

## What is this paper about?

Aside from the obvious fact that it may be one of the most pointless and uncomprehensible things ever uploaded on Internet, as some people may think, the aim of this paper is to compare chessplayers from different eras. In spite of the fact that we already have the Elo rating and the Sonas rating, it's also true that only computer-assisted analyses possesses the ability to compare players in terms of absolute playing strength.

The games are chosen randomly from the 5-year interval, where a player has achieved his rating peak. The starting point of the analysis of every game depends on a period: 19th century on 12th move, 1900-1950 on 13th, 1951-2000 on 14th and 21th century on 15th move. The minimal length of a game is 25 moves. Games are divided into 2 types: short games (25-55 moves) and long ones (60-80 moves). For 4 short games I analyze one long game so 4/5 of games are short and 1/5 of them are long ones.

## What do these charts mean?

**Average expected error by thinking time** – the most important criterion by which it is possible to estimate the playing strength of different players. -stdev and +stdev indicate values error bounds and give a hint about the stability of results.

**Absolute average error** – raw, unprocessed values by Rybka 3.

**Complexity** – indicates the irrationality and the unclarity, a high degree of complexity may also be featured in seemingly easy positions, but where an unexpected an surprising move can occur. It is calculated like this: every time Rybka finds a new best move, the difference between the best and the second best move is added to the sum. If a new move comes up in depths 10-14, the difference values are further multiplied by 2 to give a greater importance to deeper moves.

**Difference** – the difference in pawn units between Rybka's first and second choice. Also displays how important it is to choose a move preferred also by Rybka.

**Material** – the amount of material of one side on the board. Values calculated by Larry Kaufman are in use: pawn 1; knight & bishop 3.25; rook 5; queen 9.75. A bishop pair adds +0.5.

**Complexity, difference, material and average error** – these 3 graphs show the relations between the accuracy of play and various indicators of difficulty. **Expected error by complexity, by difference, by material** – the absolute average error of players that has been correlated with the 3 indicators of difficulty.

**Average expected error** – the arithmetical average of the three previous graphs, gives a basis for making calculations by time factor..

**Blunder ratio** – The ratio of moves whose error was bigger than 1.00.

**Full depth vs 6 ply** – originally an idea by Sören Riis. The point was to determine to which players so-called more obvious positions occurred more often.

**Time in seconds** – average thinking time during the games considered in the analysis.

**Relative standard deviation** – this indicates how erratic player's results are. They are calculated by dividing standard deviations by 'average expected error by thinking time' values.

**Playing style** – to determine this, I made use of the fact that positions with high difference and high complexity tend to occur more often in tactically complicated situations.

## How did I use thinking time factor to calculate final values?

Firstly, there was a need to find about time controls used throughout the history of chess. In the case of matches and tournaments where the data on time controls was unavailable, I used the following principle:

1880 – 1920 4 min    1921 – 1945 3 min 20 s    1946 – 1985 3 m 45 s    1986 - ... 3 min

Each adjournment is equated to additional 1 hour

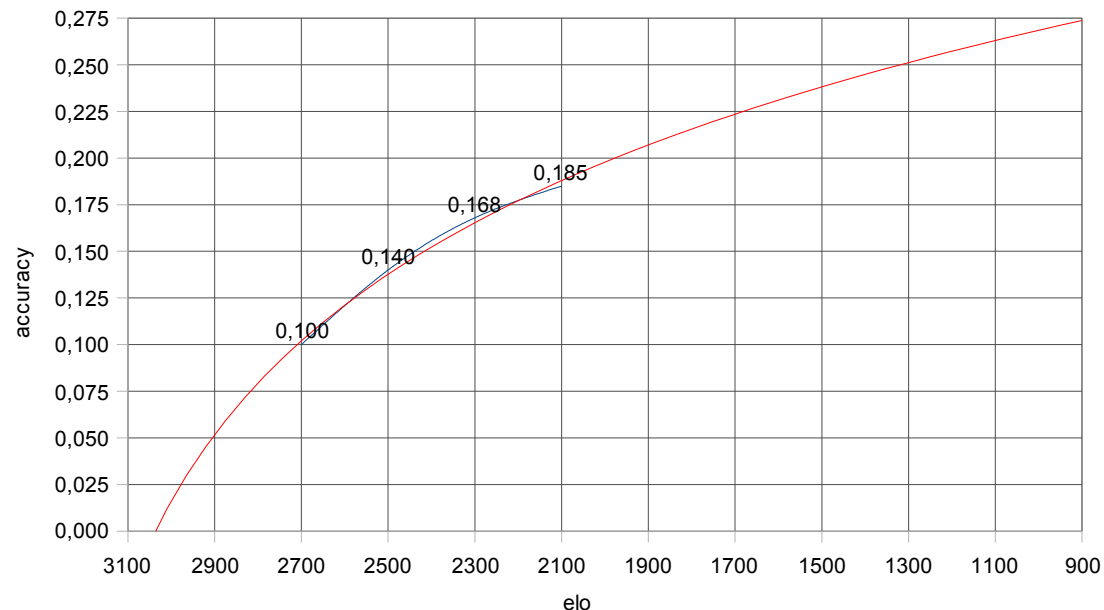
In the case of Morphy I just looked up used times in some of his games against Anderssen, Löwenthal and Paulsen, at which I divided the time spent on thinking first by two and then by the number of moves made. For instance, the game # 1 Löwenthal – Morphy, 51 moves, 8 hours. After dividing it by 2 and by 51, we get 4 minutes and 42 seconds for either player.

Secondly, to how large extent do humans usually tend to react to increasing or decreasing the available amount of thinking time? For sure, it is a lot more than computers do (ca 50 elo). The best I managed to do was to use clock simulms for that purpose.

	player	opposition	year	time odds	Elo of opposition	Elo performance	Elo of player	gap
1	Tal	Warsaw team	1966	8,0	2378	2441	2763	-322
2	Fischer	Greek team	1968	5,0	2348	2398	2795	-397
3	Kasparov	German team	1992	4,0	2632	2657	2865	-208
4	Kasparov	Czech team	2001	3,3	2596	2609	2860	-251
5	Kasparov	Czech team	2001	3,3	2596	2621	2860	-239
6	Kramnik	German team	2004	4,0	2604	2617	2765	-148
7	Kasimdzhanov	Uzbek team	2007	5,0	2408	2446	2682	-236
8	Kramnik	Sebag & Werle	2008	2,0	2551	2576	2788	-212
		<b>average</b>		4,33	2514	2546	2797	-252

According to this, humans are supposed to lose around 120 points for doubling of time. Whether this is linear or not, doesn't matter here.

And finally, I created a graph displaying the relation between the performance in rating points and the accuracy of play in Rybka pawn units. The red curve shows the logarithmic regression line



To get time-correlated values, I just moved values of 'average expected error' along the regression curve a required amount of distance.

**Paul Morphy**

no	White	Black	result	moves	year	opening
1	Mongredien	Morphy	1	50	1859	A84
2	Paulsen	Morphy	1	28	1857	C48
3	Morphy	Löwenthal	1	34	1858	C01
4	<i>Morphy</i>	<i>Anderssen</i>	0	72	1858	C52
5	<i>Löwenthal</i>	<i>Morphy</i>	0	70	1858	C42
6	Morphy	Löwenthal	1	25	1858	C01
7	Paulsen	Morphy	1	29	1857	C47
8	Löwenthal	Morphy	0,5	44	1858	C42
9	<i>Morphy</i>	<i>Paulsen</i>	1	64	1857	B40
10	Löwenthal	Morphy	0	45	1858	B44
11	Harwitz	Morphy	0,5	45	1858	A84
12	<i>Löwenthal</i>	<i>Morphy</i>	1	67	1858	C64
13	Morphy	Mongredien	1	30	1859	C41
14	Morphy	Löwenthal	1	31	1858	C30
15	Anderssen	Morphy	0,5	44	1858	C77
16	Morphy	Mongredien	1	29	1859	C58
17	Morphy	Löwenthal	1	28	1858	C30
18	Morphy	Anderssen	1	36	1858	C00
19	Morphy	Paulsen	0,5	36	1857	B40
20	Morphy	Paulsen	1	26	1857	B40
21	<i>Löwenthal</i>	<i>Morphy</i>	1	80	1858	C42
22	Morphy	Harwitz	1	48	1858	C41
23	Anderssen	Morphy	1	42	1858	A00
		<b>score</b>	78,3%			

**Johannes Zukertort**

no	White	Black	result	moves	year	opening
1	Blackburne	Zukertort	0	48	1882	C53
2	<i>Zukertort</i>	<i>Winawer</i>	1	79	1883	D00
3	Zukertort	Blackburne	1	41	1883	D05
4	Zukertort	Blackburne	1	31	1881	B45
5	Zukertort	Englisch	0	42	1882	C67
6	Chigorin	Zukertort	1	31	1882	C51
7	Mackenzie	Zukertort	0	28	1883	C80
8	<i>Mason</i>	<i>Zukertort</i>	1	73	1883	A13
9	Zukertort	Winawer	0	47	1882	C65
10	Wittek	Zukertort	1	27	1881	C77
11	<i>Mason</i>	<i>Zukertort</i>	0,5	67	1882	C49
12	Rosenthal	Zukertort	1	47	1880	C65
13	Zukertort	Paulsen	1	36	1882	B23
14	Winawer	Zukertort	1	38	1883	C67
15	Zukertort	Rosenthal	1	48	1880	C65
16	<i>Rosenthal</i>	<i>Zukertort</i>	1	60	1880	C67
17	Chigorin	Zukertort	1	29	1883	C67
18	Blackburne	Zukertort	0,5	31	1883	C53
		<b>score</b>	72,2%			

**Wilhelm Steinitz**

no	White	Black	result	moves	year	opening
1	Steinitz	Sellman	1	35	1885	C11
2	Steinitz	Blackburne	1	40	1883	C00
3	Steinitz	Mason	0,5	40	1883	C13
4	<i>Steinitz</i>	<i>Zukertort</i>	1	61	1886	C67
5	Noa	Steinitz	1	34	1883	C70
6	Mason	Steinitz	1	30	1883	D00
7	Golmayo	Steinitz	1	27	1883	C45
8	<i>Steinitz</i>	<i>Mackenzie</i>	1	68	1883	C13
9	Steinitz	Mackenzie	1	47	1883	C25
10	Zukertort	Steinitz	1	46	1886	D10
11	Steinitz	Zukertort	0	39	1886	C67
12	Blackburne	Steinitz	0	27	1883	C46
13	<i>Rosenthal</i>	<i>Steinitz</i>	0,5	63	1883	C46
14	Steinitz	Chigorin	1	32	1882	C37
15	Steinitz	Zukertort	0	46	1886	C47
16	<i>Steinitz</i>	<i>Bird</i>	1	56	1882	A80
17	Steinitz	Zukertort	1	49	1886	C65
18	Zukertort	Steinitz	0	32	1886	D10
19	Mackenzie	Steinitz	1	27	1883	C46
20	Steinitz	Rosenthal	0	37	1883	C65
		<b>score</b>	70,0%			

**Emanuel Lasker**

no	White	Black	result	moves	year	opening
1	Blackburne	Lasker	0,5	37	1892	D02
2	Pillsbury	Lasker	0,5	50	1895	C67
3	Lasker	Marco	1	29	1895	D37
4	Lasker	Marco	1	39	1896	D37
5	<i>Mason</i>	<i>Lasker</i>	0,5	[80]	1895	C50
6	Lasker	Showalter	1	45	1893	D37
7	Showalter	Lasker	1	39	1893	C84
8	<i>Steinitz</i>	<i>Lasker</i>	0,5	71	1894	C53
9	Bird	Lasker	1	43	1892	C58
10	Albin	Lasker	0,5	50	1895	B34
11	<i>Lasker</i>	<i>Showalter</i>	1	68	1892	C65
12	Lasker	Steinitz	0	30	1896	C71
13	Lasker	Steinitz	1	49	1894	C62
14	Lasker	Steinitz	0,5	32	1896	C64
15	Lasker	Pillsbury	0	33	1895	C42
16	<i>Bird</i>	<i>Lasker</i>	0	[80]	1892	A03
		<b>score</b>	62,5%			

**Siebert Tarrasch**

no	White	Black	result	moves	year	opening
1	Tarrasch	Walbrodt	1	38	1895	C77
2	Mieses	Tarrasch	0	40	1894	B24
3	Tarrasch	Pillsbury	1	41	1898	C67
4	<i>Steinitz</i>	<i>Tarrasch</i>	1	72	1895	A84
5	Lipke	Tarrasch	0,5	32	1898	C77
6	Tarrasch	Walbrodt	1	33	1894	C42
7	Tarrasch	Pillsbury	1	46	1898	C49
8	<i>Tarrasch</i>	<i>Pillsbury</i>	1	80	1896	C67
9	Tarrasch	Winawer	1	30	1898	B40
10	<i>Tarrasch</i>	<i>Walbrodt</i>	0,5	55	1896	D53
11	Lasker	Tarrasch	0	41	1896	C68
12	Showalter	Tarrasch	0,5	30	1896	D20
13	Walbrodt	Tarrasch	1	42	1894	C50
14	Walbrodt	Tarrasch	1	47	1894	C77
15	Chigorin	Tarrasch	1	49	1896	C53
16	<i>Tarrasch</i>	<i>Lipke</i>	0,5	56	1898	B34
17	Tarrasch	Janowski	1	28	1895	D53
18	Tarrasch	Lasker	1	49	1895	C67
		<b>score</b>	77,8%			

**Mikhail Chigorin**

no	White	Black	result	moves	year	opening
1	Chigorin	Tarrasch	0,5	37	1898	A02
2	Chigorin	Showalter	1	43	1898	C00
3	Maroczy	Chigorin	0,5	50	1898	C60
4	<i>Chigorin</i>	<i>Steinitz</i>	0	62	1895	C52
5	Chigorin	Walbrodt	0	43	1896	C50
6	Chigorin	Lasker	0,5	37	1895	C50
7	Chigorin	Marco	1	49	1897	C00
8	<i>Pillsbury</i>	<i>Chigorin</i>	0,5	62	1895	D07
9	<i>Schlechter</i>	<i>Chigorin</i>	1	78	1895	C79
10	Chigorin	Tarrasch	0	49	1896	C53
11	Chigorin	Lipke	0	38	1898	C52
12	Chigorin	Schlechter	0,5	47	1898	C54
13	Chigorin	Pillsbury	0	32	1895	C43
14	Chigorin	Steinitz	1	44	1898	C44
15	Chigorin	Pillsbury	0,5	32	1896	C49
16	<i>Schiffers</i>	<i>Chigorin</i>	1	55	1898	D30
17	Chigorin	Schiffers	1	30	1897	B24
		<b>score</b>	52,9%			

