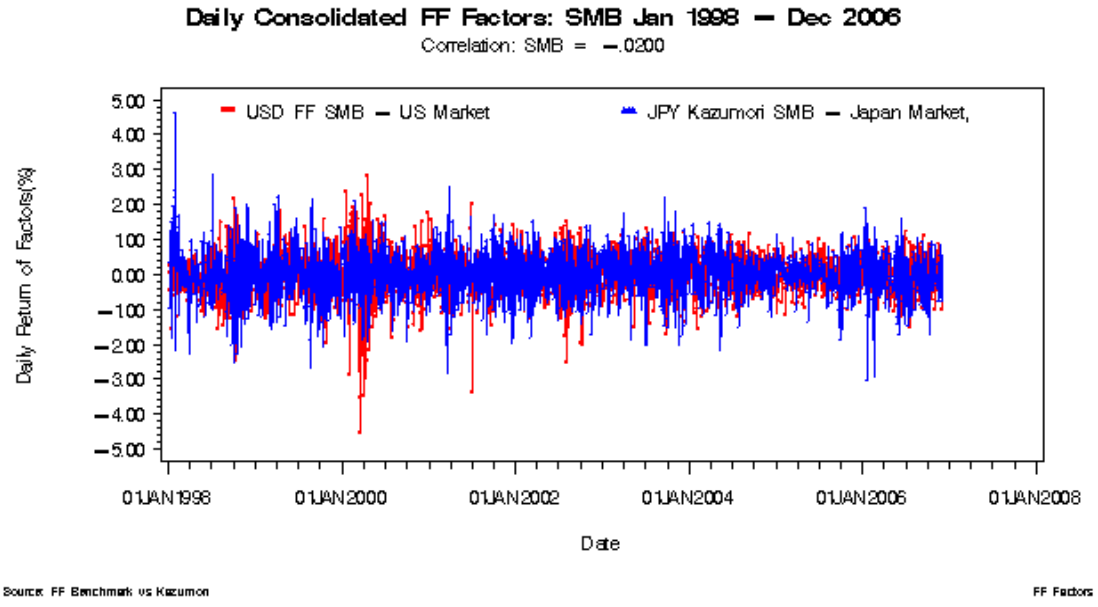
We calculated the daily factors for Japan data including:

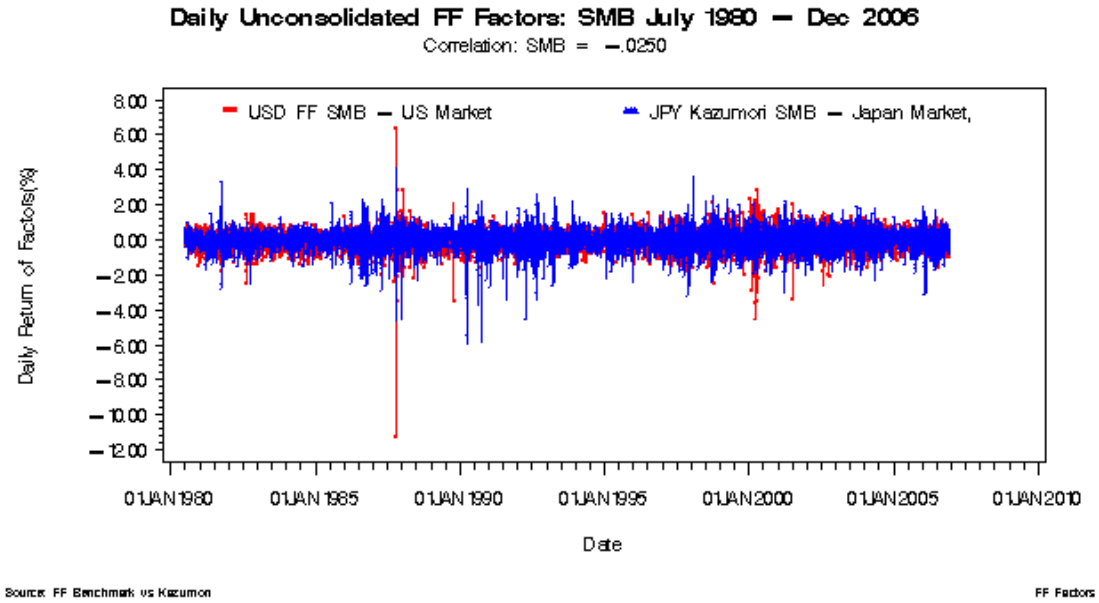
- SMB (Size), HML (Value) and Excess Market Returns: The 2×3 portfolios used to calculate these 3 factors are formed once a YEAR, i.e., the same portfolios we used to calculate the monthly factors. However, due to the peculiarity of Japan accounting

