NOVY FUND. THE QUANTITATIVE REPORT

By Grigory Sergeenko, March 2008

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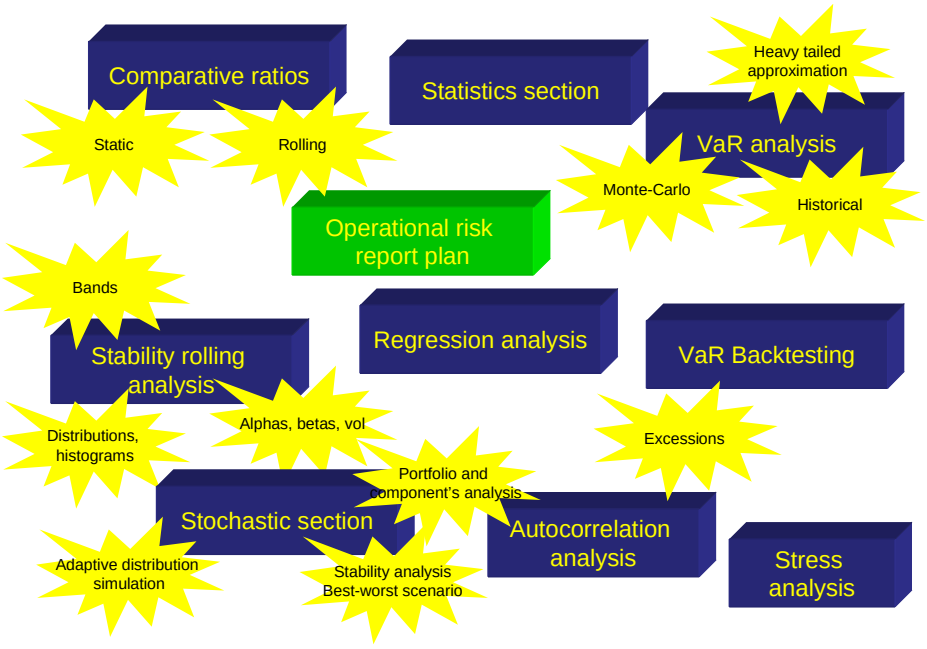
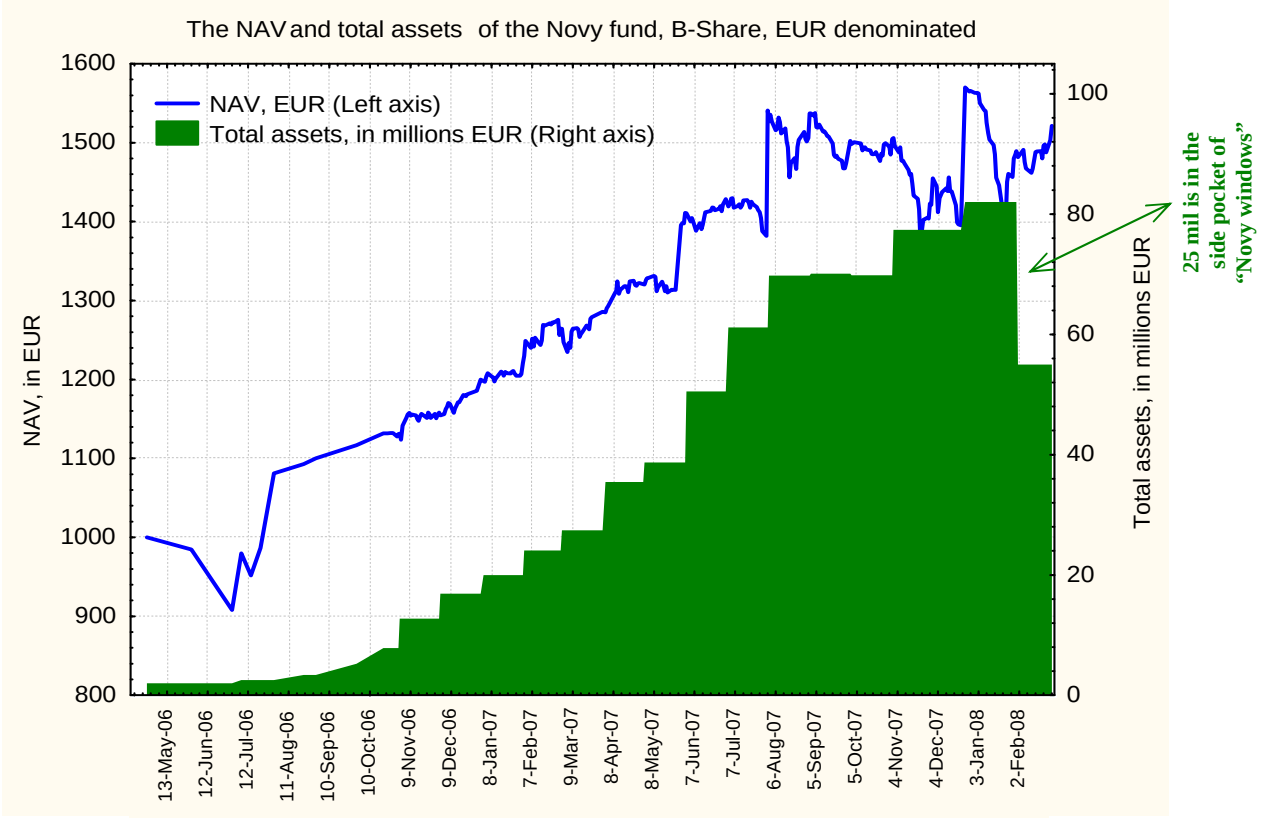
EXECUTIVE SUMMARY

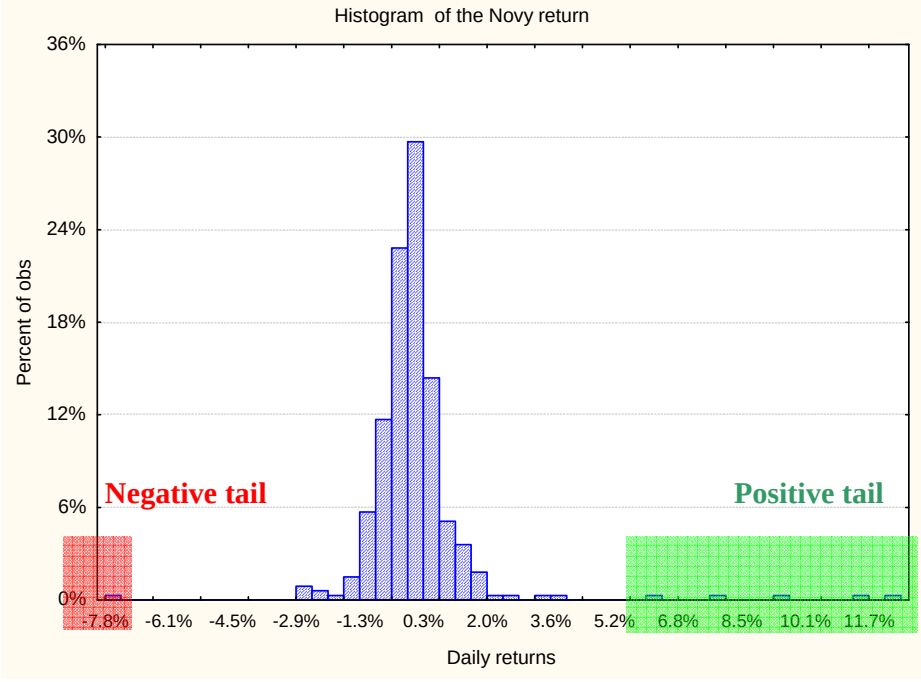
Novy fund has been analyzed under different angles and **outperformed** the benchmark and the peer group in the majority of tests. In order to make an accurate comparison we developed market cap weighted index for the Central Europe countries which we called NICE (**N**ovy **I**ndex for **C**entral **E**urope). Beginning of the 2008 year Novy started from outperforming the major competitors. Novy proved to have smooth returns which caused to have a high Sharpe, Omega and Sortino ratios. The potential monthly biggest loss is 7.7% calculated using the historical VaR with the 99% confidence. Approximation **via heavy-tailed distribution** allowed having more robust VaR 99% estimates of just **4.8%.** It is shown that Novy is really profitable fund with **low risk** and low rolling volatility. Out of sample backtesting of the VaR showed good stability and robustness of the fund's risk characteristics. Number of downside excessions is within the risk characteristics. Novy fund is uncorrelated to benchmark, alternative strategies and the peer-group. **Autocorrelation** analysis proving the good portfolio diversification and active portfolio rebalancing. **Stochastic simulations** of the market both on the portfolio level and on the each component of the portfolio supported the stability of the fund and showed really good up-trending among all the observations.



