**Lovers by night, strangers by day?**
**An investigation of simple Overnight Trading Strategies.**
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*Darling hold my hand*
*Let me know that you understand*
*That til I'm free*
*From the girl who loves me*
*We must be secretly*
*Lovers by night, strangers by day*
*Til the time you can be in my arms endlessly*
*Lovers by night, strangers by day*
(The Fleetwoods: Lovers by night, strangers by day. www.youtube.com/watch?v=51WbzRAfn9Y)

## Abstract:

This working paper investigates the claim of several publications ([1],[2] and the references herein) that most of the gains of stocks and stock-indexes are realized overnight. Additionally it is stated there is less volatility overnight than intraday. One gets with less risk more fun. But the data are in both studies outdated. This working-paper investigates if the effect still exists and if one can exploit it with a realistic trading strategy.
The effect is still there, but less pronounced than stated in the older literature. The study reveals an interesting stylized fact. Overnight returns are positive correlated with market turmoil. Without trading costs one could implement a very simple and attractive trading strategy. Under realistic assumptions trading the S&P-500 E-mini futures is clearly worse than buy&hold of the ETF SPY. The Nasdaq-100 E-mini are a more promising choice.

## The Day- and Night-Puzzle:

According to [1] practically all the profits in stock-markets are realized overnight. The intraday returns are at its best break-even. The paper was published in September 2008. The considered time range is from 1993 till 2006. I have always some doubts if someone presents – without further explanation – results which end long before the publication date. The data in the Sibyl-working papers have usually a lag of 1-2 trading days.

In [2] the difference is for S&P-500 E-mini with 0.015% daytime- and 0.026% overnight-returns not very spectacular. But the overnight returns have a considerable smaller variance (0.578 to 0.275) and especially a positive skew. The picture is different (and in agreement with [1]) for the Nasdaq-100. The relation between intraday and overnight returns is –0.008% to 0.071%. The variance is overnight also much smaller and the skew is positive. [2] was published in 2012, the data are from 2004-09-01 till 2005-08-31 (SMH aka Shaking my Head).

Graphic-1 shows the distribution of the S&P-500 E-mini ES in the last 4 years. The mean return is with 0.029% (intraday) to 0.031% (overnight) almost equal. The overnight distribution is trim and less skewed to the left. But it should be noted that the overnight returns have also a negative skew. The returns are measured according the normal trading hours from 9:30 to 16:00.

