

# Introduction of the Profit Surface

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**Abstract**

The profit surface is a visualization technique for data computed from trading rules. I simulate price paths and operate the trading rules to compute cumulative returns for the rule under different specifications. The specifications are pairs of integers, filter lag lengths, so a contour plot is useful to display cumulative returns for more specifications than can be shown otherwise.

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## 1 Introduction

There is a way to extend analysis of a trading rule, the Variable-length Moving Average (VMA) from Daskalakis and Markellos (2008). This is the Profit Surface, which I introduce. The Profit Surface is a display technique.

At dinner in Green College in December 2009, Will Carlquist told me the main idea. He said to use a grid. This helped show me to vary (a,b) in the VMA trading rule, this changes the lag length of two data filters. The output of trading is cumulative returns, from Daskalakis and Markellos (2008). The profit surface is a plot of cumulative returns across a grid of points that represent lag lengths. There are two dimensions argument, one dimension output, so the contour is natural. There is much more to do.

## 2 Review Markellos Result

To set the stage for the VMA(a,b) trading rule, Daskalakis and Markellos show that asset returns are serially predictable. Then, the search is on for a trading rule that can exploit this predictability. It is appealing to think that a test for autocorrelation can verify weak form market efficiency (Daskalakis and Markellos 2008 PP. 13), but I think something has been swept under the carpet.

VMA Results for PowerNext, 06-10 2005

| (a,b) | 1-15 | 1-30 | 1-50 |
|---|---|---|---|
| Cumulative Returns (%) | 96.0 | 39.9 | 81.1 |

(Daskalakis and Markellos 2008 PP22)

Cumulative returns are one of 10 attributes that are presented to describe each trading rule. To calculate the results in Figure 1, we pretend the trade rule invests the same dollar amount each day, then we add together the percentage returns for the side of the market we had. The side is based on the difference of moving average filters, set (a,b). Both filters are simple moving averages. The next period is a buy if the fast filter is above the slow filter. Position size is uniform, and the rule is always invested.

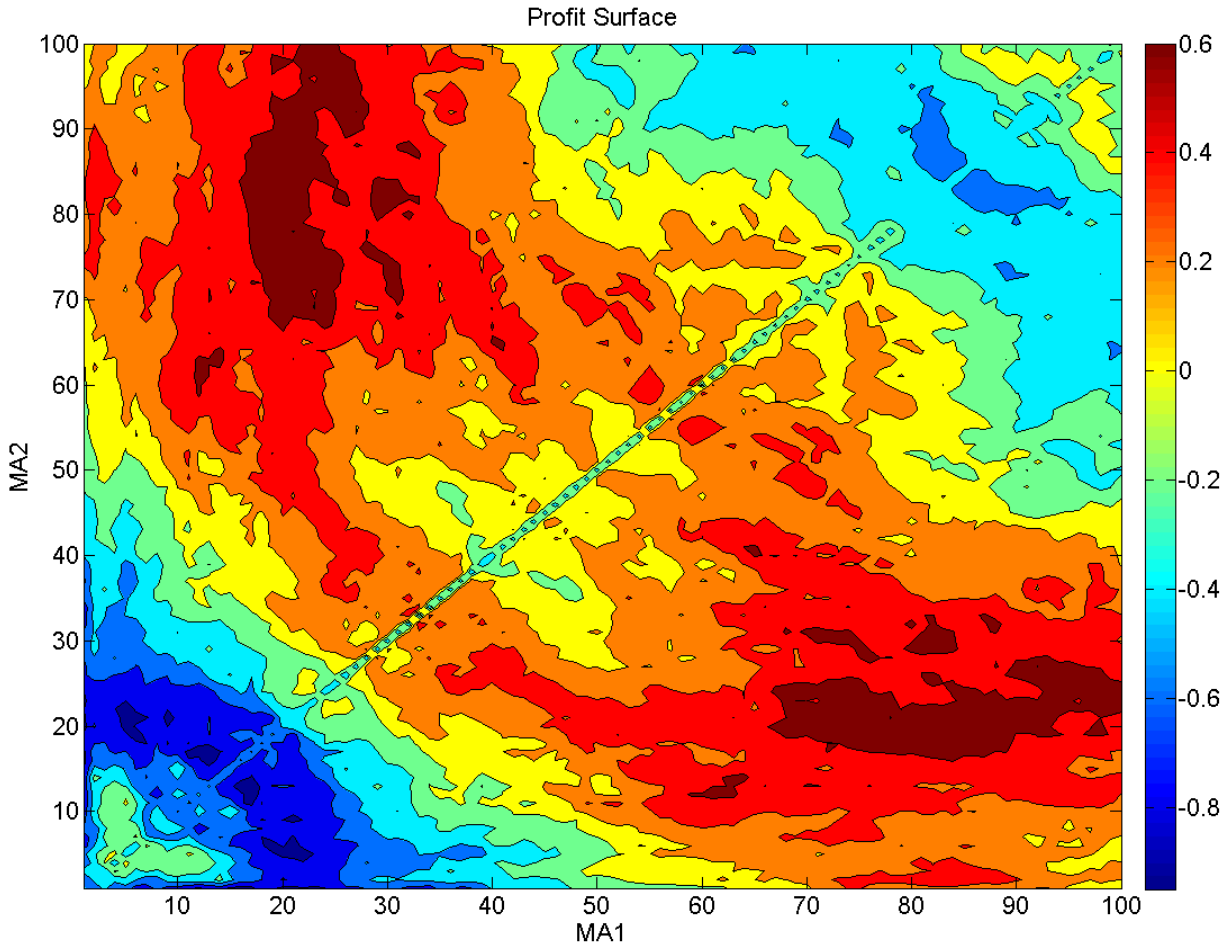
New way to display VMA Results

| | a | 1 | 2 | 3 |
|---|---|---|---|---|
| b | | | | |
| 1 | | VMA(1,1) | VMA(1,2) | VMA(1,3) |
| 2 | | VMA(2,1) | VMA(2,2) | VMA(2,3) |
| 3 | | VMA(3,1) | VMA(3,2) | VMA(3,3) |
| ... | | | | |

This is an attempt to describe the profit surface, the notation VMA(a,b) refers to the cumulative return for lag lengths (a,b) and a fixed section of prices. We consider the profitability of a trading rule in a global sense with this approach. This adapts to visualization nicely.

## 3 Graphics

The profit surface is a colourful object. I provide one example below. Rather than consider three pairs, we have 5,000 pairs of (a,b) here. I claim that this is an advantage, even if the diagram is difficult to look at.




This profit surface was calculated using the SDE toolbox from Picchini, the Ito SDE from the demo file: dX / X = ½ a^2 dt + a dW, a=0.01, X(0)=100, T=1000.

With simulated data we see that cumulative returns vary greatly depending on (a,b). Further, if this was an analysis of market efficiency we might be tempted to suggest the market is weak-form inefficient because certain specifications achieve large profits. This is misguided. It is not enough that a trading rule gives profit, this profit must be predictable! We can explore this by animating the profit surface.

## 4 Conclusion

The profit surface is an extension to a very particular trading rule, a new way to display data. The surface provides a measure for success of the trading rule, in a global sense rather than a small set of specifications.

The results here use one path, how can we do more? What about position sizes, why do we always trade the same amount? Can we adapt filters to observations that are irregular in time, so we can use transaction data? Please visit my youtube account for a video animation of a profit surface. Contact me for more information!

REFERENCES

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