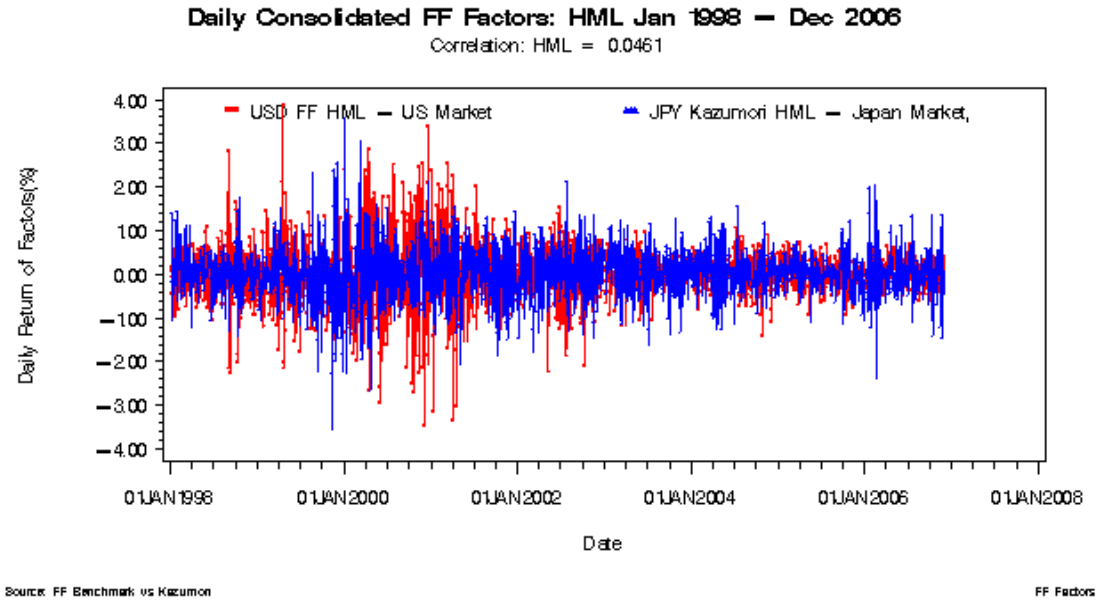
systems (historically it reported Unconsolidated Book Equity only but it started to adopt the Consolidated Book Equity recently (since early 2000)). As a result, we also calculated 2 sets of daily factors: Consolidated and Unconsolidated

