

ETF-Portfolio:
Analyzing an Allocation of the Camel-Strategy
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<http://www.godotfinance.com/>

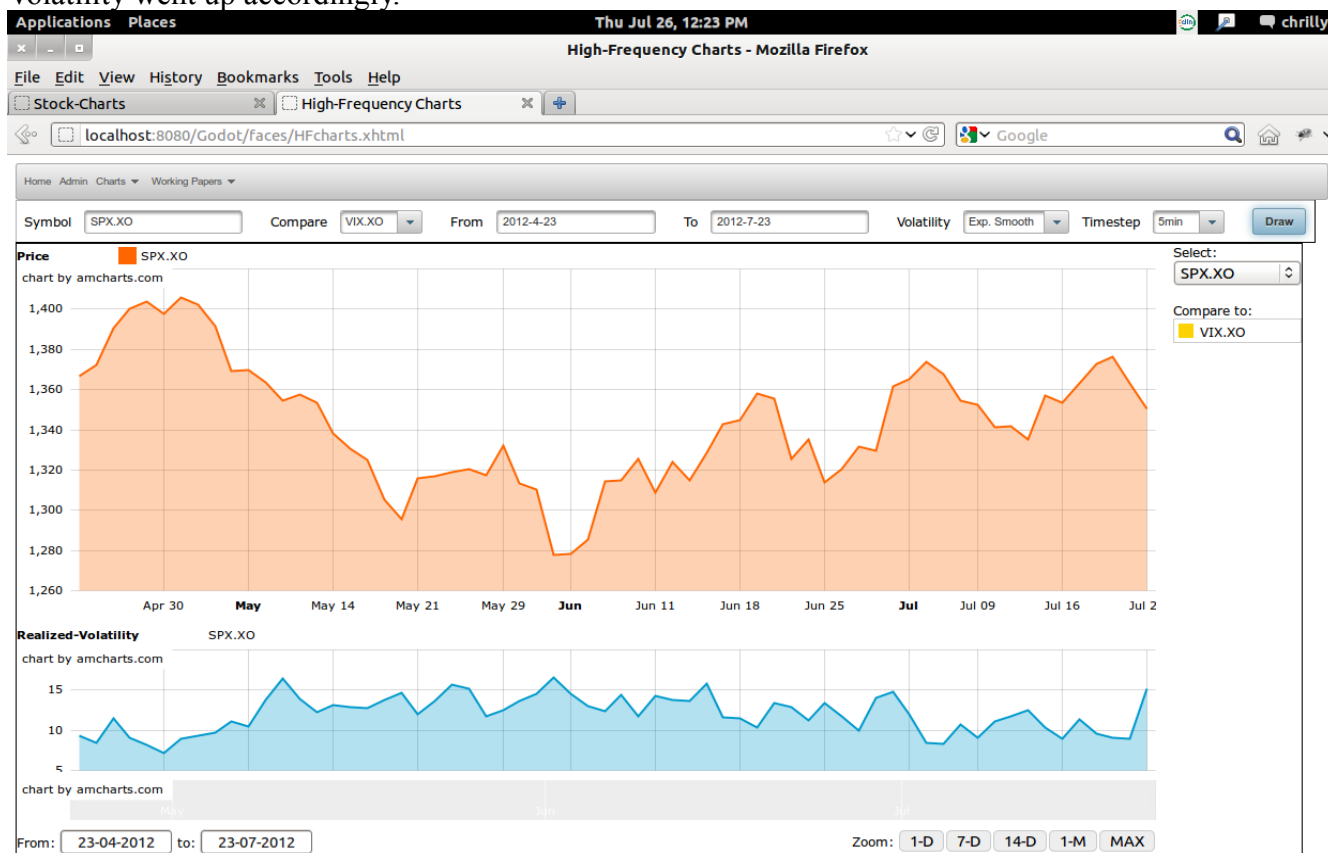
“A mathematician is a machine for turning coffee into theorems”
(Paul Erdős)

In [1] the Sibyl model for selecting an ETF-Portfolio is described. This working-paper gives an analysis of the model-results calculated at Thursday 2012.07.24. The calculation used the data up to Monday 23th. This portfolio was traded by the Sibyl-Trader Mohammad Sajid. The purpose of this analysis to provide a better understanding what the model is actually doing and which results can be expected by the Portfolio.