The difference is more pronounced for the Nasdaq-100 E-mini NQ.  The mean return is 0.023% (intraday) to 0.055% (overnight). The variance is smaller. But the skewness is about the same.
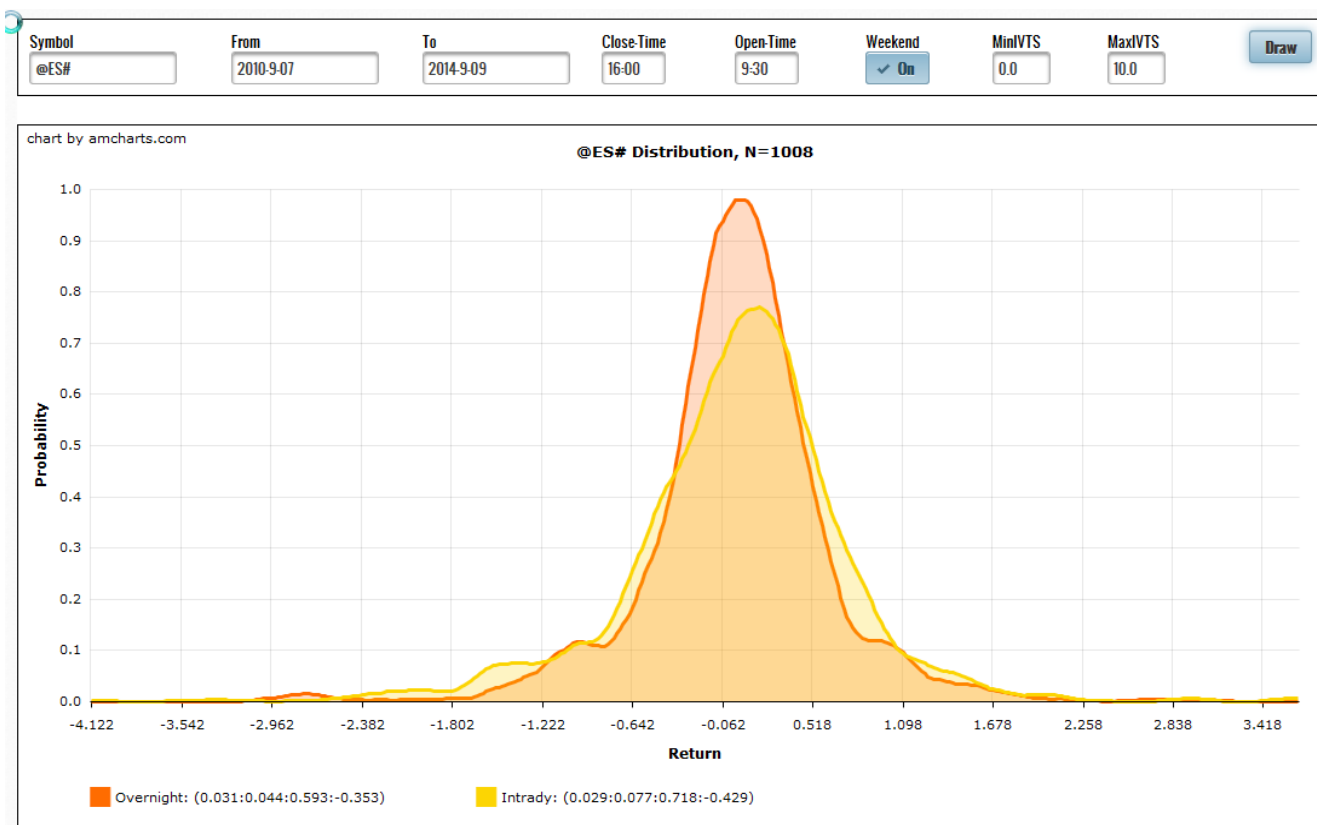
Graphic-1: Distribution of Returns for ES. Overnight (red), Intraday (yellow) from 2010-09-07 till 2014-09-09
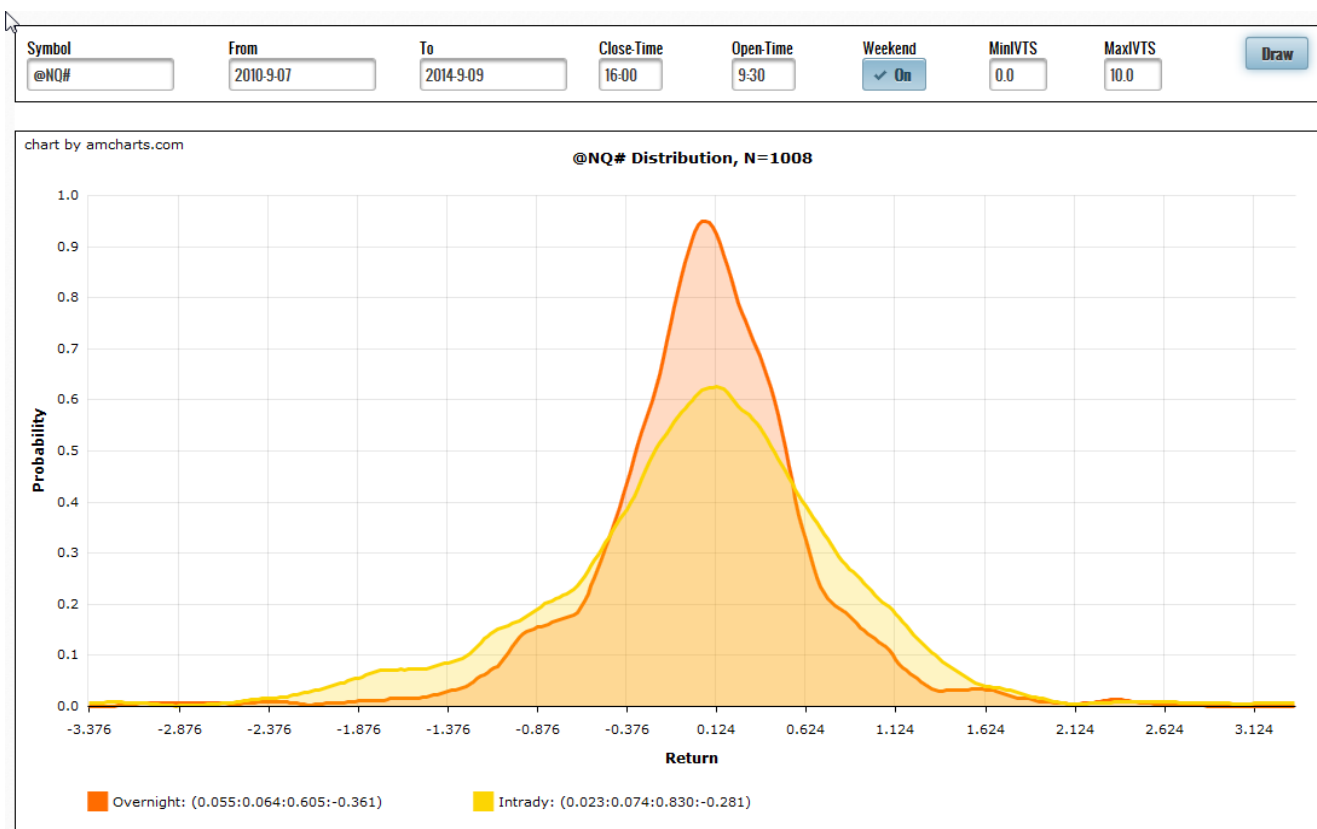