OVERVIEW OF THE PERFORMANCE. B-SHARE EUR DENOMINATED

Monthly performance	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2006					-1.55%	-7.77%	**19.06%**	1.76%	1.52%	1.25%	2.40%	3.62%	**19.99%**
2007	1.77%	3.54%	1.70%	2.71%	**6.86%**	1.22%	**7.87%**	-0.23%	-2.28%	0.16%	-3.30%	**7.42%**	**30.25%**
2008	-4.70%	2.14%											**-2.66%**





RELATIVE PERFORMANCE

As a benchmark we choose two indices:

- DJ Stoxx EU Enlarged 15 Index (EUE15P).
- As second benchmark we created our own synthetic index for the reason to be more comparable to our strategy. To construct it we used Austrian, Slovakian, Slovenian, Czech, Bulgarian, Polish, Estonian, Latvian, Lithuanian, Serbian, Rumanian, Hungarian and Croatian indices with the market cap weighting applied. Further we will call it NICE index (**N**ovy **I**ndex for **C**entral **E**urope),

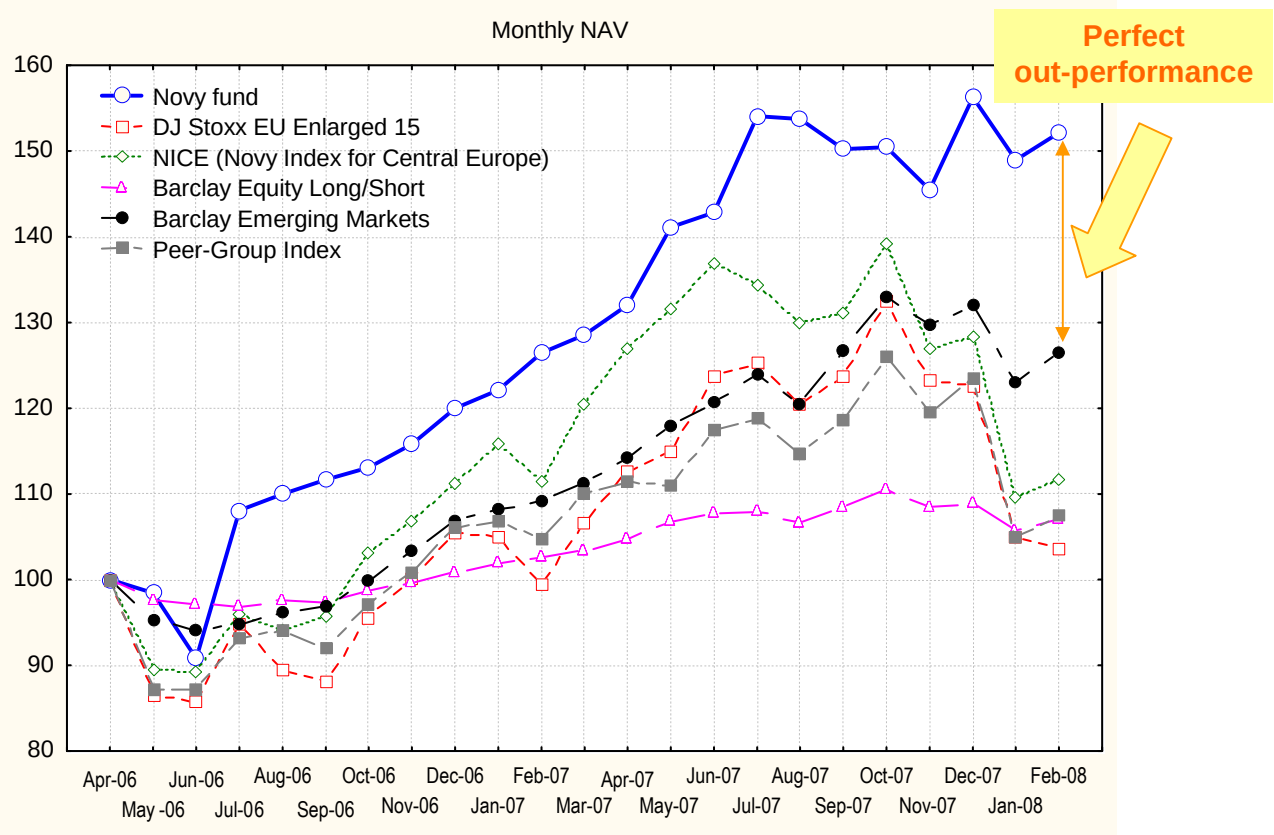
As alternative strategies we selected the following indices:

- Barclay Equity Long/Short Index (BLS);
- Barclay Emerging Markets Index (BEM),

and the following funds:

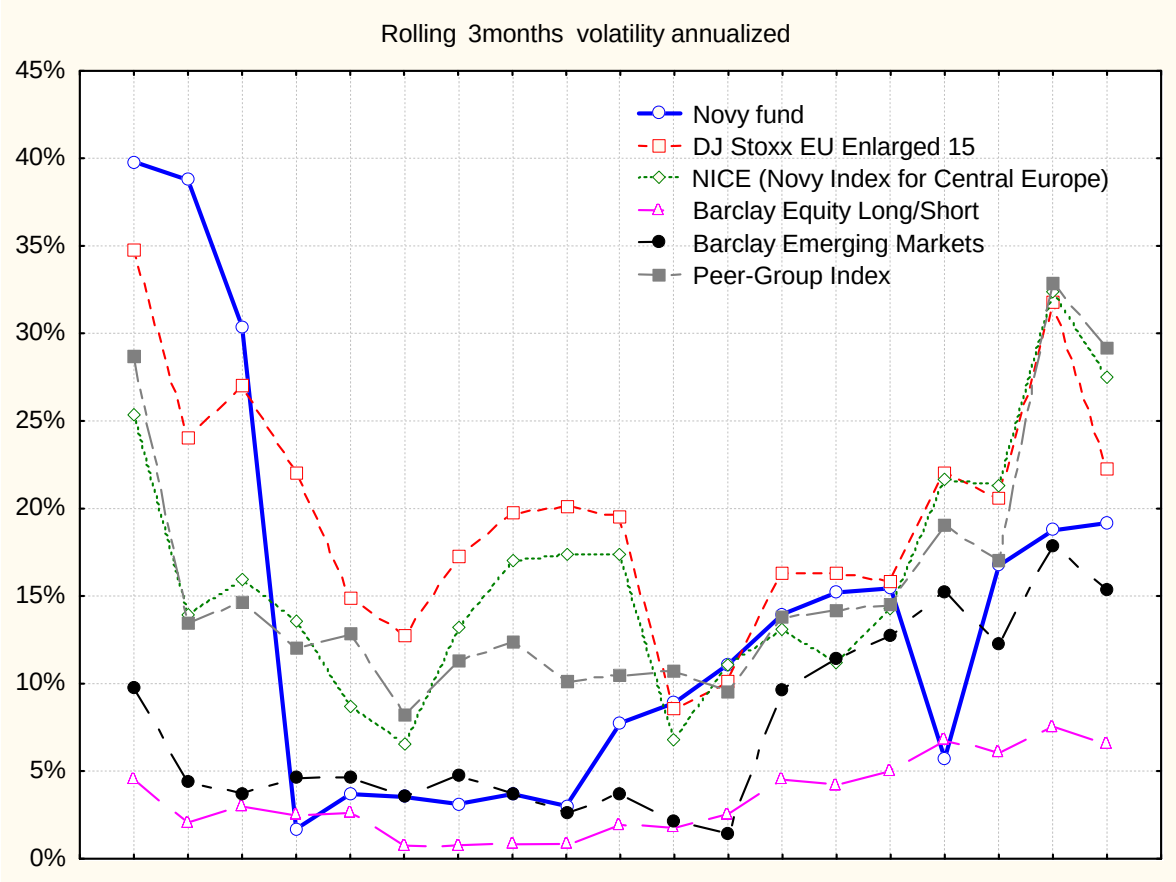
- East Capital Eastern Europe Fund (EACOSTE);
- Trigon Central and Eastern European Fund (TRICEAE);
- ING Emerging Eastern Europe Fund (IBEEE);
- AXA World Europe – Emerging Europe Fund (AXAEEEG);
- ABN AMRO Eastern Europe Equity Fund (AAEEEFA);
- Credit Suisse EQ-East Europe Fund (CRSEEUI).

NAV of the Novy fund compare to the benchmark, indices and the peer-group are presented on the following figure. All returns have been rescaled to start from the 100. We used the equal-weighted average to calculate the aggregated peer-group index, containing all the peer-group funds. So in the chart and in the later calculation we will use the Peer-group Index together with two benchmarks and two alternative strategies.



Comparative NAV, whole period

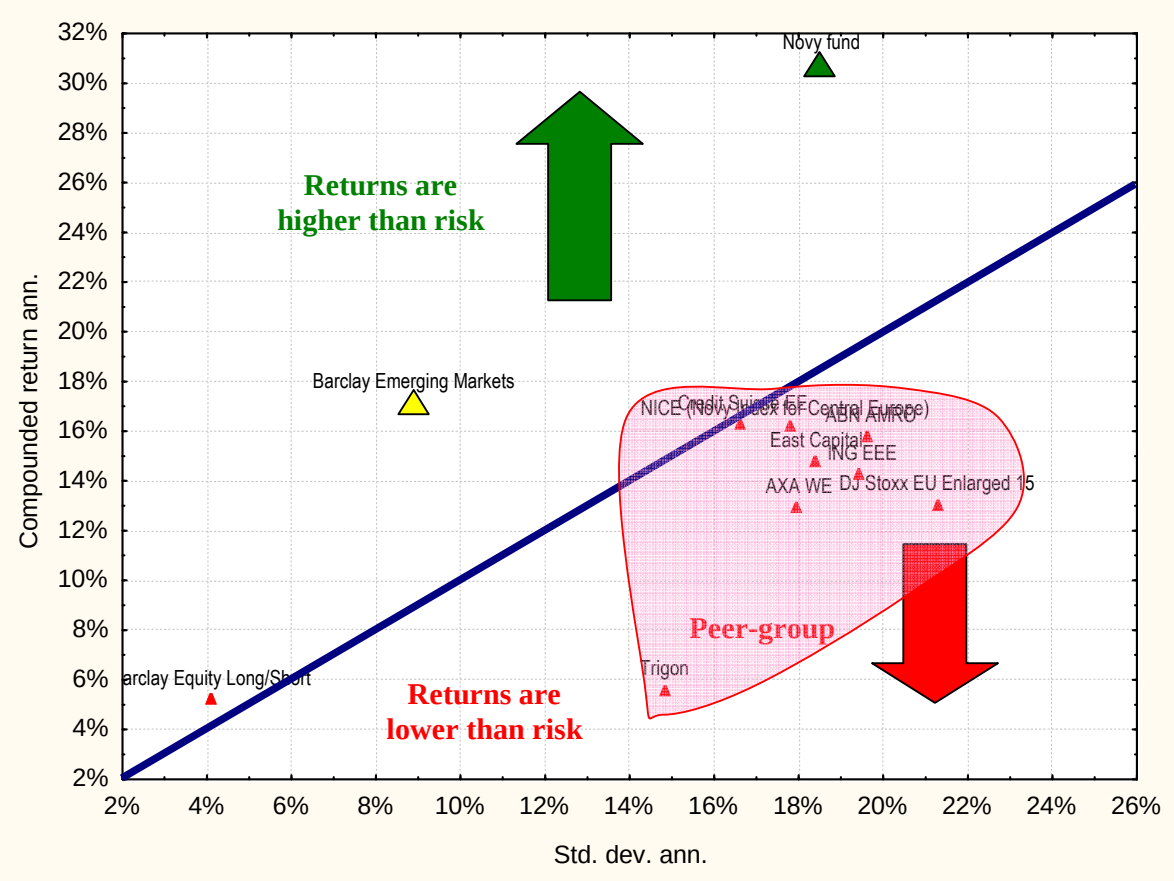
Due to the proper diversification Novy fund outperformed all of the peer-group and the benchmark and had a controlled drawdown. The next chart showing the rolling 3month volatility and our volatility is in the range of 18% which is in the middle of the analyzed .