Revision-1 adds the latest HF-Performance-Data. The data are in agreement with the statistical-model.

The market-environment:

Graphic-1 shows the general market-environment during the last 3 months. The S&P-500 is in a sideways movement. The realized-volatility (bottom-panel) is in a medium range. The same holds for the VIX. Due to fresh Euro-fears the S&P declined considerable on Friday 20th and Monday 23th. Volatility went up accordingly.

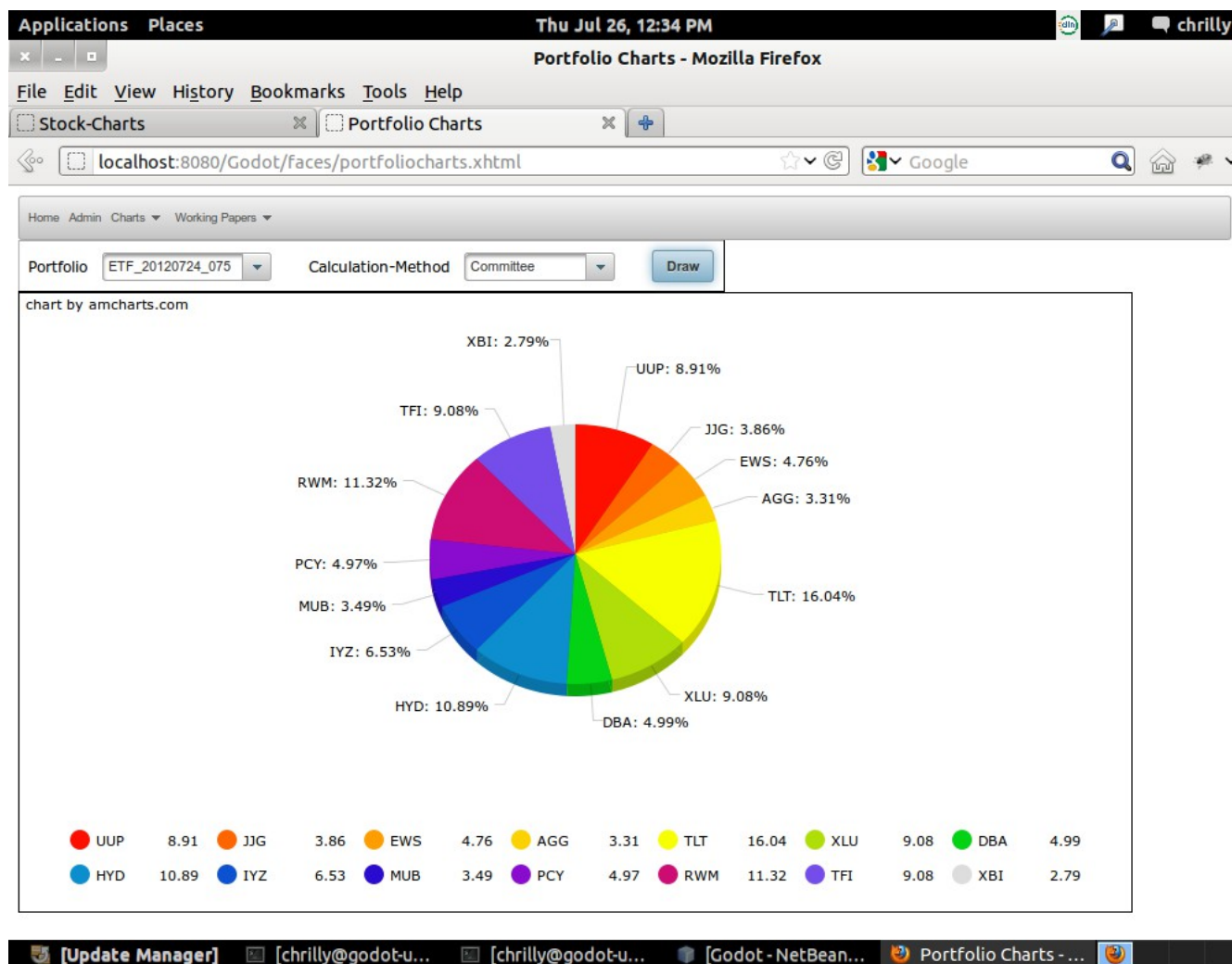


Graphic-1: S&P-500 from 2012.04.23 to 2012.07.23. Blue chart is realized Volatility.