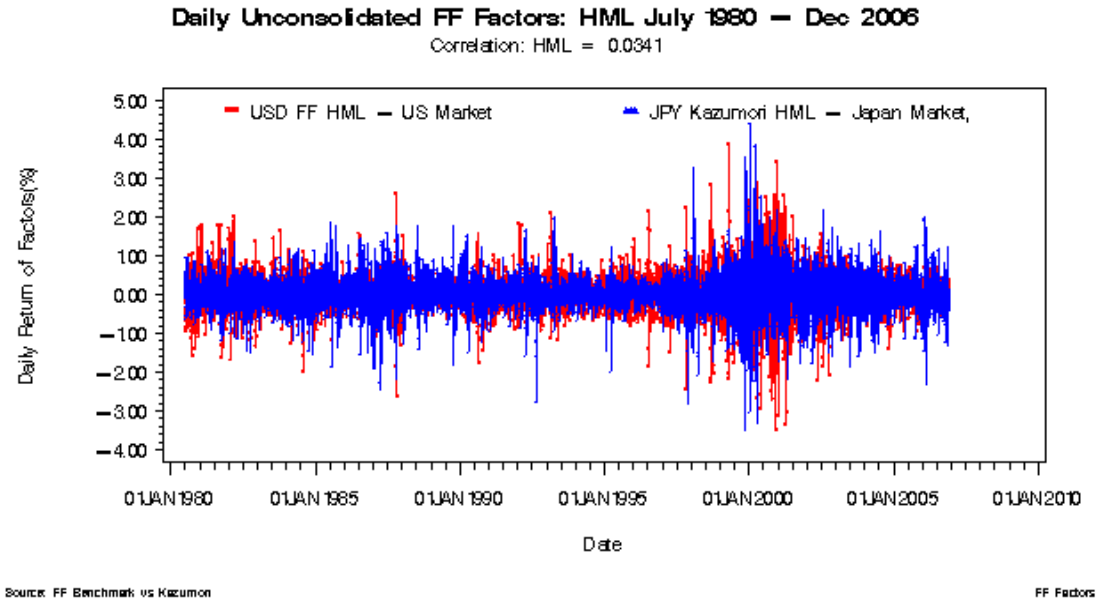
- ST/LT Reversals and Momentum: the 2×3 portfolios used to calculate these are formed each DAY based on previous days market equity and prior cumulative returns. This is different from the calculation of monthly factors. The monthly factors' portfolios were formed each month and the calculation of prior cumulative returns are also different.

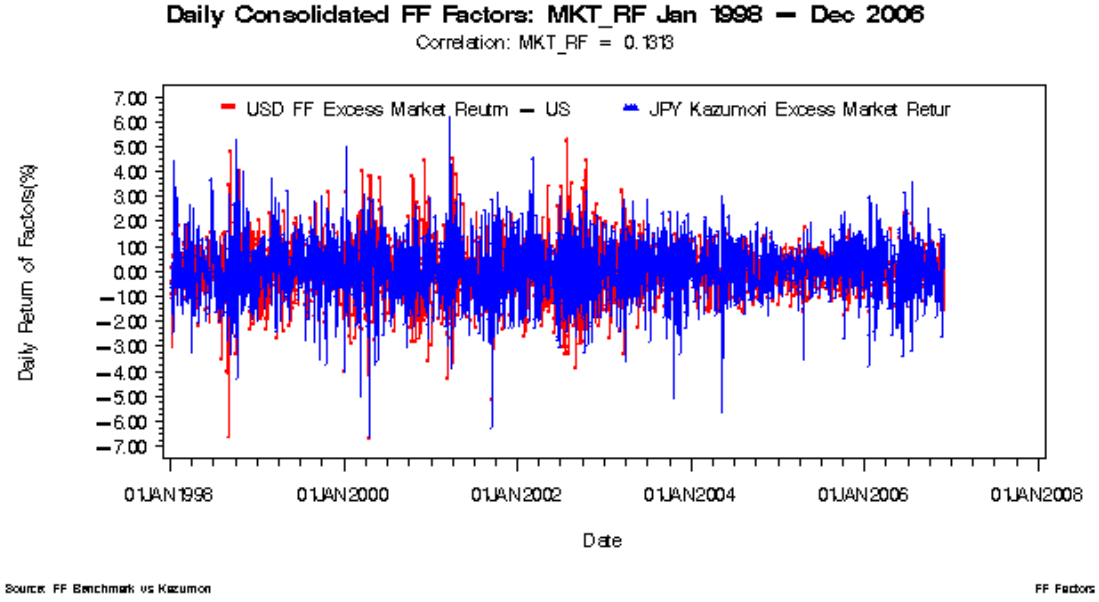
3.17.1. *SMB (Size), HML (Value) and Excess Market Returns*