**Harry Nelson Pillsbury**

no	White	Black	result	moves	year	opening
1	Pillsbury	Gunsberg	0,5	31	1902	C67
2	Pillsbury	Marshall	1	29	1902	D32
3	Pillsbury	Chigorin	0	35	1899	D07
4	Pillsbury	Marco	0,5	26	1900	D55
5	<i>Pillsbury</i>	<i>Maroczy</i>	<i>0,5</i>	<i>72</i>	<i>1903</i>	<i>C14</i>
6	Marshall	Pillsbury	0	35	1903	C38
7	<i>Cohn</i>	<i>Pillsbury</i>	<i>1</i>	<i>62</i>	<i>1899</i>	<i>D00</i>
8	Pillsbury	Teichmann	0,5	48	1902	D53
9	Pillsbury	Schlechter	1	44	1900	C84
10	<i>Pillsbury</i>	<i>Mason</i>	<i>1</i>	<i>60</i>	<i>1900</i>	<i>C13</i>
11	Pillsbury	Showalter	0,5	46	1899	D60
12	Pillsbury	Maroczy	0,5	50	1899	C13
13	Lee	Pillsbury	1	32	1899	C26
14	Maroczy	Pillsbury	0,5	34	1903	C67
15	Janowski	Pillsbury	1	45	1900	C49
16	<i>Pillsbury</i>	<i>Schlechter</i>	<i>1</i>	<i>56</i>	<i>1899</i>	<i>D60</i>
17	Pillsbury	Gunsberg	1	46	1902	D21
18	Pillsbury	Marco	0,5	26	1902	D10
19	Pillsbury	Wolf	1	33	1903	D63
		<b>score</b>	68,4%			

**Geza Maroczy**

no	White	Black	result	moves	year	opening
1	Maroczy	Blackburne	1	47	1906	C48
2	Schlechter	Maroczy	0,5	25	1904	C30
3	Marco	Maroczy	0,5	31	1904	C30
4	<i>Maroczy</i>	<i>Gottschall</i>	<i>1</i>	<i>[80]</i>	<i>1905</i>	<i>C14</i>
5	Maroczy	Janowski	1	49	1906	C49
6	Maroczy	Perlis	1	47	1907	C97
7	<i>Janowski</i>	<i>Maroczy</i>	<i>1</i>	<i>75</i>	<i>1905</i>	<i>D41</i>
8	Marshall	Maroczy	1	25	1903	D55
9	<i>Maroczy</i>	<i>Blackburne</i>	<i>1</i>	<i>61</i>	<i>1905</i>	<i>C61</i>
10	Maroczy	Marshall	0	35	1903	C33
11	Maroczy	Burn	0	30	1906	C32
12	Maroczy	Taubenhaus	0	46	1903	C87
13	Marco	Maroczy	1	31	1903	B74
14	Schlechter	Maroczy	0	28	1907	D02
15	Maroczy	Salwe	1	40	1907	C49
16	<i>Alapin</i>	<i>Maroczy</i>	<i>1</i>	<i>55</i>	<i>1905</i>	<i>B15</i>
17	Tartakower	Maroczy	0,5	40	1907	C50
18	Schlechter	Maroczy	0,5	32	1904	D63
19	Maroczy	Vidmar	0,5	37	1907	C49
		<b>score</b>	65,8%			

**Akiba Rubinstein**

no	White	Black	result	moves	year	opening
1	<i>Tarrasch</i>	<i>Rubinstein</i>	<i>0,5</i>	<i>63</i>	<i>1912</i>	<i>C50</i>
2	Rubinstein	Duras	1	27	1912	D26
3	Spielmann	Rubinstein	0,5	38	1911	C11
4	Rubinstein	Marshall	1	49	1912	D15
5	<i>Rubinstein</i>	<i>Duras</i>	<i>1</i>	<i>72</i>	<i>1911</i>	<i>D30</i>
6	Rubinstein	Nimzowitsch	0,5	30	1914	A46
7	Rubinstein	Burn	0,5	46	1911	D02
8	Levenfish	Rubinstein	1	47	1912	C45
9	<i>Marshall</i>	<i>Rubinstein</i>	<i>0,5</i>	<i>66</i>	<i>1911</i>	<i>D32</i>
10	Rubinstein	Cohn	1	37	1911	D02
11	Schlechter	Rubinstein	1	41	1912	C11
12	Rubinstein	Breyer	1	43	1912	A14
13	Rubinstein	Tartakower	0,5	41	1911	A84
14	Rubinstein	Schlechter	0,5	33	1911	D15
15	Spielmann	Rubinstein	0	37	1911	C49
16	<i>Rubinstein</i>	<i>Vidmar</i>	<i>0,5</i>	<i>61</i>	<i>1911</i>	<i>D33</i>
		<b>score</b>	68,8%			

**Frank James Marshall**

no	White	Black	result	moves	year	opening
1	Alekhine	Marshall	0,5	45	1914	C49
2	<i>Marshall</i>	<i>Schlechter</i>	<i>0</i>	<i>73</i>	<i>1912</i>	<i>C11</i>
3	Capablanca	Marshall	0,5	30	1915	C42
4	Johner	Marshall	1	26	1912	C42
5	Marshall	Janowski	1	41	1916	A46
6	Tarrasch	Marshall	1	30	1912	C49
7	<i>Rubinstein</i>	<i>Marshall</i>	<i>0</i>	<i>56</i>	<i>1912</i>	<i>D33</i>
8	<i>Marshall</i>	<i>Chajes</i>	<i>1</i>	<i>57</i>	<i>1915</i>	<i>D37</i>
9	<i>Cohn</i>	<i>Marshall</i>	<i>1</i>	<i>60</i>	<i>1912</i>	<i>C49</i>
10	Marshall	Schlechter	0,5	48	1912	D33
11	Tarrasch	Marshall	0,5	48	1914	C42
12	Janowski	Marshall	0	47	1913	D30
13	Marshall	Treybal	0,5	45	1912	D33
14	Marshall	Spielmann	0,5	43	1912	D33
15	Chajes	Marshall	0,5	40	1915	C49
16	Marshall	Chajes	1	39	1913	D51
17	Marshall	Bogoljubov	0,5	27	1914	D63
18	Marshall	Duras	1	30	1913	C21
19	Marshall	Bernstein	1	30	1914	D10
20	Teichmann	Marshall	0,5	30	1912	C42
21	<i>Marshall</i>	<i>Capablanca</i>	<i>0</i>	<i>61</i>	<i>1914</i>	<i>C01</i>
		<b>score</b>	59,5%			

**Jose Raul Capablanca**

no	White	Black	result	moves	year	opening
1	Euwe	Capablanca	1	38	1922	C66
2	Capablanca	Lasker	1	46	1921	D63
3	Capablanca	Kostic	1	48	1919	C42
4	Capablanca	Janowski	1	30	1918	D30
5	<i>Capablanca</i>	<i>Kostic</i>	<i>1</i>	<i>[80]</i>	<i>1919</i>	<i>C42</i>
6	Kostic	Capablanca	1	46	1919	C50
7	Capablanca	Tartakower	0,5	42	1922	D58
8	<i>Lasker</i>	<i>Capablanca</i>	<i>1</i>	<i>68</i>	<i>1921</i>	<i>D61</i>
9	Lasker	Capablanca	0,5	30	1921	D61
10	Lasker	Capablanca	0,5	30	1921	D12
11	Capablanca	Lasker	1	48	1921	D63
12	<i>Capablanca</i>	<i>Lasker</i>	<i>0,5</i>	<i>63</i>	<i>1921</i>	<i>C66</i>
13	Janowski	Capablanca	1	46	1916	D15
14	Capablanca	Maroczy	0,5	31	1924	D02
15	Capablanca	Marshall	1	36	1918	C89
16	<i>Lasker</i>	<i>Capablanca</i>	<i>1</i>	<i>56</i>	<i>1921</i>	<i>C66</i>
		<b>score</b>	84,4%			

**Aron Nimzowitsch**

no	White	Black	result	moves	year	opening
1	<i>Kmoch</i>	<i>Nimzowitsch</i>	<i>1</i>	<i>63</i>	<i>1927</i>	<i>B00</i>
2	Nimzowitsch	Yates	0,5	50	1928	A01
3	Nimzowitsch	Euwe	1	27	1929	A00
4	Nimzowitsch	Alekhine	0,5	34	1927	B02
5	<i>Colle</i>	<i>Nimzowitsch</i>	<i>1</i>	<i>72</i>	<i>1931</i>	<i>A46</i>
6	Vidmar	Nimzowitsch	0,5	27	1931	E16
7	Nimzowitsch	Vidmar	0,5	33	1927	B22
8	Maroczy	Nimzowitsch	0,5	32	1931	B13
9	<i>Khan</i>	<i>Nimzowitsch</i>	<i>1</i>	<i>60</i>	<i>1930</i>	<i>E15</i>
10	Nimzowitsch	Rubinstein	0	30	1930	A32
11	Kashdan	Nimzowitsch	0	45	1931	A09
12	Nimzowitsch	Spielmann	0,5	42	1927	C48
13	Vajda	Nimzowitsch	1	46	1927	B00
14	Nimzowitsch	Vajda	0,5	26	1927	E10
15	Nimzowitsch	Ahues	1	25	1930	A06
16	<i>Nimzowitsch</i>	<i>Spielmann</i>	<i>0</i>	<i>64</i>	<i>1928</i>	<i>A28</i>
17	Nimzowitsch	Spielmann	0,5	37	1931	A28
18	Johner	Nimzowitsch	1	34	1929	A83
19	Nimzowitsch	Rubinstein	1	32	1928	A06
		<b>score</b>	63,2%			

**Alexander Alekhine**

no	White	Black	result	moves	year	opening
1	Flohr	Alekhine	1	40	1931	C46
2	Colle	Alekhine	1	28	1930	D04
3	Maroczy	Alekhine	1	50	1931	B13
4	<i>Alekhine</i>	<i>Eliskases</i>	0,5	67	1933	E24
5	Alekhine	Bernstein	0,5	47	1933	D53
6	<i>Alekhine</i>	<i>Tartakower</i>	0	74	1933	D58
7	Alekhine	Bogoljubov	0,5	30	1929	D52
8	Alekhine	Mikenas	1	45	1933	B06
9	Yates	<i>Alekhine</i>	1	66	1930	C71
10	Bogoljubov	Alekhine	1	39	1929	C76
11	Alekhine	Bernstein	0,5	49	1933	C86
12	Flohr	Alekhine	0,5	35	1933	D02
13	Bogoljubov	Alekhine	0	48	1929	E22
14	Alekhine	Stahlberg	0,5	30	1933	C11
15	Alekhine	Sultan Khan	1	34	1932	B14
16	<i>Alekhine</i>	<i>Bogoljubov</i>	0,5	63	1929	D51
		<b>score</b>	65,6%			

**Max Euwe**

no	White	Black	result	moves	year	opening
1	Fine	Euwe	0,5	46	1936	D10
2	<i>Alekhine</i>	<i>Euwe</i>	0	[80]	1936	C02
3	Euwe	Capablanca	0,5	38	1934	D64
4	Euwe	Alekhine	1	41	1935	D45
5	Euwe	Alekhine	0,5	49	1937	E21
6	<i>Euwe</i>	<i>Bogoljubov</i>	1	65	1934	E24
7	Lilienthal	Euwe	0,5	28	1934	D94
8	Botvinnik	Euwe	0,5	48	1934	C83
9	Keres	Euwe	1	31	1936	C02
10	Szabo	<i>Euwe</i>	0,5	66	1938	D44
11	Alekhine	Euwe	0	37	1937	A09
12	Alekhine	Euwe	0	41	1935	C27
13	Euwe	Keres	0,5	40	1938	E00
14	Euwe	Lasker	0	50	1934	D52
15	Van Den Bosch	Euwe	1	25	1934	B14
16	<i>Euwe</i>	<i>Reshevsky</i>	0	56	1938	D70
		<b>score</b>	46,9%			

**Reuben Fine**

no	White	Black	result	moves	year	opening
1	<i>Fine</i>	<i>Reshevsky</i>	0,5	62	1940	C59
2	Fine	Petrov	1	34	1937	A50
3	Fine	Stahlberg	0,5	48	1937	D63
4	Grünfeld	Fine	0,5	30	1936	E37
5	Petrov	Fine	0	40	1937	B03
6	Botvinnik	Fine	0,5	36	1936	A09
7	Keres	<i>Fine</i>	1	63	1936	A09
8	Tartakower	Fine	0	28	1937	C00
9	Reshevsky	Fine	0,5	27	1939	E54
10	Foltys	Fine	1	31	1937	A46
11	<i>Fine</i>	<i>Alekhine</i>	0,5	66	1936	D55
12	Fine	Bogoljubov	1	36	1936	A97
13	Euwe	Fine	0,5	33	1936	D60
14	Fine	Alekhine	1	46	1938	C72
15	Fine	Becker	1	42	1936	E33
16	<i>Reshevsky</i>	<i>Fine</i>	0,5	57	1937	D28
17	Rauzer	Fine	0,5	27	1937	B03
18	Keres	Fine	0,5	41	1937	A09
19	Fine	Lasker	1	33	1936	D37
		<b>score</b>	63,2%			

**Mikhail Botvinnik**

no	White	Black	result	moves	year	opening
1	Botvinnik	Flohr	0,5	41	1946	D42
2	Euwe	Botvinnik	0,5	29	1948	C07
3	Botvinnik	Reshevsky	1	32	1948	E40
4	<i>Botvinnik</i>	<i>Alatortsev</i>	0,5	62	1945	D13
5	Ragozin	Botvinnik	1	41	1945	B74
6	Bondarevsky	Botvinnik	0,5	36	1947	D30
7	Botvinnik	Reshevsky	0,5	44	1946	E47
8	<i>Botvinnik</i>	<i>Bronstein</i>	1	64	1945	E67
9	Ragozin	Botvinnik	0,5	40	1945	C59
10	Smyslov	Botvinnik	1	41	1948	B60
11	Botvinnik	Smyslov	1	50	1946	D98
12	<i>Botvinnik</i>	<i>Smyslov</i>	0,5	79	1948	D98
13	Chekhover	Botvinnik	1	40	1945	C77
14	Botvinnik	Ragozin	1	40	1946	D13
15	Botvinnik	Reshevsky	0	42	1948	E29
16	<i>Konstantinopolsky</i>	<i>Botvinnik</i>	1	57	1945	C09
17	Ragozin	Botvinnik	1	34	1947	C36
		<b>score</b>	73,5%			

**Samuel Reshevsky**

no	White	Black	result	moves	year	opening
1	Reshevsky	Gligoric	1	42	1952	E95
2	Botvinnik	Reshevsky	0,5	32	1955	D41
3	Reshevsky	Euwe	1	40	1953	E59
4	<i>Gligoric</i>	<i>Reshevsky</i>	0,5	76	1952	E46
5	Reshevsky	Najdorf	1	42	1953	E97
6	<i>Reshevsky</i>	<i>Bronstein</i>	0	65	1953	E68
7	Najdorf	Reshevsky	0,5	25	1953	D29
8	Reshevsky	Averbakh	1	44	1953	E46
9	<i>Kotov</i>	<i>Reshevsky</i>	0	67	1953	E14
10	Reshevsky	Petrosian	0,5	41	1953	E58
11	Petrosian	Reshevsky	0,5	30	1953	A07
12	Reshevsky	Stahlberg	1	41	1953	D33
13	Najdorf	Reshevsky	1	41	1952	E39
14	Reshevsky	Euwe	0	35	1951	D45
15	Reshevsky	Gligoric	1	44	1952	D35
16	<i>Smyslov</i>	<i>Reshevsky</i>	0	56	1953	A17
17	Reshevsky	Kotov	1	42	1953	E94
		<b>score</b>	61,8%			