Note: The realized-Volatility is calculated with 5-min High-Frequency data. The calculation is done with a sliding exponential-smoothing method. The overnight return is included in the volatility-measure.

The calculated Portfolio:

Graphic-2 shows the calculated portfolio. The weights of the highly correlated municipal bonds TFI and MUB were summed up and only TFI was traded with a weight 12.60%. Selecting very similar assets is a consequence of the Camel-approach. Some committee-members prefer TFI others MUB. It's the task of the human to recognize such effects. For a description of the symbols see table-1. The traded weights differ slightly from the values show in graphic-2 (see table 2).



Graphic-2: ETF-Portfolio at 2012.07.24 with minR=0.75%

Stock related assets are EWS, XLU, IYZ, XBI and RWM. But RWM is an inverse ETF. DBA and JJC are (agriculture-) commodities. AGG, TFI are Bonds. TLT and PCY are treasuries. UUP is the FX related ETF.

Symbol	Description	USA	Sector
AGG	US graded bonds	Yes	Bond
DBA	PowerShares DB Agriculture	No	Commodity
EWS	iShares MSCI Singapore Index	No	Stock-Index
HYD	Market Vectors High-Yield Muni ETF	Yes	Bond
IYZ	iShares Dow Jones US Telecom	Yes	Industry-Sector
JJG	iPath Dow Jones UBS Grains	Yes	Commodity
MUB	iShares S&P National AMT-Free Muni Bond	Yes	Bond
PCY	PowerShares Emerging Market Sovereign Debt	No	Treasury
RWM	ProShares Short Russel 2000	Yes	Short-Index
TFI	SPDR Nuveen Barclays Capital Muni Bond	Yes	Bond
TLT	iShares Barclays 20+ Treasuries Bond	Yes	Treasury
UUP	Power Shares DB US Dollar Index Bullish	Yes	FX
XBI	SPDR S&P Biotech	Yes	Industry-Sector
XLU	Utilities Select Sector SPDR	Yes	Industry-Sector

Table-1: Symbol-Description

The Analysis-Model:

For the Analysis one calculates the market alpha and beta according formula (1). The market is represented by the S&P-500 index.

$$R_{ETF}(t) = \alpha + \beta \cdot R_{SP500}(t) \quad (1)$$

$R_{ETF}(t)$ is the daily-return of an ETF at time-t.

$R_{SP500}(t)$ is the daily-return of the S&P-500 at time-t.

If e.g. $\beta=0.5$ a 1% change of the S&P would trigger (in the mean) a 0.5% change in the ETF.

