

Supplementary Material for
“An Application of Factor Pricing Models to the Polish Stock Market”

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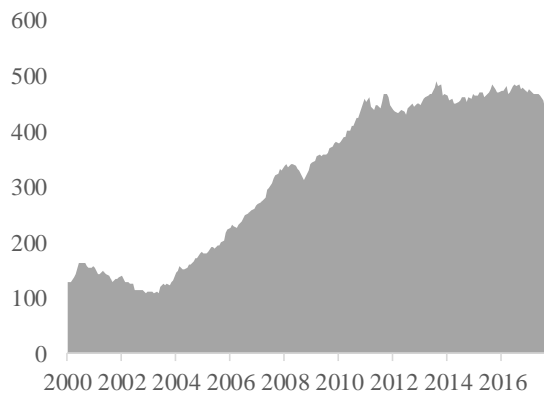
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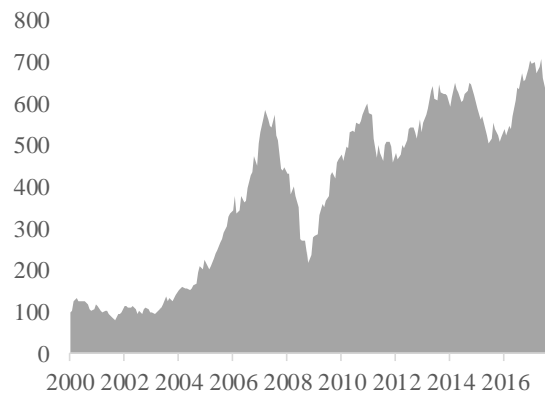
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Abstract

The Supplementary Material contains additional exhibits for the article. Figure S1 presents the research sample. Table S1 reports the monthly returns on portfolios from two-way sorts. Table S2 displays the models' results for returns on two-way sorted portfolios.



Panel A: Number of firms



Panel B: Total market value of firms in the sample

Figure S1. *Research Sample*

Note. This figure provides an overview of the sample used in this study. Panel A depicts the composition in terms of the number of firms and Panel B presents an aggregation of total stock market capitalization (expressed in billion PLN).