Graphic-2: Distribution of Returns for NQ. Overnight (red), Intrady (yellow) from 2010-09-07 till 2014-09-09

## The IVTS-Puzzle:

The implied volatility term structure (IVTS) was developed and applied with good success in several previous working papers (see [3], [4]). The IVTS is defined as the quotient of the 1-month VIX to the 3-month VXV implied volatility index.

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IVTS(t) = VIX(t)/VXV(t)    (1)
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The IVTS is an indicator of market-regimes. A low value (<=0.93) indicates a quiet bull-market. A value larger than 1.0 marks the inversion of the usual contango of the implied volatility. This happens only in times of troubles. The VIX explodes faster than the VXV. Returns are hence negatively correlated with the IVTS.

This is not true for the overnight returns. There is a slight positive correlation. The yellow line in Graphic-3 shows an OLS regression between the IVTS on the x-Axis and the overnight returns on the y-Axis. The green line is the robust Theil-Sen estimator. Both lines have a positive slope. Pearsons-R is 0.057. The IVTS is measured at 16:00. The Nasdaq E-mini show exactly the same pattern (Graphic-4).
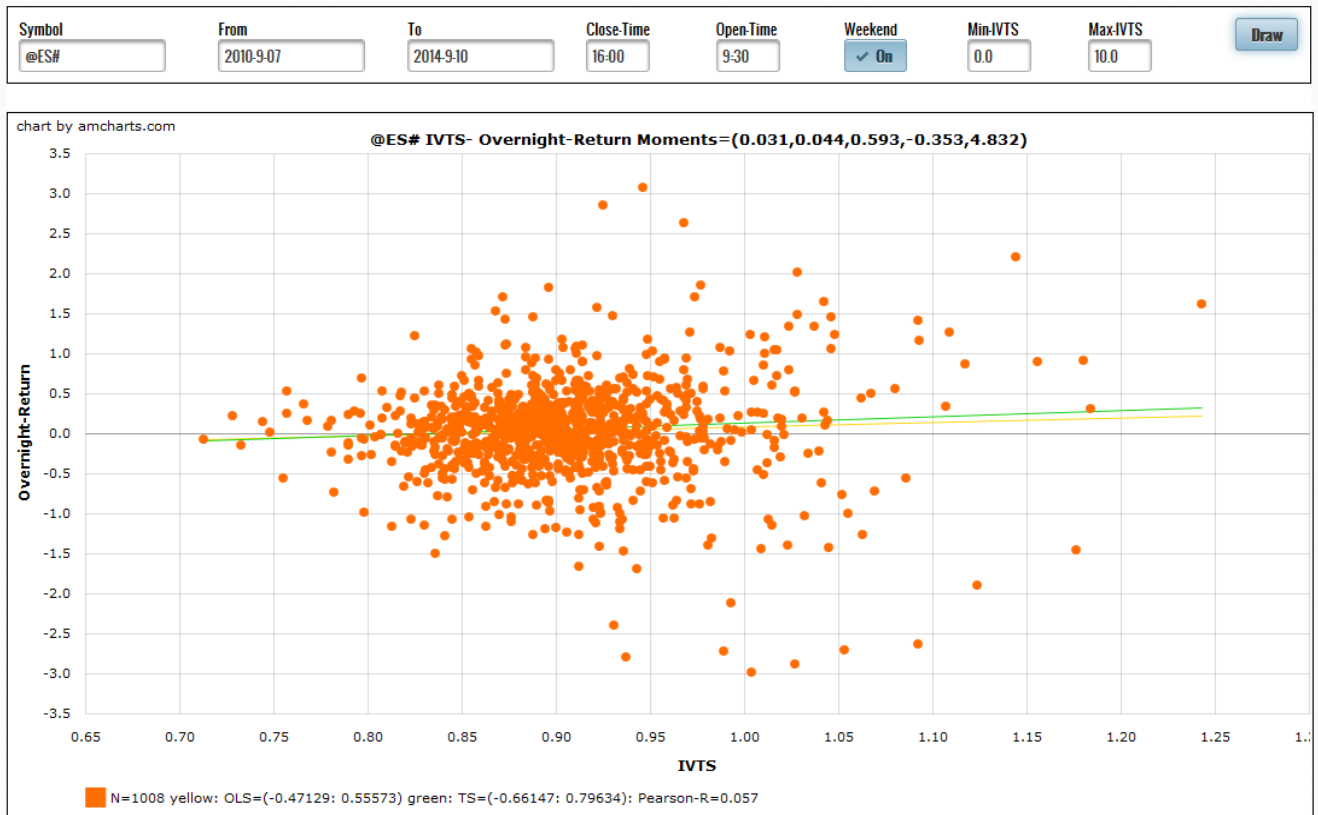
Graphic-3: x-Axis: IVTS, y-Axis: ES Overnight-Return 2010-09-07 till 2014-09-09
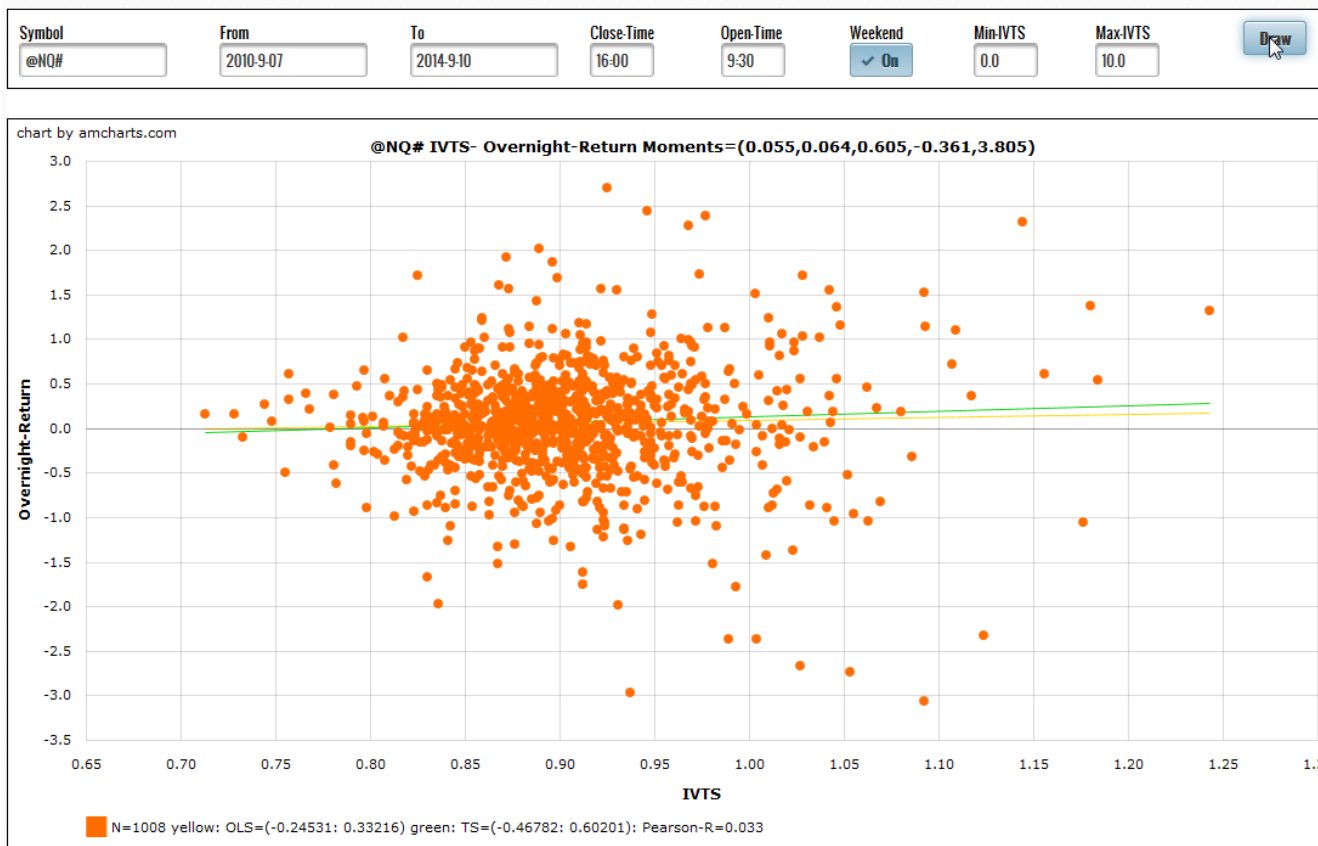
Graphic-4: x-Axis: IVTS, y-Axis: NQ Overnight-Return 2010-09-07 till 2014-09-09
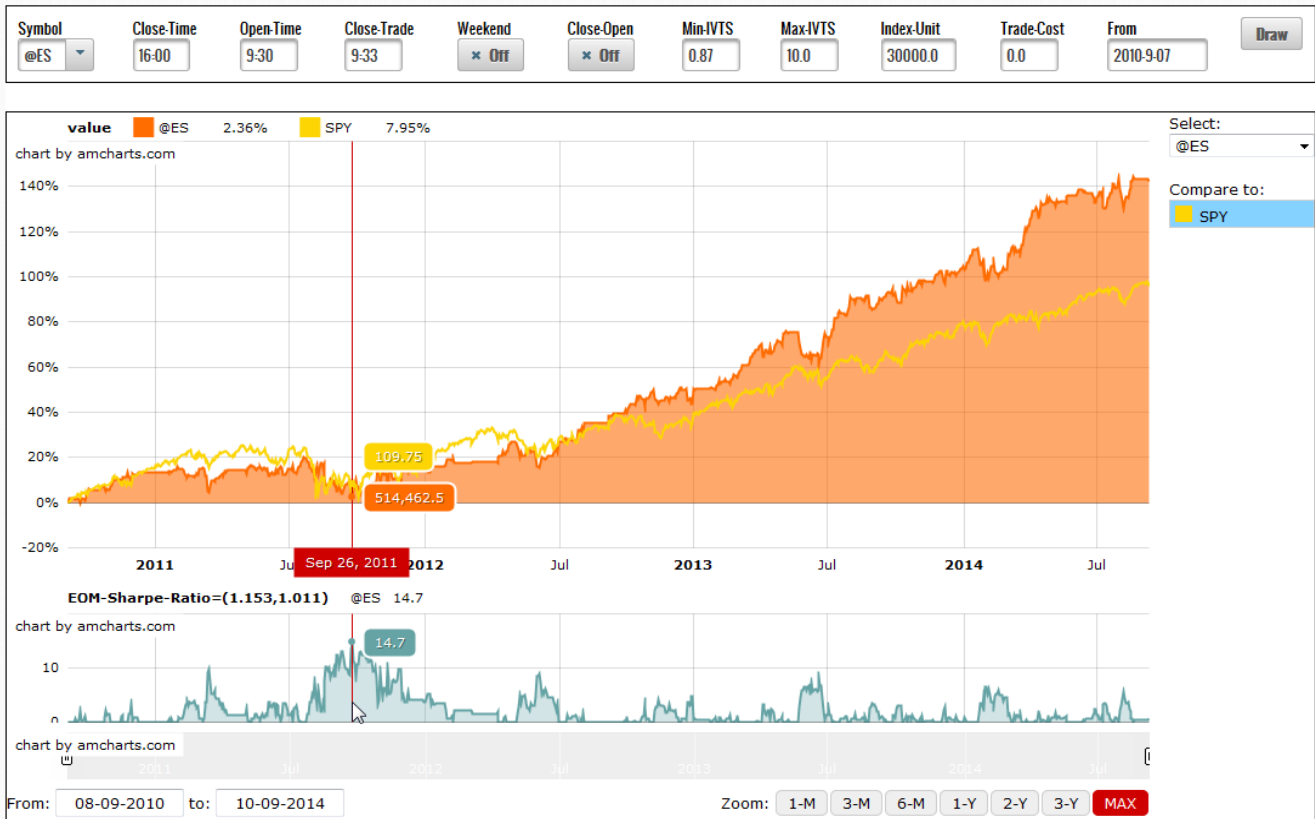
## Overnight-Trading:

