

Empirical Finance Final Project

Fama 3-factor model in Chinese financial markets(In SAS)

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Table 1

Descriptive statistics for 25 stock portfolios formed on size and book-to-market equity: 2003-2013, 11 years

Size quintile	Book-to-market equity(BE/ME) quintiles									
	Low	2	3	4	High	Low	2	3	4	High
	Average of annual averages of firm size-in millions					Average of annual B/E ratios for portfolio				
Small	641.13	617.92	634.72	676.3	777.83	0.21	0.36	0.45	0.57	0.77
2	1247.86	1264.21	1257.03	1261.46	1279.87	0.24	0.35	0.46	0.58	0.80
3	1979.84	1966.72	1973.5	1974.51	1981.76	0.25	0.36	0.46	0.59	0.80
4	3390.67	3349.65	3396.52	3390.64	3333.33	0.25	0.36	0.46	0.57	0.83
Big	14628.82	12500.25	14949.39	21971.06	28533.7	0.24	0.37	0.47	0.61	1.04
	Average of annual percent of market value in portfolio					Average of annual number of firms in portfolio				
Small	1.32	1.26	1.15	0.73	0.37	109.08	119.5	113.83	69.92	28.50
2	1.33	1.47	1.51	1.36	1.17	59.83	66.75	66.25	57.67	52.83
3	1.54	1.73	1.91	1.97	2.16	47.42	52.83	54.75	55.75	57.25
4	3.04	2.88	2.58	2.90	3.84	55.50	52.58	46.42	49.67	62.08
Big	12.34	9.8	9.24	10.63	19.46	54.58	46.58	41.92	42.58	64.00
	Average of annual E/P ratios(in percent) for portfolio									
Small	-7.45	-4.29	-3.32	-1.62	-7.73					
2	-0.48	1.44	2.16	0.69	-1.43					
3	2.94	4.10	4.78	4.23	-1.26					
4	4.13	5.41	5.95	6.33	6.14					
Big	6.13	10.73	10.9	15.76	10.99					

The 25 size-BE/ME stock portfolios are formed as follows. Each year t from 2003 to 2013 quintile break points for size (ME, stock price times shares outstanding), measured at the end of June, are used to allocate stocks in China A-Share Market to five size quintiles. The 25 size-BE/ME portfolios are formed as the intersections of the five sizes and the five BE/ME groups. In BE/ME, BE is the book common equity for the fiscal year ending in calendar year $t-1$, and ME is for the end of December of $t-1$.

A portfolio's book-to-market equity, BE/ME, for the portfolio formation year t is the sum of book equity, BE, for the firms in the portfolio for the fiscal year ending in calendar year $t-1$, divided by the sum of their market equity, ME, in December of $t-1$. A portfolio's earnings/price ratio (E/P) for year t is the sum of equity income for the firms in the portfolio for the fiscal year ending in calendar year $t-1$, divided by the sum of their market equity in December of $t-1$. Equity income is income before extraordinary items, plus income-statement deferred taxes, minus the preferred dividends.

The descriptive statistics are computed when the portfolio is formed in June of each year, 2003 – 2013, and are then averaged across the 11 years.

Table 2

Summary statistics for the monthly dependent and explanatory returns (in percent) in the regressions of table 3 to 8: January 2003 to December 2013, 132 observations.

				Autocorr.for lag			Correlations				
Name	Mean	Std	t(mn)	1	2	12					
Explanatory returns											
RM	1.14	9.07	1.44	0.13	0.22	-0.04					
TB	-0.06	0.17	-4.22	0.41	0.35	0.37					
LTG	-0.06	0.17	-4.22	0.41	0.35	0.37					
CB	0.41	0.06	79.00	0.82	0.76	-0.31					
RM-RF	0.91	9.08	1.16				RM-RF	RMO	SMB	HML	TERM
RMO	6.78	8.43	9.25	0.02	0.17	-0.12	0.93	1.00			
SMB	0.58	4.56	1.47	0.08	-0.05	0.14	0.18	0.00	1.00		
HML	0.17	3.13	0.63	0.00	0.00	0.10	0.19	0.00	0.01	1.00	
TERM	0.09	0.06	17.21	0.95	0.88	0.25	0.08	0.00	-0.08	0.02	1.00
DEF	0.09	0.04	27.13	0.63	0.58	0.21	-0.27	0.00	0.02	-0.01	-0.39
Dependent variables: Excess returns on government and corporate bonds											
TB	-0.06	0.17	-4.22	0.41	0.35	0.37					
LTG	-0.06	0.17	-4.22	0.41	0.35	0.37					
AAA	0.15	0.05	34.36	0.69	0.6	-0.31					
AA+	0.25	0.04	50.39	0.80	0.45	-0.22					
AA	0.28	0.05	46.38	0.84	0.63	-0.15					
AA-	0.35	0.09	29.86	0.22	0.54	0.05					

Dependent variables: Excess returns on 25 stock portfolios formed on ME and BE/ME

Size quintile	Book-to-market equity (BE/ME) quintiles									
	Low	2	3	4	High	Low	2	3	4	High
	Mean					Standard deviations				
Small	1.56	1.58	1.70	1.85	1.83	11.05	11.25	10.92	11.12	11.44
2	1.06	1.62	1.35	1.64	1.52	10.67	10.59	10.82	11.39	11.2
3	1.17	1.24	1.03	1.24	1.26	10.06	10.52	10.48	10.71	10.77
4	0.93	0.93	1.20	1.28	1.00	9.81	9.91	10.7	10.62	10.50
Big	0.72	0.65	0.85	0.83	1.07	8.92	9.56	9.63	9.68	9.14
t-statistics for means										
Small	1.62	1.61	1.79	1.91	1.84					
2	1.14	1.76	1.43	1.65	1.56					
3	1.33	1.35	1.12	1.33	1.34					
4	1.09	1.08	1.29	1.38	1.09					
Big	0.93	0.78	1.02	0.98	1.34					

RM is the value-weighted monthly percent return on the stocks in the 25 size-BE/ME portfolios, plus the negative-BE stocks excluded from the portfolios. RF comes from GTA database, observed at the beginning of the month. LTG is the long-term government bond return. CB is the return on a proxy for the market portfolio of long-term corporate bonds. TERM is

LTG-RF. DEF is CB-LTG. SMB (small minus big) is the difference between the returns on small-stock and big-stock portfolios with about the same weighted average book-to-market equity. HML (high minus low) is the difference between the returns on high and low book-to-market equity portfolios with about the same weighted average size. RMO is the sum of the intercept and residuals from the regression (1) of RM-RF on TERM, DEF, SMB and HML.

The seven bond portfolios used as dependent variables in the excess-return regressions are 1-to-10-year and more than 10-year governments and corporate bonds rated AAA, AA+, AA and AA-. The 25 size-BE/ME stock portfolios are formed as follows. Each year t from 2003 to 2013 quintile break points for size (ME, stock price times shares outstanding), measured at the end of June, are used to allocate stocks to five size quintiles. In BE/ME, BE is the book common equity for the fiscal year ending in calendar year $t-1$, and ME is for the end of December of $t-1$. The 25 size-BE/ME portfolios are formed as the intersections of the five sizes and the five BE/ME groups. Value-weighted monthly percent returns on the portfolios are calculated from July of year t to June of $t+1$.

Table 3

Regressions of excess stock and bond returns (in percent) on the bond-market returns, TERM and DEF: January 2003 to December 2013, 132 months.

$$R(t) - RF(t) = a + mTERM(t) + dDEF(t) + e(t)$$

Dependent variables: Excess returns on 25 stock portfolios formed on ME and BE/ME

Size quintile	Book-to-market equity (BE/ME) quintiles									
	Low	2	3	4	High	Low	2	3	4	High
	m					t(m)				
Small	-12.46	-13.28	-10.01	-7.27	-7.99	-0.76	-0.79	-0.62	-0.44	-0.47
2	-8.91	-7.77	-10.48	-8.99	-9.77	-0.56	-0.49	-0.65	-0.53	-0.59
3	-12.94	-6.75	-5.17	-5.40	-8.53	-0.87	-0.43	-0.33	-0.34	-0.54
4	-10.58	-2.41	-4.21	-4.73	-4.65	-0.73	-0.16	-0.27	-0.30	-0.30
Big	-9.42	2.37	3.08	-1.81	-5.95	-0.72	0.17	0.22	-0.13	-0.44
	d					t(d)				
Small	-69.05	-65.05	-62.21	-65.85	-66.11	-2.55	-2.35	-2.32	-2.41	-2.35
2	-66.65	-64.73	-64.49	-70.71	-70.28	-2.55	-2.49	-2.43	-2.53	-2.56
3	-67.94	-69.39	-64.38	-59.12	-71.37	-2.77	-2.7	-2.51	-2.24	-2.71
4	-63.72	-62.07	-71.27	-70.68	-65.87	-2.65	-2.56	-2.74	-2.73	-2.56
Big	-59.78	-75.79	-64.72	-61.08	-64.49	-2.75	-3.31	-2.77	-2.58	-2.9
	R^2					s(e)				
Small	0.03	0.03	0.03	0.03	0.03	10.87	11.1	10.77	10.95	11.28
2	0.03	0.03	0.03	0.03	0.04	10.48	10.42	10.66	11.2	11
3	0.04	0.04	0.04	0.03	0.04	9.85	10.3	10.3	10.57	10.55
4	0.04	0.04	0.05	0.04	0.04	9.63	9.71	10.45	10.38	10.3
Big	0.04	0.08	0.06	0.04	0.05	8.73	9.17	9.36	9.48	8.91

Dependent variable: Excess returns on government and corporate bonds

	G-Short	G-Long	AAA	AA+	AA	AA-
m	-0.22	-0.22	0.97	0.37	0.44	0.92
t(m)	-0.40	-0.40	9.79	4.07	3.45	3.61
d	-0.23	-0.23	0.61	0.30	0.53	0.22
t(d)	-0.36	-0.36	5.36	2.83	3.61	0.73
R^2	-0.03	-0.03	0.60	0.20	0.19	0.17
s(e)	0.18	0.18	0.03	0.03	0.04	0.09

TERM is LTG-RF. LTG is the long-term government bond return. RF comes from GTA database, observed at the beginning of the month. DEF is CB-LTG. CB is the return on a proxy for the market portfolio of long-term corporate bonds.

The seven bond portfolios used as dependent variables in the excess-return regressions are 1-to-10-year and more than 10-year governments and corporate bonds rated AAA, AA+, AA and AA-. The 25 size-BE/ME stock portfolios are formed as follows. Each year t from 2003 to 2013 quintile break points for size (ME, stock prize times shares outstanding), measured at the end of June, are used to allocate stocks in China A-Share Market to five size quintiles. In BE/ME, BE is the book common equity for the fiscal year ending in calendar year t-1, and ME is for the end of December of t-1. The 25 size-BE/ME portfolios are formed as the intersections of the five size and the five BE/ME groups. Value-weighted monthly percent returns on the portfolios are calculated from July of year t to June of t+1.

R square are the residual standard error, s(e) are adjusted for degrees of freedom.

Table 4

Regressions of excess stock and bond returns (in percent) on the excess stock-market return, RM-RF: January 2003 to December 2013, 132 months.

$$R(t) - RF(t) = a + b[RM(t) - RF(t)] + e(t)$$

Dependent variables: Excess returns on 25 stock portfolios formed on ME and BE/ME

Size quintile	Book-to-market equity (BE/ME) quintiles									
	Low	2	3	4	High	Low	2	3	4	High
	b					t(b)				
Small	1.05	1.09	1.07	1.08	1.12	19.57	21.35	22.16	21.41	21.78
2	1.06	1.07	1.09	1.15	1.13	23.54	25.66	25.61	26.46	26.57
3	0.99	1.08	1.08	1.10	1.11	22.78	29.86	30.7	30.29	30.39
4	1.00	1.02	1.13	1.12	1.11	27.46	30.29	38.33	36.98	37.56
Big	0.90	1.00	1.02	1.03	0.94	27.04	34.29	41.61	42.70	29.75
	R ²					s(e)				
Small	0.74	0.78	0.79	0.78	0.78	5.59	5.32	5.01	5.25	5.32
2	0.81	0.83	0.83	0.84	0.84	4.67	4.32	4.42	4.53	4.43
3	0.80	0.87	0.88	0.87	0.88	4.52	3.77	3.66	3.79	3.80
4	0.85	0.87	0.92	0.91	0.91	3.78	3.50	3.06	3.14	3.06
Big	0.85	0.90	0.93	0.93	0.87	3.48	3.03	2.56	2.51	3.28

Dependent variable: Excess returns on government and corporate bonds

	G-Short	G-Long	AAA	AA+	AA	AA-
b	0.00	0.00	0.00	0.00	0.00	0.00
t(b)	0.14	0.14	1.55	1.51	0.95	0.19
R ²	-0.02	-0.02	0.02	0.02	0.00	0.00
s(e)	0.18	0.18	0.05	0.03	0.05	0.09

RM is the value-weighted monthly percent return on the stocks in the 25 size-BE/ME portfolios, plus the negative-BE stocks excluded from the portfolios. RF comes from GTA database, observed at the beginning of the month.