**Vasily Smyslov**

no	White	Black	result	moves	year	opening
1	Botvinnik	Smyslov	1	38	1958	A95
2	<i>Smyslov</i>	<i>Lisitsin</i>	0	67	1955	A13
3	Smyslov	Botvinnik	0	36	1954	B25
4	Botvinnik	Smyslov	0,5	41	1958	E69
5	<i>Botvinnik</i>	<i>Smyslov</i>	1	72	1954	E60
6	Smyslov	Pachman	1	30	1956	D35
7	<i>Smyslov</i>	<i>Botvinnik</i>	0	66	1958	B19
8	Smyslov	Unzicker	1	26	1955	A49
9	Szabo	Smyslov	1	36	1956	E29
10	Ivkov	Smyslov	1	41	1956	C73
11	Smyslov	Keres	0,5	41	1956	A04
12	Smyslov	Botvinnik	0,5	41	1958	A05
13	Smyslov	Botvinnik	0	41	1954	B24
14	Botvinnik	Smyslov	0	49	1958	A42
15	Smyslov	Trifunovic	1	48	1955	A17
16	<i>Stahlberg</i>	<i>Smyslov</i>	1	64	1954	D19
17	Smyslov	Panno	1	41	1956	B92
18	Smyslov	Botvinnik	0,5	47	1957	C98
		<b>score</b>	61,1%			

**Paul Keres**

no	White	Black	result	moves	year	opening
1	Larsen	Keres	0,5	60	1959	C99
2	Keres	Gligoric	1	38	1959	C92
3	Petrosian	Keres	0,5	25	1959	A29
4	Keres	Najdorf	1	25	1955	B98
5	Smyslov	Keres	0,5	41	1956	A04
6	Tal	Keres	1	46	1959	B19
7	Keres	Szabo	1	28	1955	A15
8	Szabo	Keres	0	77	1956	A23
9	Keres	Petrosian	0,5	41	1956	B63
10	Gligoric	Keres	0	27	1958	E41
11	Pachman	Keres	1	36	1956	A28
12	Keres	Tal	1	64	1959	A16
13	Keres	Bronstein	0,5	47	1956	C28
14	Tal	Keres	0,5	35	1959	D32
15	Keres	Bronstein	0,5	41	1958	E59
16	Keres	Barcza	0	75	1957	C78
17	Geller	Keres	0,5	26	1956	C97
18	Keres	Ivkov	0,5	27	1956	C84
19	Keres	Najdorf	0,5	28	1957	B62
20	Unzicker	Keres	1	44	1955	C71
			<b>score</b>	60,0%		

**Mikhail Tal**

no	White	Black	result	moves	year	opening
1	Tal	Smyslov	1	41	1959	B84
2	Tal	Najdorf	1	49	1961	B92
3	Portisch	Tal	0	35	1961	C05
4	Korchnoi	Tal	1	62	1962	D41
5	Tal	Fischer	0,5	29	1962	C64
6	Tal	Benkö	1	50	1958	B32
7	Keres	Tal	0	64	1959	A16
8	Barcza	Tal	0,5	41	1959	A04
9	Filip	Tal	1	34	1962	A49
10	Tal	Korchnoi	0	60	1959	B94
11	Tal	Botvinnik	1	45	1961	B18
12	Boleslavsky	Tal	0,5	40	1962	C89
13	Tal	Pachman	0,5	50	1958	C11
14	Tal	Trifunovic	0,5	38	1958	D45
15	Tal	Smyslov	1	26	1959	B10
16	Tal	Botvinnik	0	58	1960	B18
17	Tal	Keres	0,5	35	1959	D32
18	Tal	Geller	1	33	1958	C96
19	Spassky	Tal	0	35	1961	E66
			<b>score</b>	57,9%		

**Tigran Petrosian**

no	White	Black	result	moves	year	opening
1	Benkö	Petrosian	0,5	67	1962	A00
2	Olafsson	Petrosian	1	32	1961	C16
3	Botvinnik	Petrosian	0	63	1964	A30
4	Petrosian	Najdorf	1	40	1961	E80
5	Fischer	Petrosian	0,5	40	1962	C11
6	Petrosian	Tal	0,5	50	1962	A16
7	Tal	Petrosian	0,5	49	1961	B18
8	Petrosian	Gligoric	1	48	1963	E81
9	Pomar-Salamanca	Petrosian	0,5	61	1964	A31
10	Petrosian	Krogus	1	42	1960	D03
11	Petrosian	Larsen	1	45	1960	A55
12	Petrosian	Benkö	0,5	42	1962	D91
13	Petrosian	Botvinnik	0,5	39	1963	E14
14	Korchnoi	Petrosian	0,5	36	1962	C97
15	Fischer	Petrosian	0	36	1961	B17
16	Petrosian	Matanovic	0,5	77	1960	A21
			<b>score</b>	59,4%		

**Boris Spassky**

no	White	Black	result	moves	year	opening
1	Spassky	Petrosian	0,5	43	1969	B36
2	Spassky	Bilek	1	25	1967	B61
3	Portisch	Spassky	0	67	1967	D58
4	Spassky	Kavalek	1	27	1969	E80
5	Petrosian	Spassky	0,5	61	1969	D34
6	Spassky	Botvinnik	0,5	65	1970	B19
7	Korchnoi	Spassky	1	42	1968	A14
8	Spassky	Stein	0,5	30	1971	D87
9	Spassky	Larsen	0	38	1970	E12
10	Stein	Spassky	1	37	1967	C09
11	Spassky	Savon	1	36	1971	A67
12	Spassky	Portisch	1	35	1967	D63
13	Korchnoi	Spassky	0	29	1971	A14
14	Donner	Spassky	1	41	1967	E47
15	Spassky	Stein	1	41	1971	A57
16	Korchnoi	Spassky	0	55	1968	E16
17	Petrosian	Spassky	0,5	31	1969	D55
18	Botvinnik	Spassky	0,5	29	1970	A26
19	Larsen	Spassky	1	48	1968	A25
20	Spassky	Larsen	0,5	40	1970	E30
			<b>score</b>	62,5%		

**Robert James Fischer**

no	White	Black	result	moves	year	opening
1	Fischer	Spassky	1	41	1972	D59
2	Matulovic	Fischer	1	40	1968	B91
3	Fischer	Larsen	1	41	1971	C19
4	Fischer	Korchnoi	0,5	62	1970	B88
5	Fischer	Unzicker	1	42	1970	C69
6	Spassky	Fischer	0,5	49	1972	B97
7	Petrosian	Fischer	1	66	1971	A04
8	Fischer	Petrosian	1	39	1970	B13
9	Taimanov	Fischer	1	40	1971	E97
10	Mecking	Fischer	0,5	30	1970	D80
11	Gligoric	Fischer	1	65	1970	E94
12	Fischer	Petrosian	1	34	1971	B42
13	Smyslov	Fischer	1	44	1970	A36
14	Fischer	Gheorghiu	1	35	1970	C42
15	Fischer	Taimanov	1	43	1971	B44
16	Parma	Fischer	1	57	1970	B97
17	Fischer	Petrosian	0,5	38	1971	C42
			<b>score</b>	88,2%		

**Viktor Korchnoi**

no	White	Black	result	moves	year	opening
1	Sosonko	Korchnoi	0,5	41	1980	E10
2	Korchnoi	Gligoric	0,5	34	1978	E49
3	Petrosian	Korchnoi	0	37	1977	D41
4	Korchnoi	Browne	0,5	79	1979	E38
5	Ljubojevic	Korchnoi	0,5	50	1979	A08
6	Korchnoi	Hort	1	40	1981	D10
7	Korchnoi	Karpov	1	60	1978	D37
8	Karpov	Korchnoi	0,5	27	1978	A21
9	Polugaevsky	Korchnoi	0,5	33	1977	A40
10	Polugaevsky	Korchnoi	0	73	1980	E17
11	Korchnoi	Kavalek	1	41	1978	E92
12	Hübner	Korchnoi	0,5	34	1980	C07
13	Petrosian	Korchnoi	0,5	40	1977	E14
14	Korchnoi	Polugaevsky	0,5	41	1980	A33
15	Korchnoi	Polugaevsky	0,5	30	1980	A17
16	Karpov	Korchnoi	1	61	1978	C82
17	Spassky	Korchnoi	1	41	1977	C02
18	Karpov	Korchnoi	0	41	1978	B08
			<b>score</b>	55,6%		

**Anatoli Karpov**

no	White	Black	result	moves	year	opening
1	<i>Karpov</i>	<i>Timman</i>	1	75	1990	E60
2	Karpov	Sokolov	0,5	41	1987	E15
3	Karpov	Seirawan	1	38	1989	D20
4	Karpov	Van der Wiel	1	39	1987	E15
5	Kasparov	Karpov	0	50	1987	A21
6	Yusupov	Karpov	0,5	44	1989	E15
7	<i>Karpov</i>	<i>Timman</i>	1	71	1986	E60
8	Sokolov	Karpov	0,5	42	1989	C92
9	Kasparov	Karpov	1	32	1987	A29
10	Karpov	Malaniuk	1	35	1988	A87
11	Karpov	Yusupov	1	42	1989	A88
12	<i>Miles</i>	<i>Karpov</i>	0,5	74	1986	E30
13	Karpov	Kasparov	0,5	38	1986	A15
14	Karpov	Van der Wiel	1	35	1988	A13
15	Korchnoi	Karpov	1	40	1986	A04
16	<i>Karpov</i>	<i>Kasparov</i>	0,5	60	1987	D58
		<b>score</b>	75,0%			

**Garry Kasparov**

no	White	Black	result	moves	year	opening
1	Kamsky	Kasparov	1	41	1992	E88
2	Psakhis	Kasparov	1	36	1990	E81
3	Beliavsky	Kasparov	1	27	1988	D97
4	Kasparov	Karpov	0,5	41	1990	C92
5	Kramnik	Kasparov	0,5	30	1992	D85
6	Kasparov	Salov	0,5	26	1993	B31
7	<i>Karpov</i>	<i>Kasparov</i>	0,5	61	1991	E88
8	Ljubojevic	Kasparov	1	37	1989	B96
9	<i>Kasparov</i>	<i>Anand</i>	1	65	1993	D19
10	<i>Kasparov</i>	<i>Speelman</i>	0,5	60	1992	B17
11	Karpov	Kasparov	0,5	42	1990	D85
12	Kasparov	Short	1	36	1993	C84
13	Kasparov	Ivanchuk	1	32	1991	E92
14	Karpov	Kasparov	0,5	39	1990	E92
15	Kamsky	Kasparov	0	38	1993	E97
16	<i>Kasparov</i>	<i>Hübner</i>	0,5	60	1989	D20
17	Kasparov	Psakhis	1	36	1990	E42
18	Kasparov	Speelman	0,5	50	1991	A30
19	Kasparov	Karpov	0,5	37	1990	C92
20	Kasparov	Vaganian	1	43	1989	A33
		<b>score</b>	70,0%			

**Viswanathan Anand**

no	White	Black	result	moves	year	opening
1	Shirov	Anand	0,5	49	2001	C10
2	Anand	Khalifman	0,5	29	1999	B33
3	Topalov	Anand	0	45	2001	C11
4	Anand	Kramnik	0,5	40	2000	B66
5	<i>Anand</i>	<i>Ivanchuk</i>	0,5	71	1997	C92
6	Anand	Leko	0,5	34	2001	B33
7	Kramnik	Anand	1	42	1997	D43
8	Anand	Van Wely	1	34	2001	B90
9	<i>Anand</i>	<i>Khalifman</i>	0,5	64	2000	C84
10	Ivanchuk	Anand	0,5	43	2001	C10
11	Topalov	Anand	0,5	40	1998	B17
12	<i>Svidler</i>	<i>Anand</i>	0,5	69	1999	C80
13	Anand	Georgiev	1	30	1997	B78
14	Kasparov	Anand	0	35	1998	B17
15	Adams	Anand	0,5	39	1997	B23
16	<i>Shirov</i>	<i>Anand</i>	1	55	1998	B12
17	Polgar	Anand	0	34	1999	B90
		<b>score</b>	52,9%			

**Vladimir Kramnik**

no	White	Black	result	moves	year	opening
1	Ponomarev	Kramnik	0,5	26	2002	C67
2	Kramnik	Khalifman	0,5	49	2000	D58
3	Kramnik	Kasparov	0,5	26	1998	A34
4	<i>Kramnik</i>	<i>Kasparov</i>	0,5	66	2000	D27
5	Kramnik	Deep Fritz	0,5	41	2002	D34
6	Kasparov	Kramnik	0,5	41	2000	C78
7	Korchnoi	Kramnik	1	31	1998	D43
8	<i>Shirov</i>	<i>Kramnik</i>	0	63	1998	C43
9	Topalov	Kramnik	1	40	1999	A32
10	Gelfand	Kramnik	0,5	29	2001	D58
11	<i>Kramnik</i>	<i>Kasparov</i>	0,5	74	2000	D27
12	Kramnik	Short	1	32	2000	D37
13	Kramnik	Topalov	0,5	25	1998	A34
14	Kramnik	Topalov	0,5	33	1999	A35
15	Kramnik	Svidler	0,5	25	1998	D86
16	<i>Adams</i>	<i>Kramnik</i>	0,5	78	1999	B26
17	Shirov	Kramnik	0	45	2002	B19
18	Kramnik	Svidler	1	30	1998	D86
		<b>score</b>	55,6%			

**Deep Blue**

no	White	Black	result	moves	year	opening
1	Kasparov	Deep Blue	0,5	48	1997	A00
2	Bronstein	Deep Blue	0,5	34	1996	B20
3	Deep Blue	Kasparov	1	45	1997	C93
4	Kasparov	Deep Blue	0	73	1996	A49
5	Deep Blue	Kasparov	1	37	1996	B22
6	Deep Blue	Kasparov	0,5	39	1996	B22
7	Deep Blue	Kasparov	0,5	56	1997	B10
8	Kasparov	Deep Blue	0	43	1996	D30
9	Kasparov	Deep Blue	0,5	50	1996	D30
10	Kasparov	Deep Blue	0	45	1997	A06
11	Deep Blue	Bronstein	1	46	1996	A00
12	Kasparov	Deep Blue	0,5	49	1997	A07
13	Deep Blue	Kasparov	0	47	1996	C47
14	Deep Blue	Kasparov	1	19	1997	B17
		<b>score</b>	50,0%			