The performance of a very simple lovers by night, strangers by day trading strategy can be seen in Graphic-5. One buys ES E-mini futures at 16:00 and holds them overnight. The the IVTS must be above 0.87. An IVTS below 0.87 indicates a very quiet market. One avoids the trades on the far-left in Graphic-3. Additionally one does not enter the position on Friday. One avoids the so called weekend effect. The index is initially at 500.000$. One trades 1 E-mini future long for each 30.000$ of the index. The same settings were used in [4]. One can compare directly the performance with these intraday strategies. The results are for the last 4 years from 2010-09-07 till 2014-09-09.

There is a fine twist for closing the position at the next morning. If the overnight return is negative, one closes the position immediate at the open at 9:30. But if the return is at this time positive, one keeps the position for another 3 minutes till 9:33. It was shown in [4] and [5] that the overnight momentum is continued a short time after the open. This rule exploits this effect. One could close a loosing position already before 9:30. But this does not improve the overall result.

This simple strategy clearly beats the SPY. The overall win is 143.2% to 97.3%. The Sharpe-Ratio is 1.153 to 1.011 and the max. relative drawdown is 14.7% on 2011-09-26 to 18.6% of the SPY. Graphic-6 shows the performance for the Nasdaq-100 E-mini NQ. The final win is 208.0% to 126.7% of the ETF QQQ. The Sharpe-Ratio is 1.224 to 1.051 and the max. relative Drawdown is 14.1% to 16.1%. There is no negative weekend effect in the considered time-range. One trades also on Friday.