The seven bond portfolios used as dependent variables in the excess-return regressions are 1-to-10-year and more than 10-year governments and corporate bonds rated AAA, AA+, AA and AA-. The 25 size-BE/ME stock portfolios are formed as follows. Each year t from 2003 to 2013 quintile break points for size (ME, stock price times shares outstanding), measured at the end of June, are used to allocate stocks to five size quintiles. In BE/ME, BE is the book common equity for the fiscal year ending in calendar year t-1, and ME is for the end of December of t-1. The 25 size-BE/ME portfolios are formed as the intersections of the five sizes and the five BE/ME groups. Value-weighted monthly percent returns on the portfolios are calculated from July of year t to June of t+1.

R square are the residual standard error, s(e) are adjusted for degrees of freedom.

Table 5

Regressions of excess stock and bond returns (in percent) on the mimicking returns for the size (SMB) and book-to-market equity (HML) factors: January 2003 to December 2013, 132 months.

$$R(t) - RF(t) = a + sSMB(t) + hHML(t) + e(t)$$

Dependent variables: Excess returns on 25 stock portfolios formed on ME and BE/ME										
Size quintile	Book-to-market equity (BE/ME) quintiles									
	Low	2	3	4	High	Low	2	3	4	High
s					t(s)					
Small	1.50	1.47	1.40	1.45	1.39	9.06	8.53	8.33	8.6	7.93
2	1.27	1.24	1.27	1.30	1.26	7.39	7.26	7.29	7.15	7.11
3	1.05	1.03	1.04	1.10	1.06	6.11	5.71	5.9	6.23	6.01
4	0.85	0.84	0.80	0.86	0.80	4.9	4.77	4.14	4.63	4.47
Big	0.12	0.05	0.14	0.09	0.07	0.69	0.29	0.75	0.52	0.44
h					t(h)					
Small	0.38	0.37	0.4	0.56	0.89	1.56	1.49	1.62	2.28	3.50
2	0.28	0.36	0.48	0.75	0.88	1.12	1.45	1.91	2.84	3.39
3	-0.02	0.30	0.55	0.70	0.90	-0.10	1.12	2.12	2.71	3.47
4	-0.03	0.17	0.45	0.68	1.01	-0.12	0.65	1.61	2.52	3.87
Big	-0.35	0.14	0.64	0.95	1.24	-1.41	0.52	2.43	3.68	5.30
R ²					s(e)					
Small	0.39	0.36	0.35	0.37	0.36	8.65	9.01	8.81	8.81	9.15
2	0.29	0.29	0.3	0.31	0.32	8.97	8.94	9.08	9.49	9.26
3	0.21	0.20	0.22	0.25	0.26	8.93	9.43	9.24	9.25	9.25
4	0.14	0.14	0.12	0.17	0.20	9.08	9.19	10.03	9.70	9.37
Big	0.00	-0.01	0.03	0.08	0.17	8.90	9.62	9.47	9.27	8.34

Dependent variable: Excess returns on government and corporate bonds

	G-Short	G-Long	AAA	AA+	AA	AA-
m	0.00	0.00	0.00	0.00	0.00	0.01
t(m)	0.16	0.16	1.02	1.56	0.86	1.80
d	0.00	0.00	0.00	0.00	0.00	0.01
t(d)	-0.59	-0.59	-0.28	1.33	0.81	1.31
R ²	-0.02	-0.02	0.00	0.01	-0.02	0.02
s(e)	0.18	0.18	0.05	0.03	0.05	0.09

SMB (small minus big) is the difference between the returns on small-stock and big-stock portfolios with about the same weighted average book-to-market equity. HML (high minus low) is the difference between the returns on high and low book-to-market equity portfolios with about the same weighted average size.

The seven bond portfolios used as dependent variables in the excess-return regressions are 1-to-10-year and more than 10-year governments and corporate bonds rated AAA, AA+, AA and AA-. The 25 size-BE/ME stock portfolios are formed as follows. Each year t from 2003 to 2013 quintile break points for size (ME, stock price times shares outstanding), measured at the end of June, are used to allocate stocks in China A-Share Market to five size quintiles. In BE/ME, BE is the book common equity for the fiscal year ending in calendar year t-1, and ME is for the end of December of t-1. The 25 size-BE/ME portfolios are formed as the intersections of the five sizes and the five BE/ME groups. Value-weighted monthly percent returns on the

portfolios are calculated from July of year t to June of $t+1$.

R square are the residual standard error, $s(e)$ are adjusted for degrees of freedom.

Table 6

Regressions of excess stock and bond returns (in percent) on the mimicking returns for the size (SMB) and book-to-market equity (HML) factors: January 2003 to December 2013, 132 months.

$$R(t) - RF(t) = a + b[RM(t) - RF(t)] + sSMB(t) + hHML(t) + e(t)$$

Dependent variables: Excess returns on 25 stock portfolios formed on ME and BE/ME										
Size quintile	Book-to-market equity (BE/ME) quintiles									
	Low	2	3	4	High	Low	2	3	4	High
b					t(b)					
Small	0.96	1.00	0.98	0.98	1.00	50.51	60.86	64.52	57.77	41.90
2	0.99	1.00	1.01	1.06	1.03	49.56	65.93	60.93	61.80	63.90
3	0.96	1.04	1.02	1.03	1.02	35.17	48.49	50.81	58.01	54.92
4	0.99	1.00	1.10	1.07	1.04	40.01	40.26	45.42	47.12	54.05
Big	0.98	1.06	1.04	1.03	0.92	49.9	45.04	44.77	57.86	45.33
s					t(s)					
Small	1.16	1.12	1.06	1.10	1.03	31.43	34.66	35.50	33.31	22.19
2	0.92	0.89	0.91	0.92	0.89	23.52	30.06	28.03	27.66	28.34
3	0.70	0.66	0.68	0.74	0.70	13.17	15.80	17.36	21.34	19.19
4	0.50	0.48	0.41	0.48	0.43	10.36	9.95	8.55	10.86	11.55
Big	-0.23	-0.32	-0.23	-0.27	-0.26	-6.03	-7.00	-5.13	-7.88	-6.46
h					t(h)					
Small	-0.13	-0.16	-0.13	0.04	0.36	-2.47	-3.42	-2.90	0.81	5.29
2	-0.25	-0.17	-0.05	0.19	0.33	-4.34	-3.96	-1.15	3.90	7.09
3	-0.54	-0.26	0.00	0.15	0.35	-6.88	-4.24	0.05	3.02	6.57
4	-0.56	-0.37	-0.14	0.11	0.46	-7.90	-5.19	-1.99	1.75	8.40
Big	-0.87	-0.42	0.09	0.40	0.75	-15.56	-6.34	1.35	7.97	12.95
R ²					s(e)					
Small	0.97	0.98	0.98	0.98	0.96	1.90	1.65	1.53	1.70	2.39
2	0.96	0.98	0.98	0.98	0.98	2.00	1.52	1.66	1.72	1.62
3	0.93	0.96	0.96	0.97	0.97	2.74	2.15	2.02	1.78	1.87
4	0.94	0.94	0.95	0.95	0.97	2.48	2.50	2.43	2.27	1.93
Big	0.95	0.94	0.94	0.97	0.95	1.98	2.35	2.33	1.79	2.03

Dependent variable: Excess returns on government and corporate bonds

	G-Short	G-Long	AAA	AA+	AA	AA-
s	0.00	0.00	0.00	0.00	0.00	0.01
t(s)	0.13	0.13	0.65	1.22	0.64	1.8
h	-0.01	-0.01	0.00	0.00	0.00	0.01
t(h)	-0.59	-0.59	-0.47	1.15	0.68	1.33
m	0.00	0.00	0.00	0.00	0.00	0.00
t(m)	0.09	0.09	1.33	1.15	0.75	-0.27
R ²	-0.04	-0.04	0.02	0.02	-0.03	0.01
s(e)	0.18	0.18	0.05	0.03	0.05	0.09

RM is the value-weighted monthly percent return on the stocks in the 25 size-BE/ME portfolios, plus the negative-BE

stocks excluded from the portfolios. RF comes from GTA database, observed at the beginning of the month. SMB (small minus big) is the difference between the returns on small-stock and big-stock portfolios with about the same weighted average book-to-market equity. HML (high minus low) is the difference between the returns on high and low book-to-market equity portfolios with about the same weighted average size.

The seven bond portfolios used as dependent variables in the excess-return regressions are 1-to-10-year and more than 10-year governments and corporate bonds rated AAA, AA+, AA and AA-. The 25 size-BE/ME stock portfolios are formed as follows. Each year t from 2003 to 2013 quintile break points for size (ME, stock price times shares outstanding), measured at the end of June, are used to allocate stocks in China A-Share Market to five size quintiles. In BE/ME, BE is the book common equity for the fiscal year ending in calendar year $t-1$, and ME is for the end of December of $t-1$. The 25 size-BE/ME portfolios are formed as the intersections of the five sizes and the five BE/ME groups. Value-weighted monthly percent returns on the portfolios are calculated from July of year t to June of $t+1$.

R square are the residual standard error, $s(e)$ are adjusted for degrees of freedom.

Table 7a

Regressions of excess stock returns (in percent) on 25 stock portfolios formed on the size and book-to-market equity on the stock-market-market returns, RM-RF, SMB, and HML, and the bond-market returns, TERM and DEF: January 2003 to December 2012, 120 months.

$$R(t) - RF(t) = a + b[RM(t) - RF(t)] + sSMB(t) + hHML(t) + mTERM(t) + dDEF(t) + e(t)$$

Dependent variables: Excess returns on 25 stock portfolios formed on ME and BE/ME										
Size quintile	Book-to-market equity (BE/ME) quintiles									
	Low	2	3	4	High	Low	2	3	4	High
b					t(b)					
Small	0.95	1.01	0.99	0.98	1.00	48.08	58.72	62.07	55.40	40.00
2	0.99	1.00	1.01	1.06	1.03	47.21	63.13	58.62	58.92	60.86
3	0.96	1.04	1.02	1.04	1.02	33.58	46.23	48.83	57.08	52.24
4	0.99	1.00	1.10	1.07	1.04	38.48	38.76	43.44	44.98	51.85
Big	0.99	1.04	1.04	1.04	0.91	49.49	43.46	43.24	56.27	43.43
s					t(s)					
Small	1.16	1.11	1.05	1.11	1.04	31.17	34.32	35.14	33.29	21.97
2	0.92	0.89	0.91	0.93	0.89	23.27	29.80	27.70	27.34	27.98
3	0.70	0.66	0.68	0.74	0.70	12.99	15.68	17.27	21.46	19.00
4	0.50	0.49	0.41	0.48	0.43	10.17	9.97	8.52	10.82	11.44
Big	-0.24	-0.31	-0.23	-0.28	-0.26	-6.41	-6.82	-5.00	-7.97	-6.49
h					t(h)					
Small	-0.13	-0.16	-0.13	0.04	0.36	-2.42	-3.44	-2.93	0.80	5.24
2	-0.25	-0.17	-0.06	0.19	0.33	-4.30	-3.97	-1.18	3.86	7.04
3	-0.53	-0.26	0.00	0.15	0.35	-6.82	-4.21	0.01	2.95	6.54
4	-0.56	-0.37	-0.14	0.11	0.46	-7.88	-5.22	-1.99	1.73	8.32
Big	-0.88	-0.42	0.09	0.40	0.75	-15.92	-6.39	1.32	7.92	12.97
m					t(m)					
Small	-1.34	-2.20	0.63	3.49	2.18	-0.47	-0.88	0.27	1.36	0.60
2	1.05	1.99	-0.65	0.93	-0.26	0.35	0.87	-0.26	0.35	-0.11
3	-4.14	1.95	3.35	3.37	-0.22	-0.99	0.60	1.10	1.27	-0.08
4	-2.82	5.19	3.16	2.71	2.10	-0.75	1.38	0.85	0.78	0.72
Big	-5.71	5.53	6.26	0.80	-4.07	-1.95	1.58	1.79	0.30	-1.33
d					t(d)					
Small	-4.87	2.79	4.23	0.09	1.48	-0.99	0.65	1.07	0.02	0.24
2	-0.23	2.31	3.76	0.46	-0.77	-0.04	0.59	0.87	0.10	-0.18
3	-3.85	0.03	4.23	10.57	-2.63	-0.54	0.00	0.81	2.33	-0.54
4	2.40	4.80	2.20	0.64	3.95	0.37	0.74	0.35	0.11	0.79
Big	5.33	-7.06	4.10	7.76	-3.66	1.07	-1.18	0.68	1.69	-0.70
R^2					s(e)					
Small	0.97	0.98	0.98	0.98	0.96	1.91	1.65	1.53	1.70	2.41
2	0.96	0.98	0.98	0.98	0.98	2.02	1.52	1.67	1.73	1.63
3	0.92	0.96	0.96	0.97	0.97	2.75	2.16	2.02	1.75	1.89
4	0.94	0.94	0.95	0.95	0.97	2.49	2.50	2.45	2.29	1.94

