Природа моментум эффекта. Выявление природы через декомпозицию статистически значимой положительной доходности арбитражного портфеля (доходности моментум стратегии)

Nature of momentum effect on the Russian stock market. Decomposition of momentum profits

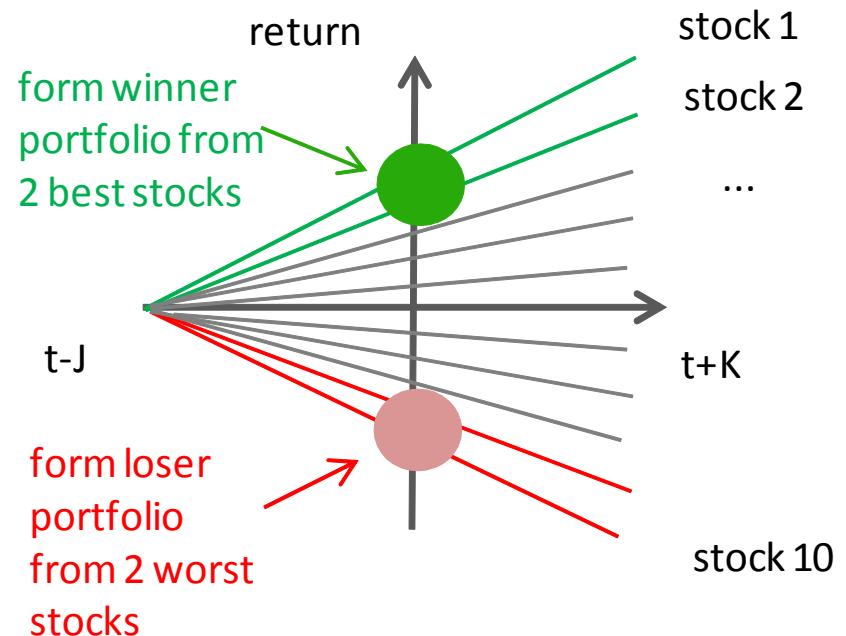Tamara Teplova,   Evgeniia Mikova,

Momentum effect and momentum strategy

Momentum effect:

- A price anomaly on the assets of the same class when securities that have performed relatively well (poorly) to peers in past continue to outperform (underperform) in future

Momentum strategy:

- Investment strategy, based on momentum effect with proving the elements of strategy's design

return

form winner portfolio from 2 best stocks

stock 1

stock 2

...

t-J

t+K

form loser portfolio from 2 worst stocks

stock 10

- Momentum effect **has grown in popularity in investment industry** and has made substantial inroads into investors' portfolios (MSCI World Momentum Index, iShares MSCI USA Momentum Factor ETF, AQR Momentum Index).

- Momentum is empirically observed in more than **40 countries** and during the **different and long-term periods of time** (212 years in the US, dating back to the Victorian age in U.K. equity data).

- The momentum return premium is robust **across different asset classes** (stocks, bonds, indices, commodities, currency).

- Momentum is proved to be a challenge to the **efficient market hypothesis** (EMH).

pre-market-efficiency era (i.e., pre-1960s) - Alexander (1961, 1964), Cootner (1964), Fama (1965, 1970), Fama and Blume (1966), Levy (1967), Van Home and Parker (1967), James (1968), and Jensen and Bennington (1970)

market-efficiency era - benefit from the analysis of past price dynamics defy classical finance theory. Whereby investors receive arbitrage profit ?

It is important to determine the sources of the apparent profitability of trading strategies *because of* (i) the explicit assumption in the literature that time-series patterns in stock prices form the sole basis of return-based trading strategies, and (ii) that the lack of predictability in stock returns is viewed by some as synonymous with market efficiency [Fama (1970, 1991)]. Lehmann (1990) and Lo and MacKinlay (1990) decomposed the momentum profits
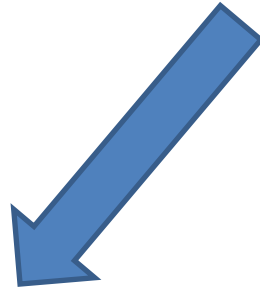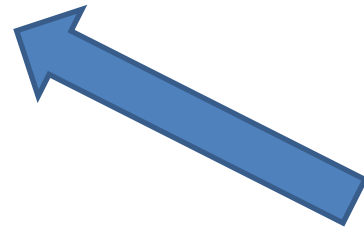
Rational

Risk premium

Data-snooping bias
Data selection bias

Market Microstructure
(transaction costs, the
restriction on short selling, etc.)