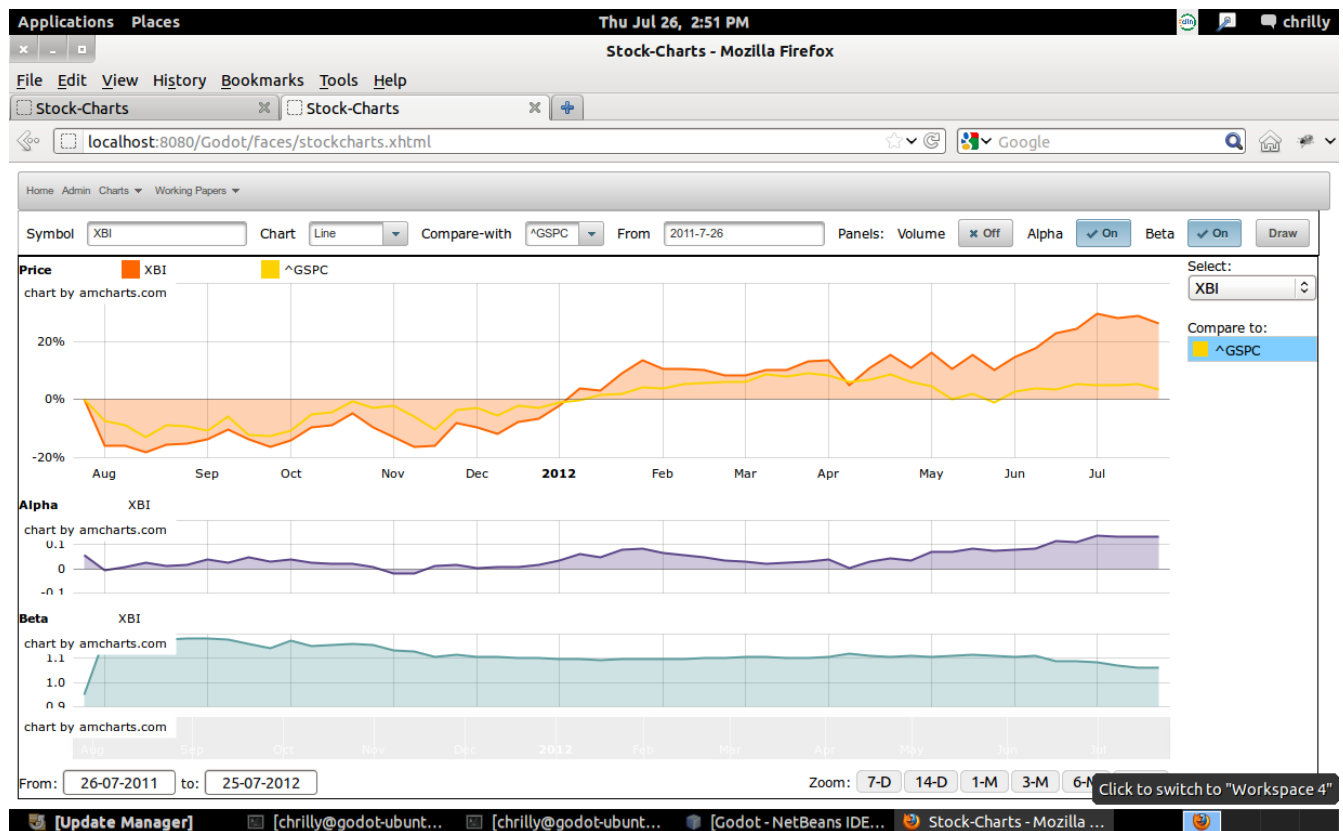
Stocks and commodities have usually a positive beta. The float with the market-tide. US-Treasuries and Bonds have a negative-beta. But the size of beta varies considerable. Bonds are typically much less volatile than the S&P. A 1% change in the S&P is nothing special. A 1% change in a Bond index is in contrast quite dramatic. Hence the absolute value of beta is rather small (see table-2)

The relation between assets and the market varies over time. It depends on the market-environment and trader-sentiment. Hence it makes not much sense, to compute the linear-regression over the whole time-period. For the analysis a time-window of 1 year was used. Additionally more recent returns have a greater weight than distant ones. In technical terms, one uses a weighted linear-regression with an Epanechnikov-Kernel.

Graphic-3 shows alpha and beta for XBI (Biotechnology) within the last year. Beta is somewhat greater than 1. Biotechnology has a higher volatility than the S&P. But beta is decreasing over time. Alpha increased in the last months. Biotechnology outperformed the S&P. Hence Alpha goes up. Volatility is decreasing for upwards trending assets. For this reason beta showed a declining tendency.