Big	0.95	0.94	0.94	0.97	0.95	1.93	2.32	2.32	1.78	2.03
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Table 7b

Regressions of excess stock returns (in percent) on government and corporate bonds (in percent) on the stock-market-market returns, RM-RF, SMB, and HML, and the bond-market returns, TERM and DEF: January 2003 to December 2013, 132 months.

$$R(t) - RF(t) = a + b[RM(t) - RF(t)] + sSMB(t) + hHML(t) + mTERM(t) + dDEF(t) + e(t)$$

	Bond Portfolio					
	G-Short	G-Long	AAA	AA+	AA	AA-
b	0.00	0.00	0.00	0.00	0.00	0.00
t(b)	0.22	0.22	-0.34	0.44	0.40	-1.61
s	0.00	0.00	0.00	0.00	0.00	0.01
t(s)	0.08	0.08	1.72	1.81	1.25	2.09
h	-0.01	-0.01	0.00	0.00	0.00	0.01
t(h)	-0.68	-0.68	0.93	2.06	1.49	2.10
m	-0.34	-0.34	0.97	0.37	0.44	1.07
t(m)	-0.58	-0.58	9.32	3.99	3.29	4.11
d	-0.24	-0.24	0.64	0.34	0.58	0.29
t(d)	-0.37	-0.37	5.52	3.26	3.86	1.00
R ²	-0.07	-0.07	0.60	0.23	0.19	0.21
s(e)	0.18	0.18	0.03	0.03	0.04	0.08

RM is the value-weighted monthly percent return on the stocks in the 25 size-BE/ME portfolios, plus the negative-BE stocks excluded from the portfolios. RF comes from GTA database, observed at the beginning of the month. LTG is the long-term government bond return. CB is the return on a proxy for the market portfolio of long-term corporate bonds. TERM is LTG-RF. DEF is CB-LTG. SMB (small minus big) is the difference between the returns on small-stock and big-stock portfolios with about the same weighted average book-to-market equity. HML (high minus low) is the difference between the returns on high and low book-to-market equity portfolios with about the same weighted average size.

The seven bond portfolios used as dependent variables in the excess-return regressions are 1-to-10-year and more than 10-year governments and corporate bonds rated AAA, AA+, AA and AA-. The 25 size-BE/ME stock portfolios are formed as follows. Each year t from 2003 to 2013 quintile break points for size (ME, stock price times shares outstanding), measured at the end of June, are used to allocate stocks in China A-Share Market to five size quintiles. In BE/ME, BE is the book common equity for the fiscal year ending in calendar year t-1, and ME is for the end of December of t-1. The 25 size-BE/ME portfolios are formed as the intersections of the five sizes and the five BE/ME groups. Value-weighted monthly percent returns on the portfolios are calculated from July of year t to June of t+1.

R square are the residual standard error, s(e) are adjusted for degrees of freedom.

Table 8a

Regressions of excess stock returns (in percent) on 25 stock portfolios formed on the size and book-to-market equity on the stock-market-market returns, RMO, SMB, and HML, and the bond-market returns, TERM and DEF: January 2003 to December 2012, 120 months.

$$R(t) - RF(t) = a + bRMO(t) + sSMB(t) + hHML(t) + mTERM(t) + dDEF(t) + e(t)$$

Dependent variables: Excess returns on 25 stock portfolios formed on ME and BE/ME										
Size quintile	Book-to-market equity (BE/ME) quintiles									
	Low	2	3	4	High	Low	2	3	4	High
b					t(b)					
Small	0.95	1.01	0.99	0.98	1.00	48.08	58.72	62.07	55.40	40.00
2	0.99	1.00	1.01	1.06	1.03	47.21	63.13	58.62	58.92	60.86
3	0.96	1.04	1.02	1.04	1.02	33.58	46.23	48.83	57.08	52.24
4	0.99	1.00	1.10	1.07	1.04	38.48	38.76	43.44	44.98	51.85
Big	0.99	1.04	1.04	1.04	0.91	49.49	43.46	43.24	56.27	43.43
s					t(s)					
Small	1.51	1.48	1.41	1.46	1.4	41.25	46.55	48.04	44.85	30.28
2	1.28	1.25	1.28	1.31	1.27	33.02	42.81	39.78	39.48	40.51
3	1.05	1.04	1.06	1.12	1.07	19.86	25.09	27.22	33.12	29.66
4	0.86	0.85	0.81	0.87	0.81	17.94	17.80	17.24	19.89	21.88
Big	0.12	0.07	0.15	0.10	0.08	3.22	1.62	3.42	2.96	1.94
h					t(h)					
Small	0.37	0.37	0.39	0.55	0.88	6.88	7.91	9.07	11.59	13.11
2	0.27	0.35	0.48	0.74	0.87	4.80	8.23	10.19	15.38	19.00
3	-0.03	0.28	0.54	0.69	0.89	-0.42	4.70	9.50	14.10	16.82
4	-0.04	0.15	0.44	0.67	1.00	-0.55	2.22	6.41	10.51	18.55
Big	-0.36	0.13	0.63	0.94	1.23	-6.60	1.94	9.75	19.00	21.65
m					t(m)					
Small	-3.93	-4.94	-2.06	0.83	-0.54	-1.36	-1.98	-0.89	0.32	-0.15
2	-1.64	-0.72	-3.42	-1.95	-3.07	-0.54	-0.31	-1.35	-0.75	-1.24
3	-6.75	-0.88	0.56	0.54	-3.00	-1.62	-0.27	0.18	0.20	-1.05
4	-5.52	2.46	0.16	-0.19	-0.74	-1.47	0.65	0.04	-0.06	-0.25
Big	-8.41	2.69	3.43	-2.03	-6.56	-2.88	0.77	0.98	-0.75	-2.14
d					t(d)					
Small	-67.3	-63.33	-60.55	-64.04	-64.17	-14.16	-15.37	-15.85	-15.11	-10.68
2	-65.19	-63.25	-62.92	-68.94	-68.49	-12.94	-16.64	-15.11	-15.99	-16.82
3	-66.88	-68.16	-63.00	-57.58	-69.77	-9.74	-12.63	-12.50	-13.18	-14.83
4	-62.87	-61.11	-70.19	-69.41	-64.47	-10.13	-9.82	-11.51	-12.18	-13.35
Big	-59.86	-75.64	-64.21	-60.43	-63.71	-12.42	-13.10	-11.10	-13.62	-12.59
R^2					s(e)					
Small	0.97	0.98	0.98	0.98	0.96	1.91	1.65	1.53	1.70	2.41
2	0.96	0.98	0.98	0.98	0.98	2.02	1.52	1.67	1.73	1.63
3	0.92	0.96	0.96	0.97	0.97	2.75	2.16	2.02	1.75	1.89
4	0.94	0.94	0.95	0.95	0.97	2.49	2.50	2.45	2.29	1.94

Big	0.95	0.94	0.94	0.97	0.95	1.93	2.32	2.32	1.78	2.03
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Table 8b

Regressions of excess stock returns (in percent) on government and corporate bonds (in percent) on the stock-market-market returns, RMO, SMB, and HML, and the bond-market returns, TERM and DEF: January 2003 to December 2012, 120 months.

$$R(t) - RF(t) = a + bRMO(t) + sSMB(t) + hHML(t) + mTERM(t) + dDEF(t) + e(t)$$

	Bond Portfolio					
	G-Short	G-Long	AAA	AA+	AA	AA-
b	0.00	0.00	0.00	0.00	0.00	0.00
t(b)	0.22	0.22	-0.34	0.44	0.40	-1.61
s	0.00	0.00	0.00	0.00	0.00	0.01
t(s)	0.11	0.11	1.71	1.91	1.33	1.91
h	-0.01	-0.01	0.00	0.00	0.00	0.01
t(h)	-0.65	-0.65	0.88	2.16	1.58	1.84
m	-0.34	-0.34	0.97	0.37	0.44	1.08
t(m)	-0.58	-0.58	9.29	3.96	3.27	4.12
d	-0.28	-0.28	0.65	0.33	0.56	0.43
t(d)	-0.42	-0.42	5.47	3.04	3.63	1.45
R ²	-0.07	-0.07	0.60	0.23	0.19	0.21
s(e)	0.18	0.18	0.03	0.03	0.04	0.08

RMO, the orthogonalized market return, is the sum of intercept and residuals from the regression of RM-RF on SMB, HML, TERM, and DEF. RM is the value-weighted monthly percent return on the stocks in the 25 size-BE/ME portfolios, plus the negative-BE stocks excluded from the portfolios. RF comes from GTA database, observed at the beginning of the month. SMB (small minus big), the return on the mimicking portfolio for the common size factor in stock returns, is the difference each month between the simple average of the percent returns on the three small-stock portfolios(S/L, S/M, and S/H) and the simple average of the percent returns on the three big-stock portfolio (B/L, B/M, and B/H). HML(high minus low), the return on the mimicking portfolio for the common book-to-market equity factor in returns, is the difference each month between the simple average of the returns on the two high-BE/ME portfolios(S/H and B/H) and the average of the returns on the two low-BE/ME portfolios(S/L and B/L). TERM is LTG-RF, where LTG is the long-term government bond return. DEF is CB-LTG, where CB is the return on a proxy for the market portfolio of long-term corporate bonds.

The seven bond portfolios used as dependent variables in the excess-return regressions are 1-to-10-year and more than 10-year governments and corporate bonds rated AAA, AA+, AA and AA-. The 25 size-BE/ME stock portfolios are formed as follows. Each year t from 2003 to 2013 Shanghai and Shenzhen Stock Exchange quintile breakpoints for size(ME, stock price times shares outstanding), measured at the end of June, are used to allocate stocks of Shanghai and Shenzhen Stock Exchange to five size quintiles. Similarly, Shanghai and Shenzhen Stock Exchange quintile breakpoints for BE/ME are used to allocate stocks of Shanghai and Shenzhen Stock Exchange to five book-to-market equity quintiles. In BE/ME, BE is book common equity for the fiscal year ending in calendar year t-1, and ME is for the end of December of t-1. The 25 size-BE/ME portfolios are formed as the intersections of the five size and the five BE/ME groups. Value-weighted monthly percent returns on the portfolios are calculated from July of year t to June of t+1.

R-square and residual standard error, s(e), are adjusted for degrees of freedom.

Table 9a

Intercepts from excess stock return regressions for 25 stock portfolios formed on size and book-to-market equity: January 2003 to December 2012, 120 months.