Explanation
of momentum
profits

vs

Behavior
(irrational)

Investor overconfidence in
the valuation of assets and
Refusing of errors,
Stickiness Effect and the
rejection of fixation losses,
Overreaction or
underreaction to incoming
news, etc.

Momentum effect is not due to data mining

Authors	Design of strategy	Data	Time period	Monthly return
Jegadeesh and Titman (1993)	12/0.25/3	US	1965-1989	1.96%
Schiereck, Weber, 1995	12/0/6	Germany	1961-1991	0.9%
Rouwenhorst (1998)	9/1/6	Europe (12 capital markets)	1978-1995	1.45%
Rouwenhorst (1999)	6/1/6	Emerging markets (20 capital marketss)	1982-1997	0.39%
Moskowitz and Grinblatt (1999)	6/0/6	US	1963-1995	0.78%
Chui et al. (2000)	6/1/6	Asia region (8 capital markets)	1975-2000	0.38% (not stat. signifficant)
Bacmann, Dubois, Isakov, 2001	12/0/12	G-7 countries	1973-2000	from 0.8% to 2.128%
Bhojraj, Swaminathan, 2001	6/0/12	Cross-country study (38 capital markets)	1975-1999	1.2%
Hameed, Yuanto, 2002	6/0/6	Asia region (9 capital markets)	1981-1994	0.37%
Griffin et al. (2003)	6/1/6	Cross-country study (39 capital markets)	1975-2000	0.49%
Forner and Marhuenda (2003)	12/0/12	Spain	1967-1997	0.133%
Doukas and McKnight (2005)	12/0/12	Europe (13 capital markets)	1998-2001	0.73%
Dimson (2008)	12/1/12	UK	1900-2007	0.9%
Alsubaie and Najand, 2008	12/0/12	Saudi Arabia	1993-2005	0.76%

The purpose of research

To prove the evidence of cross sectional momentum effect in Russian stock market within the variety of momentum strategy design elements and disclosure of the momentum effect nature

Momentum strategy's design

✓**Time periods of 2-3 window lengths - 2 in this paper**

✓ **Indicators for ranking periods**

✓**method of portfolio formation**

✓**Time periods of 3 window lengths**

✓ (3 or 6 or 9 or 12 months) for   a) **ranking period;**
(to determine winners and losers according to stocks'

past performance),

b) **skip;**

c) **holding period.**

✓   **Momentum indicators for ranking periods**
(past cumulative returns or the ratio of current stock price to its 52-week high price or ratio of the short-term moving average to the long-term moving average);

✓ The way of calculating stocks' weights in portfolio (equal- or value- return-weighted);

✓ The method of portfolio formation:

RSS (Relative Strength Strategies) or

WRSS (Weighted Relative Strength Strategies).

Not EMH

Rational explanation, EMH

$$\delta^2[\mu(k)]$$

time-series   or cross-sectional variation in mean returns

$$E\left(\prod_t\right) = -C + O + S$$

$$-\text{cov}(r_{mt-1}, r_{mt}) \qquad \frac{1}{N}\sum_{i=1}^{N}(\text{cov}(r_{it-1}, r_{it})) \qquad \frac{1}{N}\sum_{i=1}^{N}(\mu_I - \mu_m)^2$$

irrational

rational

$$E[\pi_t(k)] = P(k) + \delta^2[\mu(k)].$$

Data

- The data cover the sample period from January 2006 to December 2014.

- Our study is based on the monthly return of Russian 20 liquid common stocks previously traded and which continue to trade on the MICEX.