Table S1

Monthly Returns on Portfolios from Two-Way Sorts

	Low	2	3	High	H-L		Low	2	3	High	H-L
<i>Panel A</i>						<i>Panel B</i>					
Book-to-market ratio						Momentum					
Market value	Low	-1.42*	-0.10	0.46	1.13*	2.55**	-0.80	0.82	0.79	1.73*	2.53**
		(-2.18)	(-0.18)	(0.69)	(2.21)	(3.69)	(-1.54)	(1.39)	(1.52)	(2.54)	(4.36)
	2	-0.23	0.08	0.49	0.14	0.36	-1.24*	0.26	0.04	1.02	2.26**
		(-0.38)	(-0.05)	(1.05)	(0.18)	(0.51)	(-2.08)	(0.51)	(0.07)	(1.82)	(4.14)
	3	-0.79*	-0.22	0.12	1.09*	1.88**	-1.03	-0.28	0.48	1.00*	2.03**
	(-2.02)	(-0.59)	(0.04)	(2.12)	(5.19)	(-1.92)	(-0.75)	(1.07)	(1.97)	(3.82)	
High	-0.47	-0.27	0.07	0.42	0.89*	-1.11*	-0.13	0.09	0.68	1.79**	
	(-1.07)	(-0.71)	(0.08)	(1.02)	(2.22)	(-1.98)	(-0.44)	(0.15)	(1.33)	(2.91)	
H-L	0.96	-0.18	-0.39	-0.71		-0.32	-0.95*	-0.70	-1.05		
	(1.53)	(-0.32)	(-0.64)	(-1.61)		(-0.59)	(-1.97)	(-1.42)	(-1.70)		
<i>Panel C</i>						<i>Panel D</i>					
Return on assets						Asset growth					
Market value	Low	0.14	1.33	0.47	1.23*	1.09*	0.78	0.10	1.24	0.04	-0.74
		(0.09)	(1.58)	(0.67)	(2.28)	(2.29)	(1.21)	(0.06)	(1.45)	(0.06)	(-1.22)
	2	-0.99	0.30	0.42	0.85	1.84**	-0.22	0.44	0.92	-0.05	0.18
		(-1.53)	(0.43)	(0.68)	(1.42)	(2.87)	(-0.43)	(0.81)	(1.17)	(-0.19)	(0.31)
	3	-0.33	0.18	0.18	0.59	0.92	-0.09	-0.10	-0.20	0.42	0.51
	(-0.62)	(0.22)	(0.27)	(1.07)	(1.54)	(-0.36)	(-0.37)	(-0.59)	(0.76)	(1.28)	
High	-0.16	-0.10	-0.11	0.76	0.92	-0.16	-0.11	-0.03	-0.34	-0.18	
	(-0.46)	(-0.30)	(-0.16)	(0.88)	(1.15)	(-0.47)	(-0.31)	(-0.14)	(-0.78)	(-0.40)	
H-L	-0.30	-1.43	-0.58	-0.47		-0.94	-0.21	-1.28	-0.38		
	(-0.46)	(-1.94)	(-0.89)	(-0.73)		(-1.43)	(-0.32)	(-1.72)	(-0.73)		
<i>Panel E</i>						<i>Panel F</i>					
Momentum						Return on assets					
Book-to-market ratio	Low	-1.97**	-0.39	-0.50	0.11	2.08**	-0.99	-0.84	-0.41	0.08	1.08
		(-3.28)	(-0.73)	(-1.04)	(0.09)	(3.15)	(-1.55)	(-1.90)	(-0.84)	(0.06)	(1.44)
	2	-0.87	-0.44	0.49	0.40	1.27	-0.69	-0.43	0.47	0.07	0.76
		(-1.37)	(-0.94)	(0.85)	(0.67)	(1.82)	(-1.64)	(-1.02)	(0.98)	(-0.07)	(1.43)
	3	-1.08	-0.45	0.33	1.21*	2.29**	-0.71	-0.45	0.31	1.37*	2.07**
	(-1.88)	(-0.99)	(0.62)	(2.30)	(4.06)	(-1.32)	(-0.94)	(0.69)	(2.08)	(3.09)	
High	-0.57	0.37	0.79	1.81**	2.38**	0.17	1.42**	0.88	1.59	1.42	
	(-0.90)	(0.63)	(1.72)	(3.11)	(3.17)	(0.23)	(2.87)	(1.54)	(1.30)	(1.16)	
H-L	1.40*	0.75	1.29**	1.70**		1.16	2.26**	1.29*	1.51		
	(2.14)	(1.26)	(2.58)	(2.91)		(1.58)	(4.50)	(2.17)	(1.45)		
<i>Panel G</i>						<i>Panel H</i>					
Asset growth						Return on assets					
Book-to-market ratio	Low	-0.71	0.07	-1.31*	-0.12	0.59	-1.00	-1.78**	-1.63**	-1.29*	-0.29
		(-1.39)	(0.15)	(-2.02)	(-0.37)	(0.79)	(-1.60)	(-2.75)	(-2.70)	(-2.08)	(-0.55)
	2	0.23	-0.31	-0.24	-0.27	-0.49	0.32	-0.13	-0.44	0.39	0.07
		(0.17)	(-0.80)	(-0.69)	(-0.60)	(-0.69)	(0.41)	(-0.39)	(-1.00)	(0.44)	(-0.02)
	3	0.06	-0.01	0.63	-0.38	-0.43	0.36	-0.14	-0.12	0.06	-0.30
	(0.08)	(-0.24)	(1.07)	(-0.67)	(-0.81)	(0.63)	(-0.36)	(-0.23)	(0.02)	(-0.60)	
High	0.61	0.51	0.48	1.42	0.81	-0.11	1.11*	0.49	1.42**	1.53	
	(1.09)	(1.05)	(0.73)	(1.26)	(0.61)	(-0.16)	(2.25)	(0.89)	(2.70)	(1.94)	
H-L	1.32*	0.43	1.79**	1.54		0.89	2.89**	2.12**	2.71**		
	(2.08)	(0.72)	(2.73)	(1.34)		(1.05)	(4.16)	(3.52)	(4.08)		
<i>Panel I</i>						<i>Panel J</i>					
Asset growth						Return on assets					
Momentum	Low	-0.99	-0.64	-1.78**	-1.51*	-0.52	0.04	0.37	-0.30	-0.22	-0.26
		(-1.80)	(-1.18)	(-2.85)	(-2.24)	(-0.89)	(0.03)	(0.59)	(-0.63)	(-0.38)	(-0.40)