Size quintile	Book-to-market equity (BE/ME) quintiles									
	a					t(a)				
	Low	2	3	4	High	Low	2	3	4	High
(i) $R(t)-RF(t)=a+mTERM(t)+dDEF(t)+e(t)$										
Small	0.09	0.09	0.08	0.08	0.09	2.56	2.44	2.38	2.41	2.36
2	0.08	0.08	0.08	0.09	0.09	2.35	2.44	2.38	2.46	2.48
3	0.08	0.08	0.07	0.07	0.08	2.69	2.45	2.21	2.08	2.50
4	0.08	0.07	0.08	0.08	0.07	2.48	2.16	2.39	2.42	2.23
Big	0.07	0.07	0.06	0.06	0.07	2.49	2.46	2.12	2.13	2.60
(ii) $R(t)-RF(t)=a+b[RM(t)-RF(t)]+e(t)$										
Small	0.01	0.01	0.01	0.01	0.01	1.23	1.24	1.64	1.88	1.75
2	0.00	0.01	0.00	0.01	0.00	0.23	1.70	0.92	1.48	1.25
3	0.00	0.00	0.00	0.00	0.00	0.66	0.75	0.11	0.70	0.73
4	0.00	0.00	0.00	0.00	0.00	0.07	0.00	0.62	0.92	-0.05
Big	0.00	0.00	0.00	0.00	0.00	-0.34	-1.00	-0.37	-0.52	0.72
(iii) $R(t)-RF(t)=a+sSMB(t)+hHML(t)+e(t)$										
Small	0.01	0.01	0.01	0.01	0.01	0.82	0.83	1.05	1.17	1.09
2	0.00	0.01	0.01	0.01	0.01	0.34	1.06	0.66	0.90	0.78
3	0.01	0.01	0.00	0.00	0.00	0.72	0.71	0.40	0.59	0.60
4	0.00	0.00	0.01	0.01	0.00	0.56	0.52	0.75	0.77	0.43
Big	0.01	0.01	0.01	0.01	0.01	0.91	0.70	0.8	0.75	1.11
(iv) $R(t)-RF(t)=a+b[RM(t)-RF(t)]+sSMB(t)+hHML(t)+e(t)$										
Small	0.00	0.00	0.00	0.00	0.00	0.21	0.26	1.53	2.04	1.22
2	0.00	0.00	0.00	0.00	0.00	-1.92	1.64	-0.63	0.68	0.00
3	0.00	0.00	0.00	0.00	0.00	-0.13	-0.29	-1.71	-0.99	-0.88
4	0.00	0.00	0.00	0.00	0.00	-0.76	-0.91	-0.10	0.01	-1.66
Big	0.00	0.00	0.00	0.00	0.00	0.62	-0.28	0.11	-0.14	1.41
(v) $R(t)-RF(t)=a+b[RM(t)-RF(t)]+sSMB(t)+hHML(t)+mTERM(t)+dDEF(t)+e(t)$										
Small	0.01	0.00	0.00	0.00	0.00	0.96	-0.01	-0.47	-0.06	-0.11
2	0.00	0.00	0.00	0.00	0.00	-0.63	-0.36	-0.68	-0.05	0.18
3	0.01	0.00	-0.01	-0.01	0.00	0.78	-0.34	-1.51	-2.48	0.18
4	0.00	-0.01	-0.01	0.00	-0.01	-0.14	-1.37	-0.64	-0.42	-1.31
Big	0.00	0.00	-0.01	-0.01	0.01	0.26	0.08	-1.23	-1.37	1.45

Table 9b

Intercepts from excess stock return regressions for on government and corporate bonds (in percent): January 2003 to December 2012, 120 months.

		Bond Portfolio				
	G-Short	G-Long	AAA	AA+	AA	AA-
(i) $R(t)-RF(t)=a+mTERM(t)+dDEF(t)+e(t)$						
a	0.00	0.00	0.00	0.00	0.00	0.00
t(a)	-1.28	-1.28	1.32	12.34	9.18	6.21
(ii) $R(t)-RF(t)=a+b[RM(t)-RF(t)]+e(t)$						
a	0.00	0.00	0.00	0.00	0.00	0.00
t(a)	-6.85	-6.85	22.98	57.81	47.24	29.62
(iii) $R(t)-RF(t)=a+sSMB(t)+hHML(t)+e(t)$						
a	0.00	0.00	0.00	0.00	0.00	0.00
t(a)	-6.64	-6.64	21.3	54.45	44.43	28.27
(iv) $R(t)-RF(t)=a+b[RM(t)-RF(t)]+sSMB(t)+hHML(t)+e(t)$						
a	0.00	0.00	0.00	0.00	0.00	0.00
t(a)	-6.58	-6.58	21.47	54.59	44.25	27.99
(v) $R(t)-RF(t)=a+b[RM(t)-RF(t)]+sSMB(t)+hHML(t)+mTERM(t)+dDEF(t)+e(t)$						
a	0.00	0.00	0.00	0.00	0.00	0.00
t(a)	-1.16	-1.16	0.96	11.87	8.66	5.70

RM is the value-weighted monthly percent return on the stocks in the 25 size-BE/ME portfolios, plus the negative-BE stocks excluded from the portfolios. RF comes from GTA database, observed at the beginning of the month. SMB (small minus big), the return on the mimicking portfolio for the common size factor in stock returns, is the difference each month between the simple average of the percent returns on the three small-stock portfolios (S/L, S/M, and S/H) and the simple average of the percent returns on the three big-stock portfolios (B/L, B/M, and B/H). HML (high minus low), the return on the mimicking portfolio for the common book-to-market equity factor in returns, is the difference each month between the simple average of the returns on the two high-BE/ME portfolios (S/H and B/H) and the average of the returns on the two low-BE/ME portfolios (S/L and B/L). TERM is LTG-RF, where LTG is the long-term government bond return. DEF is CB-LTG, where CB is the return on a proxy for the market portfolio of long-term corporate bonds.

The seven bond portfolios used as dependent variables in the excess-return regressions are 1-to-10-year and more than 10-year governments and corporate bonds rated AAA, AA+, AA and AA-. The 25 size-BE/ME stock portfolios are formed as follows. Each year t from 2003 to 2013 Shanghai and Shenzhen Stock Exchange quintile breakpoints for size (ME, stock price times shares outstanding), measured at the end of June, are used to allocate stocks of Shanghai and Shenzhen Stock Exchange to five size quintiles. Similarly, Shanghai and Shenzhen Stock Exchange quintile breakpoints for BE/ME are used to allocate stocks of Shanghai and Shenzhen Stock Exchange to five book-to-market equity quintiles. In BE/ME, BE is book common equity for the fiscal year ending in calendar year t-1, and ME is for the end of December of t-1. The 25 size-BE/ME portfolios are formed as the intersections of the five size and the five BE/ME groups. Value-weighted monthly percent returns on the portfolios are calculated from July of year t to June of t+1.

Table 10

Tests for January seasonals in the dependent returns, explanatory returns, and residuals from the five-factor regressions: January 2003 to December 2012, 120 months.

$$R(t) = a + bJAN(t) + e$$

	a	b	t(a)	t(b)	R^2	a	b	t(a)	t(b)	R^2
Factor	Five-factor explanatory returns									
RM-RF	0.01	0.03	0.81	1.03	0.00					
RMO	0.07	0.01	8.75	0.24	-0.01					
SMB	0.00	0.01	1.20	0.71	0.00					
HML	0.00	0.01	0.28	1.11	0.00					
TERM	0.00	0.00	16.42	-0.03	-0.01					
DEF	0.00	0.00	26.67	-1.72	0.01					
Stock Portfolio	Excess stock returns					Five-Factor regression residuals				
Smallest-size quintile										
BE/ME Low	0.01	0.04	1.25	1.04	0.00	0.00	0.00	0.14	-0.50	-0.01
BE/ME 2	0.01	0.02	1.34	0.68	0.00	0.00	-0.01	0.84	-2.92	0.05
BE/ME 3	0.01	0.03	1.45	0.88	0.00	0.00	-0.01	0.43	-1.49	0.01
BE/ME 4	0.02	0.03	1.55	0.98	0.00	0.00	-0.01	0.33	-1.15	0.00
BE/ME High	0.02	0.03	1.55	0.73	0.00	0.00	-0.02	0.68	-2.36	0.03
Size quintile 2										
BE/ME Low	0.01	0.03	0.80	1.01	0.00	0.00	0.00	0.08	-0.27	-0.01
BE/ME 2	0.01	0.03	1.39	1.00	0.00	0.00	0.00	0.16	-0.55	-0.01
BE/ME 3	0.01	0.04	1.06	1.09	0.00	0.00	0.00	0.03	-0.11	-0.01
BE/ME 4	0.01	0.04	1.24	1.19	0.00	0.00	0.00	0.00	0.02	-0.01
BE/ME High	0.01	0.04	1.15	1.19	0.00	0.00	0.00	0.07	-0.25	-0.01
Size quintile 3										
BE/ME Low	0.01	0.06	0.76	1.82	0.02	0.00	0.03	-0.95	3.29	0.07
BE/ME 2	0.01	0.04	0.96	1.16	0.00	0.00	0.00	-0.18	0.61	0.00
BE/ME 3	0.01	0.04	0.74	1.16	0.00	0.00	0.00	-0.1	0.36	-0.01
BE/ME 4	0.01	0.04	0.92	1.23	0.00	0.00	0.00	-0.21	0.74	0.00
BE/ME High	0.01	0.03	1.00	1.00	0.00	0.00	-0.01	0.38	-1.31	0.01
Size quintile 4										
BE/ME Low	0.01	0.03	0.73	1.10	0.00	0.00	0.01	-0.24	0.84	0.00
BE/ME 2	0.01	0.03	0.72	1.10	0.00	0.00	0.00	-0.18	0.62	0.00
BE/ME 3	0.01	0.04	0.87	1.28	0.00	0.00	0.01	-0.32	1.12	0.00
BE/ME 4	0.01	0.04	0.96	1.26	0.00	0.00	0.00	-0.2	0.68	0.00
BE/ME High	0.01	0.04	0.73	1.09	0.00	0.00	0.00	0.15	-0.50	-0.01
Biggest-size quintile										
BE/ME Low	0.01	0.00	0.87	0.07	-0.01	0.00	-0.01	0.69	-2.4	0.04
BE/ME 2	0.00	0.04	0.40	1.20	0.00	0.00	0.01	-0.47	1.64	0.01
BE/ME 3	0.01	0.02	0.75	0.77	0.00	0.00	0.00	0.19	-0.66	0.00
BE/ME 4	0.01	0.02	0.71	0.79	0.00	0.00	-0.01	0.33	-1.14	0.00
BE/ME High	0.01	0.03	0.99	1.02	0.00	0.00	0.00	0.17	-0.58	-0.01

Bond Portfolio	Excess bond returns					Five-factor regression residuals				
gb_short	0.00	0.00	-4.42	1.30	0.01	0.00	0.00	6.17	1.20	0.00
gb_long	0.00	0.00	-4.42	1.30	0.01	0.00	0.00	6.17	1.20	0.00
AAA	0.00	0.00	33.03	-0.68	0.00	0.00	0.00	-4.16	-0.07	-0.01
AA+	0.00	0.00	48.02	0.81	0.00	0.00	0.00	0.62	1.30	0.01
AA	0.00	0.00	44.67	1.49	0.02	0.00	0.00	-1.45	2.95	0.10
AA-	0.00	0.00	28.46	-0.13	-0.02	0.00	0.00	0.12	-0.43	-0.01

JAN(t) is a dummy variable that is 1 if month t is January on 0 otherwise. RMO is the sum of intercept and residuals from the regression of RM-RF on SMB, HML, TERM, and DEF. RM is the value-weighted monthly percent return on the stocks in the 25 size-BE/ME portfolios, plus the negative-BE stocks excluded from the portfolios. RF comes from GTA database, observed at the beginning of the month. SMB and HML are the returns on the mimicking portfolio for the size and book-to-market equity factor in stock returns. TERM is LTG-RF, where LTG is the long-term government bond return. DEF is CB-LTG, where CB is the return on a proxy for the market portfolio of long-term corporate bonds.

The seven bond portfolios used as dependent variables in the excess-return regressions are 1-to-10-year and more than 10-year governments and corporate bonds rated AAA, AA+, AA and AA-. The 25 size-BE/ME stock portfolios are formed as the intersections of independent sorts of stocks into size and book-to-market equity quintiles in June of each year from 2003-2013. The variables are described in more detail in table 8.