Data for Weighted Relative Strength Strategies

Тикер	Название	Отрасль	Специализация	Рыночная капитализация на 2015 г., млрд. руб.	Рыночная капитализация на 2015 г. с учетом доли акций в свободном образении, млрд. руб.	Начало данных
GAZP RX Equity	GAZPROM	Energy	Oil&Gas	3 755	817	Jan-06
ROSN RX Equity	ROSNEFT	Energy	Oil&Gas	2 917	308	Jul-06
LKOH RX Equity	LUKOIL	Energy	Oil&Gas	2 581	2 138	Jan-06
GMKN RX Equity	NORILSK NICKEL	Basic Materials	Mining	1 805	709	Dec-06
SBER RX Equity	SBERBANK	Financial	Banks	1 637	780	Jan-06
SNGS RX Equity	SURGUTNEFTEGAS	Energy	Oil&Gas	1 308	1 302	Jan-06
MGNT RX Equity	MAGNIT	Consumer, Non-cyclical	Food	1 098	670	Jul-06
VTBR RX Equity	VTB BANK	Financial	Banks	880	238	May-07
TATN RX Equity	TATNEFT	Energy	Oil&Gas	727	488	Jan-06
CHMF RX Equity	SEVERSTAL	Basic Materials	Iron/Steel	617	128	Jan-06
MTSS RX Equity	MOBILE TELESYST	Communications	Telecommunications	531	257	Jan-06
URKA RX Equity	URALKALI	Basic Materials	Chemicals	519	302	Nov-07
NLMK RX Equity	NLMK	Basic Materials	Iron/Steel	512	74	Apr-06
HYDR RX Equity	RUSHYDRO	Utilities	Electric	247	71	May-08
FEES RX Equity	FEDERAL GRID	Utilities	Electric	95	19	Jul-08
PIKK RX Equity	PIK GROUP	Financial	Real Estate	127	50	Jun-07
AFLT RX Equity	AEROFLOT	Consumer, Cyclical	Airlines	44	18	Jan-06
PHST RX Equity	PHARMSTAND	Consumer, Non-cyclical	Pharmaceuticals	43	18	Aug-07
NVTK RX Equity	NOVATEK	Energy	Oil&Gas	1 580	629	Jan-06
SIBN RX Equity	GAZPROM NEFT	Energy	Oil&Gas	824	225	Jan-06

Descriptive statistics of our sample. Monthly returns

	Mean	Median	St. Dev.	Min	Max
GAZPROM NEFT	0.008	0.019	0.098	-0.438	0.227
NOVATEK	0.024	0.02	0.119	-0.420	0.382
PHARMSTAND	0.006	0	0.131	-0.467	0.383
AEROFLOT	0.007	0.002	0.13	-0.451	0.461
PIK GROUP	0.009	-0.003	0.212	-0.689	1.019
FEDERAL GRID	0.005	-0.008	0.219	-0.524	0.952
RUSHYDRO	-0.005	-0.01	0.135	-0.475	0.385
NLMK	0.012	0.02	0.133	-0.518	0.377
URALKALI	0.019	0.006	0.173	-0.603	0.733
MOBILE TELESYST	0.007	0.018	0.095	-0.402	0.289
SEVERSTAL	0.02	0.018	0.148	-0.670	0.441
TATNEFT	0.017	0.016	0.125	-0.545	0.428
VTB BANK	0	-0.011	0.131	-0.335	0.435
MAGNIT	0.036	0.039	0.128	-0.525	0.401
SURGUTNEFTEGAS	0.004	0.007	0.103	-0.232	0.322
SBERBANK	0.015	0.008	0.14	-0.356	0.588
NORILSK NICKEL	0.017	0.022	0.116	-0.277	0.437
LUKOIL	0.007	0.005	0.084	-0.323	0.254
ROSNEFT	0.007	0.007	0.092	-0.273	0.240
GAZPROM	0.001	0.001	0.091	-0.327	0.346