Table-2 shows the detailed calculation. The value for Alpha are Daily>Returns in %. The value of 0.124 for TLT means, that TLT wins per day in the mean 0.124% more than the S&P. The beta entry of -0.70 means, that TLT goes additionally up by 0.7% if the S&P falls by 1%. And it falls by the same amount, when the S&P rises with 1%. All the numbers are of course only valid for the (recent-) past. There is additionally the usual noise-component of any linear regression. The daily returns will usually deviate from this relation. In the next column are the weighted Alpha values. The sum of this column is the

Alpha of the portfolio. The value is 0.052% per day. The next two columns are the beta and the weighted beta. The sum of the weighted-columns is the overall beta of the portfolio. According these calculation the portfolio has a small negative beta of -0.08 to the S&P. It should perform slightly better when the S&P goes down. But in first approximation it is almost market-neutral.



Graphic-3: Alpha- and Beta of XLU from 2011-07-26 till 2012-07-25

Symbol	Weight	Alpha	W-Alpha	Beta	W-Beta
UUP	8.93%	+0.041	+0.0037	-0.29	-0.0259
JJG	3.78%	+0.151	+0.0057	0.38	+0.0144
EWS	4.81%	+0.006	+0.0003	1.10	+0.0529
AGG	3.33%	+0.029	+0.0010	-0.08	-0.0027
TLT	16.01%	+0.124	+0.0199	-0.70	-0.1121
XLU	9.08%	+0.041	+0.0037	0.46	+0.0418
DBA	4.94%	-0.022	-0.0011	0.35	+0.0173
HYD	10.90%	+0.073	+0.0080	-0.01	-0.0011
IYZ	6.54%	-0.003	-0.0002	0.84	+0.0549
PCY	4.94%	+0.060	+0.0030	0.13	+0.0064
RWM	11.35%	-0.011	-0.0012	-1.33	-0.1510
XBI	2.77%	+0.131	+0.0036	1.06	+0.0294
TFI	12.60%	+0.042	+0.0053	-0.06	-0.0076
Portfolio			0.052		-0.0832

Table-2: Weights, Alpha and Beta.

The portfolio value is almost independent from the market (S&P-500) movement. It moves with a (mean) daily rate of 0.052% up. This is 13.8% a year.

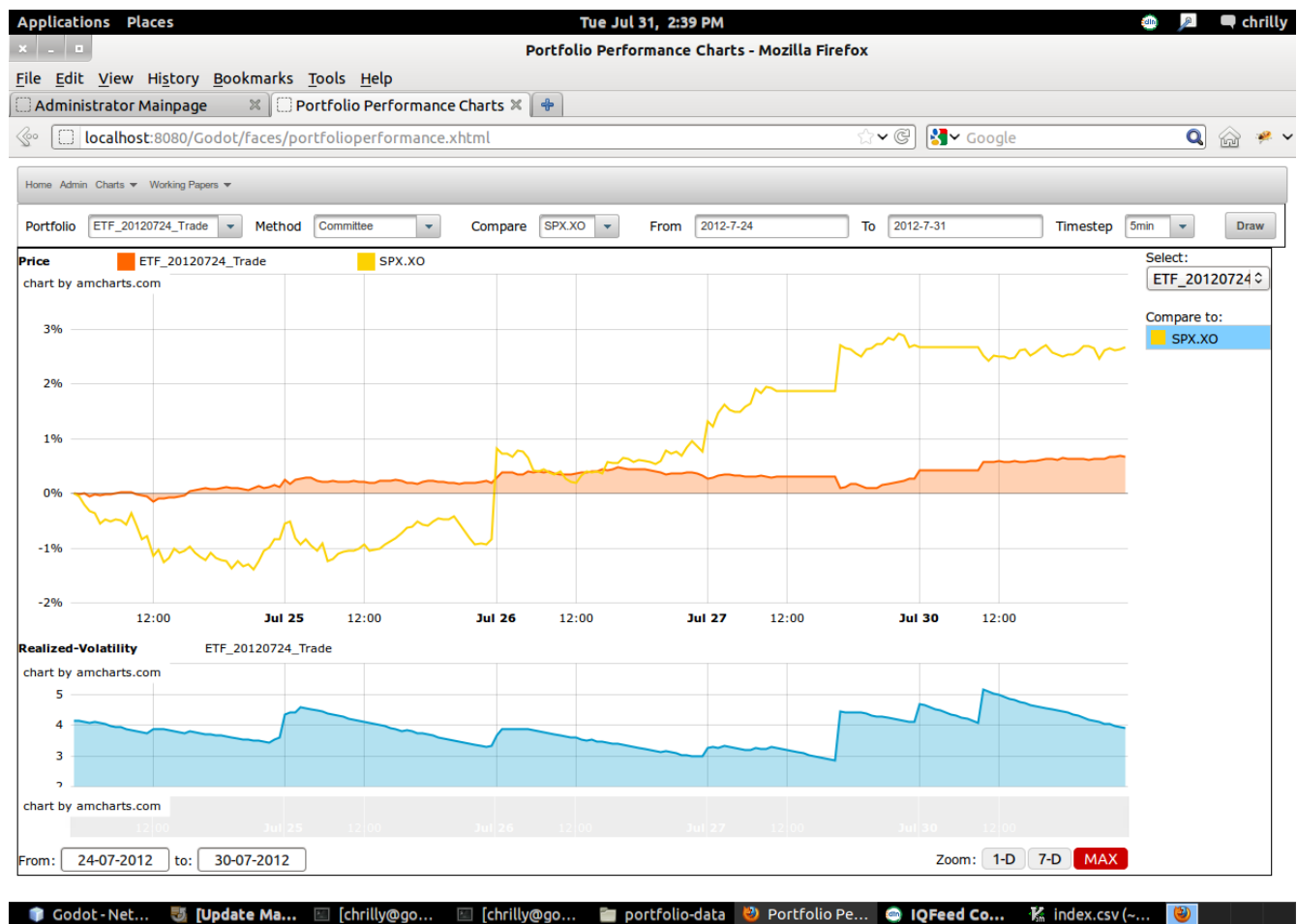
There is of course no guarantee that past performance can be extended linearly to the future. Alpha and Beta can change. The model is also only a first approximation. The relation between the market and assets is non-linear and asymmetric. But more sophisticated models show usually only a better fit for the past. They are not superior forecasters.