Table 11

Summary statistics for value-weighted monthly excess returns (in percent) on portfolios formed on dividend/price(D/P) and regressions of excess portfolio returns on (i) the excess market return(RM-RF) and (ii) the excess market return (RM-RF) and the mimicking returns for the size(SMB) and book-to-market equity (HML) factors: January 2003 to December 2012, 120 months.

$$(i) R(t) - RF(t) = a + b[RM(t) - RF(t)] + e(t)$$

$$(ii) R(t) - RF(t) = a + b[RM(t) - RF(t)] + sSMB(t) + hHML(t) + e(t)$$

Portfolios formed on E/P			
Portfolio	Mean	Std.	t(mn)
<=0	0.01	0.12	1.02
Low	0.01	0.12	1.12
2	0.01	0.10	1.46
3	0.01	0.10	1.37
4	0.01	0.10	1.32
High	0.01	0.10	1.22

Portfolios formed on E/P								
Portfolio	Regression(i)			Regression(ii)				
	a	b	R ²	a	b	s	h	R ²
E/P<=0	0.00 (-0.38)	1.11 (23.02)	0.82	-0.01 (-2.79)	1.03 (36.55)	0.85 (15.46)	0.17 (2.16)	0.94
Low	0.00 (-0.31)	1.15 (29.39)	0.88	-0.01 (-3.79)	1.09 (60.97)	0.75 (21.68)	-0.01 (-0.12)	0.98
2	0.00 (0.70)	1.03 (32.11)	0.90	0.00 (-0.96)	1.01 (50.98)	0.54 (13.89)	-0.25 (-4.42)	0.97
3	0.00 (0.46)	0.97 (43.53)	0.94	0.00 (-0.4)	0.98 (52.53)	0.19 (5.25)	-0.32 (-6.03)	0.96
4	0.00 (0.26)	0.99 (51.12)	0.96	0.00 (-0.25)	1.00 (49.85)	-0.02 (-0.39)	-0.09 (-1.55)	0.96
High	0.00 (-0.18)	1.02 (46.04)	0.95	0.00 (0.74)	1.02 (53.45)	-0.20 (-5.49)	0.27 (4.85)	0.97

Portfolios are formed in June of year t, 2003-2013. The earnings/price ratio (E/P) for year t is equity income for the fiscal year ending in calendar year t-1, divided by market equity in December of t-1. Equity income is income before extraordinary items, plus income-statement deferred taxes, minus preferred dividends. The quintile breakpoints for E/P are determined using only Shanghai and Shenzhen Stock Exchange firms with positive dividends or earnings. Regression t-statistics are in parentheses. See table 7 for definitions of RM-RF, SMB, and HML.

Codes:

```

libname fm93 'E:\sas_data\fm93';
/*libname adreturn 'E:\sas_data\fourfactors';*/

filename odsout "E:\sas_data\fm93\result";
ods html path=odsout body="1993-Fama and French from 2003 to 2012.htm" (title="1993-Fama and
French from 2003 to 2012");

/*extract trading data, replace WIN return with absolute value */
data allmon;
set fm93.monthly;
where stkcd like '60%' or stkcd like '00%' or stkcd like '300%'; /*select out all stocks in
Shanghai & Shenzhen Market*/
year=input(substr(left(Trdmnt),1,4),4.); /*extract the year*/
month=input(substr(left(Trdmnt),6,2),2.); /* extract the month*/
Msmvttl=Msmvttl*1000; /*data from GTA are in thousands*/
Msmvosd=Msmvosd*1000;
rename Mretwd=raw_return Msmvttl=marketvalue Msmvosd=amarketvalue; /*marketvalue-total market
value, amarketvalue-current market value*/
run;
proc sort data=allmon; by stkcd year month; run;

data allmon1; set allmon; by stkcd;
if first.stkcd ^=1 then lamarketvalue=lag(amarketvalue); else lamarketvalue=.; run;

data fm93.allmon; set allmon1; run;

/*(1).construct predictors*/
/*1、compute the 3 factors of stock market */
/*compute BM ratio */
data a;
set fm93.assetdebt;
where stkcd like '60%' or stkcd like '00%' or stkcd like '300%';
year=input(substr(left(Accper),1,4),4.);
month=input(substr(left(Accper),6,2),2.);
/*if year>=1996; start from 1996*/
if month=12; /*choose the data of December(annual report)*/
rename A003000000=bookvalue accper=date;
label accper=date; label a003000000=bookvalue;
keep stkcd accper year month A003000000; /*net assets at the end of the year*/
run;
proc sort data=a;
by stkcd year;
run; /*dataset a, contains the information about the equity of qualified stocks */

```

```

data fm93.bookvalue; set a; run;

/*extract the data of market value(total & current), merged with net assets */
data a; set allmon; if month=12; run; /*market value of December*/
data a1; set a; keep stkcd year month amarketvalue marketvalue; run;
data b; set fm93.bookvalue; run;

proc sort data=a1; by stkcd year; run;
proc sort data=b; by stkcd year; run;
data c; merge a1(in=id) b; by stkcd year; if id; run;
data d; set c; bm1=bookvalue/amarketvalue; bm2=bookvalue/marketvalue; run;
data d1; set d; if bm2^='.'; if bm2>0; run; /*companies with positive net assets remain */
data d2; set d1; drop date month; run;
data fm93.bm; set d2; run; /*store the data of BM of December in fm93.bm */

data w; set fm93.bm; where stkcd like '60%'; run; /*groups by the quantiles of Shanghai stock
Market*/
proc sort data=w; by year; run;
proc univariate data=w noprint;
var bm2; by year;
output out=bm2 pctlpts=30 70 pctlpre=dec; run; /*take 30 70 quantiles*/
data fm93.bm2rank; set bm2; run;
/*3 groups by BM*/
data w1; set fm93.bm; run; /*group all 'A'-type stocks */
proc sort data=w1; by year; run;
proc sort data=fm93.bm2rank; by year; run;
data w2; merge w1(in=id) fm93.bm2rank; by year; if id; run;
data w3; set w2; if bm2<=dec30 then HL=0;
if dec30<bm2<=dec70 then HL=1; if bm2>dec70 then HL=2;
rankyear=year+1; /*rankyear-the following year, take a company's BM of year t as the basis for
its rank in year t+1*/
run;
data fm93.bmrank; set w3; keep stkcd rankyear HL; run;

/*choose the size data of June to compare */
data a; set fm93.allmon; if month=6; keep stkcd amarketvalue year; if amarketvalue^=.; run;
data a1; set a; where stkcd like '60%'; run; /* groups by the quantiles of Shanghai stock */
proc sort data=a1; by year amarketvalue; run;
proc univariate data=a1 noprint; var amarketvalue; by year; output out=size pctlpts=50
pctlpre=dec; run;

proc sort data=a; by year; run; /*group all 'A'-type stocks */
proc sort data=size; by year; run;

```

```

data c; merge a(in=id) size; by year; if id;run;
data c1; set c; if amarketvalue>dec50 then big=1; else big=0;
rankyear=year; /*rankyear-the following year, take a company's size of year t as the basis
for its rank in year t+1*/
run;

data fm93.sizerank; set c1; keep stkcd rankyear big; run;

data bm; set fm93.bmrnk; run;
data sz; set fm93.sizerank; run;
proc sort data=bm; by stkcd rankyear; run;
proc sort data=sz; by stkcd rankyear; run;
data bmsize; merge bm(in=id1) sz(in=id2); by stkcd rankyear;
if id1 and id2; run;

/*get 6 groups*/
data bmsize1; set bmsize; portnum=big*3+hl; run;
proc sort data=bmsize1; by stkcd rankyear; run;
data fm93.bmsize; set bmsize1; run; /*groups by both BM & Size */

/*merge the return data with group data */
data a;
set fm93.allmon;
if month>=7 then rankyear=year;
if month<7 then rankyear=year-1;
run;
proc sort data=a; by stkcd rankyear; run;
data a1; merge a(in=id1) fm93.bmsize(in=id2); by stkcd rankyear; if id1 and id2;run;

/*compute each portfolio's weighted market value & monthly return */
proc sort data=a1; by Trdmnt portnum; run;
proc means data=a1 noprint; var raw_return; weight lamarketvalue; by year month portnum;
/*****take the current market value as the weight*****/
output out=portreturn mean=portreturn; run;
data portreturn1; set portreturn; where year>=2003; run;

/*compute SMB & HML */
data portreturn2;
set portreturn1;
smb=(lag3(portreturn)+lag4(portreturn)+lag5(portreturn))/3-(portreturn+lag(portreturn)+la
g2(portreturn))/3;
hml=(portreturn+lag3(portreturn))/2-(lag2(portreturn)+lag5(portreturn))/2;
if portnum=5;
keep year month smb hml;
run;
data fm93.smb_hml; set portreturn2; if year^=2014;run;

```

```

/* weighted current market value index of all A-type stocks, i.e. compute RM */
data a; set fm93.allmon; by stkcd year month; run;
data a1; set a;
where lamarketvalue^=.; /*If the former monthly current market value isn't default, use that
to compute the RM of this month */
run;
/*delete the stocks issued within 6 months for each year */
data ipo; set fmreg.ipo; run;
proc sort data=ipo; by stkcd; run;
proc sort data=a1; by stkcd; run;
data a2; merge a1(in=id) ipo; by stkcd; if id; run;
data a3; set a2; ipoyear=substr(Listdt,1,4)+0; ipomonth=substr(Listdt,6,2)+0; run;
data a4; set a3; if year=ipoyear and month-ipomonth<=6 then delete;
if year-ipoyear=1 and month+12-ipomonth<=6 then delete;
run;
proc sort data=a4; by year month stkcd; run;
proc means data=a4 noprint;
var raw_return; weight lamarketvalue; /*compute the weighted current market value */
by year month;
output out=vwindex(drop=_freq_ _type_) mean=vwindex;
run;
data fm93.vwindex; set vwindex; where year>=2003; run;

/*2. Compute the 2 factors in bond market TERM & DEFAULT */
data trade; set fm93.BND_trade; run;
data a; set trade; keep _COL0 _COL1 _COL14;
rename _COL0=bndcd _COL1=trdmnt _COL14=return;
run;
data a1; set a; return=return/1200;
label return='月度化到期收益率'; run;

data inf; set fm93.bnd_bndinfo;
rename _COL0=bndcd _COL16=term _COL6=bndtype; run;

/*compute TERM first*/
data gb; set inf; where bndtype='01'; run; /*Select out treasury bonds*/

proc sort data=a1; by bndcd; run;
proc sort data=gb; by bndcd; run;

data gbtrade; merge a1(in=ie) gb(in=id); by bndcd; if id and ie; run;
data b; set gbtrade; if term>10; run; /*set treasury bonds with terms more than 10 as long-term

```

```

bonds */
proc sort data=b; by trdmnt; run;

proc means data=b noprint;
by trdmnt;
var return;
output out=lgbnd(drop=_freq_ _type_) mean=lgbnd;
run;
data lgbnd2; set lgbnd; if substr(trdmnt,1,4)+0>=2003; run;
data nrmt; set fm93.nrmt; nrmt=nrmt/100; run;

data term; merge lgbnd2 nrmt; by trdmnt; run;
data term1; set term; term=lgbnd-nrmt; run;
/*TERM: the deviation of the return of the long-term bonds from risk-free return, i.e. the
difference of the two returns */
data fm93.term; set term1; keep trdmnt term; run;

/* compute DEFAULT /
data firmdbnd; set inf; where bndtype='02' or bndtype='03';
where _COL32='N' and _COL36='N' and _COL40='N'; run; /*delete bonds with options*/
/*select company bonds out*/

proc sort data=a1; by bndcd; run;
proc sort data=firmdbnd; by bndcd; run;

data fdtrade; merge a1(in=ie) firmdbnd(in=id); by bndcd; if id and ie; run;
data b; set fdtrade; if term>=10; run;
proc sort data=b; by trdmnt; run;

proc means data=b noprint;
by trdmnt;
var return;
output out=fdbnd(drop=_freq_ _type_) mean=fdbnd;
run;
/*get the return of company bonds*/
data fdbnd2; set fdbnd; if substr(trdmnt,1,4)+0>=2003; run;
data fm93.cb; set fdbnd2; run;

data dft; merge fdbnd2 lgbnd2; by trdmnt; run;
data dft2; set dft; default=fdbnd-lgbnd; run;
/*DEF: the difference of the returns of long-term company bonds and treasury bonds */
data fm93.default; set dft2; keep trdmnt default; run;