**Modern 2700-rated player**

no	White	Black	result	moves	year	opening
1	Karjakin (2686)	Grischuk	1	77	2007	B90
2	Grischuk	Sokolov (2706)	0	30	2004	C96
3	Rublevsky (2680)	Ponomariov	0,5	41	2007	B86
4	Carlsen (2698)	Ponomariov	0,5	60	2006	E04
5	Kamsky	Bacrot (2709)	0	36	2007	C88
6	Gelfand	Volokitin (2685)	0,5	30	2005	A32
7	Aronian (2684)	Grischuk	1	31	2005	D75
8	Ivanchuk (2711)	Bacrot	0,5	48	2005	C55
9	Dreev (2694)	Gelfand	0,5	60	2005	D45
10	Milov	Carlsen (2714)	0,5	29	2007	A57
11	Karjakin	Grischuk (2715)	0,5	42	2007	C88
12	Short	Gelfand (2693)	0,5	44	2004	C42
13	Gelfand (2723)	Adams	1	39	2006	E09
14	Ponomariov	Carlsen (2690)	0	30	2007	D15
15	Van Wely	Karjakin (2678)	0,5	37	2007	E20
16	Bologan (2679)	Sokolov	1	55	2004	D17
17	Grischuk	Dreev (2704)	0	35	2005	D52
18	Grischuk	Ponomariov (2700)	0	31	2005	B90
19	Leko (2722)	Bologan	1	30	2004	B17
20	Leko (2722)	Akopian	0,5	40	2004	B90
		<b>score</b>	50,0%			

**Modern 2500-rated player**

no	White	Black	result	moves	year	opening
1	Janssen	Lahno (2493)	0,5	26	2004	E20
2	Cifuentes (2505)	Del Rio	1	39	2004	D25
3	Solovjov	Zakharevich (2499)	0,5	42	2005	C13
4	Megaranto (2492)	Al Sayed	0,5	67	2006	B19
5	Gavrilov (2512)	Alavkin	1	67	2007	D23
6	Vazquez (2496)	Giaccio	1	32	2005	D45
7	Badea	Szabo (2496)	0,5	29	2007	E60
8	Parligras	Badea (2508)	0	37	2006	B06
9	Vasiukov	Jansa (2511)	0,5	43	2005	B46
10	Khairullin (2507)	Novikov	0,5	62	2005	B22
11	Hector	Cramling(2521)	1	38	2006	B48
12	Iotov (2502)	Starostits	0,5	40	2007	A25
13	Sedlak	Haba (2520)	0	42	2005	C83
14	Appel (2488)	Kalinichev	0	43	2006	A40
15	Levin (2520)	Blatny	0	29	2004	A25
16	Rogic (2482)	Predojevic	0,5	56	2005	C83
17	Fish (2509)	Müller	0,5	25	2004	D46
18	Schandorff (2520)	Lau	0,5	44	2004	D37
		<b>score</b>	50,0%			

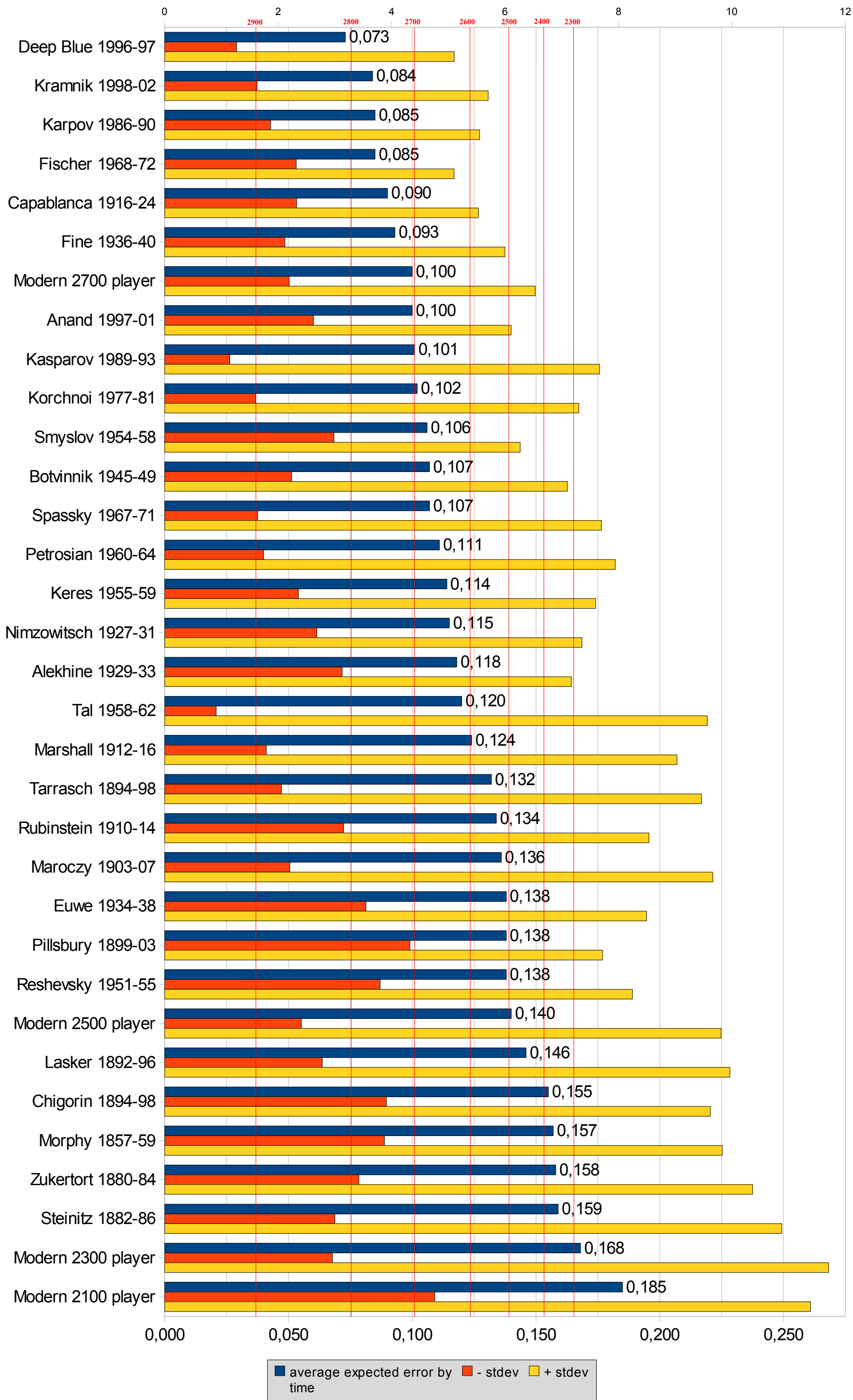
**Modern 2300-rated player**

no	White	Black	result	moves	year	opening
1	Madsen (2290)	Stokke	0,5	25	2006	B38
2	Hase	Rissotti (2300)	0	47	2007	B67
3	Martinez (2292)	Torres	0	35	2007	A38
4	Malinichev (2290)	Zargarian	0	39	2007	D14
5	Stopa	Izbinski (2289)	0	78	2004	B31
6	Delgado	Rogule (2309)	0,5	38	2005	B53
7	Boiko	Malinichev (2290)	1	28	2007	E35
8	Petrenko	Guseva (2303)	0,5	69	2006	B33
9	Neumann	Kocur (2287)	0	69	2004	A07
10	Stopkin (2310)	Moliboga	1	43	2006	A15
11	Navinsek (2300)	Markun	0,5	41	2005	E60
12	Reuss (2303)	Namyslo	0	45	2007	D45
13	Karpov (2304)	Kaiyrbekov	1	64	2007	C55
14	Chahrani	Aderito (2308)	0,5	27	2006	B40
15	Hermann	Weyrich (2312)	1	26	2006	C45
16	Reilly (2307)	Wang	0	58	2007	A58
17	Leskovar Raimondi	Kovalyov (2279)	1	31	2006	D03
18	Ciesla (2275)	Nikolaev	0,5	36	2005	B06
19	Ferron Garcia (2305)	Llorente Zaro	1	42	2005	C42
20	Alonso Fernandez (2311)	Vega Gutierrez	1	31	2007	D45
21	Berger	Hoffmann (2300)	0	57	2004	B23
22	Christ	Boetzer (2280)	0,5	42	2004	A33
		<b>score</b>	47,7%			