BASIC STATISTICAL BLOCK

Statistical section	Novy fund	DJ Stoxx EU Enlarged 15	NICE	Barclay Equity Long/Short	Barclay Emerging Markets	Peer-Group Index
Mean 1 year	1.78%	0.09%	-0.09%	0.39%	1.26%	0.22%
Median 1 year	1.70%	1.36%	1.04%	0.80%	2.39%	1.15%
Std. dev. ann.	18.41%	23.37%	20.67%	4.68%	10.49%	19.77%
Rolling 1 year returns	**20.33%**	4.17%	0.03%	4.35%	15.86%	2.69%
Compounded Annualized Returns	**25.72%**	1.88%	6.16%	3.80%	13.70%	4.07%
Skewness	**1.24**	-0.61	-1.03	-0.99	-1.13	-1.37
Kurtosis	**6.18**	2.75	3.45	3.02	3.68	4.44
1% Percentile	**-7.77%**	-14.43%	-14.62%	-2.85%	-6.86%	-14.89%
5% Percentile	-5.93%	-13.85%	-12.14%	-2.56%	-5.55%	-13.64%
95% Percentile	12.35%	9.34%	7.82%	1.95%	5.03%	6.47%
99% Percentile	19.06%	10.53%	8.03%	1.99%	5.11%	6.81%
25th Percentile (First quartile)	-0.23%	-3.96%	-1.90%	-0.31%	0.66%	-1.86%
50th Percentile (Second quartile)	1.73%	0.51%	1.75%	0.80%	1.81%	1.14%
75th Percentile (Third quartile)	3.54%	5.68%	4.17%	1.24%	2.99%	5.14%
Gaining Months,%	73%	50%	64%	68%	77%	64%
Losing Months,%	27%	50%	36%	32%	23%	36%
Pos/Neg ratio	2.67	1.00	1.75	2.14	3.40	1.75

The description of each statistical formula is presented in the appendix. The Novy fund shows higher average performance, higher annual return and higher positive/negative ratio. Bigger skewness prove that Novy's returns are shifted to the right, i.e. favoring the right tail. Percentiles suggest that there is only 1% probability chance that returns could be below 7.8% monthly or upper than 19%. Let us now present the gain/risk diagram. On the abscises (horizontal) axis wee will put the annualized volatility and on the ordinate (vertical) axis compounded annual return.

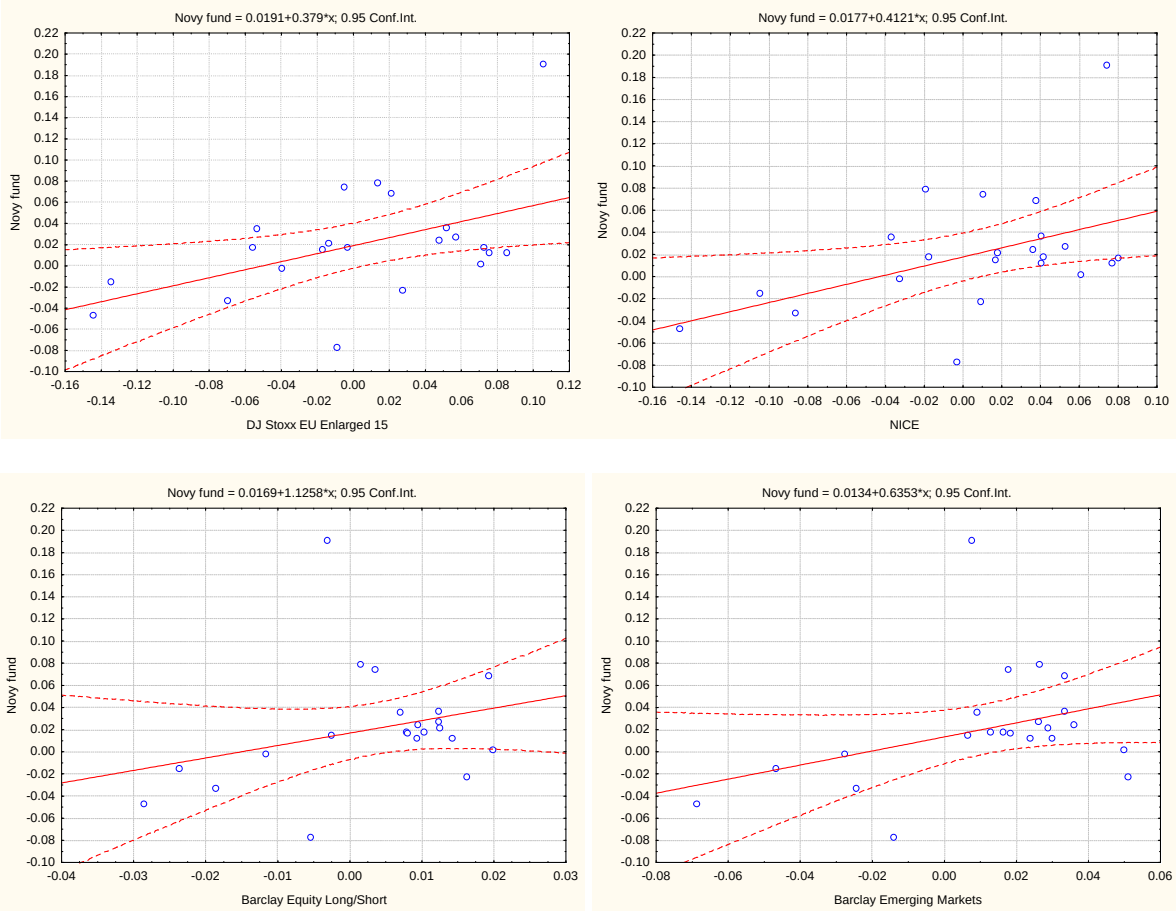


This graph compare relative risk of the Novy return vs. benchmarks, alternative strategies and peer-group. The blue line represents risk-neutral line and everything which is above that line is more profitable compare to those which are under that line. Novy's returns is remarkably higher despite the volatility on the second half of the chart.

BASIC REGRESSION BLOCK

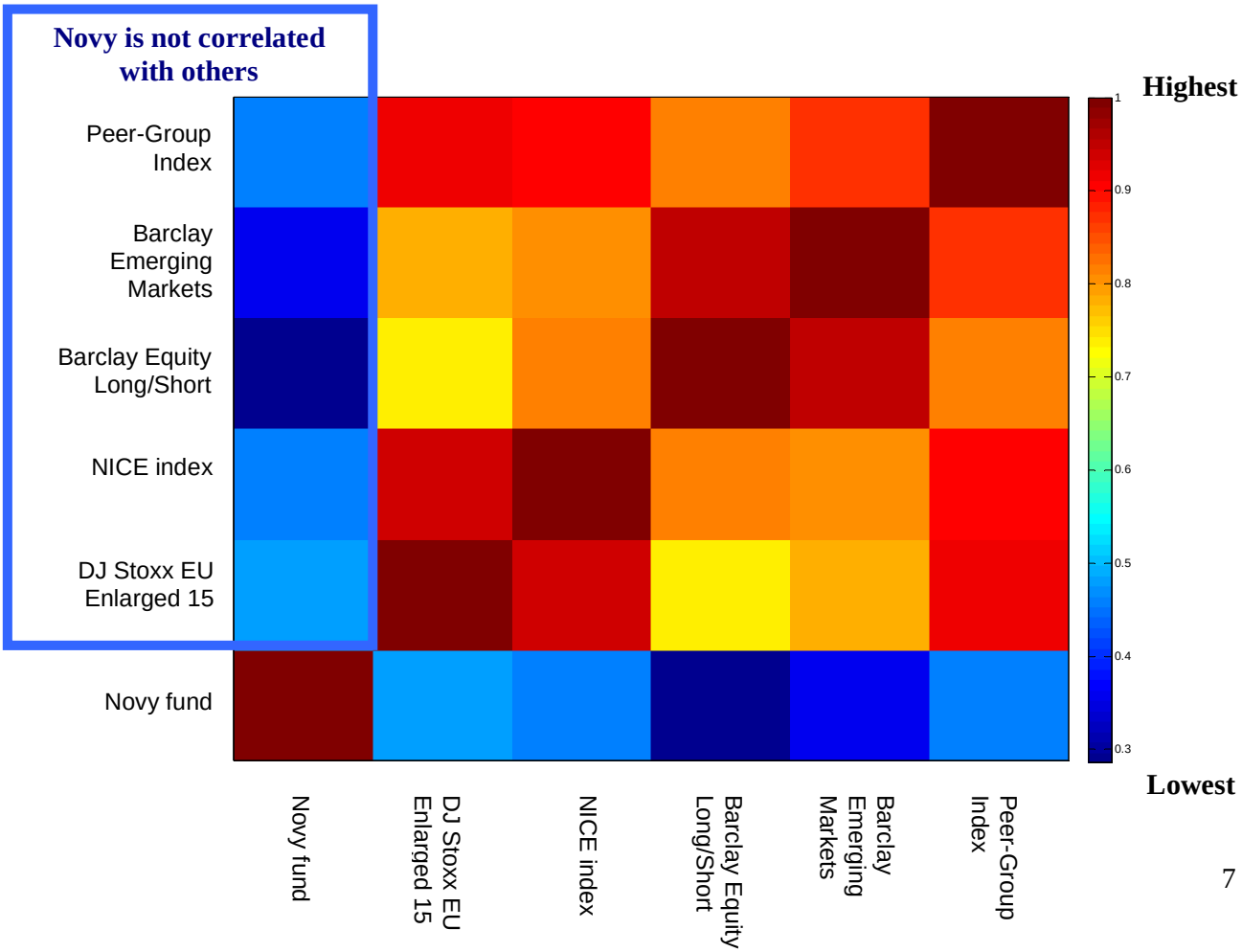
Pos/Neg ratio	DJ Stoxx EU Enlarged 15	NICE	Barclay Equity Long/Short	Barclay Emerging Markets	Peer-Group Index
Alpha	**0.0191**	**0.0177**	**0.0169**	**0.0134**	**0.0184**
Alpha 5% conf.int.	-0.0022	-0.0039	-0.0070	-0.0107	-0.0032
Alpha 95% conf.int.	0.0404	0.0394	0.0408	0.0376	0.0401
Beta	**0.3790**	**0.4121**	**1.1258**	**0.6353**	**0.4252**
Beta 5% conf.int.	0.0568	0.0437	-0.6314	-0.1281	0.0386
Beta 95% conf.int.	0.7011	0.7805	2.8830	1.3986	0.8119
Determination coefficient R^2	**0.2314**	**0.2140**	**0.0820**	**0.1309**	**0.2083**
F-stat	6.0220	5.4448	1.7859	3.0135	5.2632
p-val	0.0234	0.0302	0.1964	0.0980	0.0327