The results are too good to be true. This is indeed the case. The calculations assumed zero trading costs.

Graphic-5: Overnight-Trading ES (orange) and SPY buy&hold (yellow) from 2010-09-07 till 2014-09-09
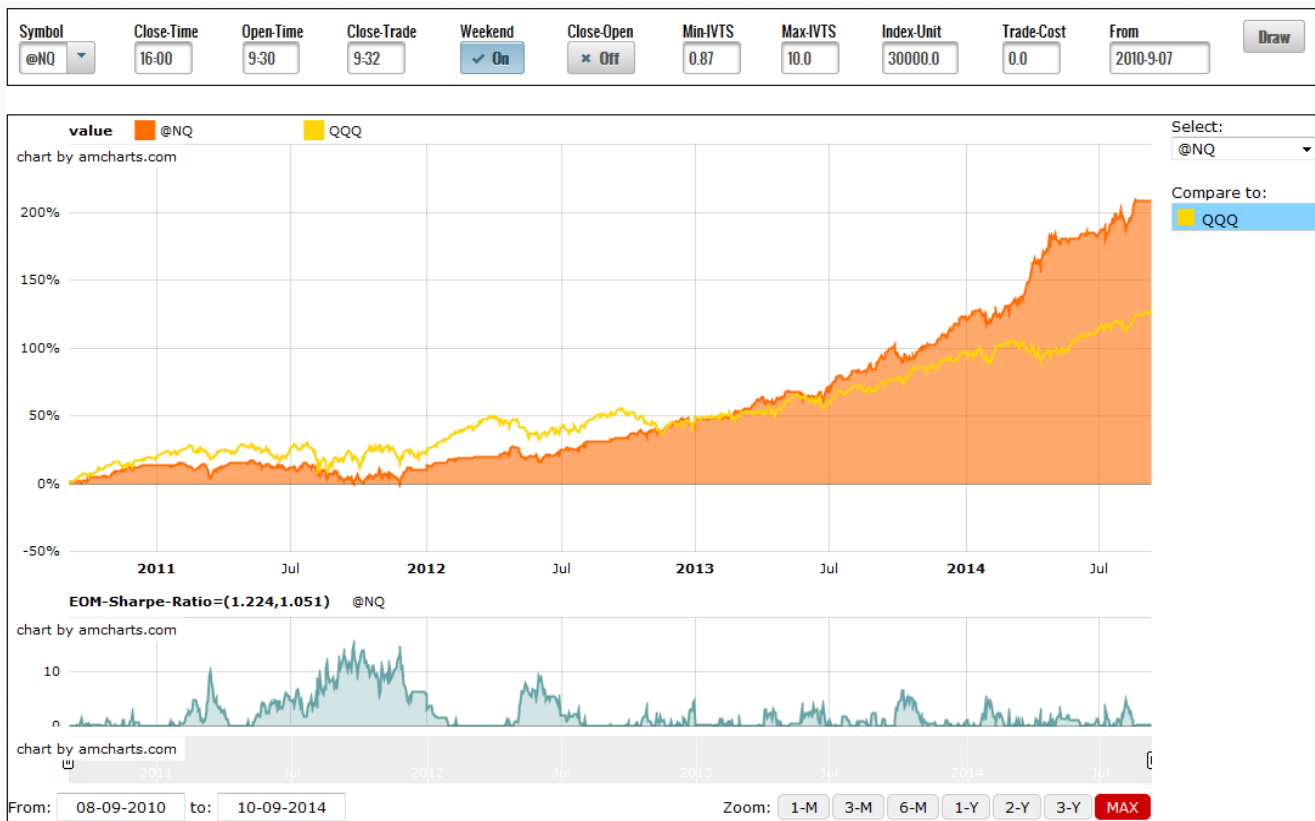


Graphic-6: Overnight-Trading NQ (orange) and QQQ buy&hold (yellow) from 2010-09-07 till 2014-09-09

## Trading-Costs:

Assuming no trading costs is of course not realistic. In [4] I assumed 12.5$ costs per trade and future. A round-trip is hence 25$. 12.5$ is the money-value of one tick for ES E-mini futures. One assumes that one looses at each trade the bid/ask spread. There are additional broker-fees. But as the first assumption is relative pessimistic, these fees are ignored.