2	-0.37 (-0.89)	0.14 (0.19)	-0.40 (-0.85)	-0.54 (-1.15)	-0.17 (-0.44)	-0.14 (-0.47)	0.21 (0.49)	0.06 (0.08)	-0.39 (-0.82)	-0.25 (-0.52)
3	0.83 (1.63)	0.66 (1.41)	-0.43 (-0.85)	0.40 (0.77)	-0.43 (-0.82)	-0.24 (-0.53)	-0.02 (-0.15)	0.21 (0.37)	0.39 (0.56)	0.63 (1.00)
High	0.57 (0.75)	-0.43 (-0.92)	1.74** (2.94)	0.35 (0.53)	-0.21 (-0.44)	0.77 (1.07)	-0.03 (-0.12)	1.54* (2.24)	0.45 (0.53)	-0.32 (-0.52)
H-L	1.56* (1.96)	0.21 (0.26)	3.52** (4.88)	1.87** (2.77)		0.72 (0.97)	-0.40 (-0.70)	1.84** (3.01)	0.66 (0.69)	

Note. This table reports mean monthly returns on value-weighted portfolios formed using two-way sorts on market value (*MV*), the book-to-market (*BM*) ratio, momentum (*MOM*), return on assets (*ROA*), and asset growth (*AG*). *High* and *Low* are portfolios with the highest and lowest underlying variables and *H-L* are the long-short portfolios, which are long (short) in the *High* (*Low*) portfolio. Returns are expressed as percentages and the numbers in brackets are bootstrap *t*-statistics. The asterisks, * and **, indicate values significantly different from zero at the 5% and 1% levels of significance, respectively.