```

```
/*二.construct outcome variable*/

/*1.divide stocks into 5*5=25 groups by Size & BM */
data bm; set fm93.bm; run;
data w; set bm; where stkcd like '60%'; run;
proc sort data=w; by year; run;
proc univariate data=w noprint;
var bm2; by year;
output out=bm5 pctlpts=20 40 60 80 pctlpre=dec; run;

/* divide stocks into 5groups by BM */
proc sort data=bm; by year; run;
proc sort data=bm5; by year; run;
data w1; merge bm(in=id) bm5; by year;if id; run;
data w2; set w1; if bm2<=dec20 then HL=1;
if dec20<bm2<=dec40 then HL=2;
if dec40<bm2<=dec60 then HL=3;
if dec60<bm2<=dec80 then HL=4;
if bm2>=dec80 then HL=5;
rankyear=year+1;
run;
data fm93.bm5rank; set w2; keep stkcd rankyear HL; run;

data a; set fm93.allmon; if month=6;keep stkcd amarketvalue year; if amarketvalue^=.; run;
data a1; set a; where stkcd like '60%'; run;
proc sort data=a1; by year amarketvalue; run;
proc univariate data=a1 noprint;
var amarketvalue; by year;
output out=size pctlpts=20 40 60 80 pctlpre=dec; run;
proc sort data=a; by year; run;
proc sort data=size; by year; run;
data c; merge a(in=id) size; by year; if id;run;
data c1; set c;
if amarketvalue<=dec20 then big=1;
if dec20<amarketvalue<=dec40 then big=2;
if dec40<amarketvalue<=dec60 then big=3;
if dec60<amarketvalue<=dec80 then big=4;
if amarketvalue>=dec80 then big=5;
rankyear=year;
run;
data fm93.size5rank; set c1; keep stkcd rankyear big; where rankyear>=2002; run;

data bm; set fm93.bm5rank; run;
data sz; set fm93.size5rank; run;
proc sort data=bm; by stkcd rankyear; run;
```



```

proc sort data=sz; by stkcd rankyear; run;
data bmsize; merge bm(in=id1) sz(in=id2); by stkcd rankyear;
if id1 and id2; run;

/*get 25 groups */
data bmsize1; set bmsize; portnum=big*5+hl; run;
proc sort data=bmsize1; by stkcd rankyear; run;
data fm93.bm5size; set bmsize1; run;

data a;
set fm93.allmon;
if month>=7 then rankyear=year;
if month<7 then rankyear=year-1;
run;
proc sort data=a; by stkcd rankyear; run;
data a1; merge a(in=id1) fm93.bm5size(in=id2); by stkcd rankyear; if id1 and id2; run;

proc sort data=a1; by Trdmnt portnum; run;
proc means data=a1 noprint; var raw_return; weight lamarketvalue; by year month portnum big
hl;
output out=portreturn(drop=_type_ _freq_) mean=portreturn; run;
data portreturn1; set portreturn; where year>=2003 and year<=2013; run;
data fm93.portreturn25; set portreturn1; run;

/*2.construct 7 portfolios of bonds: short-term treasury bonds, long-term treasury bonds, AAA、
AAA-、AA+、AA、AA- & worse company bonds */
/*there are few bonds with a BBB or worse in China, different from paper in 1993 */
data trade; set fm93.BND_trade; run;
data a; set trade; keep _COL0 _COL1 _COL14;
rename _COL0=bndcd _COL1=trdmnt _COL14=return;
run;
data a1; set a; return=return/1200;
label return='月度化到期收益率'; run;

data inf; set fm93.bnd_bndinfo;
rename _COL0=bndcd _COL16=term _COL6=bndtype; run;

/*returns of short-term treasury bonds */
data gb; set inf; where bndtype='01'; run;

proc sort data=a1; by bndcd; run;
proc sort data=gb; by bndcd; run;

data gbtrade; merge a1(in=ie) gb(in=id); by bndcd; if id and ie; run;
data b; set gbtrade; if term<10; run; /

```

```

proc sort data=b; by trdmnt; run;

proc means data=b noprint;
by trdmnt;
var return;
output out=lgbnd(drop=_freq_ _type_) mean=lgbnd;
run;
data lgband3; set lgband; if substr(trdmnt,1,4)+0>=2003; run;

/*fm93.gb_short & fm93.gb_long record the returns of short-term & long-term treasury bonds
separately */
data fm93.gb_short; set lgband3; if substr(trdmnt,1,4)+0>=2003; run;
data fm93.gb_long; set lgband; if substr(trdmnt,1,4)+0>=2003; run;

/*compute the returns of company bonds*/
data firmband; set inf; where bndtype='02' or bndtype='03'; rename _COL31=credit;
where _COL32='N' and _COL36='N' and _COL40='N';
run;
proc sort data=a1; by bndcd; run;
proc sort data=firmband; by bndcd; run;
data fdtrade; merge a1(in=ie) firmband(in=id); by bndcd; if id and ie; run;
proc sort data=fdtrade; by trdmnt credit; run;

proc means data=fdtrade noprint;
by trdmnt credit;
var return;
output out=firmporport(drop=_freq_ _type_) mean=firmporport;
run;
data firmporport2; set firmporport; if substr(trdmnt,1,4)+0>=2003; run;
/*four groups: AAA、AA+、AA和AA-(No Chinese company is rated under AA-)*
data fm93.firmporport_AAA; set firmporport2; where credit='AAA'; if
substr(trdmnt,1,4)+0>=2003; run;
data fm93.firmporport_AA1; set firmporport2; where credit='AA+'; if
substr(trdmnt,1,4)+0>=2003; run;
data fm93.firmporport_AA2; set firmporport2; where credit='AA'; if
substr(trdmnt,1,4)+0>=2003; run;
data fm93.firmporport_AA3; set firmporport2; where credit='AA-'; if
substr(trdmnt,1,4)+0>=2003; run;

/*****Table
1*****/
data bm5size; set fm93.bm5size; rename rankyear=year; run; /*input the outcome after division*/
data bm; set fm93.bm; keep stkcd year bm2; run; /*store the data of BM in fm93.bm */

```

```

/*data of market value on June */
data size; set fm93.allmon; if month=6; keep stkcd amarketvalue year; if amarketvalue^=.; run;

/*weight f the market value*/
proc sort data=size out=size2; by year; run;
data totalsize; set size2; by year; retain tmv 0;
if first.year then tmv=0; tmv=tmv+amarketvalue; if last.year;
keep year tmv; run;

proc sort data=bm5size; by year stkcd; run;
proc sort data=size; by year stkcd; run;
data size3; merge size bm5size(in=id); by year stkcd; if id; run;
proc sort data=size3; by year big hl; run;
data size4; set size3; by year big hl;
retain pmv 0; if first.year or first.big or first.hl then pmv=0;
pmv+amarketvalue; if last.year or last.big or last.hl; drop stkcd amarketvalue; run;
proc sort data=size4; by year; run;

data size5; merge size4(in=id) totalsize; by year; p=pmv/tmv*100;
if id; /*in percent*/ run;
data size; set size; amarketvalue=amarketvalue/1000000; run; /*Unit: millions*/

/*compute E/P & RM*/
%macro ratiofactor(infile=,var=,factor=);
data finance1; set &infile; keep stkcd year &var; run;
data finance2; set finance1; where &var^=.; run;
data proxy1; set fm93.allmon;
if month=12; keep stkcd amarketvalue year; if amarketvalue^=.; run;
data proxy2;
merge finance2(in=id) proxy1;
by stkcd year;
if id;
&factor = &var/amarketvalue*100; /*in percent*/
if &factor ^= .; /*compute the index, no default */
keep stkcd year &factor;
where year>=2003;
run; /*dataset proxy2, containing the most original data of computing the index*/
data proxy3; set proxy2;
where &factor > 0;
run; /*positive value only */
proc sort data=proxy2 out=&factor._all; by year stkcd; run;
proc sort data=proxy3 out=&factor; by year stkcd; run;
/*dataset &factor for only positive value; &factor._all for all */
%mend;

/*compute: EP_positive*/
%ratiofactor(infile=fm93.fmreg,var=netprofit,factor=ep);

```

```

/*compute: RM, revenue is the operation revenue */
%ratiofactor(infile=fm93.fmreg,var=revenue,factor=rm);

/*compute the mean by group */
%macro descrip(infile=,var=);
data a; set &infile;
where year>=2003 and year<=2012; /*the time duration of the sample*/
run;
proc sort data=a; by stkcd year; run;
proc sort data=bm5size; by stkcd year; run;
data fenzu; merge a(in=id1) bm5size(in=id2); by stkcd year;
  if id1 and id2; run;
proc sort data=fenzu; by big hl year; run;

proc means data=fenzu noprint;
by big hl year;
var &var;
output out=ave&var(drop=_freq_ _type_) mean=ave&var;
run;
proc means data=ave&var noprint;
by big hl;
var ave&var;
output out=ave_&var(drop=_freq_ _type_) mean=ave_&var;
run;
proc transpose data=ave_&var out=transave_&var(drop=_LABEL_ _NAME_) PREFIX=BM_; by big; id
hl;run;
%mend;

/*mean of Size*/
%descrip(infile=size,var=amarketvalue);
/* mean of BM */
%descrip(infile=bm,var=bm2);
/* mean of E/P*/
%descrip(infile=ep_all,var=ep);
/* mean of RM*/
%descrip(infile=rm_all,var=rm);

/* mean of size proportion */
proc sort data=size5; by big hl; run;
proc means data=size5 noprint;
var p;
by big hl;
output out=size6(drop= _type_ _freq_) mean=ave_p;
run;
proc transpose data=size6 out=transave_p(drop=_LABEL_ _NAME_) PREFIX=BM_; by big; id hl;run;

```

```

/*average number of companies for each group yearly */
proc sort data=bm5size; by big hl year; run;
proc means data=bm5size noprint n; by big hl year; output out=n n=n;run;
proc means data=n noprint; by big hl; var n; output out=ave_n(drop=_freq_ _type_)
mean=ave_n;run;
proc transpose data=ave_n out=transave_n(drop=_NAME_) PREFIX=BM_; by big; id hl;run;
    title "Table 1(Panel 1-Panel 5)";
    title2 "Descriptive staticstics for 25 stock portfolios formed on size and book-to-market
equity:2003-2012, 10 years";
/*get Table 1*/
%macro print_table1(infile=,title=);
* table1 panell1 print;
    title3 "&title";
    proc print data=&infile noobs;
        format bm_1 bm_2 bm_3 bm_4 bm_5 comma20.2;
    run;
%mend;

%print_table1(infile=transave_amarkevvalue,title=Panel 1: Average of annual averages of firm
size-in millions);
%print_table1(infile=transave_bm2,title=Panel 2: Average of annual B/E ratios for portfolio);
%print_table1(infile=transave_p,title=Panel 3: Average of annual percent of market value in
portfolio);
%print_table1(infile=transave_n,title=Panel 4: Average of annual number of firms in portfolio);
%print_table1(infile=transave_ep,title=Panel 5: Average of annual E/P raioes(in percent) for
portfolio);
/*%print_table1(infile=transave_rm,title=Panel 6: Average of annual RM raioes(in percent) for
portfolio);*/

/*****Table
2*****/

/*input data */
data nrrt; set fm93.nrrt; nnrmt=nnrmt/100; label nnrmt="月度化无风险收益率";
    year=substr(trdmnt,1,4)+0; month=substr(trdmnt,6,2)+0; run;

/* returns of short-term treasury bonds */
data gb_short; merge fm93.gb_short nrrt; by trdmnt; gb_short=lgbnd-nnrmt;run;
/* returns of long-term treasury bonds */