Empirical Behavior:

At least in the first 2 trading days the portfolio behaved almost perfectly according plan. The S&P declined by -0.89% on the first day. The Portfolio went up by 0.10%. On the second day, the S&P made a minor plus of 0.02%. The Portfolio went up by 0.09%. I have also watched the behavior during the trading-day. The relation was even valid for small time-steps. If e.g. the positive beta XLU went up, TLT went down and the other way round. After some time one can even forecast (in ones head) from a few assets the movements of the other ones.

It seems that the portfolio-optimizer has found in a sideways moving and very unclear market a relative conservative and solid strategy. To a certain extend is the Portfolio just a tricky way to replicate the performance of the Municipal Bonds HYD. Alpha and Beta are at least quite similar. It is an open question, if it would be better to by HYD or select the portfolio. The portfolio approach is in general certainly more flexible. On can react to changing market-conditions.

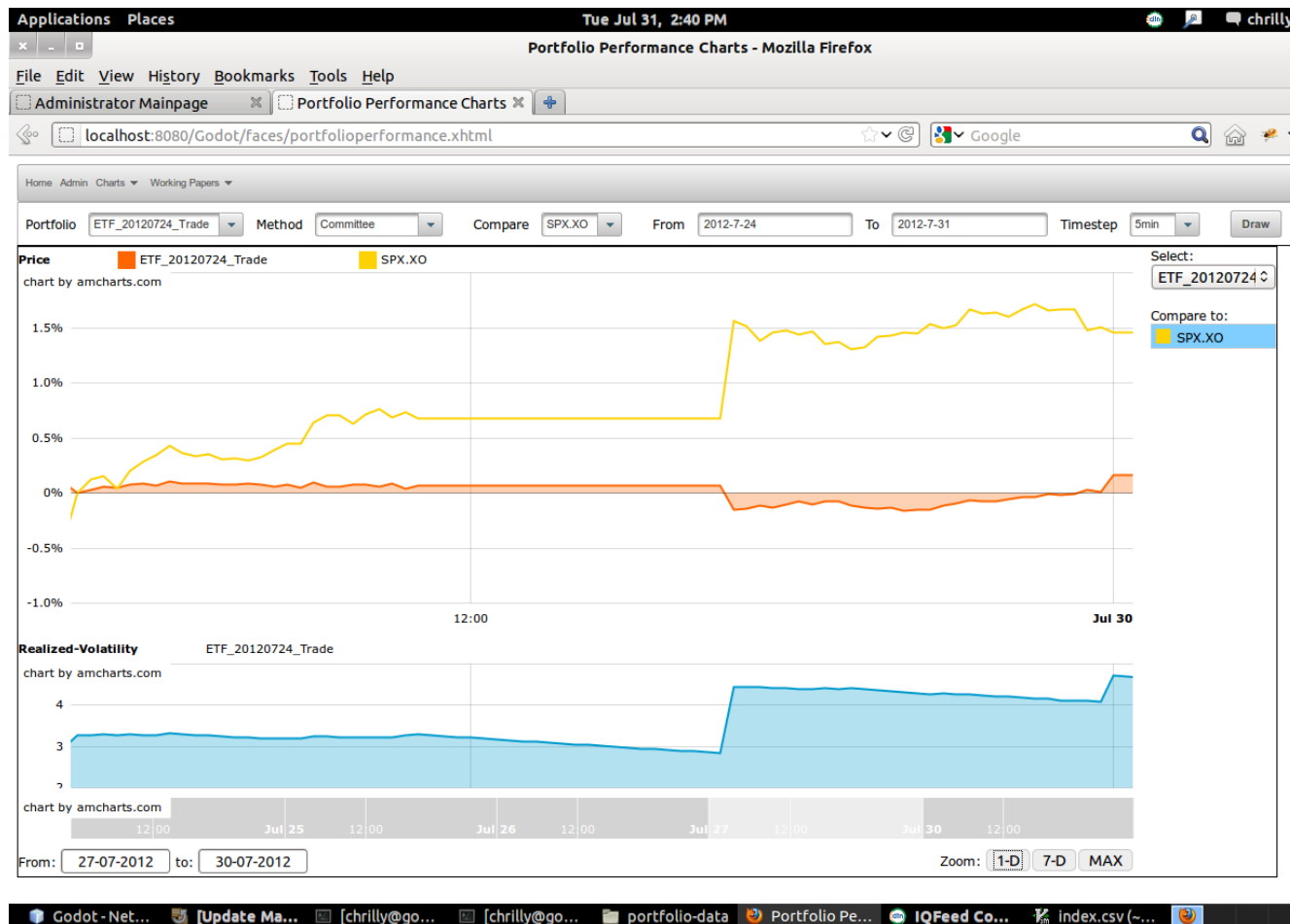
Revision-1: Update Empirical-Behavior:



Graphic-4: HF-Portfolio-Performance 2012.07.24 to 2012.07.30

The orange-line in Graphic-4 shows the High-Frequency Portfolio-Performance. The yellow line is the S&P-500. Markets fell slightly on Tuesday, Wednesday. Sentiment was upbeat on Thursday and Friday after an announcement of ECB head M. Draghi. The S&P went sharply up. On Monday 30th the market moved sideways. Draghi mania was over.

The Portfolio moved generally steadily up, but it lost somewhat at the sharp upwards-spike on Friday. (Graphic-5)