144 portfolios

		Investment period											
		1	2	3	4	5	6	7	8	9	10	11	12
	1	-0,008	-0,008	-0,007	-0,007	0,005	0,010	0,013	0,000	0,004	-0,006	-0,016	-0,006
		-1,07	-0,77	-0,54	-0,45	0,26	0,45	0,53	0,00	0,15	-0,20	-0,47	-0,17
	2	-0,007	-0,007	-0,005	0,005	0,020	0,026	0,019	0,010	0,008	-0,004	0,000	-0,004
		-0,77	-0,58	-0,30	0,31	1,15	1,28	0,73	0,32	0,26	-0,11	-0,01	-0,11
	3	-0,006	-0,005	0,004	0,019	**0,033**	**0,032**	0,026	0,015	0,010	0,008	0,004	-0,006
		-0,83	-0,41	0,34	1,35	2,30 **	1,94 *	1,17	0,60	0,35	0,26	0,11	-0,16
	4	-0,004	0,003	0,016	**0,030**	**0,040**	**0,037**	0,031	0,019	0,020	0,012	0,003	-0,013
		-0,44	0,26	1,26	2,17 **	2,57 **	2,09 **	1,41	0,66	0,64	0,35	0,08	-0,30
	5	0,001	0,015	**0,026**	**0,035**	**0,043**	**0,041**	0,031	0,027	0,020	0,007	-0,007	-0,023
		0,12	1,35	1,85 *	2,18 **	2,41 **	2,07 **	1,20	0,83	0,56	0,17	-0,16	-0,48
Formation period	6	0,009	0,018	**0,024**	**0,031**	**0,037**	**0,032**	0,029	0,019	0,008	-0,010	-0,026	-0,040
		1,05	1,57	1,67 *	1,86 *	2,10 **	1,75 *	1,04	0,58	0,22	-0,26	-0,56	-0,82
	7	0,008	0,013	0,018	0,023	0,029	0,028	0,021	0,008	-0,009	-0,026	-0,039	-0,052
		0,96	1,18	1,18	1,48	1,62	1,31	0,76	0,25	-0,24	-0,62	-0,84	-1,04
	8	0,004	0,008	0,014	0,017	0,024	0,021	0,011	-0,008	-0,026	-0,041	-0,054	-0,068
		0,44	0,71	0,92	1,01	1,30	0,93	0,39	-0,23	-0,69	-1,00	-1,16	-1,37
	9	0,002	0,008	0,010	0,015	0,021	0,015	0,000	-0,018	-0,034	-0,049	-0,062	-0,080
		0,26	0,68	0,62	0,85	1,05	0,64	0,00	-0,54	-0,91	-1,17	-1,31	-1,61
	10	0,003	0,005	0,008	0,011	0,015	0,004	-0,012	-0,029	-0,044	-0,059	-0,076	**-0,091**
		0,40	0,38	0,50	0,63	0,73	0,17	-0,40	-0,81	-1,12	-1,38	-1,60	-1,77 *
	11	-0,001	0,003	0,005	0,006	0,005	-0,007	-0,022	-0,039	-0,054	-0,072	**-0,085**	**-0,102**
		-0,10	0,26	0,28	0,30	0,22	-0,29	-0,69	-1,05	-1,35	-1,64	-1,73 *	-1,95 *
	12	0,003	0,004	0,004	0,001	0,000	-0,009	-0,025	-0,042	**-0,061**	**-0,076**	**-0,093**	**-0,113**
		0,30	0,28	0,22	0,07	0,00	-0,37	-0,78	-1,14	-1,74 *	-1,73 *	-1,88 *	-2,15 **

*, ** denote significance at 10% and 5%, respectively

25 portfolios

		Investment period				
		1	3	6	9	12
Formation period	1	-0,008	-0,007	0,010	0,004	-0,006
		-1,07	*-0,54*	*0,45*	*0,15*	*-0,17*
	3	-0,006	0,004	**0,032**	0,010	-0,006
		-0,83	*0,34*	*1,94* *	*0,35*	*-0,16*
	6	0,009	**0,024**	**0,032**	0,008	-0,040
		1,05	*1,67*	*1,75* *	*0,22*	*-0,82*
	9	0,002	0,010	0,015	-0,034	-0,080
		0,26	*0,62*	*0,64*	*-0,91*	*-1,61*
	12	0,003	0,004	-0,009	-0,061	**-0,113**
		0,30	*0,22*	*-0,37*	***-1,74*** *	***-2,15*** **

*, ** denote significance at 10% and 5%, respectively

Decompozition

	$\hat{E}[\pi_t(k)]$	$\hat{P}_1(k)$	$-\hat{C}_1(k)$	$\hat{O}_1(k)$	$\hat{\delta}^2[\mu(k)]$
3/1	-0,006	-0,385	-0,322	-0,707	0,379
	-0,83	-17,53	-4,42	-8,28	19,55
3/3	0,004	-0,367	-0,284	-0,651	0,372
	0,34	-14,07	-3,19	-6,38	19,47
3/6	0,032	-0,333	-0,424	-0,758	0,365
	1,94	-12,41	-2,49	-4,10	19,05
3/9	0,010	-0,358	-0,503	-0,861	0,367
	0,35	-9,04	-2,40	-3,73	18,65
3/12	-0,006	-0,375	-0,602	-0,977	0,369
	-0,16	-7,84	-2,21	-3,26	18,19
6/1	0,009	-0,542	-0,758	-1,300	0,552
	1,05	-18,97	-4,19	-6,90	20,20
6/3	0,024	-0,514	-0,885	-1,399	0,539
	1,64	-17,30	-3,49	-5,29	20,53
6/6	0,032	-0,503	-1,180	-1,683	0,535
	1,55	-13,99	-3,00	-4,12	19,91
6/9	0,008	-0,531	-1,429	-1,961	0,539
	0,22	-10,94	-2,86	-3,72	19,52
6/12	-0,040	-0,582	-1,742	-2,323	0,541
	-0,82	-10,23	-2,75	-3,47	19,02
12/1	0,003	-0,857	-1,091	-1,948	0,860
	0,30	-15,25	-5,16	-8,18	15,56
12/3	0,004	-0,843	-1,286	-2,128	0,846
	0,22	-14,46	-4,63	-7,03	15,23
12/6	-0,009	-0,847	-1,687	-2,534	0,837
	-0,37	-13,61	-4,29	-6,10	14,72
12/9	-0,061	-0,905	-2,066	-2,971	0,843
	-1,54	-13,65	-4,06	-5,50	14,37
12/12	-0,113	-0,964	-2,406	-3,371	0,851
	-2,15	-12,98	-3,83	-5,06	14,05

$$E[\pi_t(k)] = P(k) + \delta^2[\mu(k)],$$

Is

$$\hat{\delta}^2[\mu(k)] \; > \; \hat{P}_1(k)$$

?