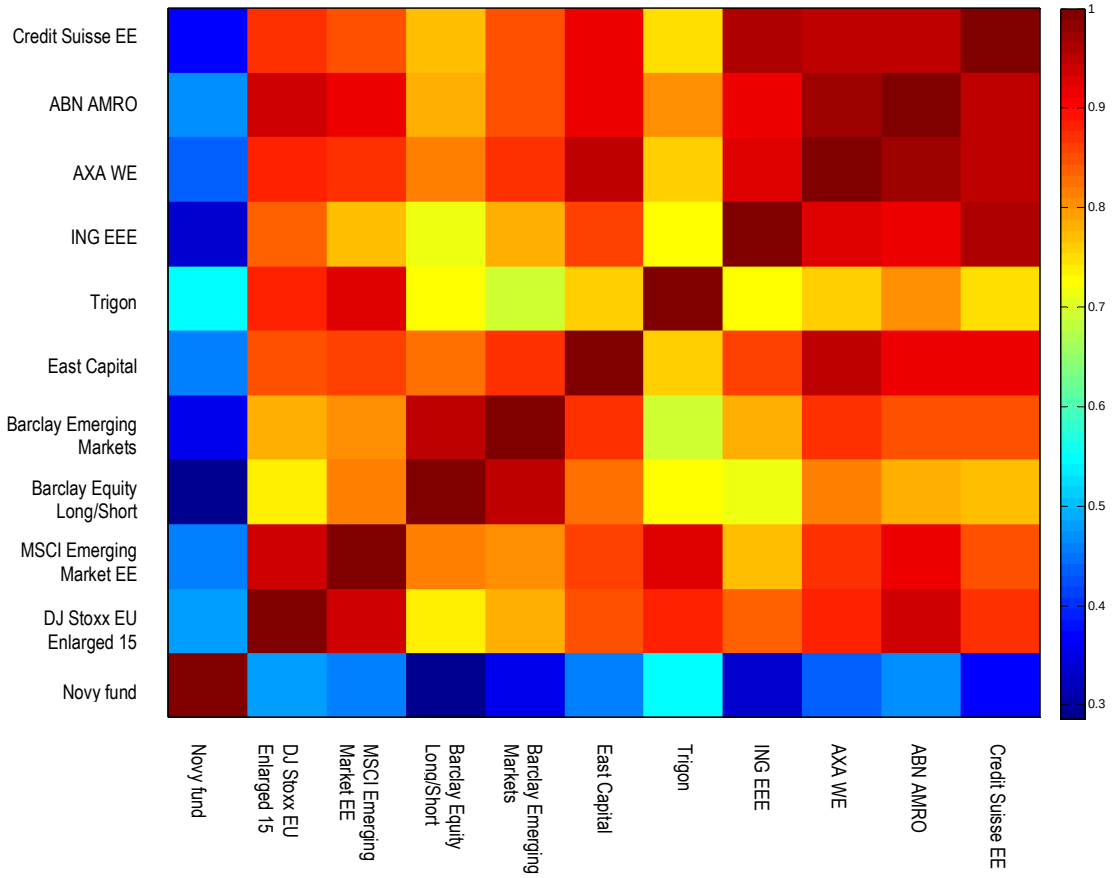
This table represents the basic linear regression of Novy returns as a functions from benchmark and a peer-group index. Novy delivering alpha and not really correlated with the benchmark, Barclay indices and the peer-group. Definition of each coefficient is written in appendix. Linear regression line are shown in the following charts.



Linear regressions of Novy fund

This chart is presenting the 2sigmas Bollinger interval bands represented by red lines. Bands are moving together with the chart and this is a sign of the good predictability of the Novy's performance. Last big performance has shifted bands to be not so close with the returns, but that is only due to the higher rolling volatility which by definition will make bands a bit wider.





Those charts are showing the cross-correlation matrix of the Novy fund, Barclay indices, benchmarks and peer-group. On the second chart the deep cross-correlation is presented with analysis of each peer-group component. The lowest correlation in our case is 0.3 and the highest is 1. The diagonal represents correlation to itself which will be by definition 1. Bluish color scale represents the low correlation and the reddish –higher correlation. Novy fund is almost orthogonal to others where both benchmark and the peer-group tends to move together. As an exception of correlation 0.54 is a Trigon fund. But still this number is low enough. Definition of the correlation and the cross-correlation matrix is presented in appendix.

IMPORTANT PERFORMANCE METRICS

William Sharpe first proposed a ratio of excess return to total risk as an investment performance metric. Subsequent work by Sharpe, Lintner, and Mossin extended these ideas to entire asset markets in what is called the Capital Asset Pricing Model (CAPM). Since the development of the CAPM, a variety of investment performance metrics has evolved. Classic metrics include the Sharpe ratio, the information ratio, and tracking error. The second class of metrics is relative investment performance metrics to compute risk-adjusted returns. These metrics are also based on the CAPM and include Jensen's Alpha, the Security Market Line (SML), and Modigliani and Modigliani Risk-Adjusted Return. The third class of the metrics is a max drawdowns and alternative investment performance metrics based on the lower partial moments (Omega, Sortino,

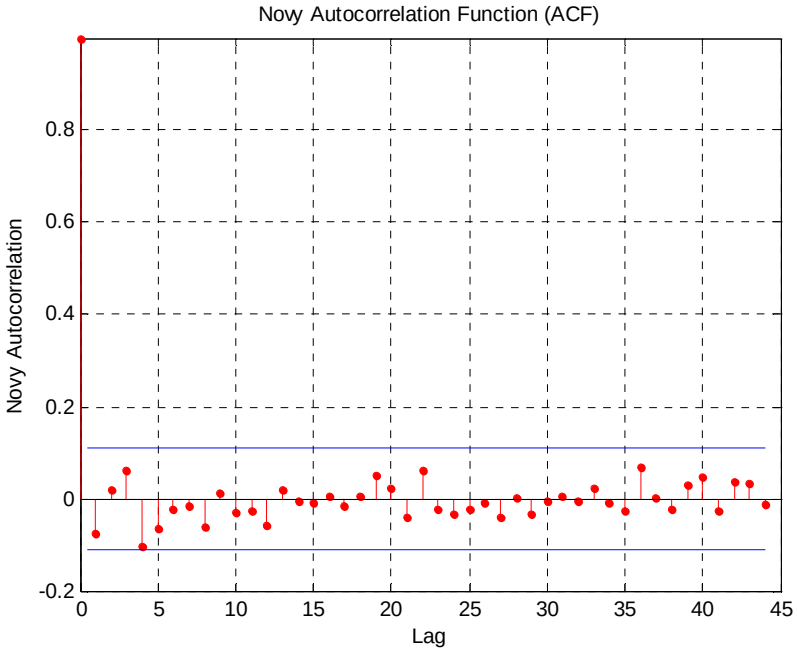
Upside, etc). Formulas, explaining the calculations presented in the appendix. All those calculated measures a presented in the following table:

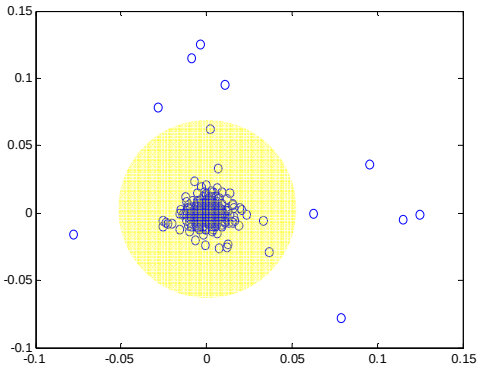
	Absolute performance ratios					
	Novy fund	DJ Stoxx EU Enlarged 15	NICE	Barclay Equity Long/Short	Barclay Emerging Markets	Peer-Group Index
Sharpe ratio 1-Year	**1.25**	-0.17	-0.28	-0.02	0.92	-0.11
Omega ratio 1-Year	**3.03**	1.05	1.00	2.03	2.45	1.15
Sortino ratio 1-Year	**2.50**	-0.21	-0.33	-0.02	1.28	-0.13
Upside potential ratio 1-Year	**1.22**	0.47	0.42	0.47	0.81	0.42
Max drawdown	**9%**	22%	21%	4%	8%	17%
	Relative performance ratios					
		DJ Stoxx EU Enlarged 15	NICE	Barclay Equity Long/Short	Barclay Emerging Markets	Peer-Group Index
Information ratio	-	0.2734	0.2400	0.3481	0.1881	0.2767
Tracking error	-	0.2121	0.1988	0.1725	0.1718	0.1948
Security Market Line	-	0.0167	0.0141	0.0197	0.0039	0.0156
Jensen's Alpha	-	0.0166	0.0154	0.0174	0.0120	0.0161
Modigliani & Modigliani	-	0.0212	0.0158	0.0050	0.0022	0.0168

To calculate the Sharpe, Omega, Sortino and Upside potential ratios we used 5% annual risk-free-rate. Novy outperforming the peer-group and benchmarks by all ratios (only Barclay got smallest drawdown).