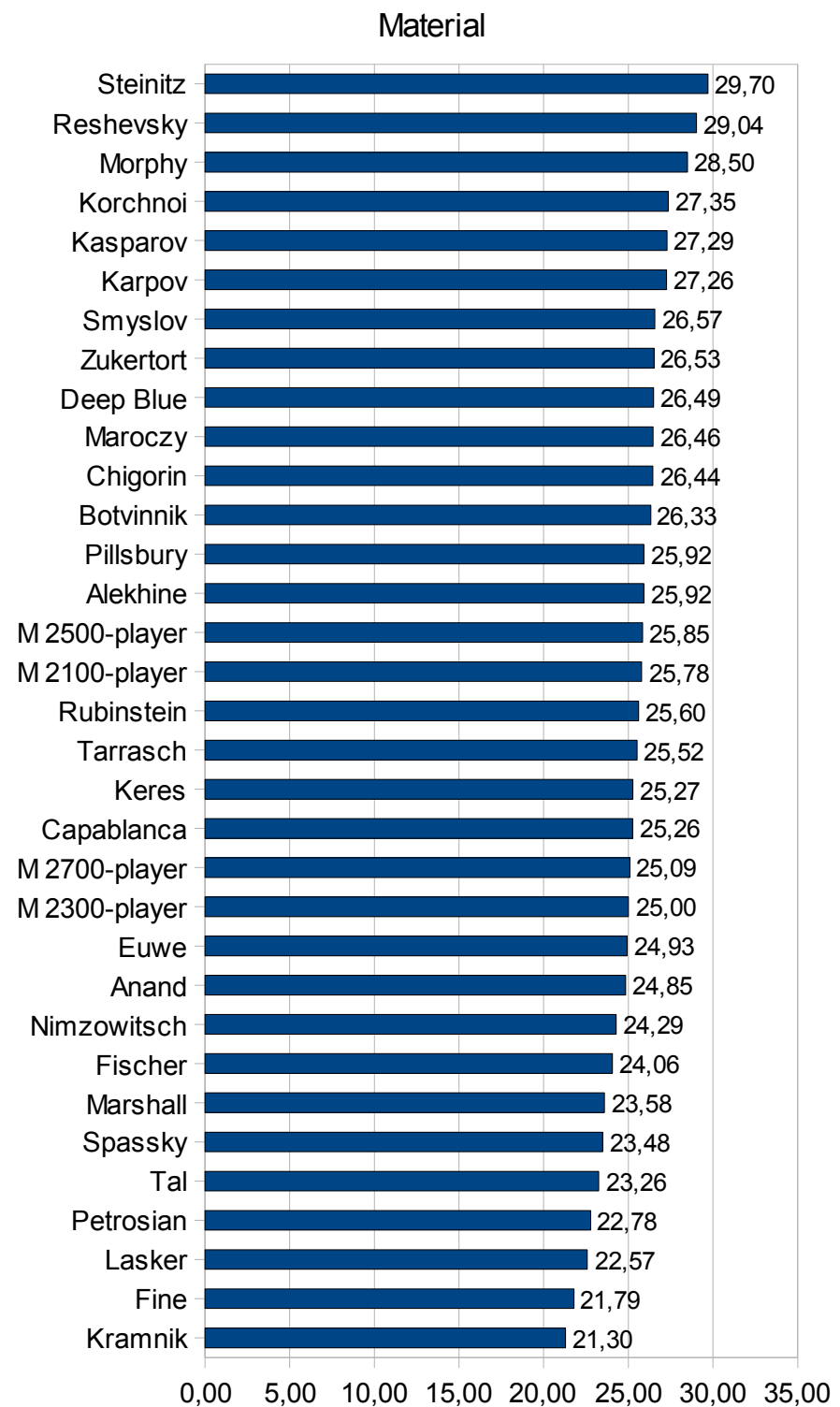
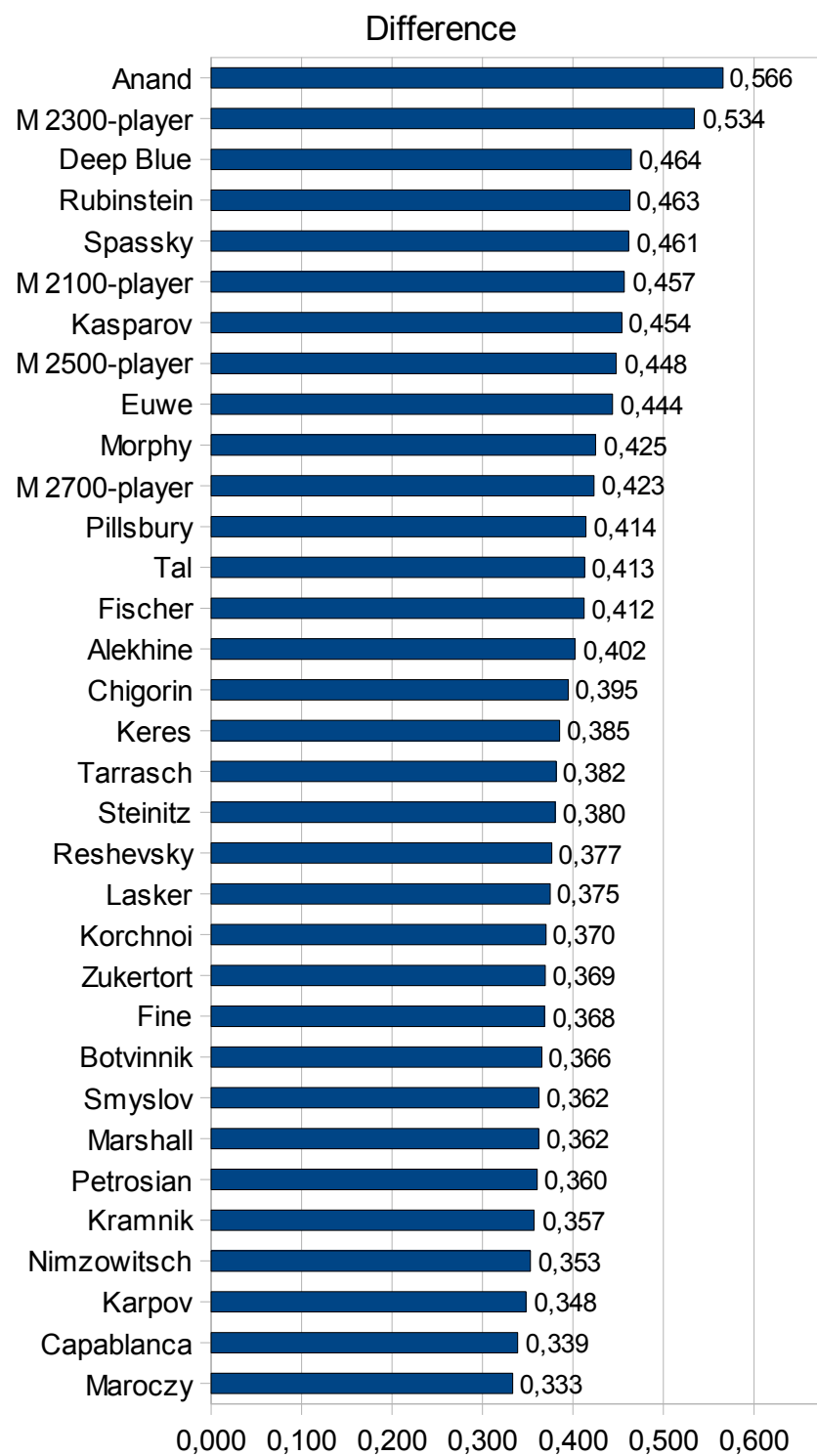
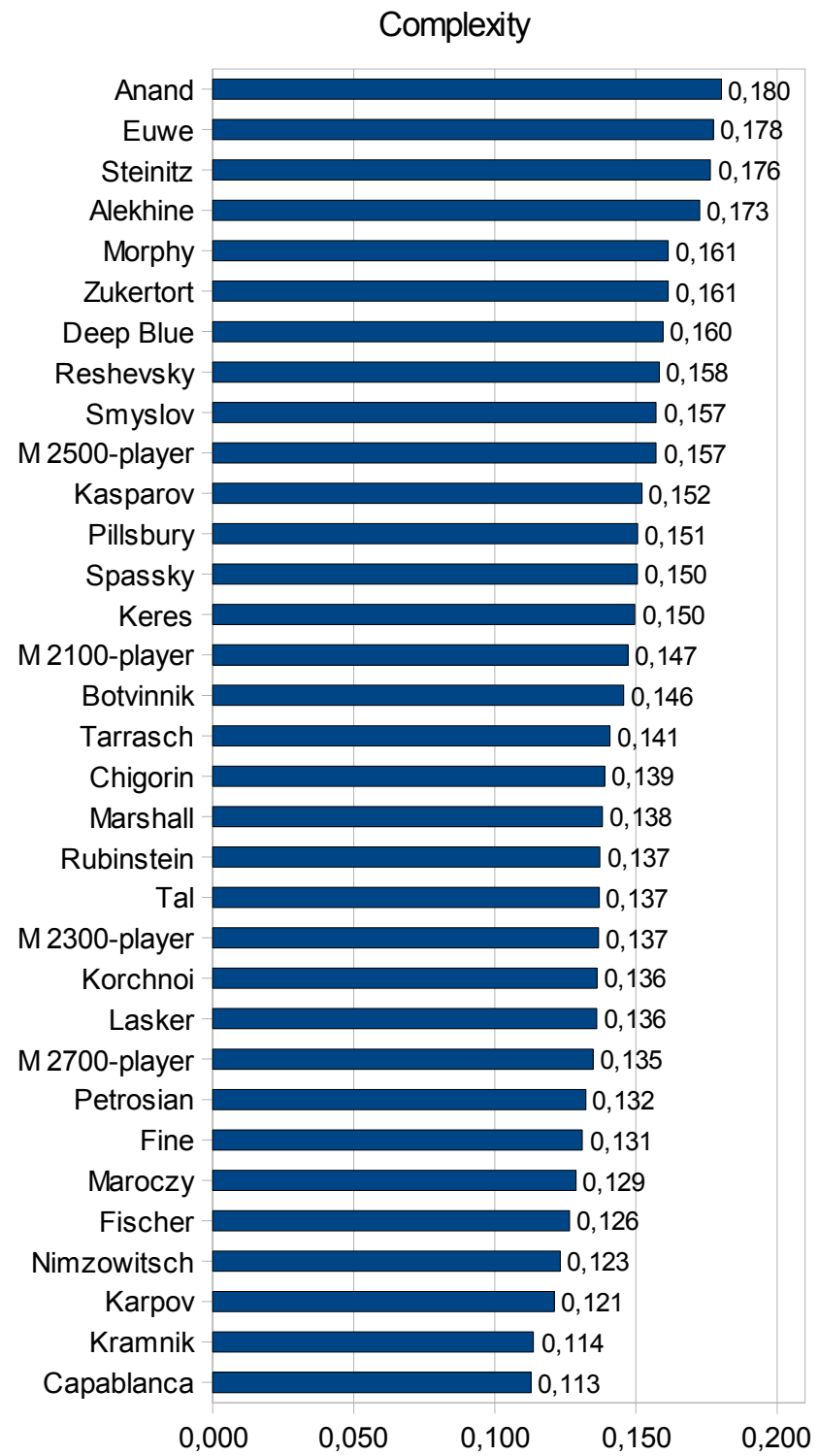
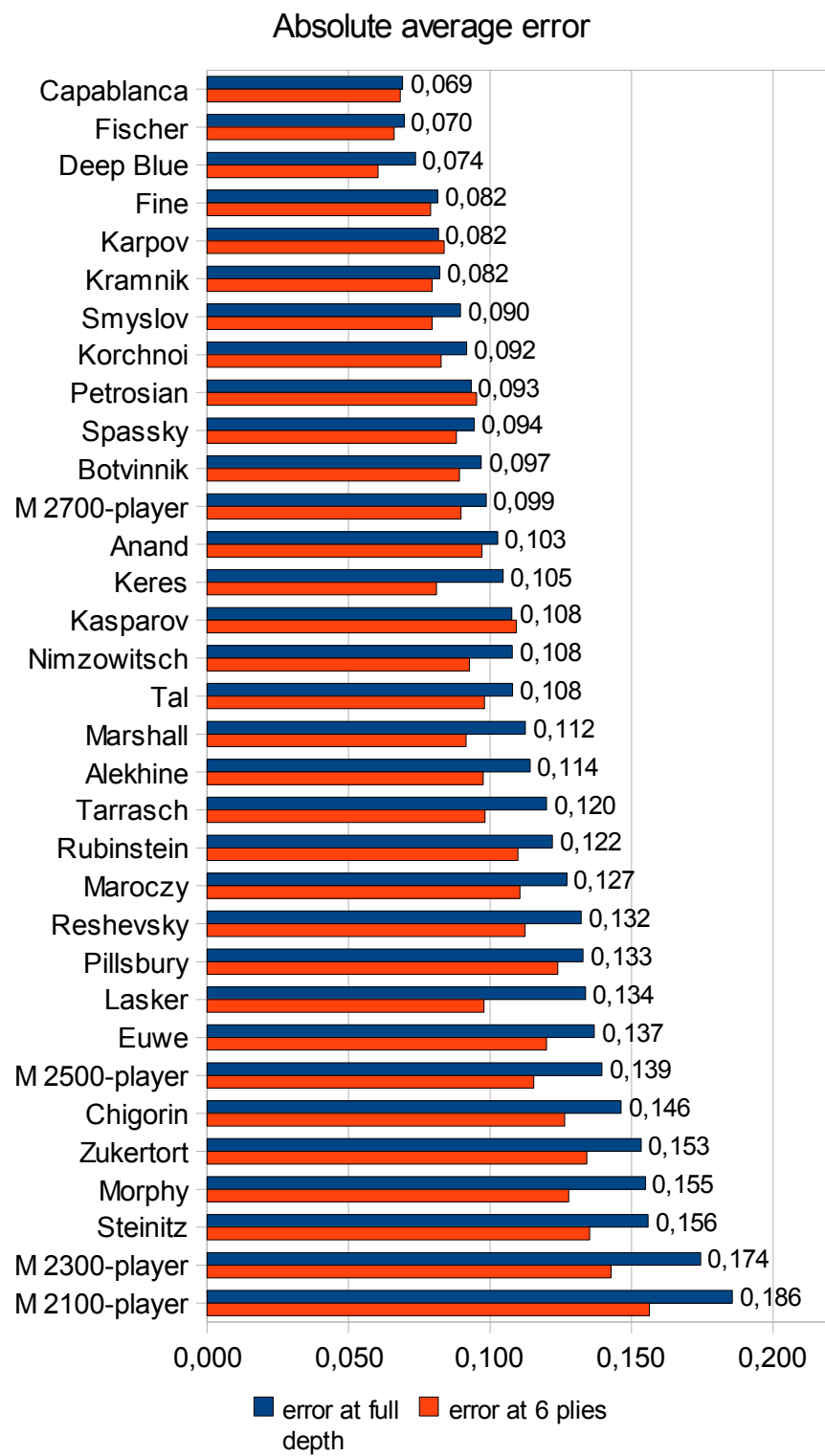
**Modern 2100-rated player**

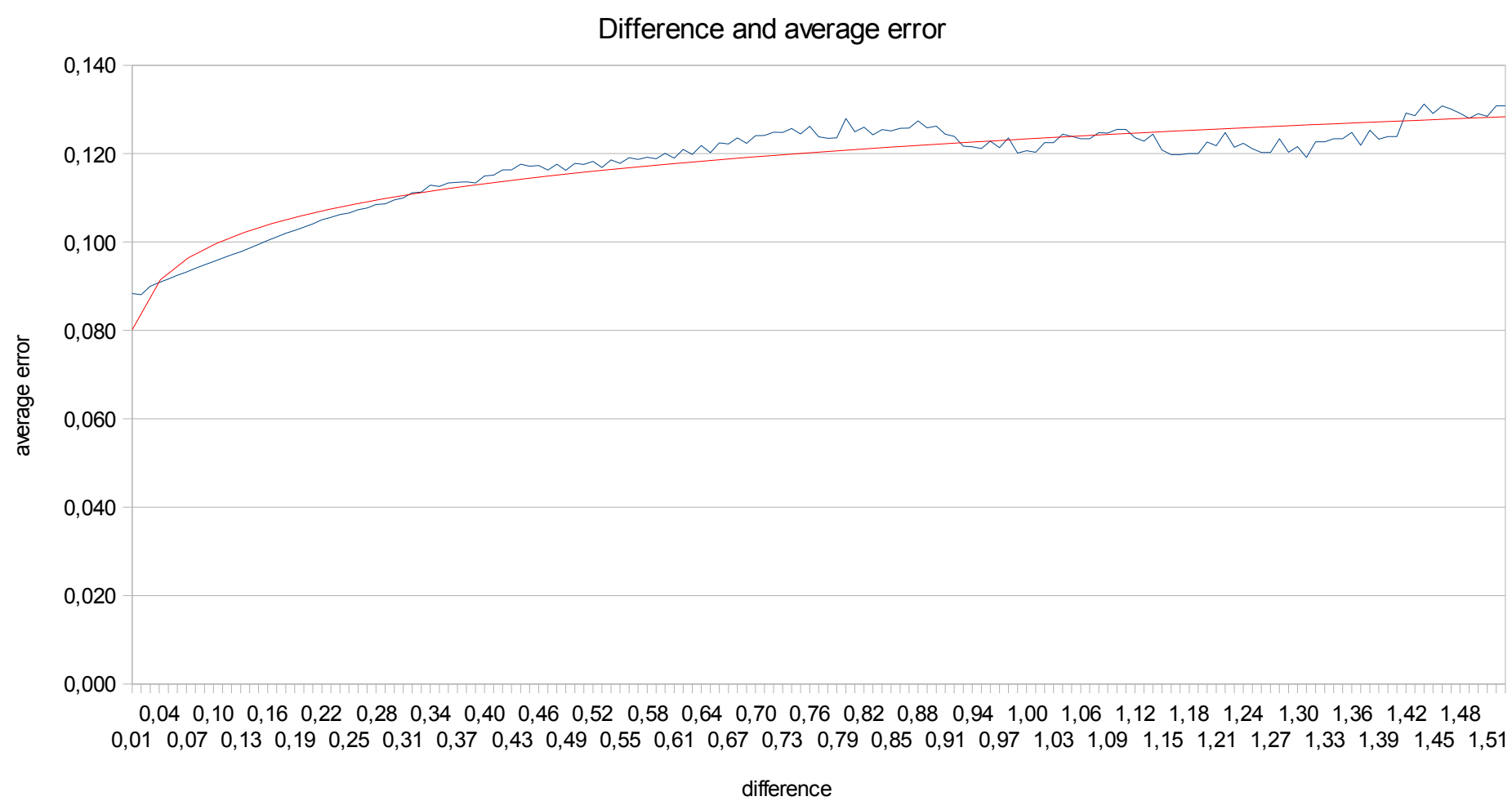
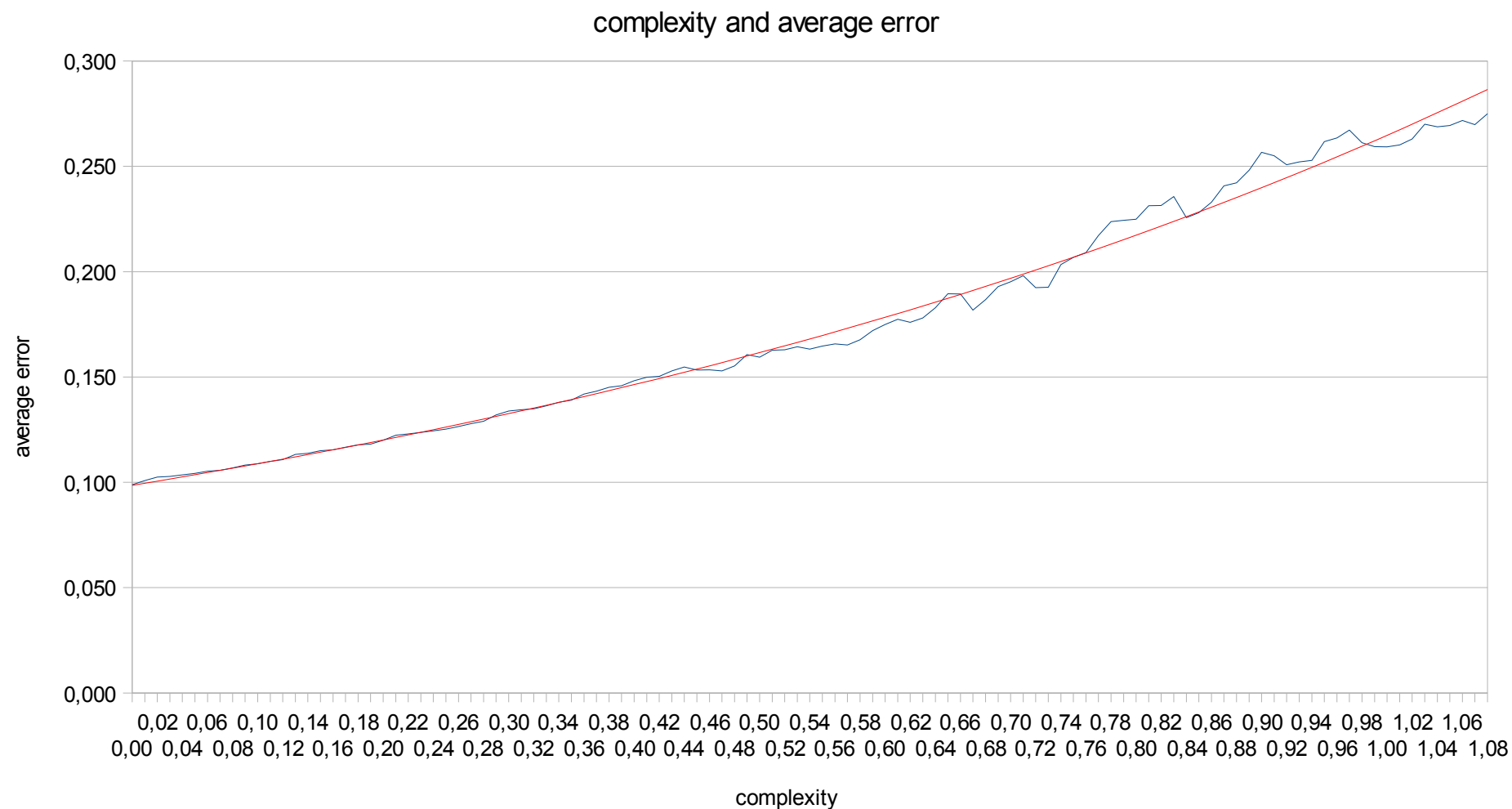
no	White	Black	result	moves	year	opening
1	Nuritdinova (2087)	Kopinits	0	32	2006	B33
2	Talib	Ayyad (2104)	0,5	36	2006	D52
3	Hook (2109)	Faulks	0	35	2006	A04
4	Hook	Neumann (2100)	1	27	2006	A51
5	Pedersen	Fryer (2101)	0	66	2006	C25
6	Draghici (2096)	Bendana Guerrero	0,5	40	2006	C29
7	Partac (2095)	Nur Shazwani	1	33	2006	C01
8	Kunitson	Sööt (2096)	1	60	2007	C10
9	Partac (2095)	Gavrilova	0,5	31	2006	B53
10	Nenov	Djakov (2105)	0,5	36	2007	C02
11	Vdovichenko	Babiy (2099)	0,5	77	2006	E61
12	Ayyad (2095)	Surbir	0	42	2006	B53
13	Macenis	Silva (2107)	0	49	2007	C10
14	Kulago	Pickersgill (2093)	1	46	2007	D02
15	Willim	Szirmai (2119)	0,5	44	2005	A26
16	Guglielmi	Petraki (2108)	0,5	60	2005	A36
17	Straub	Almond (2096)	1	45	2006	B01
18	Pym (2100)	Humphreys	0	32	2006	B85
		<b>score</b>	47,2%			