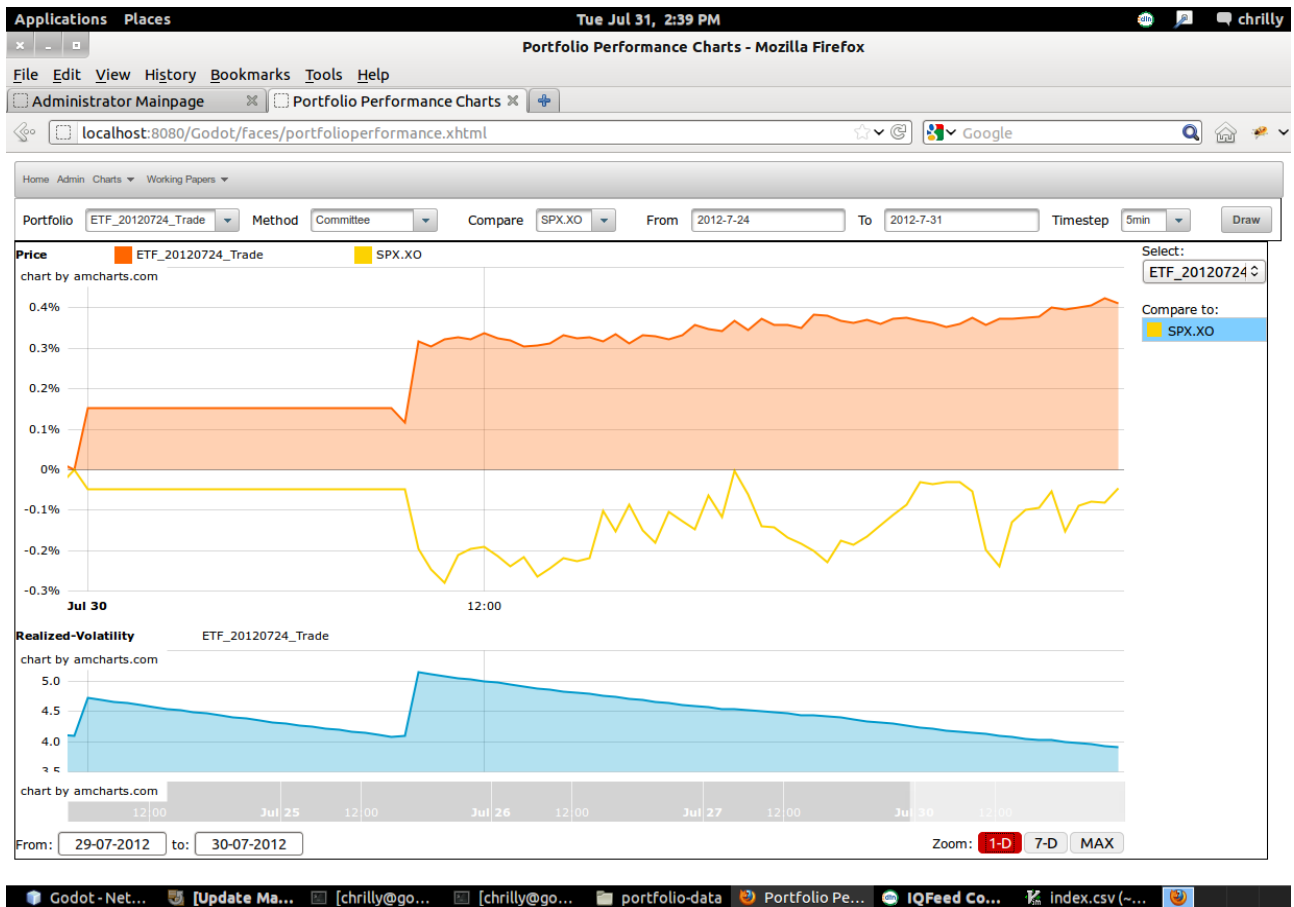


Graphic-5: HF-Portfolio-Performance on Friday 2012.07.27 (orange). Yellow is S&P-500.

On Monday it was the other way round (Graphic-6). This clearly demonstrates the slight negative beta of the Portfolio. It can be discussed, if a slight negative beta is a good idea. But on the positive side the Portfolio behaves so far according plan.

The bottom-panels in Graphic-4 to 6 show the realized volatility of the Portfolio. The volatility is calculated by the HF-Data. The overnight-return is included. The realized-volatility of the portfolio is between 3 and 4.

The realized volatility of the S&P-500 is about 4-times larger. The volatility of the bond HYD is about 5. The Portfolio outperforms so far HYD.



Graphic-6: HF-Portfolio-Performance on Monday 2012.07.30 (orange). Yellow is S&P-500.

References:

[1] Ch. Donninger: ETF-Portfolio-Construction: The Camel-Strategy, Sibyl-Working-Paper, September 2011, Revised Version 2012.07.19