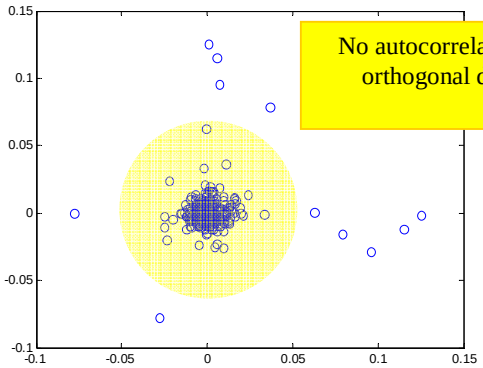
AUTOCORRELATION ANALYSIS

Autocorrelation is a mathematical tool used frequently in signal processing for analyzing time series. Informally, it is a measure of how well a signal matches a time-shifted version of itself, as a function of the amount of time shift. More precisely, it is the cross-correlation of a signal with itself. Autocorrelation is useful for finding repeating patterns in a signal, such as determining the presence of a periodic signal which has been buried under noise, or identifying the missing fundamental frequency in a signal implied by its harmonic frequencies. See appendix for more explanation. The following figure shows the autocorrelation function of the Novy fund. Portfolio autocorrelation is the correlation in portfolio returns from one day to the next. If it is positive then high returns tend to be followed by high returns and vice versa. If portfolio autocorrelation is negative, then the portfolio returns tend to be 'mean reverting' which means that very high return months tend to be followed by returns closer to the mean--the portfolio tends to damp out periods of very high or very low returns. But in order for the described effects to be the case the autocorrelation of the particular lag should be significant. The interpretation of the chart is showing that in the Novy fund there is basically no autocorrelation which is good sign of the portfolio diversification and active portfolio rebalancing. Following by the autocorrelation charts showing that basically returns are not depended from the previous days performance.



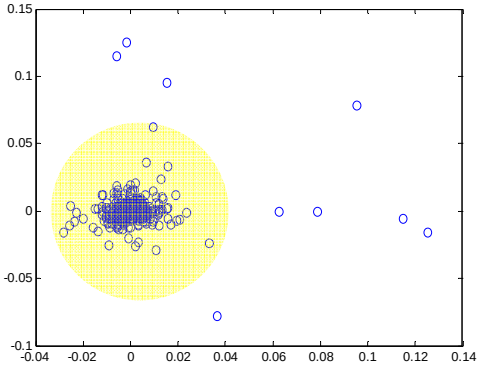


Novy returns vs. returns in the previous day

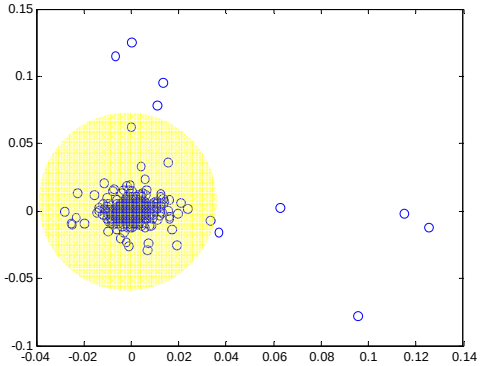


No autocorrelation – almost orthogonal dependence

Novy returns vs. returns in the previous 2 days



Novy returns vs. returns in the previous 3 days



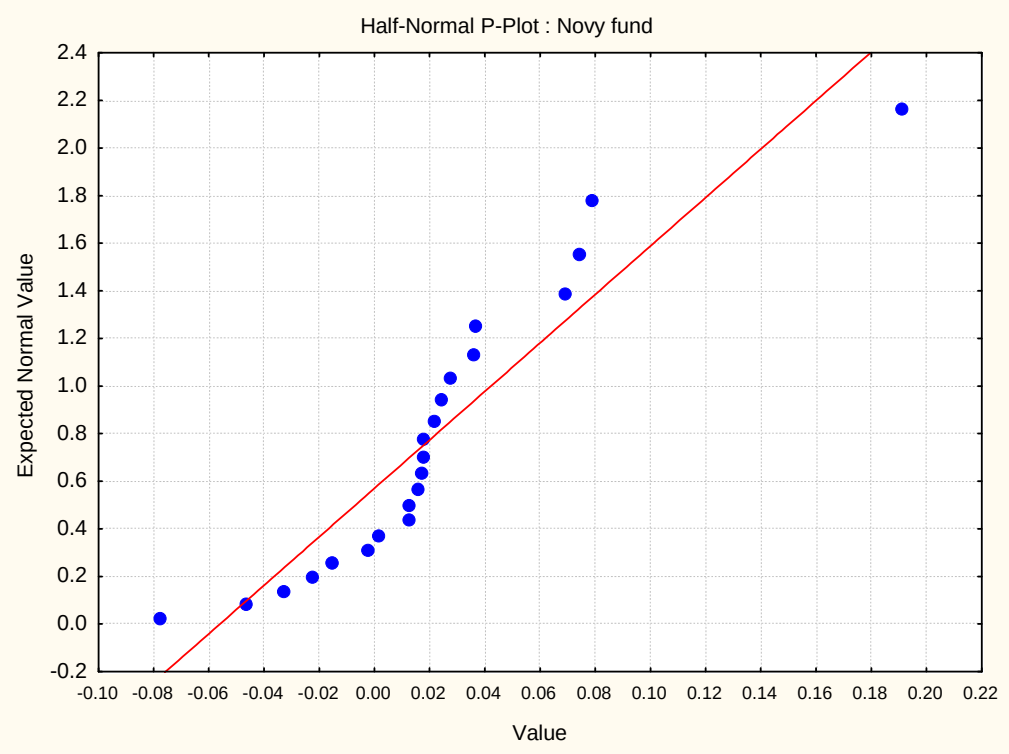
Novy returns vs. returns in the previous 4 days

VAR ANALYSIS

Value at risk (VaR) is a measure of how the market value of an asset or of a portfolio of assets is likely to decrease over a certain time period (in our case over one month) under usual conditions. Note that VaR cannot anticipate changes in the composition of the portfolio during the day. Instead, it reflects the riskiness of the portfolio based on the portfolio's current composition. In our study we will calculate two type of VaRs: historical approximation of the distribution and Monte-Carlo simulation using the Normal distribution.

	Novy fund	DJ Stoxx EU Enlarged 15	NICE	Barclay Equity Long/Short	Barclay Emerging Markets	Peer-Group Index
VaR, Monte-Carlo 95%	**6.67%**	10.72%	9.15%	1.91%	3.86%	8.89%
VaR, Monte-Carlo 99%	**10.32%**	15.30%	13.22%	2.82%	5.93%	12.76%
VaR, hist.distr. 95%	**5.93%**	13.85%	12.14%	2.56%	5.55%	13.64%
VaR, hist.distr. 99%	**7.77%**	14.43%	14.62%	2.85%	6.86%	14.89%

So, using the historical approximation of the return's distribution method to calculate VaR we can see that potential loss of Novy fund is approximately 7.7%. Monte-Carlo simulation shows bigger figure, i.e. 10%, but that is a bit misleading. The main problem is that the standard method to calculate the Monte-Carlo VaR is to use the normal distribution using the mean and a standard deviation from your returns. But as we mentioned before returns of the Novy fund represents the tailed distribution and is far from normal. In order to represent it let us show the QQ(Quantile-Quantile) plot. The idea is to plot the quantiles of the sample returns against the quantiles of the distribution used. If the returns truly follows the distribution, then the chart should be like straight line. Below for normality testing we will be using the normal distribution as a target.