```

```

data gb_long; merge fm93.gb_long nrrt; by trdmnt; gb_long=lgbnd-nnrmt;run;

/* returns of company bonds */
data firmport_AAA; merge fm93.firmport_AAA nrrt; by trdmnt; firmport_AAA=firmport-nnrmt;
drop credit;run;
data firmport_AA1; merge fm93.firmport_AA1 nrrt; by trdmnt; firmport_AA1=firmport-nnrmt;
drop credit;run;
data firmport_AA2; merge fm93.firmport_AA2 nrrt; by trdmnt; firmport_AA2=firmport-nnrmt;
drop credit;run;
data firmport_AA3; merge fm93.firmport_AA3 nrrt; by trdmnt; firmport_AA3=firmport-nnrmt;
drop credit;run;
data term; set fm93.term; run;
data default; set fm93.default; run;
data smb_hml; merge fm93.smb_hml(in=id) nrrt; by year month; if id; keep trdmnt smb hml;run;
data Vwindex; set fm93.Vwindex; if year<2014; run;
data r_m; merge Vwindex nrrt; by year month; rm=vwindex-nnrmt;keep trdmnt rm; run;
data cb; set fm93.cb; run;

/*****compute RMO after the regression of RMRF against four factors *****/
data fct; merge r_m smb_hml term default; by trdmnt; run;
proc reg data=fct noprint outest=fctreg_result rsquare adjrsq cp ;
model rm=smb hml term default/ dw spec;
output out=out2 r=r p=p l95=l u95=u; /*residuals remain in out2 */
run;
quit;

proc sql;
create table rmo as select
out2.trdmnt,out2.r, fctreg_result.intercept
from out2, fctreg_result
;
quit;
data RMO1; set RMO; RMO=intercept+r;keep trdmnt rmo; run;
data fm93.rmo; set rmo1; run;

data sum; delete; run;
%macro Summary(var=,name=,infile=); /*input parameters are the names of the variable and the
dataset */
data variable; set &infile; &var=&var*100; run; /*in percent*/
proc means data=variable noprint t std;
var &var;
output out=a(drop=_type_ _freq_) mean=mean t=t std=std;
run;
data b; set a;
name=input("&name",&8.);

```

```

label ave=mean t=t std=std;
run;
data sum; set sum b; run;
%mend;

/*outcome variable*/
%Summary(var=vindex,name=RM,infile=Vindex);/*stock index*/
%Summary(var=gb_short,name=TB,infile=gb_short);/* short-term treasury bonds */
%Summary(var=gb_long,name=LTG,infile=gb_long);/* long-term treasury bonds */
%Summary(var=fdbnd,name=CB,infile=cb);/* long-term company bonds */

%Summary(var=rm,name=RM-RF,infile=r_m);/*excess return of stock market */
%Summary(var=rmo,name=RMO,infile=rmo1);/*sum of the residual and the intercept in the
regression of RMRF */
%Summary(var=smb,name=SMB,infile=smb_hml);/*SMB*/
%Summary(var=hml,name=HML,infile=smb_hml);/*HML*/
%Summary(var=term,name=TERM,infile=term);/*term factor*/
%Summary(var=default,name=DEF,infile=default);/*default factor*/

/* outcome variables in bond market债券市场被解释变量*/
%Summary(var=gb_short,name=TB,infile=gb_short);/* short-term treasury bonds */
%Summary(var=gb_long,name=LTG,infile=gb_long);/* long-term treasury bonds */

%Summary(var=firmport_AAA,name=AAA,infile=firmport_AAA);/*AAA */
%Summary(var=firmport_AA1,name=AA+,infile=firmport_AA1);/*AA+ */
%Summary(var=firmport_AA2,name=AA,infile=firmport_AA2);/*AA */
%Summary(var=firmport_AA3,name=AA-,infile=firmport_AA3);/*AA- */
data sum; retain name mean t std; set sum; run;
* table2 panell print;
  title1 "Table 2";
  title2 "Panel 1: Average t_value and standard error";
proc print data=sum noobs;
  format _numeric_ comma20.2;
run;

/*Autocorr. for lag*/
data corr1; delete; run;
data corr2; delete; run;
data corr12; delete; run;

%macro autocorr(var=,name=,infile=);
data variable; set &infile; &var=&var*100; run; /*in percent*/
%do t=1 %to 12;
data v; set variable; lag&t&var=lag&t(&var); run;
proc corr data=v outp=a noprint;/*correlation*/

```

```

var &var lag&t&var;
run;
data b; retain name lag&t&var;
set a; if _type_=input('CORR',$8.) and &var=1;
name=input("&name",$8.);
keep name lag&t&var;
rename lag&t&var=lag&t;
run;
data corr&t; set corr&t b;
run;
%end;
%mend;

%autocorr(var=rm,name=RM-RF,infile=r_m);
%autocorr(var=gb_short,name=TB,infile=gb_short);
%autocorr(var=fdbnd,name=CB,infile=cb);
%autocorr(var=rmo,name=RMO,infile=rmo1);
%autocorr(var=smb,name=SMB,infile=smb_hml);
%autocorr(var=hml,name=HML,infile=smb_hml);
%autocorr(var=term,name=TERM,infile=term);
%autocorr(var=default,name=DEF,infile=default);

%autocorr(var=gb_short,name=TB,infile=gb_short);/* short-term treasury bonds */
%autocorr(var=gb_long,name=LTG,infile=gb_long);/* long-term treasury bonds */

%autocorr(var=firmport_AAA,name=AAA,infile=firmport_AAA);/*AAA */
%autocorr(var=firmport_AA1,name=AA+,infile=firmport_AA1);/*AA+ */
%autocorr(var=firmport_AA2,name=AA ,infile=firmport_AA2);/*AA */
%autocorr(var=firmport_AA3,name=AA-,infile=firmport_AA3);/*AA- */

data corr1; set corr1; rank=_n_; run;
data corr2; set corr2; rank=_n_; run;
data corr12; set corr12; rank=_n_; run;
data autocorr; merge corr1 corr2 corr12; by rank; drop rank; run;

*Table2 panel2 print;
title2 "Panel 2: Autocorrelation";
proc print data=autocorr noobs;
format _numeric_ comma20.2;
run;

/*correlations of RM-RF,RMO,SMB,HML,TERM & DEF */
data fct1; merge fct rmo1; by trdmnt; run;
proc corr data=fct1 outp=corrout noprint;
var rm rmo smb hml term default;
run;

```



```

data corr; set corROUT; if _TYPE_=input('CORR',$8.); run;

*Table2 Panel3 print;
title2 "Panel 3: Correlation";
proc print data=corr;
  format _numeric_ comma20.2;
run;

/*statistics of 25 stock portfolios' monthly excess returns*/
data a; set fm93.portreturn25; run;
data portreturn25; merge a(in=id) nrrt; by year month; portreturn=portreturn-nnrmt; if id;
rename portreturn=prex; label portreturn='组合每月超额收益率'; drop nnrmt; run;

data port; set portreturn25; prex=prex*100; /*in percent*/ run;
proc sort data=port; by big h1; run;
proc means data=port noprint t std;
by big h1;
var prex;
output out=port1(drop=_type_ _freq_) mean=mean t=t std=std;
run;
data port2; set port1; label t="t" std="std"; run;
proc transpose data=port2 out=port3(drop=_label_) PREFIX=BM_;
by big; id h1; run;
proc sort data=port3; by _NAME_ big; run;
data port4; set port3; format bm_1 bm_2 bm_3 bm_4 bm_5 10.2; run;
data port5; set port4; big1=put(big,$1.); drop big; run;
data port6; retain big; set port5; big=input(big1,$8.);
if big="1" then big="Small"; if big="5" then big="Big"; drop big1; run;

*Table 2 Panel 4;
title2 "Panel 4: Excess returns on 25 stock portfolios formed on ME and BE/ME";
proc print data=port6 noobs;
  format _numeric_ comma20.2;
run;

/*****Table
3-8*****/
/*outcome variable: Stock*/

data stk; merge portreturn25 term default r_m smb_hml rmo1; by trdmnt; run;
proc sort data=stk; by portnum; run;

/*construct a macro of the regression in stock market */

```

```

%macro stkreg(var1=,var2=,var3=,var4=,var5=,sign=,num=);
title "&sign.";
ods trace on/label listing;
proc reg data=stk noprint outest=result1 rsquare adjrsq cp tableout;
model prex = &var1 &var2 &var3 &var4 &var5/r clm cli stb ;
by portnum big hl; /*make regressions for each group individually */
output out=out1 r=r p=p l95=l u95=u ;
run;
quit;
ods trace off;

/*record the intercept */
data &sign._a; set result1;
keep portnum big hl Intercept;
x=input('PARMS', $8.);
if _TYPE_=x;
run;

/* record the t-value of intercept */
data &sign._a_t; set result1;
keep portnum big hl Intercept;
x=input('T', $8.);
if _TYPE_=x;
run;

/* record the residuals */
data &sign._u; set out1; keep big hl trdmnt r; run;

/*compute residual standard error*/
data &sign._se; set result1;
se=_RMSE_*100; /*in percent*/ /*(_EDF+_P/_EDF)^0.5*/;
keep portnum big hl se;
x=input('PARMS', $8.);
if _TYPE_=x;
run;

data &sign; set result1; run;

/*extract adjusted R square */
data &sign._R2; set result1; keep portnum big hl _ADJRSQ_; x=input('PARMS', $8.); if _TYPE_=x;
rename _ADJRSQ_=R2; run;

%do n=1 %to &num;
data &sign._paramt_&&var&n; set result1; keep portnum big hl &&var&n; x=input('PARMS', $8.); if
_TYPE_=x; run;
data &sign._t_&&var&n; set result1; keep portnum big hl &&var&n; x=input('T', $8.); if _TYPE_=x;
run;

```

```

proc transpose data=&sign._paramt_&&var&n(drop=portnum)
  out=&sign._paramt_&&var&n/*(drop=_LABEL_ _NAME_)*/ PREFIX=BM_;
  by big; id hl; run;
proc transpose data=&sign._t_&&var&n(drop=portnum)
  out=&sign._t_&&var&n PREFIX=BM_;
  by big; id hl; run;

/*change the name of size */
data &sign._paramt_&&var&n; retain size;set &sign._paramt_&&var&n;
big1=put(big,$1.);size=input(big1,$8.);
  if size="1" then size="Small"; if size="5" then size="Big"; drop big1 big; run;
data &sign._t_&&var&n; retain size;set &sign._t_&&var&n;
big1=put(big,$1.);size=input(big1,$8.);
  if size="1" then size="Small"; if size="5" then size="Big"; drop big1 big; run;

proc print data=&sign._paramt_&&var&n(drop=_name_) NOOBS;
  title2 "paramt(&&var&n)";
  format BM_1 BM_2 BM_3 BM_4 BM_5 comma20.2;
run;
proc print data=&sign._t_&&var&n(drop=_name_) NOOBS;
  title2 "t(&&var&n)";
  format BM_1 BM_2 BM_3 BM_4 BM_5 comma20.2;
run;
%end;

/*R square*/
proc transpose data=&sign._R2(drop=portnum)
  out=&sign._R2 /*(drop=_LABEL_ _NAME_)*/ PREFIX=BM_;
  by big; id hl; run;
data &sign._R2; retain size;set &sign._R2; big1=put(big,$1.);size=input(big1,$8.);
  if size="1" then size="Small"; if size="5" then size="Big"; drop big1 big; run;
proc print data=&sign._R2(drop=_LABEL_ _name_) NOOBS;
  title2 "R^2";
  format BM_1 BM_2 BM_3 BM_4 BM_5 comma20.2;
run;

/*RSE*/
proc transpose data=&sign._se(drop=portnum)
  out=&sign._se PREFIX=BM_;
  by big; id hl; run;
data &sign._se; retain size;set &sign._se; big1=put(big,$1.);size=input(big1,$8.);
  if size="1" then size="Small"; if size="5" then size="Big"; drop big1 big; run;

proc print data=&sign._se(drop=_name_) NOOBS ;
  title2 "s(e)";