The nice performance is gone with the trading-costs (Graphic-7). Buy and hold the SPY is now in every respect superior.
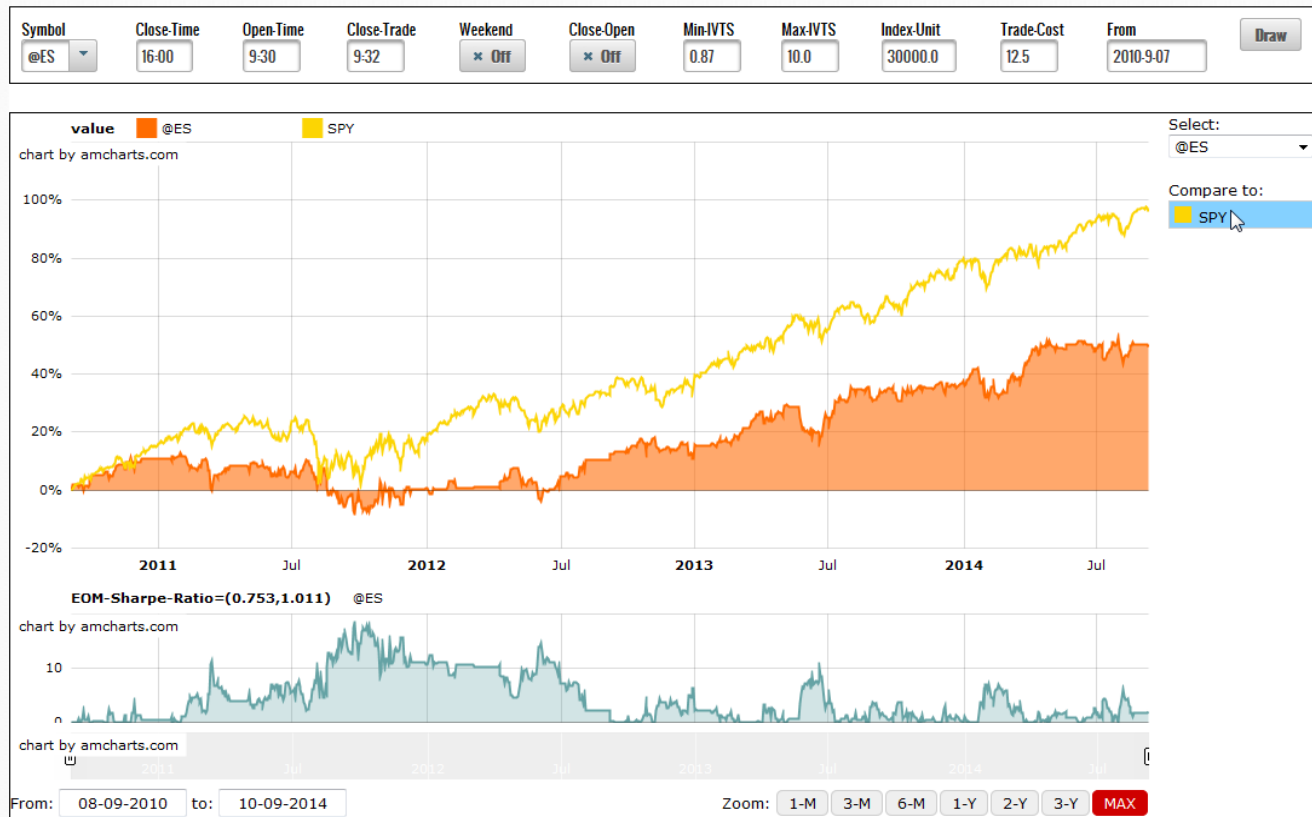


Graphic-7: Overnight ES with TC 12.5$ (orange) and SPY buy&hold (yellow) from 2010-09-07 till 2014-09-09

For the NQ the money-value of 1 tick is only 5$ (1 tick is also for the NQ the typical bid-ask spread). Assuming 5$ per trade is inclusive broker-fees too optimistic. A reasonable value seems to be 7.5$ or 15$ per round trip. Under this assumption overnight trading and buy&hold of the QQQ are about equal (Graphic-8). The Sharpe-Ratio is 1.072 to 1.051 and also the other performance measures are similar.