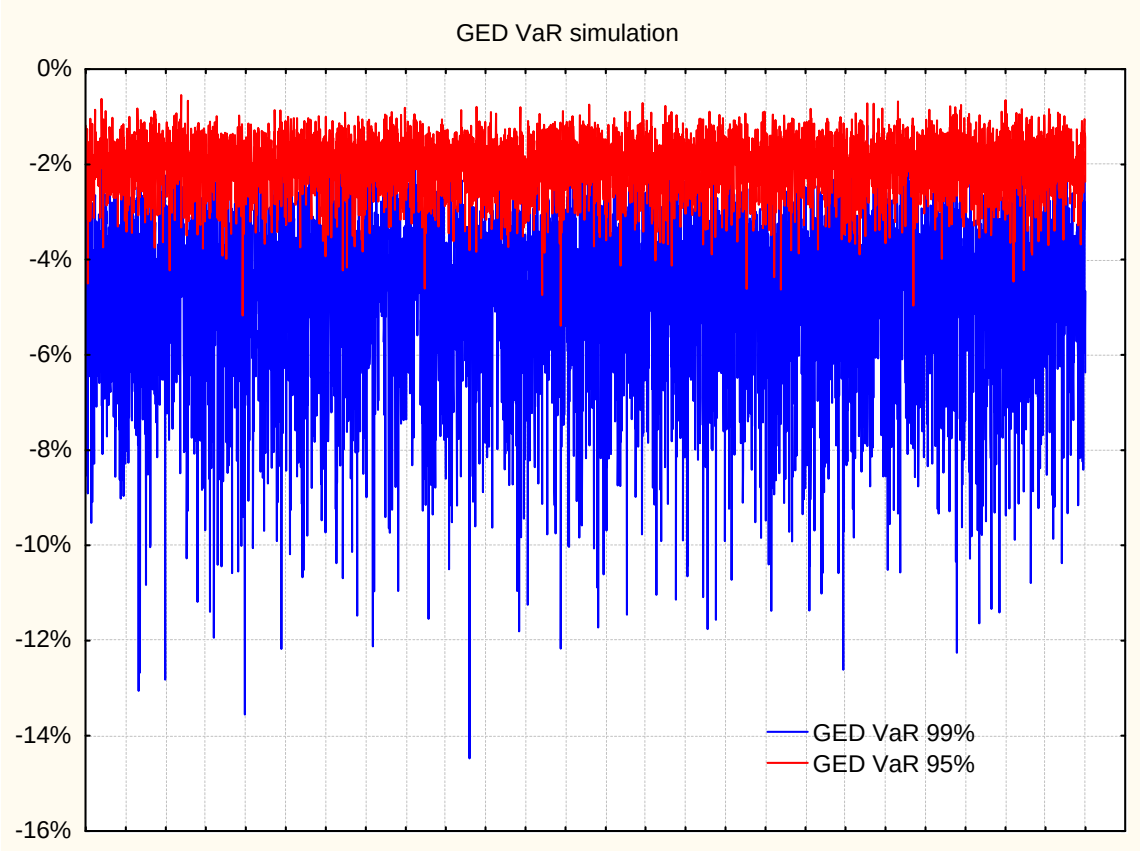
HEAVY TAILED VAR ANALYSIS

As it was shown earlier the standard method of estimating the VaR using the Monte-Carlo method is not describing the actual reality. Due to the non-normality of the fund's returns we used the heavy-tailed distribution called generalized error distribution (GED). The p.d.f. of the GED can be described by the following formula:

$$f(z)=\frac{\xi \exp\left(-\frac{1}{2}\left|z/\lambda\right|^{\xi}\right)}{\lambda 2^{1+\frac{1}{\xi}}\Gamma\left(\frac{1}{\xi}\right)};\lambda=\sqrt{\frac{2^{-\frac{2}{\xi}}\Gamma\left(\frac{1}{\xi}\right)}{\Gamma\left(\frac{3}{\xi}\right)}}$$

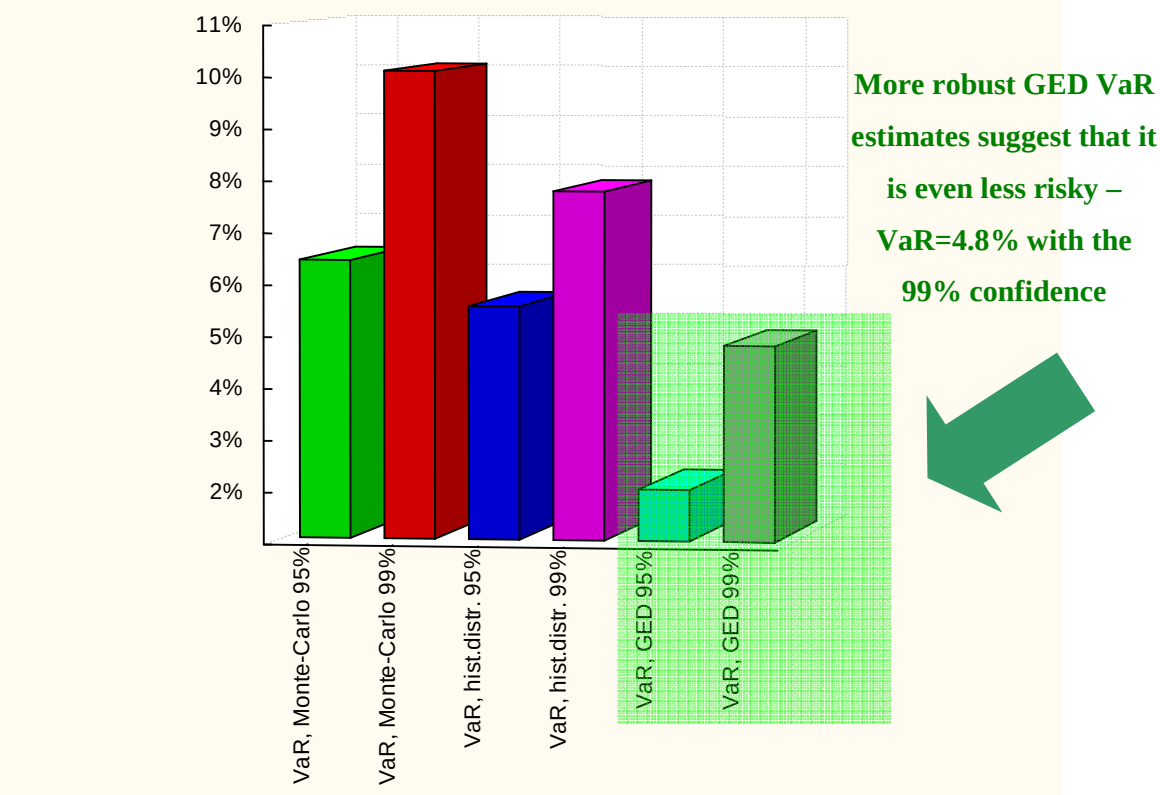
Where $\Gamma(\cdot)$ - gamma function, ξ - fixed parameter.

First we normalize the fund returns, then using the likelihood estimations we finding the optimal parameter ξ. By doing the numerical discrete optimization we found that in our case $\xi = 0.523$. After we determine the maximum value for the function $2f(y)e^{y}$ we started to generate the 10000 GED(0.523) random variables. Here is the chart showing bands of the simulated VaRs.

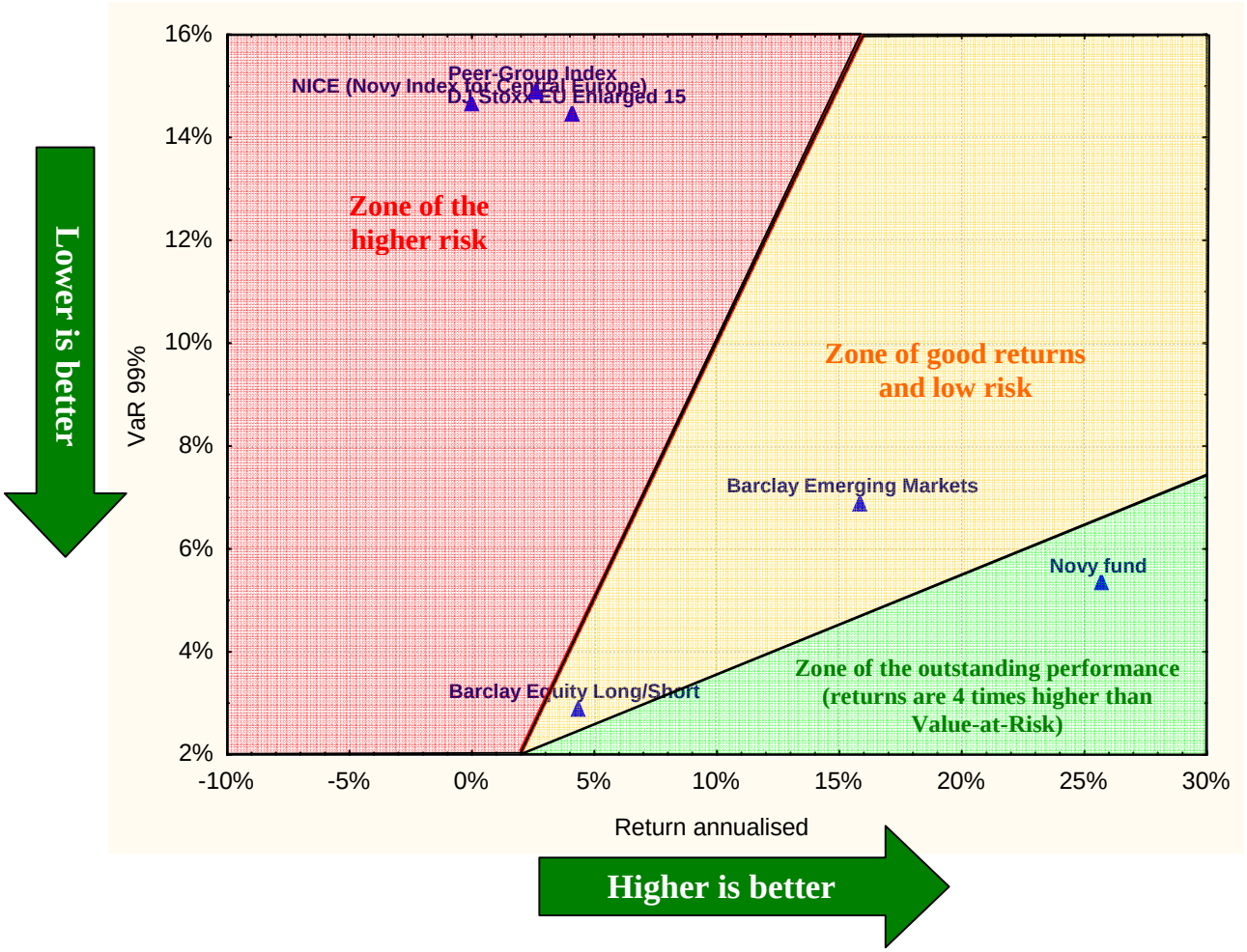


So as a true estimate of the VaR for Novy fund we are taking an average of the 10000 simulations of the heavy-tailed distribution approximation. True VaR 95% is 2.5 and true VaR 99% is 4.8 only. That finding is extremely important for the risk management. Usual VaR calculations is used for

the normal- non extreme cases scenario where the GED VaR is actually taking into account fat tails and more accurately predict the VaR. So one could see that heavy tailed analysis actually proved that risk characteristics of Novy are even smaller. Such a big difference between 95% confidence and 99% confidence is due to the heavy-tail characteristics of Novy returns. Here are different VaRs together:



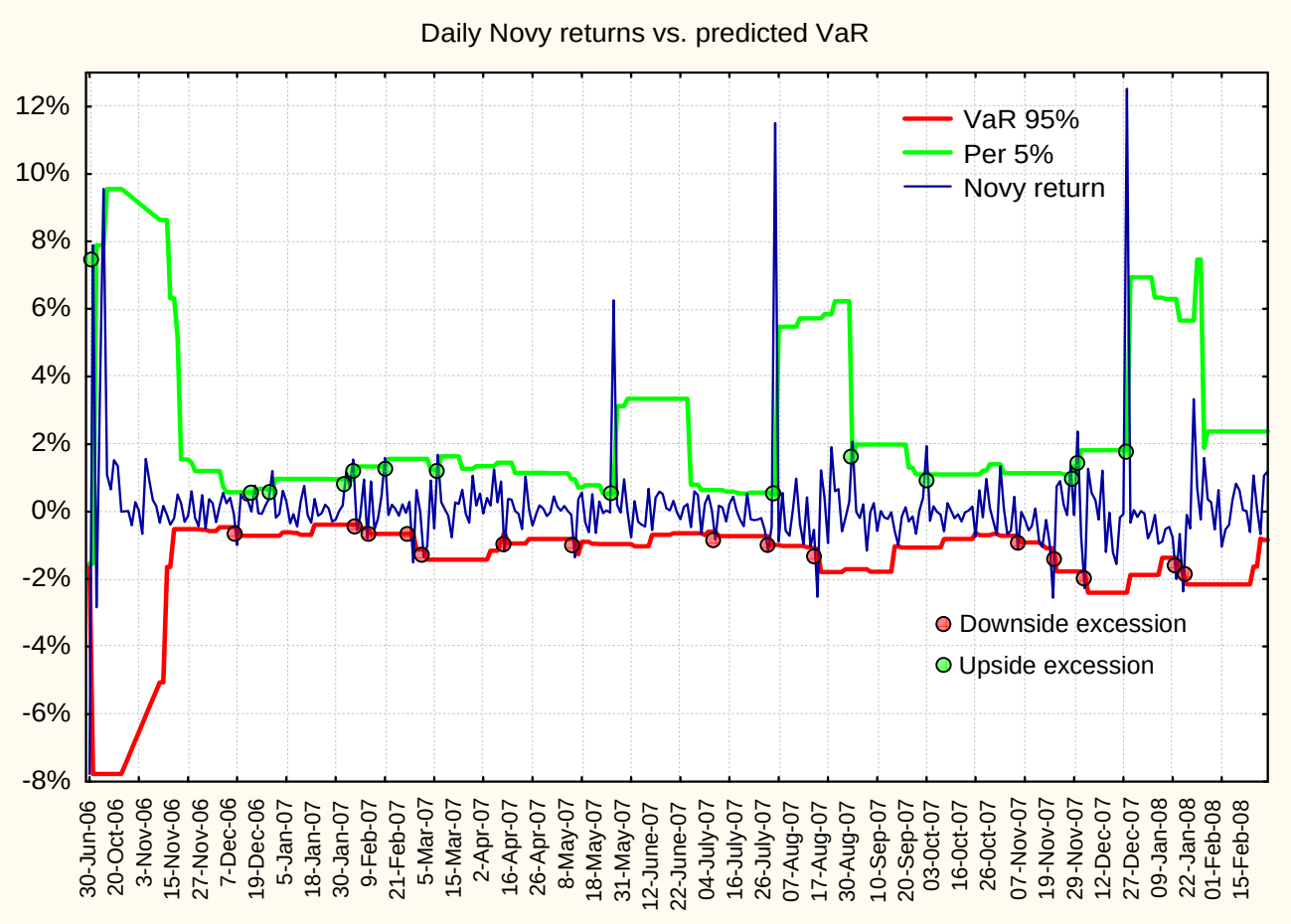
As a benchmark we are going to use the GED VaR 99% estimation as the most robust and proper estimate. In the following diagram let us show the comparative adjusted risk/profit diagram. On the vertical axes we will use VaR 99% and on the horizontal axes we will use annualized returns. Green area of that chart represents the preferable zone where profit is higher than risk and the red area represents the unwanted area where returns are lower than risk. Novy position at that chart is really steady – it is in the green zone and VaR level is 6 times lower than the annualized returns.



Novy fund relative performance showing that it is belong to the low risk and higher return area and that it outperform the benchmark and the peer-group.

PURE BACKTESTING OF VAR VS. ACTUAL RETURNS

In order to observe the forecasting power of the VaR estimates we are going to do the rolling backtesting. We will use daily Novy returns and will calculate one month rolling VaR 95%. We will use that VaR as a predictor for the risk taken and then will compare with the actual performance. Then we will record the number of excessions from the VaR confidence interval. For the downside excessions (which is the most important one) we are going to use the 95% VaR and 5% percentile we will use for the upside excessions since it will be more accurate estimator.



After analyzing the backtesting chart one could observe that the number of upside and downside excessions are 14 and 15 which is just 4.6% and 4.7% of expected 5% level. Observing that chart one could see as well that actual excessions are not significantly different to the rolling VaR and even being out of bend they basically represent the same risk characteristics. The only big difference is May, July and December performance where in one day fund made more than 6%, 11% and 12% and the last up spike was due to the reevaluation of AQ Okna. So one actually can regard that as a one upside excession and no dramatic downside excessions (at least more than 2%) for a year time.

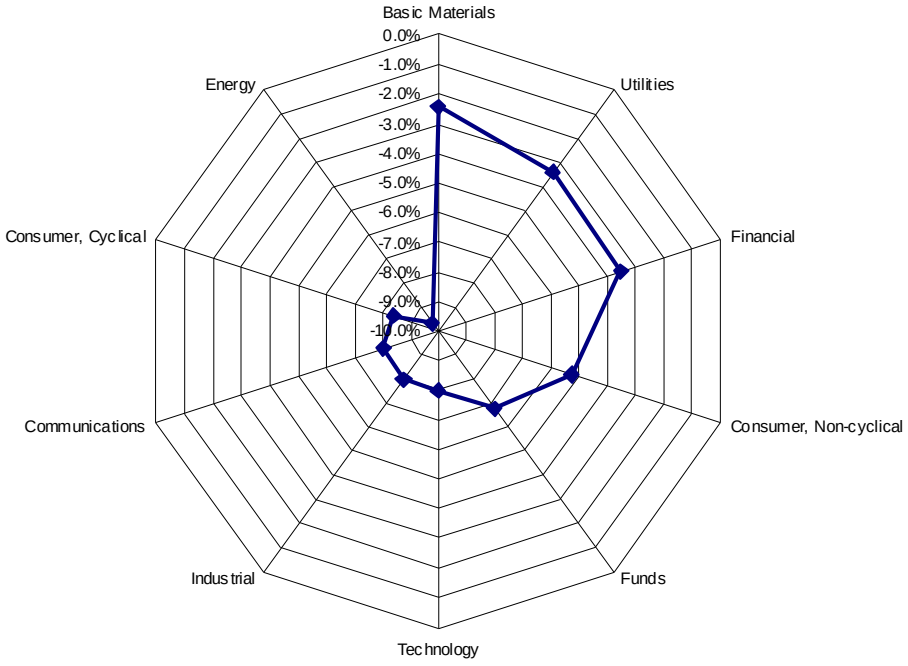
STRESS TEST

In this section we test how the Novy portfolio would perform under the different stress scenarios. We tested one month horizon. Here is the result of the worst scenarios, which could influence the portfolio.

Time horizon	1 week
Flight to Quality	-6.5%
Interest Rates Up 100 bps	-6.0%
Credit Rate Shock	-5.5%
Russian Ruble Devalues (August 2008)	-3.5%
Market Bounce, Sentiment Switch (3.14.2001 - 3.21.2001)	-1.5%

In the following table has the main description of each stress scenario.

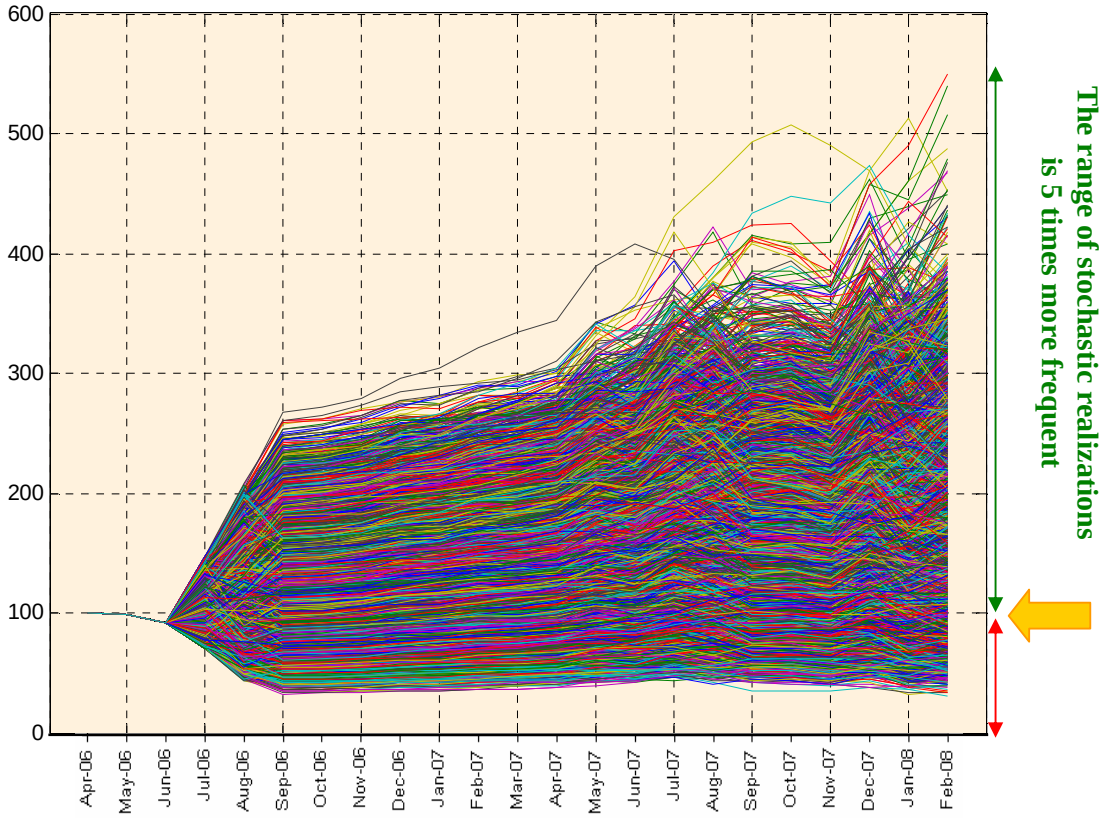
Flight to Quality
Representative of fear of global systemic failure resulting in equities down 10%, all credit spreads rising 100 bps, all AAA Sovereign rates 100 bps lower, all non-sovereign rates 100 bps higher, and exchange rates unchanged across all geographic regions.
Interest Rates Up 100 bps
Credit Rate Shock
Representative of an increase in yield of 100 bps for all spread products. No change in foreign exchange, equity or AAA sovereign bonds.
Russian Ruble Devalues (August 2008)
In August 1998, Russia announced the devaluation of its currency and temporary default on its government debt. Russian stocks fell by more than 35% while the ruble tumbled by more than 50%.
Market Bounce, Sentiment Switch (3.14.2001 - 3.21.2001)
This scenario displays the sharp change in sentiment that caused the TOPIX to rise dramatically -- 24% in seven weeks, following a 15-month 30% decline.