Table S2

Models' Results for Returns on Two-Way Sorted Portfolios

	$\bar{\alpha}$	$\overline{t - \text{stat}}$	$s(\alpha)$	$s(t - \text{stat})$	$\overline{R^2}$	GRS	GMM
<i>Panel A: Capital Asset Pricing Model</i>							
MV & BM	0.47	1.08	0.42	0.83	44.30	0.54**	0.23**
MV & MOM	0.73	1.46	0.47	0.80	44.55	0.04**	0.06**
MV & ROA	0.49	0.88	0.40	0.59	38.85	2.39*	1.09*
MV & AG	0.32	0.55	0.39	0.49	41.55	63.26	60.39
BM & MOM	0.73	1.68	0.53	1.00	43.99	0.03**	0.01**
BM & ROA	0.69	1.27	0.51	0.65	41.34	0.55**	2.01*
BM & AG	0.48	0.97	0.43	0.67	43.34	27.18	26.33
MOM & ROA	0.67	1.25	0.59	1.09	39.46	0.08**	0.04**
MOM & AG	0.73	1.48	0.50	0.80	41.13	0.02**	0.01**
ROA & AG	0.33	0.67	0.37	0.60	37.26	59.41	58.77
Average	0.56	1.13	0.46	0.75	41.58	15.35	14.89
<i>Panel B: Three-Factor Model</i>							
MV & BM	0.35	0.85	0.33	0.68	60.27	16.94	12.13
MV & MOM	0.71	1.98	0.48	1.18	59.94	0.05**	0.00**
MV & ROA	0.45	0.99	0.41	0.83	51.27	1.78*	1.09*
MV & AG	0.35	0.72	0.37	0.36	53.82	60.49	53.07
BM & MOM	0.70	1.70	0.50	1.11	49.38	0.35**	0.03**
BM & ROA	0.58	1.23	0.35	0.53	48.61	3.71*	0.80**
BM & AG	0.37	0.86	0.23	0.45	47.92	80.38	67.67
MOM & ROA	0.70	1.53	0.64	1.37	45.77	0.08**	0.00**
MOM & AG	0.75	1.74	0.51	1.09	45.74	0.02**	0.00**
ROA & AG	0.40	0.90	0.40	0.87	43.66	19.94	14.36
Average	0.54	1.25	0.42	0.85	50.64	18.37	14.92
<i>Panel C: Four-Factor Model</i>							
MV & BM	0.35	0.78	0.37	0.69	60.34	31.23	16.85
MV & MOM	0.37	1.13	0.31	0.87	64.14	8.29	2.20*
MV & ROA	0.40	0.85	0.30	0.57	52.05	12.16	12.55
MV & AG	0.41	0.91	0.35	0.49	54.22	23.14	8.92
BM & MOM	0.40	0.96	0.25	0.55	52.83	27.86	8.79
BM & ROA	0.39	0.83	0.30	0.53	49.47	23.57	13.25
BM & AG	0.36	0.80	0.26	0.52	48.04	83.87	70.36
MOM & ROA	0.54	1.10	0.33	0.67	49.15	9.91	3.12*
MOM & AG	0.53	1.25	0.36	0.85	49.18	0.76**	0.29**
ROA & AG	0.32	0.77	0.27	0.68	44.19	67.82	49.64
Average	0.41	0.94	0.31	0.64	52.36	28.86	18.60
<i>Panel D: Five-Factor Model</i>							
MV & BM	0.30	0.71	0.30	0.64	61.27	27.60	24.79
MV & MOM	0.66	1.87	0.42	1.03	60.97	0.12**	0.04**
MV & ROA	0.36	0.79	0.36	0.71	54.53	0.59**	0.85**
MV & AG	0.30	0.68	0.29	0.37	56.19	66.15	69.00
BM & MOM	0.67	1.70	0.49	1.09	50.90	0.55**	0.07**
BM & ROA	0.50	1.06	0.33	0.49	50.75	4.73*	6.86
BM & AG	0.38	0.89	0.24	0.47	49.40	74.54	61.76
MOM & ROA	0.66	1.50	0.57	1.23	49.07	0.22**	0.01**
MOM & AG	0.68	1.56	0.47	1.00	48.00	0.07**	0.00**
ROA & AG	0.36	0.92	0.33	0.72	47.35	30.09	15.86
Average	0.49	1.17	0.38	0.77	52.84	20.47	17.92

Note. This table reports the results of the models investigated applied to value-weighted quintile portfolios from two-way sorts on market value (*MV*), the book-to-market ratio (*BM*), momentum (*MOM*), return on assets (*ROA*), and asset growth (*AG*). Panel A reports results for CAPM, Panel B for the Fama and French (1993) three-factor

model, Panel C for Carhart's (1997) four-factor model, and Panel D for the Fama and French (2015) five-factor model. The $\bar{\alpha}$ and $s(\alpha)$ are the average absolute intercept and the standard deviation of the intercept, respectively, while $\overline{t\text{-stat}}$ is the average absolute t -statistic and $s(t\text{-stat})$ the t -statistic's standard deviation. GRS is the p -value for the GRS test of Gibbons et al. (1989) and GMM is the p -value for the GMM approach estimated according to the procedure described in the methodology section. \bar{R}^2 is the mean adjusted coefficient of determination for a set of portfolios. The t -statistics are adjusted for heteroscedasticity and serial correlation using Newey and West (1987) robust standard errors. The intercepts GRS , GMM , and \bar{R}^2 are expressed as percentages. *Average* refers to the average value of statistics across various sets of portfolios. The asterisks, * and **, indicate values significantly different from zero at the 5% and 1% levels of significance, respectively.