In [4] the result could be improved by restricting the trades to more volatile market-regimes (higher IVTS). I could not find a similar result for overnight trading. The Sharpe-Ratio declines if one increases the lower IVTS threshold. There are months with no trading at all and hence a flat index. Followed by some trades which move the stair-case up and sometimes also down. The Sharpe-Ratio does not honor such a performance.
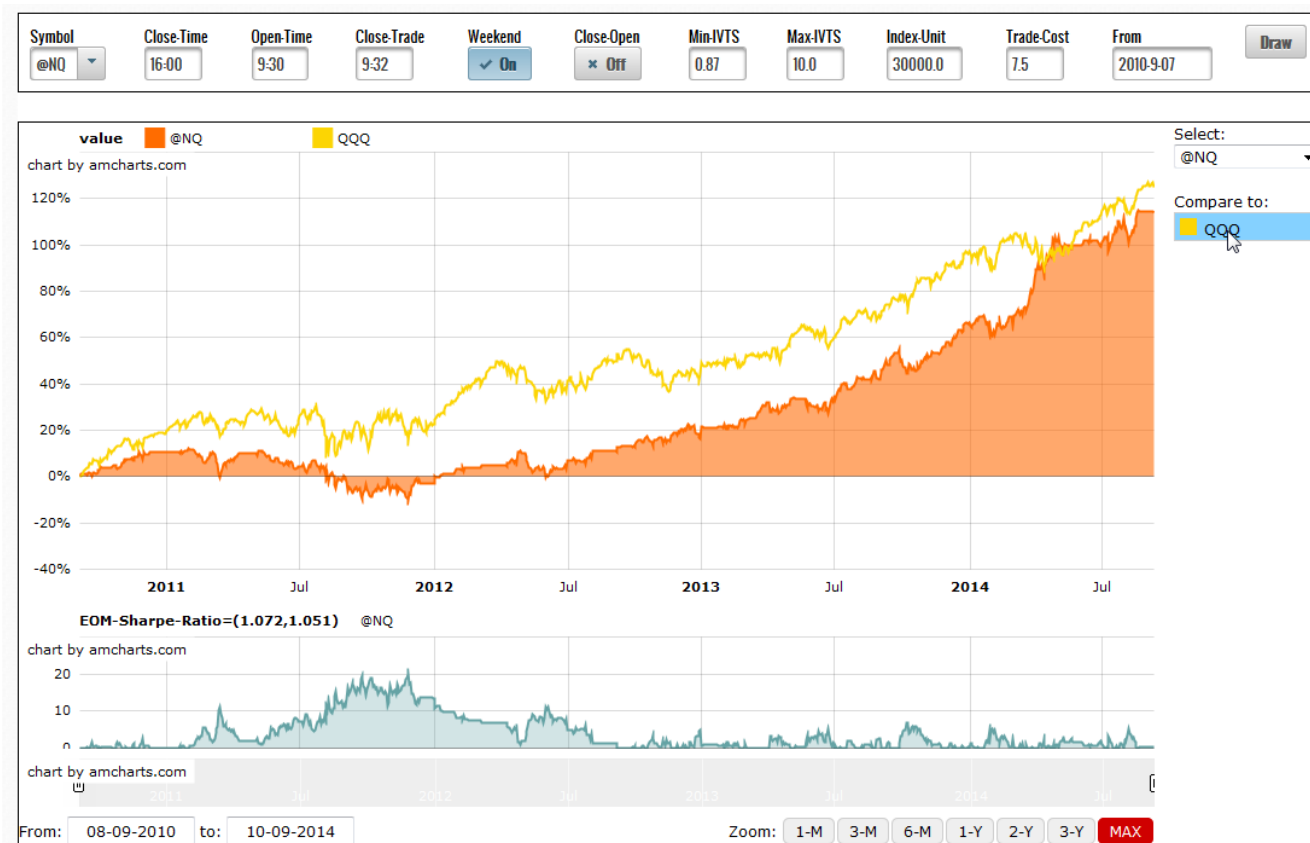
Graphic-8: Overnight NQ with TC 7.5$ (orange) and QQQ buy&hold (yellow) from 2010-09-07 till 2014-09-09

## Conclusion:

The overall results are similar to the intraday trading strategies analyzed in [4]. They work fine without trading costs. But it is for a plain trader very difficult to compensate realistic cost assumptions. The NQ futures are certainly more promising than the ES. One advantage of this sort of futures-trading is the possibility of leverage. One could think about a mid-term strategy were one holds the futures as long as some criterion's are met.

**A practical consequence of this study is that one should generally open the position at the end of the trading day and close it in the morning.**

## Further Work:

There is no intention to follow this line of investigation further. But one should never say never.

## References:

[1] Cliff, M., Cooper, M., Gulen, H.: Differences between Trading and Non-trading Hours: Like Night and Day.
[2] Dutta, S., Sharma, S.: Daytime vs. Overnight Trading in Equity Index Futures Markets.
[3] Donninger, Ch.: How to beat the market with the Implied Volatility Term Structure: The HeroRATs Strategy. Sibyl-Working-Paper, Dec. 2013
[4] Donninger, Ch.: An investigation of simple Intraday Trading Strategies, Sibyl-Working-Paper, August 2014.
[5] Grant, J., Wolf, A., Yu, S.: Intraday price reversals in the US stock index futures market: A 15-year study.