```

```

format BM_1 BM_2 BM_3 BM_4 BM_5 comma20.2;
run;

%mend;

%stkreg(var1=term,var2=default,sign=Table3_Stock,num=2);
%stkreg(var1=rm,sign=Table4_Stock,num=1);
%stkreg(var1=smb,var2=hml,sign=Table5_Stock,num=2);
%stkreg(var1=rm,var2=smb,var3=hml,sign=Table6_Stock,num=3);
%stkreg(var1=rm,var2=smb,var3=hml,var4=term,var5=default,sign=Table7_Stock,num=5);
%stkreg(var1=rmo,var2=smb,var3=hml,var4=term,var5=default,sign=Table8_Stock,num=5);

/*regressions of bonds*/
data bnd;
    merge gb_short gb_long firmport_AAA firmport_AA1 firmport_AA2 firmport_AA3 term default
    r_m smb_hml rmo1;
    by trdmnt; run;

/*construct a macro of the regression in bond market */
%macro bndreg(var1=,var2=,var3=,var4=,var5=,sign=,num=);
title "&sign.";
ods trace on/label listing;
proc reg data=bnd noprint outest=result1 rsquare adjrsq cp tableout;
model gb_short = &var1 &var2 &var3 &var4 &var5/r clm cli stb ;
output out=out1(keep=trdmnt r1) r=r1;
model gb_long = &var1 &var2 &var3 &var4 &var5/r clm cli stb ;
output out=out2(keep=trdmnt r2) r=r2;
model firmport_AAA = &var1 &var2 &var3 &var4 &var5/r clm cli stb ;
output out=out3(keep=trdmnt r3) r=r3;
model firmport_AA1 = &var1 &var2 &var3 &var4 &var5/r clm cli stb ;
output out=out4(keep=trdmnt r4) r=r4;
model firmport_AA2 = &var1 &var2 &var3 &var4 &var5/r clm cli stb ;
output out=out5(keep=trdmnt r5) r=r5;
model firmport_AA3 = &var1 &var2 &var3 &var4 &var5/r clm cli stb ;
output out=out6(keep=trdmnt r6) r=r6;
run;
quit;
ods trace off;

data &sign; set result1; run;

data &sign._a; set result1;
keep _DEPVAR_ _TYPE_ Intercept;
x=input('PARMS', $8.);
y=input('T', $8.);

```

```

if _TYPE_=x or _TYPE_=y;
run;

data &sign._u; merge out1 out2 out3 out4 out5 out6; by trdmnt; run;

data &sign._R2se; set result1;
se=_RMSE_*100;/*in percent*/ /*(_EDF+_P/_EDF)^0.5*/;
keep _DEPVAR_ se _ADJRSQ_;
x=input('PARMS',$8.);
if _TYPE_=x;
rename _ADJRSQ_=R2;
run;
proc transpose data=&sign._R2se out=&sign._R2se(drop=_label_); id _DEPVAR_; run;

/*corr & t-value*/
data &sign._para_t; set result1; keep _DEPVAR_ _TYPE_ &var1 &var2 &var3 &var4 &var5;
x=input('PARMS',$8.); y=input('T',$8.);if _TYPE_=x or _TYPE_=y; run;
proc sort data=&sign._para_t; by _type_; run;
proc transpose data=&sign._para_t out=&sign._para_t; by _type_; id _DEPVAR_; run;

data a;set &sign._para_t; by _type_; retain rank;if first._type_ then rank=0; rank=rank+1;
run;
proc sort data=a ; by rank _type_; run;/*rank in the given order */

data &sign; set a(drop=rank) &sign._R2se; run;
*&sign;
proc print data=&sign NOOBS;
    format _numeric_ comma20.2;
run;
%mend;

%bndreg(var1=term,var2=default,sign=Table3_Bond,num=2);
%bndreg(var1=rm,sign=Table4_Bond,num=1);
%bndreg(var1=smb,var2=hml,sign=Table5_Bond,num=2);
%bndreg(var1=rm,var2=smb,var3=hml,sign=Table6_Bond,num=3);
%bndreg(var1=rm,var2=smb,var3=hml,var4=term,var5=default,sign=Table7_Bond,num=5);
%bndreg(var1=rmo,var2=smb,var3=hml,var4=term,var5=default,sign=Table8_Bond,num=5);

/*****Table
9*****/
/*print the intercept of the regression */
%macro stock_a;/*stock market*/
title "Table 9:Stock";

```

```

%do t=3 %to 7;
/*intercept*/
data a; set table&t._stock_a; /* Intercept=Intercept*100;*/run;
proc transpose data=a(drop=portnum) out=b prefix=BM_ by big; id hl; run;
data c; retain size;set b; big1=put(big,$1.);size=input(big1,$8.);
  if size="1" then size="Small"; if size="5" then size="Big"; drop big1 big; run;
proc print data=c(drop=_name_ _label_) NOOBS ;
  title2 "a&t";
  format BM_1 BM_2 BM_3 BM_4 BM_5 comma20.2;
run;

/*t-value of intercept*/
data a; set table&t._stock_a_t; run;
proc transpose data=a(drop=portnum) out=b prefix=BM_ by big; id hl; run;
data c; retain size;set b; big1=put(big,$1.);size=input(big1,$8.);
  if size="1" then size="Small"; if size="5" then size="Big"; drop big1 big; run;
proc print data=c(drop=_name_ _label_) NOOBS ;
  title2 "a&t._t";
  format BM_1 BM_2 BM_3 BM_4 BM_5 comma20.2;
run;
%end;
%mend;
%stock_a;

%macro bond_a; /*Bond market*/
title "Table 9:Bond";
data table9; delete; run;
%do t=3 %to 7;
data a; set table&t._bond_a; run;
proc sort data=a; by _type_;run;
proc transpose data=a out=b(drop=_name_ _label_); by _type_; id _DEPVAR_; run;
data c; retain lab;set b; lab="Regression %eval(&t-2)"; run;
data table9; set table9 c;
%end;
proc print data=table9 NOOBS ;
  format _numeric_ comma20.2;
run;
%mend;
%bond_a;

```

```

/*****Table10*****/
*****/

title "Table 10";

data fer; delete; run;

%macro janreg1(infile=,var=);/*Five-factor explanatory returns*/
data a; set &infile; if substr(trdmnt,6,2)+0=1 then jan=1;else jan=0;run;
ods trace on/label listing;
proc reg data=a noprint outest=result1 rsquare adjrsq cp tableout;
model &var = jan /r clm cli stb ;
output out=out1 r=r;
run;
quit;
ods trace off;
data b; set result1; keep _DEPVAR_ intercept jan _ADJRSQ_;
  if _TYPE_=input('PARMS', $8.);rename intercept=a jan=b; label intercept=a jan=b;run;
data c; set result1; keep _DEPVAR_ intercept jan ;
  if _TYPE_=input('T', $8.); rename intercept=t_a jan=t_b; label intercept=t(a) jan=t(b);run;
data d; retain _DEPVAR_ a b t_a t_b _ADJRSQ_;merge b c; by _DEPVAR_; run;
data fer; set fer d; run;
%mend;

%janreg1(infile=fct,var=rm);
%janreg1(infile=rmol,var=rmo);
%janreg1(infile=fct,var=smb);
%janreg1(infile=fct,var=hml);
%janreg1(infile=fct,var=term);
%janreg1(infile=fct,var=default);

*Table 10 Panel 1:Five-factor explanatory returns;
Title2 "Panel 1:Five-factor explanatory returns";
proc print data=fer NOOBS ;
  format _numeric_ comma20.2;
run;

%macro janreg2(infile=,var=,outfile=);/*Stock returns*/
data a; set &infile; if substr(trdmnt,6,2)+0=1 then jan=1;else jan=0;run;
proc sort data=a; by big hl; run;
ods trace on/label listing;
proc reg data=a noprint outest=result1 rsquare adjrsq cp tableout;
by big hl;
model &var = jan /r clm cli stb ;
output out=out1 r=r;
run;
quit;
ods trace off;
data b; set result1; keep big hl intercept jan _ADJRSQ_;

```

```

if _TYPE_=input('PARMS', $8.); rename intercept=a jan=b; label intercept=a jan=b; run;
data c; set result1; keep big hl intercept jan ;
if _TYPE_=input('T', $8.); rename intercept=t_a jan=t_b; label intercept=t(a) jan=t(b); run;
data d; retain big hl a b t_a t_b _ADJRSQ_; merge b c; by big hl; run;
data &outfile; set d; run;
%mend;

%janreg2(infile=portreturn25, var=prex, outfile=jan_stock);
*Table 10 Panel 2: Excess stock returns;
Title2 "Panel 2: Excess stock returns";
proc print data=jan_stock NOOBS ;
    format a b t_a t_b _ADJRSQ_ comma20.2;
run;

/*Five-factor regression residuals*/
data u; set table8_stock_u; run;
%janreg2(infile=u, var=r, outfile=jan_stock_r);
*Table 10 Panel 3: Five-factor regression residuals;
Title2 "Panel 3: Five-factor regression residuals";
proc print data=jan_stock_r NOOBS ;
    format a b t_a t_b _ADJRSQ_ comma20.2;
run;

/*bond market*/
data fer; delete; run; /*Excess bond returns*/
%janreg1(infile=gb_short, var=gb_short);
%janreg1(infile=gb_long, var=gb_long);
%janreg1(infile=firmport_aaa, var=firmport_aaa);
%janreg1(infile=firmport_aa1, var=firmport_aa1);
%janreg1(infile=firmport_aa2, var=firmport_aa2);
%janreg1(infile=firmport_aa3, var=firmport_aa3);
*Table 10 Panel 4: Excess bond returns;
Title2 "Panel 4: Excess bond returns";
proc print data=fer NOOBS ;
    format _numeric_ comma20.2;
run;

data fer; delete; run; /*Five-factor regression residuals*/
%janreg1(infile=table8_bond_u, var=r1);
%janreg1(infile=table8_bond_u, var=r2);
%janreg1(infile=table8_bond_u, var=r3);
%janreg1(infile=table8_bond_u, var=r4);
%janreg1(infile=table8_bond_u, var=r5);
%janreg1(infile=table8_bond_u, var=r6);
*Table 10 Panel 5: Five-factor regression residuals;
Title2 "Panel 5: Five-factor regression residuals";
proc print data=fer NOOBS ;

```



```

format _numeric_ comma20.2;
run;

/*****Table11*****/
*****/

data w; set ep; run;
proc sort data=w; by year ep; run;
proc rank data=w out=eprank groups=5;
by year;
ranks ep_rank;
var ep;
run;
data w2; retain stkcd yer ep rankyear ep_rank; set eprank;
rankyear=year+1; run;
data neg_ep; set ep_all; if ep<0; rankyear=year+1; ep_rank=-1;run;
data ep_r; set w2 neg_ep; run;

data a;
set fm93.allmon;
if month>=7 then rankyear=year;
if month<7 then rankyear=year-1;
run;
proc sort data=a; by stkcd rankyear; run;
proc sort data=ep_r(drop=year); by stkcd rankyear; run;
data a1; merge a(in=id1) ep_r(in=id2); by stkcd rankyear; if id1 and id2;run;

data a2; set a1; if lamarketvalue^=.; run;
proc sort data=a2; by year month ep_rank; run;
proc means data=a2 noprint; var raw_return; weight lamarketvalue; by year month ep_rank;
output out=portreturn(drop=_type_ _freq_) mean=portreturn; run;
data epreturn; set portreturn; where year>=2003 and year<=2013; run;
proc sort data=epreturn; by year;run;
data epreturn1; merge epreturn nrrt; by year month; if portreturn^=.;run;
data epreturn2; set epreturn1; exr=portreturn-nnrmt;run;

data fm93.epreturn; set epreturn2; run;
proc sort data=epreturn2; by ep_rank; run;
proc means data=epreturn2 std t noprint;
by ep_rank;
var exr;
output out=epreturn3(drop=_type_ _freq_) mean=mean std=std t=t;
run;

Title "Table11";

```

```
title2 "Panel 1:Portfolios formed on E/P";
proc print data=epreturn3 NOOBS;
format mean std t comma20.2;
run;

proc sort data=epreturn2; by year month; run;
data epstk; merge epreturn2(in=id) r_m smb_hml; by trdmnt; if id; run;
proc sort data=epstk; by ep_rank; run;

ods trace on/label listing;
proc reg data=epstk noprint outest=result1 rsquare adjrsq cp tableout;
by ep_rank;
model exr=rm /r clm cli stb ;
output out=out1;
model exr=rm smb hml/r clm cli stb ;
output out=out2;
run;
quit;
ods trace off;

data result2; set result1; if _TYPE_=input('PARMS',$8.) or _TYPE_=input('T',$8.);
keep ep_rank _model_ _type_ intercept rm smb hml _ADJRSQ_; rename _ADJRSQ_=R2; run;
proc sort data=result2; by _model_; run;

data reg1; set result2; if _model_=input('MODEL1',$32.);drop _model_ smb hml;run;
data reg2; set result2; if _model_=input('MODEL2',$32.);drop _model_ ;run;

proc print data=reg1 NOOBS;
    title2 "Regression(i)";
    format intercept rm R2 comma20.2;
run;
proc print data=reg2 NOOBS;
    title2 "Regression(ii)";
    format intercept rm smb hml R2 comma20.2;
run;

ods _all_ close;
ods html;
```