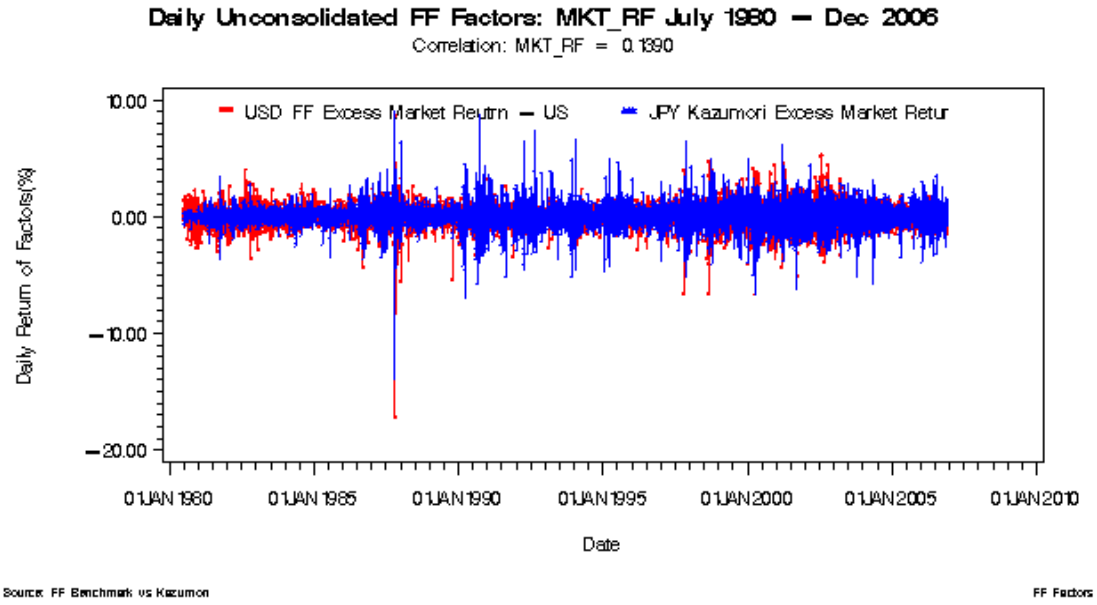



Daily Unconsolidated FF Factors: SMB July 1980 — Dec 2006
Correlation: SMB = −.0250
USD FF SMB — US Market
JPY Kazumori SMB — Japan Market,
Daily Return of Factors(%)
8.00
6.00
4.00
2.00
0.00
−2.00
−4.00
−6.00
−8.00
−10.00
−12.00
01JAN1980
01JAN1985
01JAN1990
01JAN1995
01JAN2000
01JAN2005
01JAN2010
Date
Source: FF Benchmark vs Kazumori
FF Factors