This is a typical example of a portfolio breakdown onto the sector components. This particular example is illustrating what will be influenced in case of the September 11 stress.

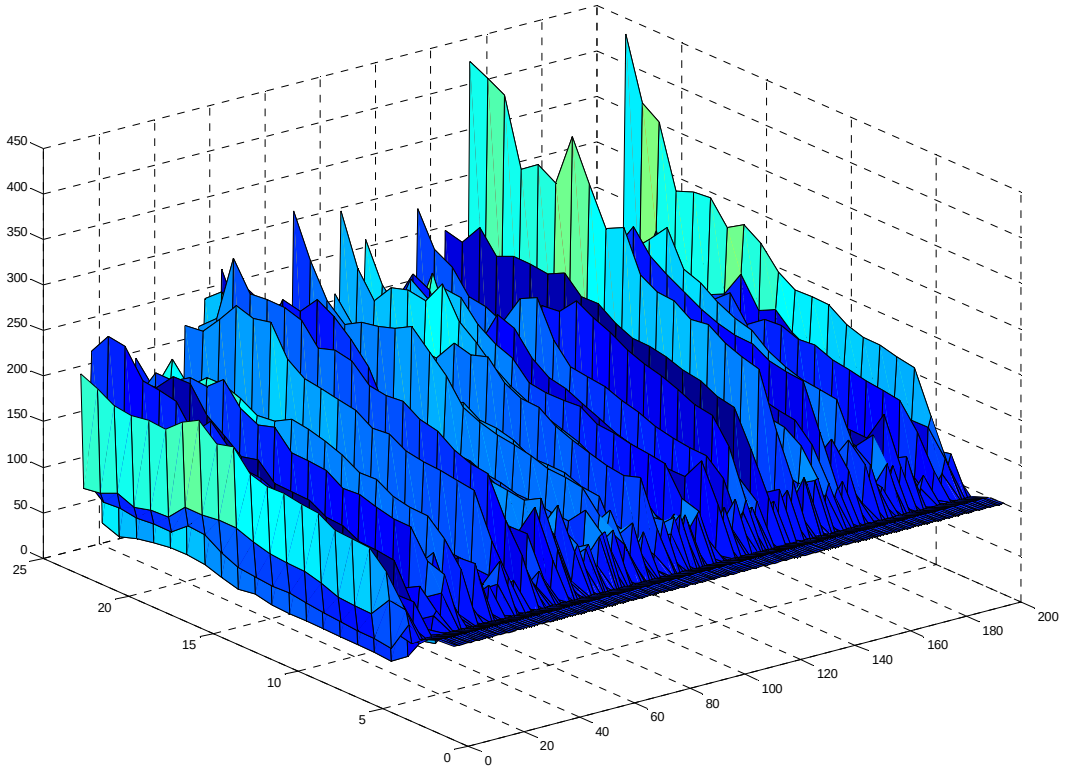
STOCHASTIC ROLLING STABILITY ANALYSIS. PORTFOLIO LEVEL

In order to check how the Novy would perform in the stochastic market environment we developed the rolling adaptive stochastic process applied to the time series and used it to apply the discrete white noise to the NAV of the Novy. That analysis could be the very important to find the potential stochastic bands and to approximate the worst-case and the best-case scenario.
The process could be described as following: fixing the rolling window, observe the sigma and mean, use the 3-sigma Chebishev rule in order to cover all potential stochastic realizations, generate N=1000000 stochastic process with the normal distribution (it is enough it here to use normal – although later we will use the stochastic approximation and choosing the type of the distribution – which will be really original and powerful in order to prove the forecasting power), record those realizations and compute N NAVs, iteratively repeat the same process. Analyze the produced NAV band describe the worst-case scenario.
In the following graph the result of that simulations are showing. We found that results are skewed to the up, despite the fact that distribution of the noise was symmetric and that all of them actually started from the drawdown period. The worst-case scenario is loosing approximately 55%, which is good.

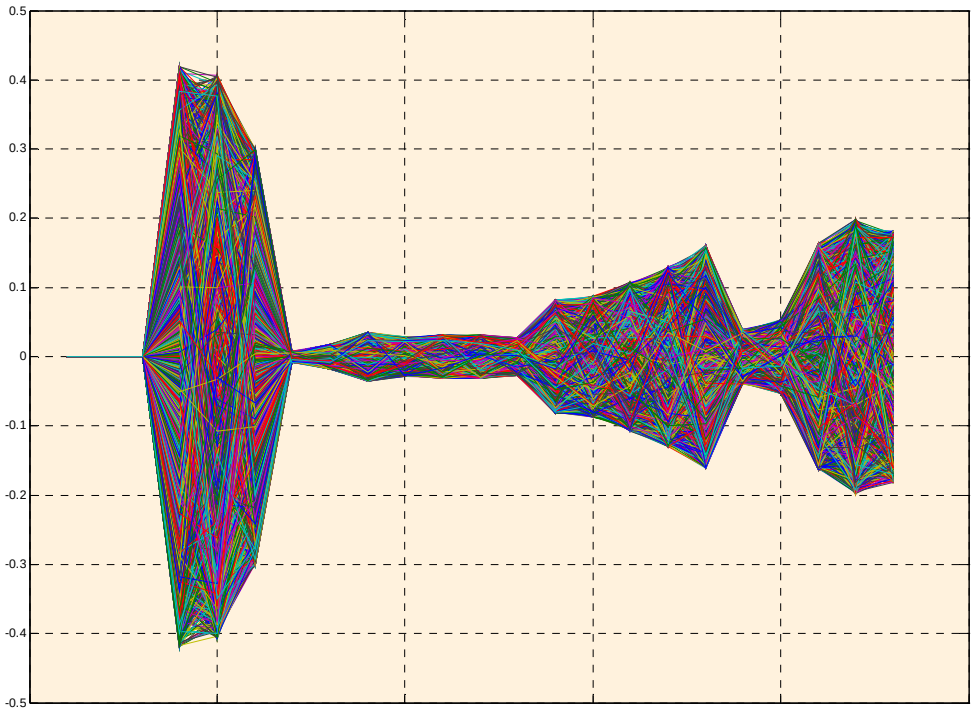


The interpretation of that chart is simple: if one would face the market uncertainty under wide risk range what is the worst and the best one could get? The lower line (ended up with 45) telling you that even in the worst scenario when every month within a year market will move against you, fund will not loose more than 55% for the entire fund existence. The upper line (ended at 550)

telling you that fund could earn 450%. Two hundred different NAVs are shown on the 3D diagram where each NAV's evolution can be viewed separately.



The stochastic simulation of white noise as a function of rolling volatility is shown on the following diagram.



APPENDIX. SOURSES EXPLAINING ALL FORMULAS USED IN THE REPORT

http://en.wikipedia.org/wiki/Histogram
http://en.wikipedia.org/wiki/Mean
http://en.wikipedia.org/wiki/Median
http://en.wikipedia.org/wiki/Standard_deviation
http://en.wikipedia.org/wiki/Skewness
http://en.wikipedia.org/wiki/Kurtosis
http://en.wikipedia.org/wiki/Percentile
http://en.wikipedia.org/wiki/Quantile
Alpha, beta, R^2 http://en.wikipedia.org/wiki/Linear_regression
p-value and F-statistic http://www.roguewave.com/support/docs/hppdocs/anaug/3-2.html
http://www.investopedia.com/terms/b/bollingerbands.asp
http://en.wikipedia.org/wiki/Cross-correlation
http://en.wikipedia.org/wiki/Sharpe_ratio
http://cisdm.som.umass.edu/research/pdffiles/omega.pdf
http://en.wikipedia.org/wiki/Sortino_ratio
http://en.wikipedia.org/wiki/Upside_potential_ratio
http://www.investopedia.com/terms/c/calmarratio.asp
http://www.andreassteiner.net/performanceanalysis/?Risk_Measurement:Absolute_Risk:Maximum_Drawdown
http://www.andreassteiner.net/performanceanalysis/?External_Analysis:Risk-Adjusted_Performance_Measures:Information_Ratio
http://en.wikipedia.org/wiki/Information_ratio
http://www.andreassteiner.net/performanceanalysis/?External_Analysis:Risk-Adjusted_Performance_Measures:Excess_Return_on_VaR
http://en.wikipedia.org/wiki/Security_market_line
http://en.wikipedia.org/wiki/Jensens_alpha
MM www.kelley.iu.edu/aukhov/Teaching/F303_Class_09.ppt
http://en.wikipedia.org/wiki/Value_at_risk
http://en.wikipedia.org/wiki/Quantile-Quantile_Plot