### Average expected error by thinking time

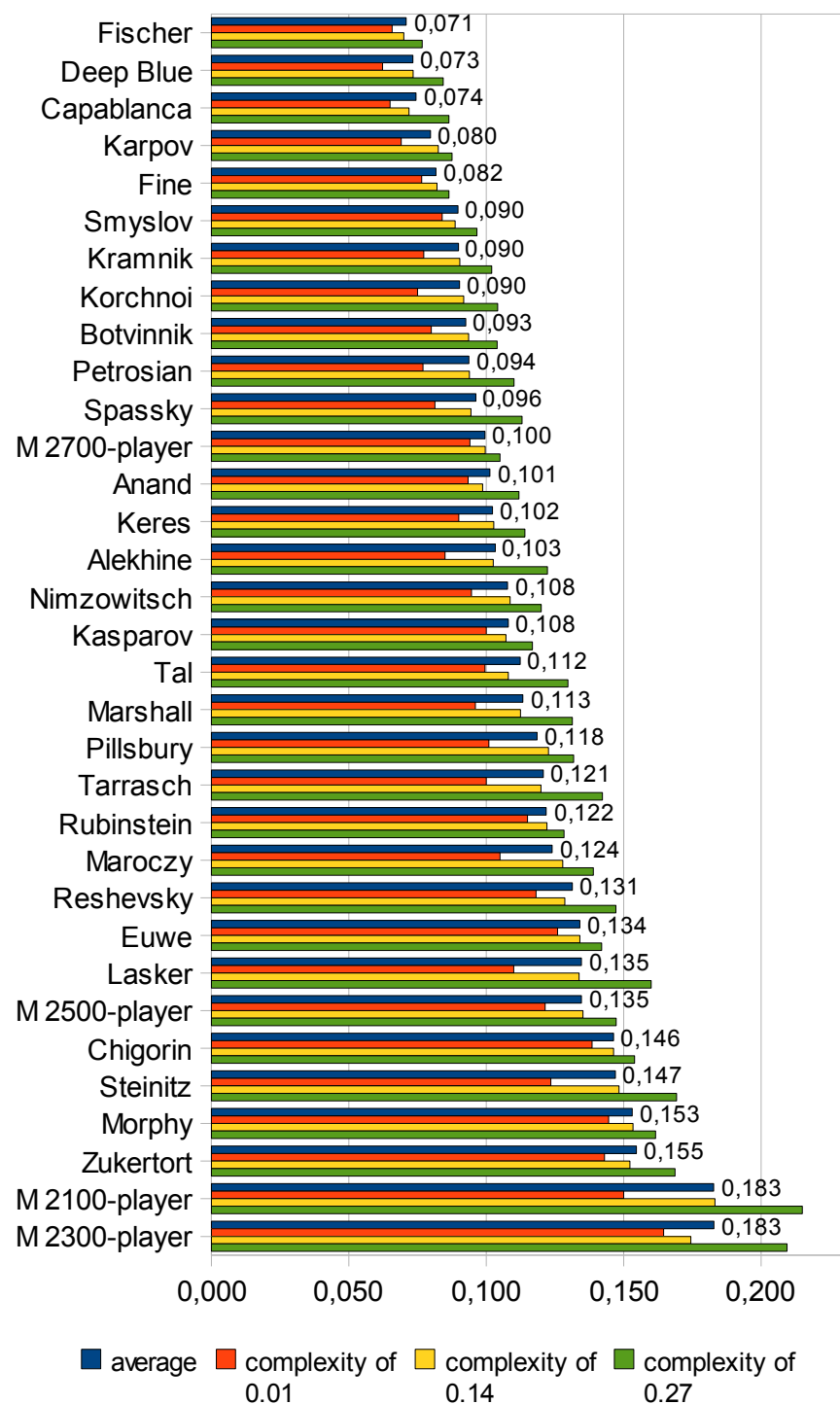




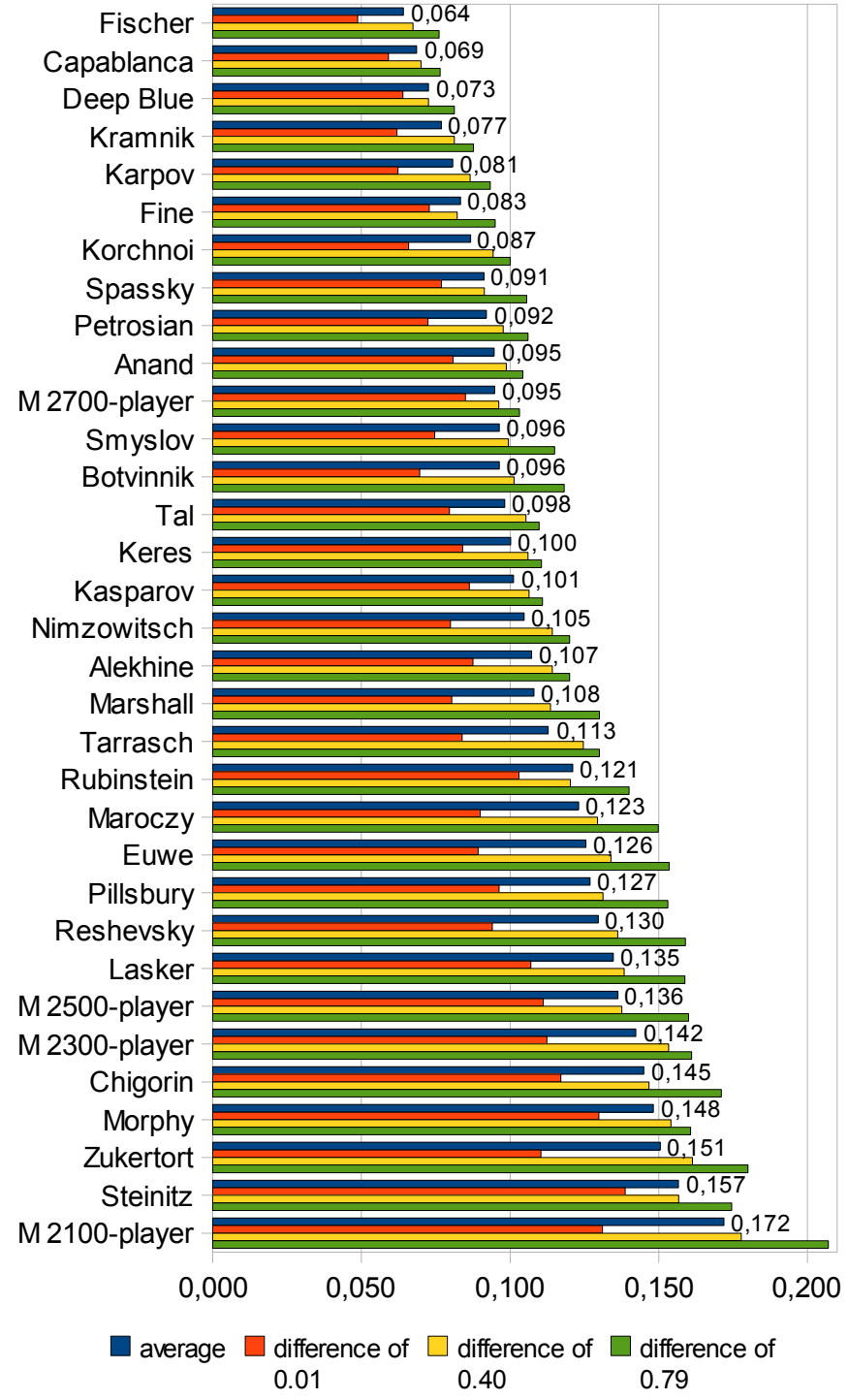




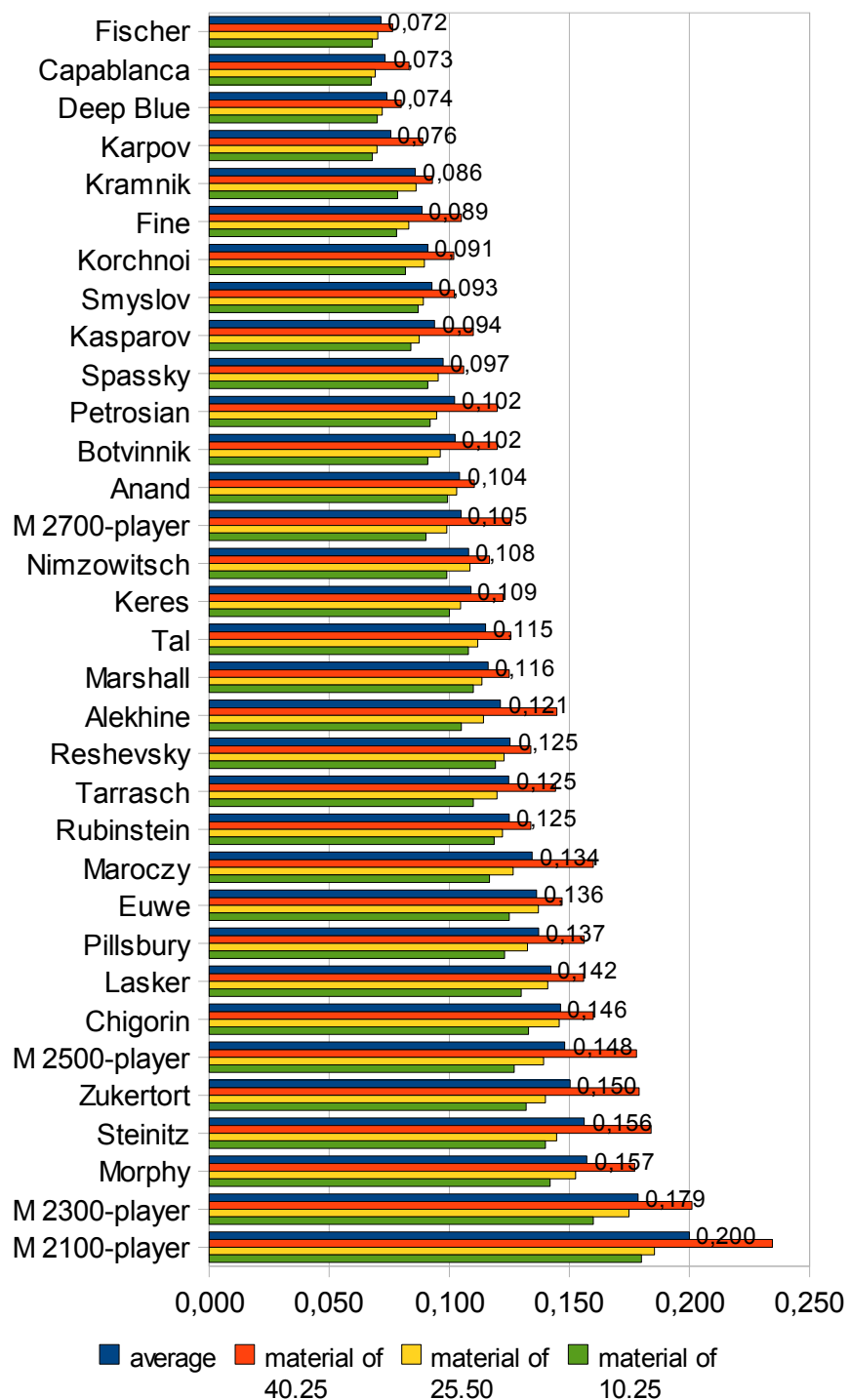
Expected error by complexity



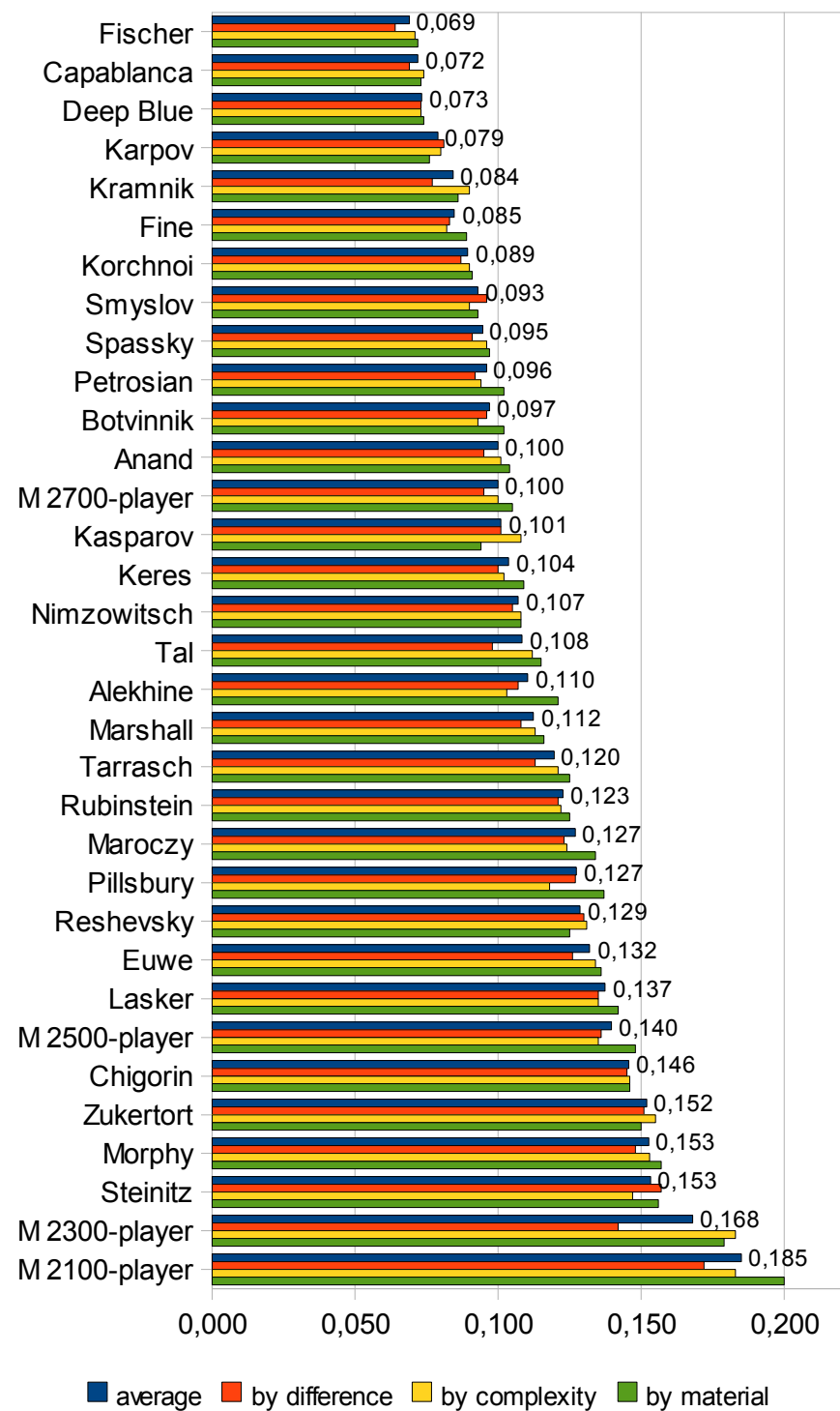
Expected error by difference



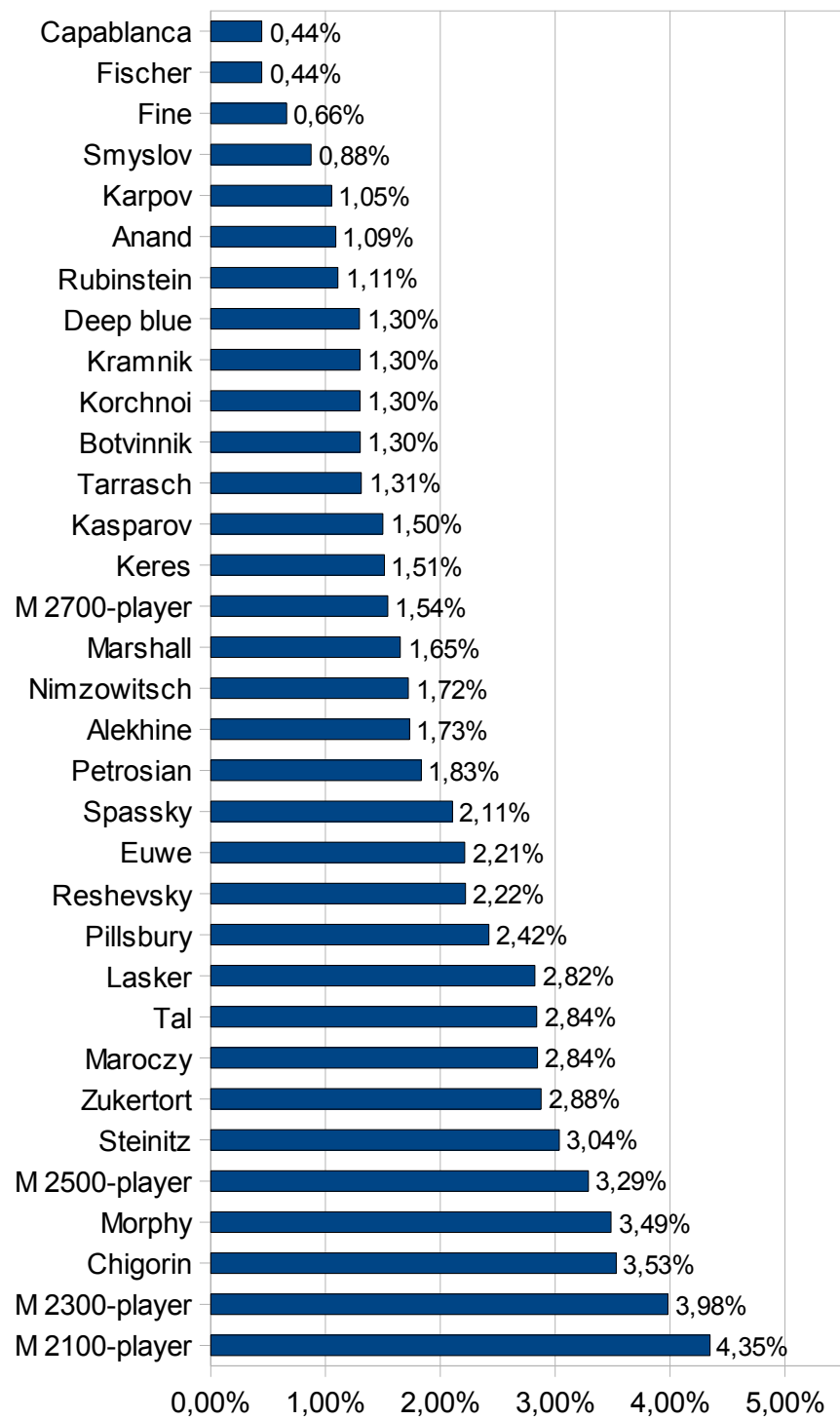
Expected error by material



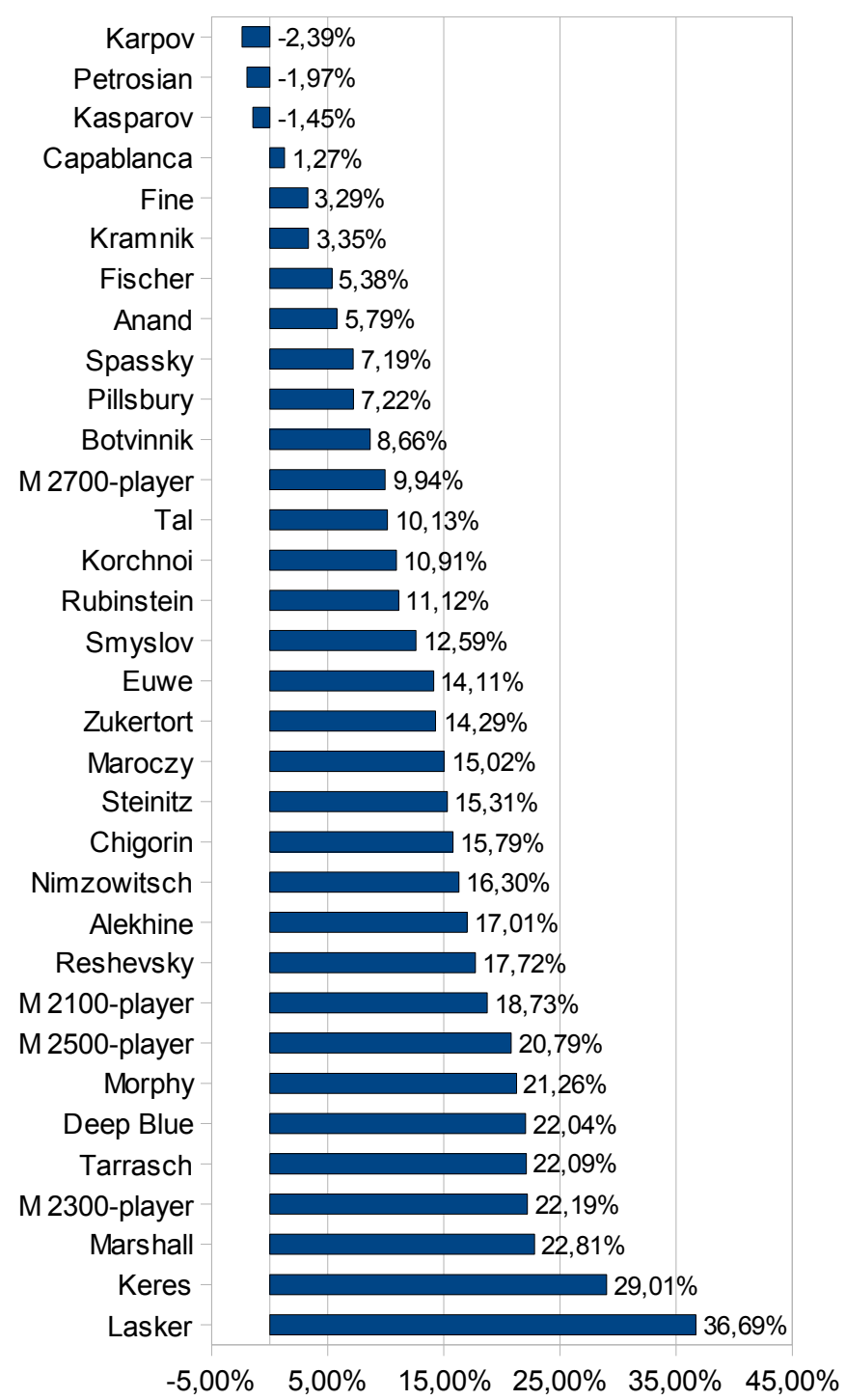
Average expected error



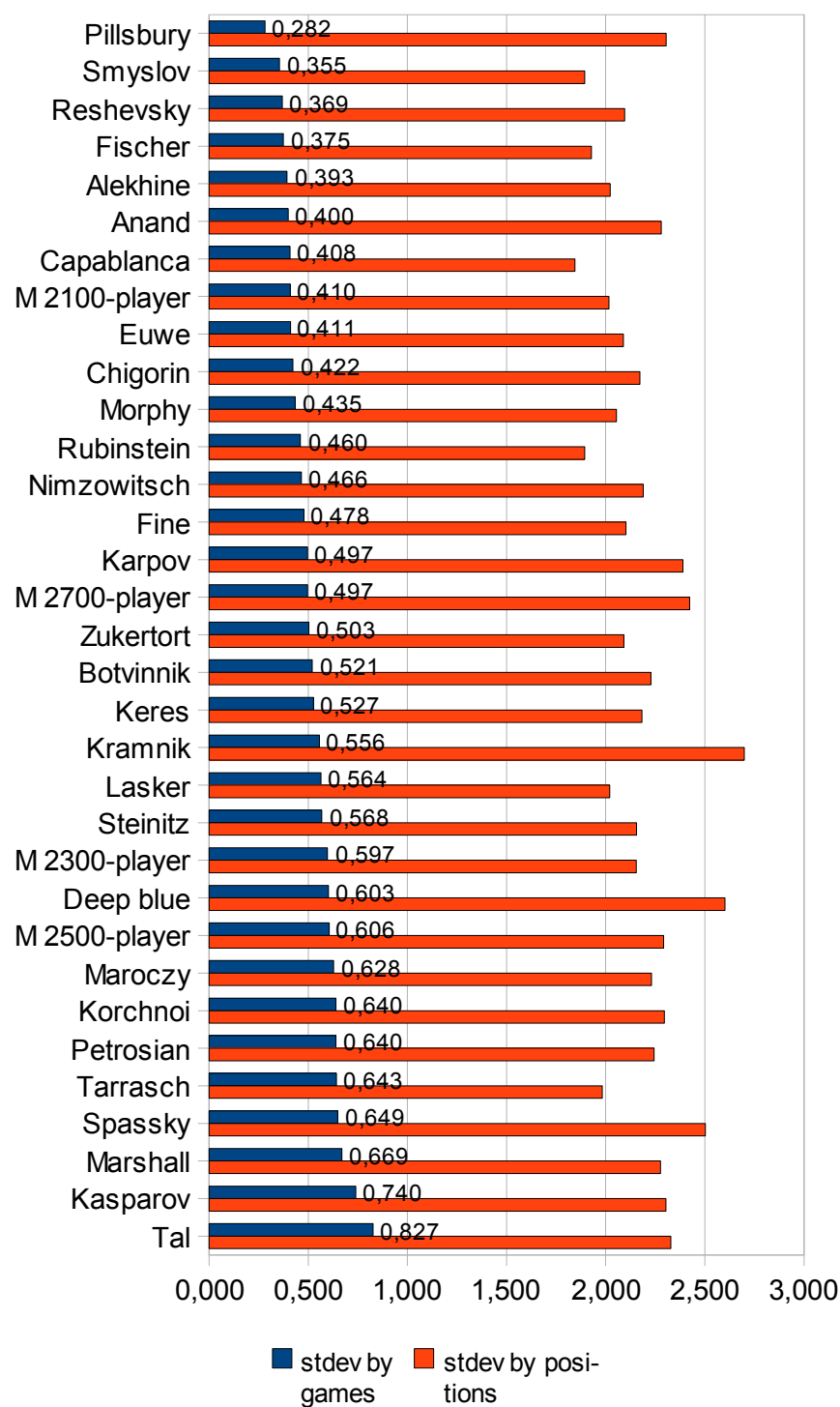
Blunder ratio



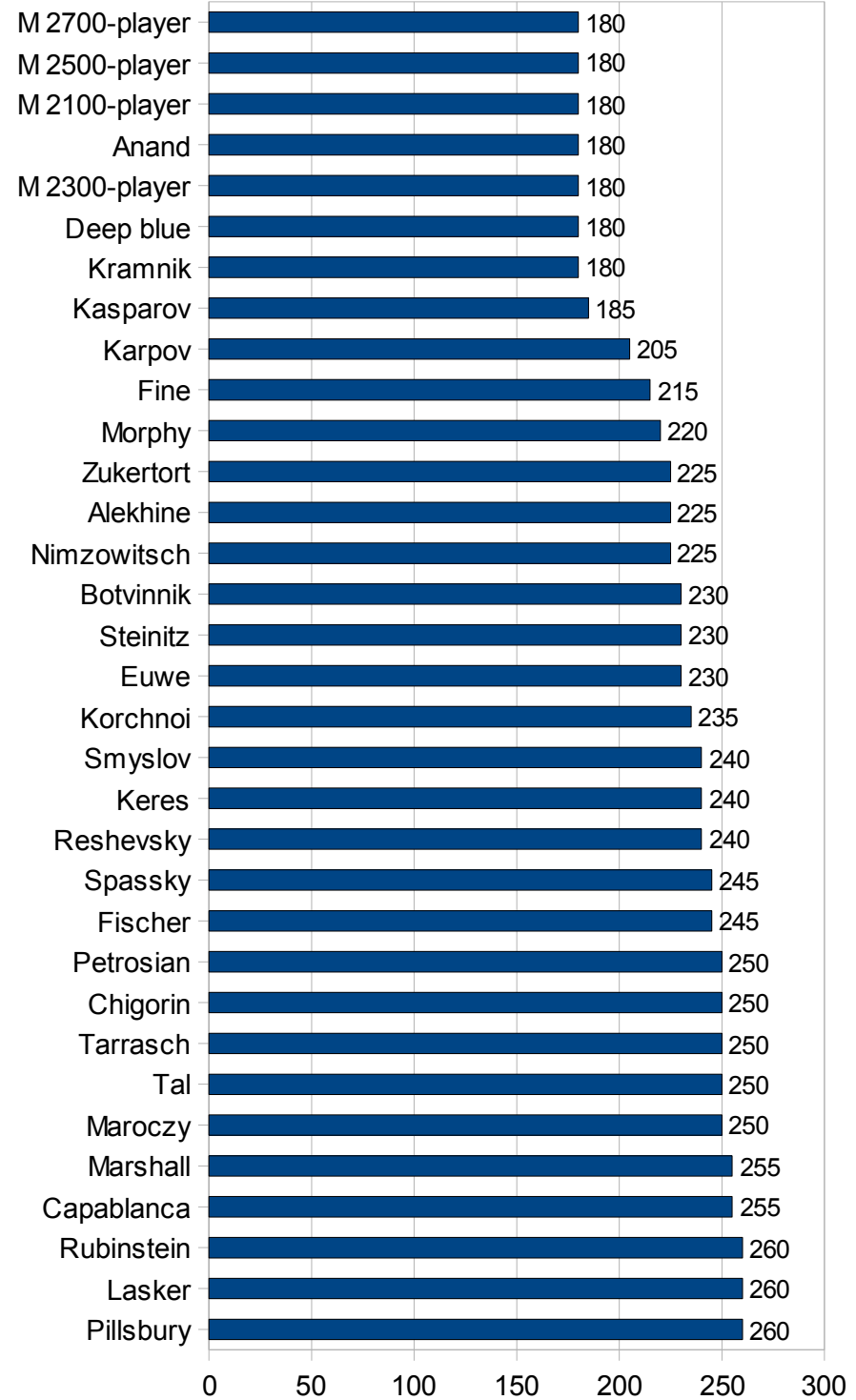
Full depth vs 6-ply

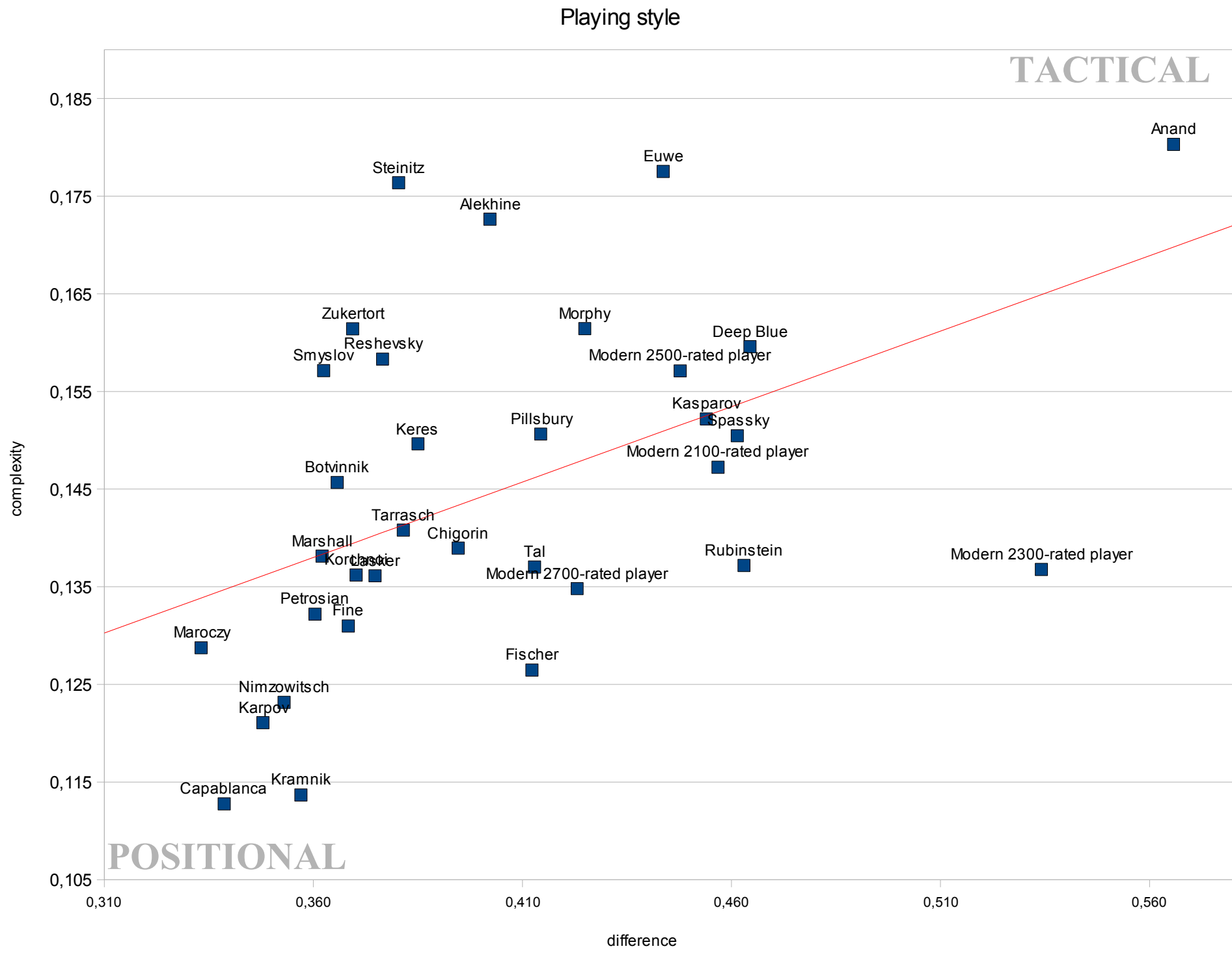


Relative standard deviation



Thinking time in seconds





### Level of play by 20-year periods

Periods	Players	Average elo	Absolute average error	Complexity	Difference	Material	Thinking time	Games	Positions	Valid positions	Percentage
1880-1899	Zukertort, Steinitz, Lasker, Tarrasch, Chigorin, Pillsbury	2438	0,140	0,149	0,382	26,047	244	95	4292	2495	58,13%
1900-1919	Pillsbury, Maroczy, Rubinstein, Marshall, Capablanca	2580	0,118	0,139	0,396	25,247	254	75	3286	1839	55,96%
1920-1939	Capablanca, Nimzowitsch, Alekhine, Euwe, Fine	2650	0,106	0,145	0,371	24,644	228	79	3435	2071	60,29%
1940-1959	Fine, Botvinnik, Reshevsky, Smyslov, Keres, Tal	2642	0,104	0,150	0,383	26,145	238	83	3691	2128	57,65%
1960-1979	Tal, Petrosian, Spassky, Fischer, Korchnoi	2685	0,092	0,136	0,406	24,193	245	74	3284	1964	59,81%
1980-1999	Korchnoi, Karpov, Kasparov, Anand, Kramnik	2730	0,094	0,143	0,410	26,184	191	62	2647	1585	59,88%

## List of most accurate games

no	White	Black	result	moves	year	opening	average error	complexity	difference	material	analyzed positions
1	Tal	Benkö	1	50	1958	B32	0,013	0,120	0,326	16,76	22
2	Deep Blue	Kasparov	1	37	1996	B22	0,017	0,118	0,652	28,67	19
3	Adams	Kramnik	0,5	78	1999	B26	0,018	0,061	0,118	14,33	64
4	Ivkov	Smyslov	1	41	1956	C73	0,019	0,076	0,294	24,72	16
5	Euwe	Fine	0,5	33	1936	D60	0,020	0,052	0,327	22,11	21
6	Ciesla (2275)	Nikolaev	0,5	36	2005	B06	0,020	0,055	0,269	19,82	22
7	Karpov	Kasparov	0,5	42	1990	D85	0,021	0,059	0,663	18,30	28
8	Miles	Karpov	0,5	74	1986	E30	0,021	0,025	0,021	31,00	60