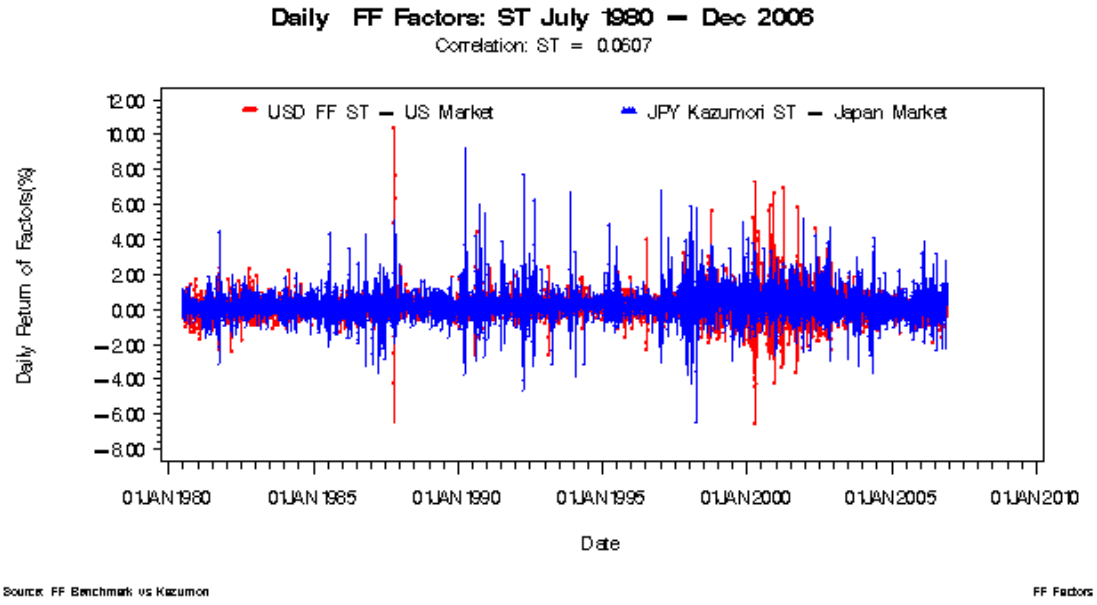

Daily Consolidated FF Factors: HML Jan 1998 — Dec 2006
Correlation: HML = 0.0461
USD FF HML — US Market
JPY Kazumori HML — Japan Market,
Daily Return of Factors(%)
4.00
3.00
2.00
1.00
0.00
−1.00
−2.00
−3.00
−4.00
01JAN1998
01JAN2000
01JAN2002
01JAN2004
01JAN2006
01JAN2008
Date
Source: FF Benchmark vs Kazumori
FF Factors

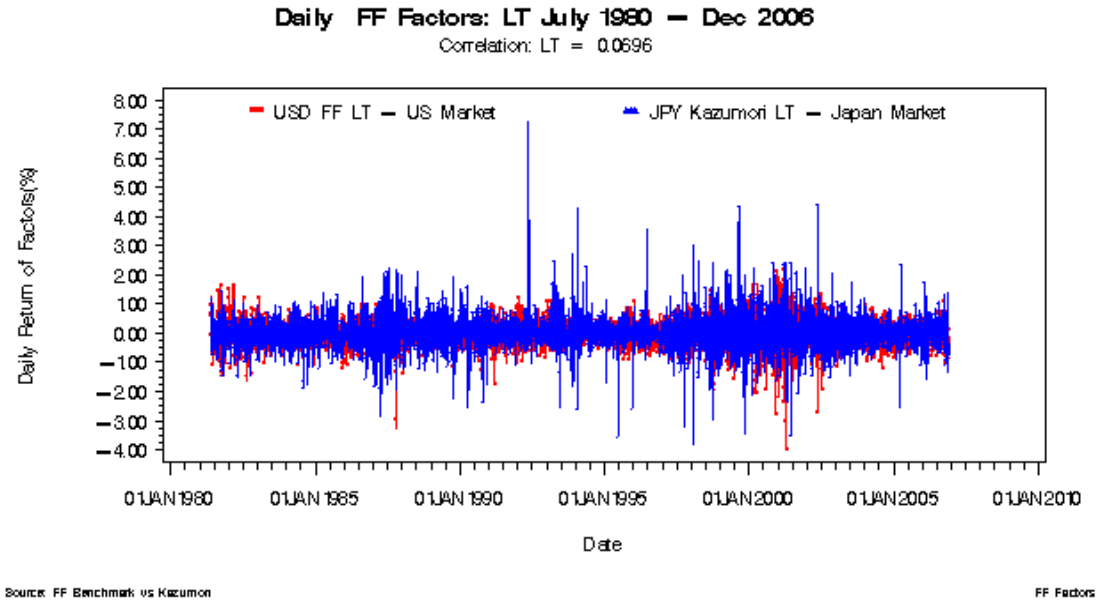

Daily Unconsolidated FF Factors: HML July 1980 – Dec 2006
Correlation: HML = 0.0341
USD FF HML – US Market
JPY Kazumori HML – Japan Market,
Daily Return of Factors(%)
5.00
4.00
3.00
2.00
1.00
0.00
−1.00
−2.00
−3.00
−4.00
01JAN1980
01JAN1985
01JAN1990
01JAN1995
01JAN2000
01JAN2005
01JAN2010
Date
Source: FF Benchmark vs Kazumori
FF Factors