	$\hat{E}[\pi_t(k)]$	$\hat{P}_1(k)$	$\hat{\delta}^2[\mu(k)]$
3/1	-0,006	-0,385	0,379
	-0,83	-17,53	19,55
3/3	0,004	-0,367	0,372
	0,34	-14,07	19,47
3/6	0,032	**-0,333**	**0,365**
	1,94	-12,41	19,05
3/9	0,010	**-0,358**	**0,367**
	0,35	-9,04	18,65
6/1	0,009	**-0,542**	**0,552**
	1,05	-18,97	20,20
6/3	0,024	**-0,514**	**0,539**
	1,64	-17,30	20,53
6/6	0,032	**-0,503**	**0,535**
	1,55	-13,99	19,91
6/9	0,008	**-0,531**	**0,539**
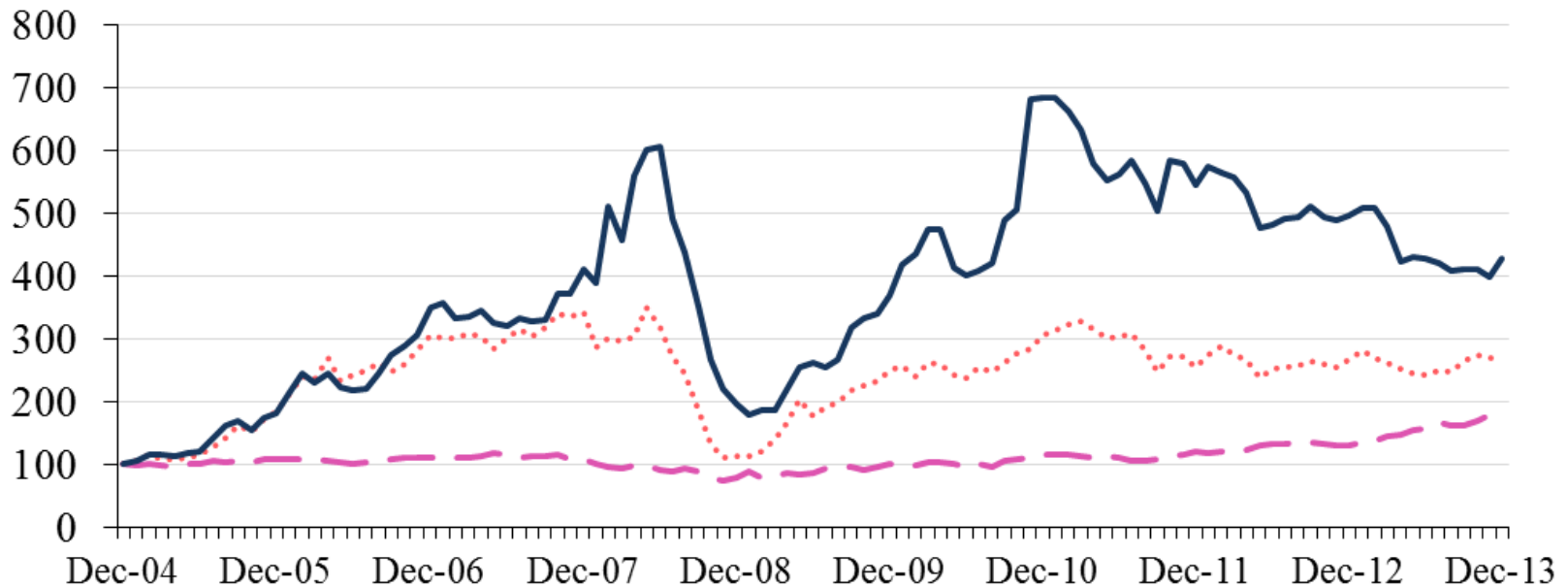
······ Value of the portfolio invested in the passive strategy (in MICEX index)

— — Value of the portfolio invested in the passive strategy (in S&P index)

—— Value of the portfolio invested in winners (3/1/6) with substracting of transaction costs

Thank you for your attention!