9	Fischer	Taimanov	1	43	1971	B44	0,022	0,116	0,521	20,19	26
10	Deep Blue	Kasparov	0,5	39	1996	B22	0,023	0,108	0,398	20,16	26
11	Schlechter	Rubinstein	1	41	1912	C11	0,024	0,114	0,310	16,81	22
12	Pachman	Keres	1	36	1956	A28	0,024	0,146	0,385	33,55	16
13	Tarrasch	Marshall	0,5	48	1914	C42	0,024	0,044	0,153	11,59	35
14	Tal	Keres	0,5	35	1959	D32	0,025	0,101	0,314	26,58	21
15	Aronian (2684)	Grischuk	1	31	2005	D75	0,025	0,129	0,307	20,72	15
16	Bondarevsky	Botvinnik	0,5	36	1947	D30	0,025	0,079	0,348	25,16	24
17	Parma	Fischer	1	57	1970	B97	0,027	0,115	0,110	16,64	41
18	Euwe	Botvinnik	0,5	29	1948	C07	0,027	0,061	0,305	15,81	16
19	Keres	Fine	1	63	1936	A09	0,027	0,129	0,371	21,14	40
20	Lasker	Capablanca	0,5	30	1921	D61	0,028	0,066	0,741	25,69	17
21	Botvinnik	Ragozin	1	40	1946	D13	0,028	0,163	0,324	34,83	18
22	Korchnoi	Polugaevsky	0,5	41	1980	A33	0,028	0,120	0,266	18,29	28
23	Marshall	Bogoljubov	0,5	27	1914	D63	0,031	0,069	0,059	29,78	15
24	Sokolov	Karpov	0,5	42	1989	C92	0,031	0,129	0,252	35,43	28
25	Smyslov	Keres	0,5	41	1956	A04	0,032	0,110	0,043	22,28	27
26	Spassky	Petrosian	0,5	43	1969	B36	0,032	0,037	0,421	13,73	30
27	Tal	Botvinnik	0	58	1960	B18	0,032	0,122	0,320	15,46	30
28	Fischer	Spassky	1	41	1972	D59	0,032	0,321	0,109	30,03	17
29	Botvinnik	Spassky	0,5	29	1970	A26	0,033	0,081	0,557	27,42	16
30	Euwe	Capablanca	0,5	38	1934	D64	0,033	0,060	0,393	31,56	25
31	Petrosian	Benkö	0,5	42	1962	D91	0,033	0,054	0,233	15,44	29
32	Lasker	Capablanca	1	56	1921	C66	0,034	0,068	0,406	32,31	25
33	Sosonko	Korchnoi	0,5	41	1980	E10	0,034	0,062	0,304	27,47	28
34	Spassky	Portisch	1	35	1967	D63	0,034	0,282	0,311	29,48	21
35	Levenfish	Rubinstein	1	47	1912	C45	0,034	0,059	0,171	27,56	25
36	Anand	Van Wely	1	34	2001	B90	0,034	0,197	0,359	32,93	18
37	Bogoljubov	Alekhine	1	39	1929	C76	0,035	0,206	0,240	31,18	24
38	Vidmar	Nimzowitsch	0,5	27	1931	E16	0,035	0,039	0,118	28,70	15
39	Nenov	Djakov (2105)	0,5	36	2007	C02	0,036	0,067	0,371	22,49	22
40	Tal	Najdorf	1	49	1961	B92	0,037	0,085	0,356	20,00	34
41	Euwe	Capablanca	1	38	1922	C66	0,038	0,102	0,298	27,45	16
42	Smyslov	Fischer	1	44	1970	A36	0,038	0,120	0,749	23,79	18