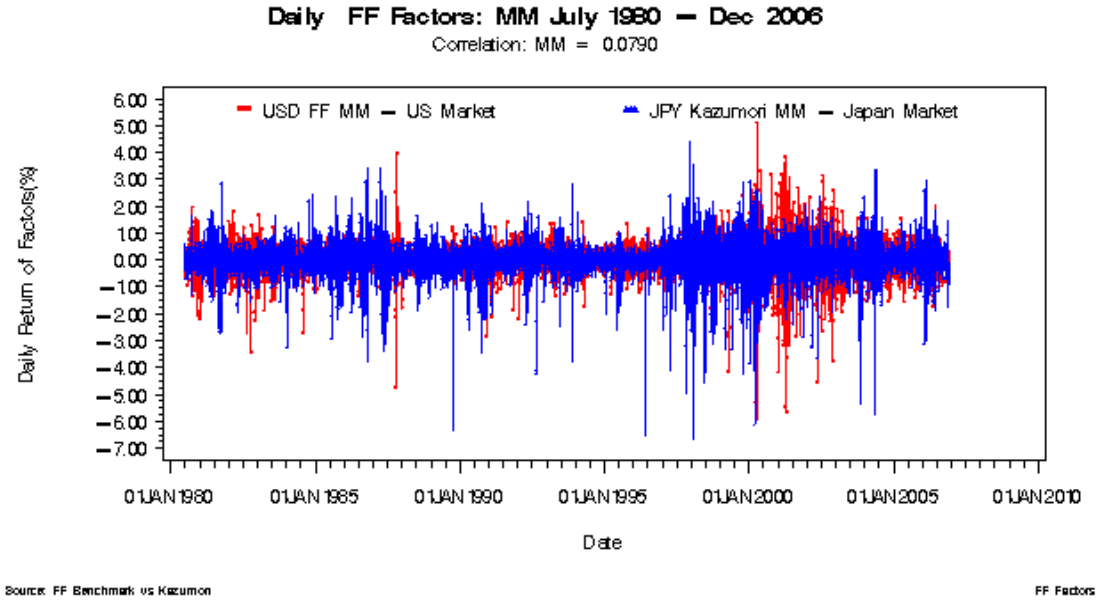

Daily Consolidated FF Factors: MKT_RF Jan 1998 – Dec 2006
Correlation: MKT_RF = 0.1313
USD FF Excess Market Returm – US
JPY Kazumori Excess Market Retur
Daily Return of Factors(%)
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
−1.00
−2.00
−3.00
−4.00
−5.00
−6.00
−7.00
01JAN1998
01JAN2000
01JAN2002
01JAN2004
01JAN2006
01JAN2008
Date
Source: FF Benchmark vs Kazumori
FF Factors



3.17.2. *ST/LT Reversals and Momentum*







4. CONCLUSION

This paper introduces our new database for stock market factors for Japanese and US markets. Our innovations are

- We use the Nikkei Financial Database that addresses the data problem in the MSCI data.

- We start by replicating the US factors data of the Ken French data library with very high precision and then use this algorithm to derive Japanese factors.
- We cover not only the Fama French factors data but also cover size, BE/ME ratio, earning yield, cash flow yield, dividend yield, the short-term reversal, the long-term reversal, and the momentum factor.

Thus, our data library will provide reliable and internationally comparable data about Japanese stock markets. We hope this data library will help researchers, practitioners and policy makers obtain more precise understandings of the behavior of the stock prices in Japan.

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