43	Keres	Petrosian	0,5	41	1956	B63	0,039	0,067	0,287	21,24	28
44	Capablanca	Kostic	1	[80]	1919	C42	0,040	0,090	0,366	19,41	55
45	Petrosian	Spassky	0,5	61	1969	D34	0,041	0,096	0,318	21,05	48
46	Rubinstein	Cohn	1	37	1911	D02	0,041	0,055	0,490	33,62	23
47	Maroczy	Vidmar	0,5	37	1907	C49	0,042	0,066	0,085	34,55	25
48	Korchnoi	Polugaevsky	0,5	30	1980	A17	0,043	0,106	0,480	25,37	17
49	Capablanca	Maroczy	0,5	31	1924	D02	0,043	0,070	0,070	32,28	19
50	Korchnoi	Petrosian	0,5	36	1962	C97	0,044	0,161	0,301	32,30	22
51	Kasparov	Deep Blue	0,5	48	1997	A00	0,045	0,111	0,269	29,31	34
52	Janowski	Capablanca	1	46	1916	D15	0,045	0,048	0,196	23,99	26
53	Yusupov	Karpov	0,5	44	1989	E15	0,045	0,148	0,290	24,68	28
54	Shirov	Anand	0,5	49	2001	C10	0,045	0,137	0,671	20,98	34
55	Lasker	Capablanca	1	68	1921	D61	0,046	0,129	0,153	20,28	45
56	Fischer	Korchnoi	0,5	62	1970	B88	0,046	0,063	0,176	17,74	49
57	Solovjov	Zakharevich (2499)	0,5	42	2005	C13	0,046	0,107	0,844	12,71	27
58	Ivanchuk (2711)	Bacrot	0,5	48	2005	C55	0,046	0,081	0,476	15,77	33
59	Deep Blue	Kasparov	0,5	56	1997	B10	0,046	0,154	0,367	22,58	39
60	Pomar-Salamanca	Petrosian	0,5	61	1964	A31	0,046	0,126	0,223	17,22	47
61	Tal	Botvinnik	1	45	1961	B18	0,046	0,114	0,297	24,59	31
62	Petrosian	Spassky	0,5	31	1969	D55	0,046	0,102	0,368	31,46	17
63	Ragozin	Botvinnik	0,5	40	1945	C59	0,047	0,168	0,611	22,34	28
64	Shirov	Anand	1	55	1998	B12	0,047	0,160	0,416	20,21	42
65	Spassky	Botvinnik	0,5	65	1970	B19	0,047	0,081	0,310	13,23	52
66	Tartakower	Maroczy	0,5	40	1907	C50	0,047	0,090	0,441	19,89	27
67	Gelfand	Volokitin (2685)	0,5	30	2005	A32	0,048	0,193	0,345	26,68	15
68	Smyslov	Pachman	1	30	1956	D35	0,048	0,120	0,358	28,87	17
69	Pillsbury	Lasker	0,5	50	1895	C67	0,049	0,063	0,182	11,49	38
70	Capablanca	Marshall	0,5	30	1915	C42	0,049	0,106	0,393	24,17	18
71	Stahlberg	Smyslov	1	64	1954	D19	0,049	0,143	0,623	17,78	38
72	Kasparov	Kramnik	0,5	41	2000	C78	0,049	0,076	0,143	11,56	27
73	Fine	Becker	1	42	1936	E33	0,049	0,124	0,482	29,72	17
74	Tal	Petrosian	0,5	49	1961	B18	0,050	0,124	0,481	19,66	35
75	Kasparov	Deep Blue	0,5	50	1996	D30	0,050	0,111	0,413	24,06	37