The Importance of Time
for Short-Term Trading

In this article, we present two day trading systems for US and European stock index futures. The key point of the systems is that entries are only allowed at special times during the trading day when big movements often take place. The success of these systems is based on the correct combination of price activity, volume and most important, time.

■ The financial markets are controlled by people who are constricted by their daily time schedule. It is clear that managers of funds and insurances start to act on the markets soon after their daily morning meeting. It is also clear that everybody who acts on the markets, from small trader to big portfolio manager, has to take a break for lunch at some time. Sure, he can make this lunch shorter or longer. On one day there might be a business lunch with some investment partners and on another day he will just eat something at his trading desk. However, it is clear that there will be an interruption of the normal behaviour in some form. For every actor on the market, the trading day ends in the evening. Eventually, it must always end, and the trader needs to sleep before he can start the next trading day with new power. Thus, everyone's trading day has phases of action, and times to relax from that action. You can argue that today it is possible to automate all trading strategies 100% and to trade them by night and day and during every break the same. However, in reality, most market participants still do not do this. If they automate their strategies, the automation considers the specialties of different trading sessions and higher or lower price activity. In the end, everybody acts according to a daily schedule - whether they want to or not.

The conclusion of all this is that time is a key element for the market behaviour throughout the trading day. Since this is the case, you can build short-term trading systems that take advantage of the different market activity phases during the trading day.

This article presents two systems that are built for stock index futures. The system "US last move" is designed for the US markets and exploits the very last move of the US day session. In contrast, the system "EU follows US" was developed for European stock index futures, and it uses the fact that European markets change their intraday trend direction into the direction of the US markets after their opening.

US Markets: The Day Trading System "US Last Move"

Of course, not all trading days are the same. There are days with special events and surprises which disturb the general pattern of activity. Nevertheless, often the main price activity, and therefore the highest volume, on the US stock markets and stock index futures is near the start and near the end of the day session (Figure 1). At the market

opening, the brokers have to first place all the orders that were given based on the previous day's close. Afterwards, it is the time of macroeconomic data releases such as employment figures, money supply etc. that keep the volume high. After some hours, the market has processed these events and becomes steadily quieter until the activity is the lowest around lunchtime (19:00 Mid-European Time (MET) which corresponds to 12:00 Chicago time or 13:00 in New York). Then the session continues with increasing activity and reaches its high when many traders have to close their positions at the end of the day to avoid overnight trades.

This dynamic can be monitored best with the intraday volume, which goes down from opening until mid-day, and then increases again until it reaches a high near the market close on "normal" days (lower part of Figure 1). Several successful day trading systems try to capture the very first move of the trading day. Maybe the most famous is the Opening Range breakout system by Toby Crabel, which we

F1) Mini Russell December 2006 Future
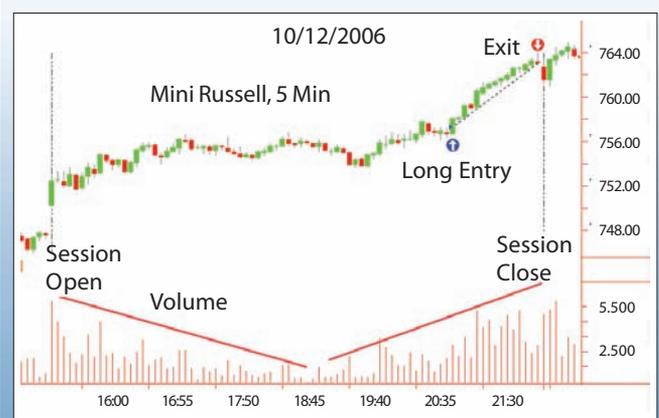
Day session from open to close. The highest volume is near the opening and near the close of the trading day. The day trading system "US last move" tries to capture a part of the movements that take place near the close of the day session. It trades only within the last 90 minutes of the day where the volume usually increases. The system exits at day session close, if not stopped out before.

F2) Day Trading System "US Last Move"
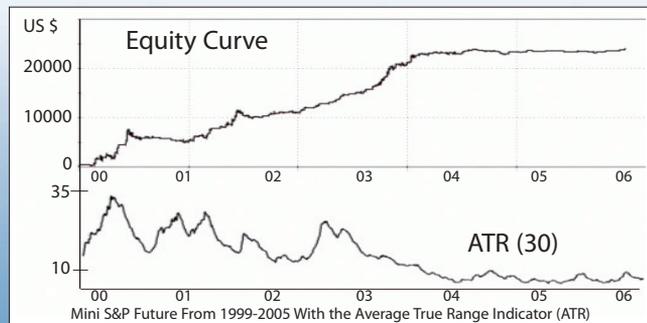
The daily ATR(30) is a good measure of volatility which is important for short-term trading systems. After the volatility disappeared from this market the last years, the equity curve became flat.

described partially in an earlier article [1, 2]. This system tries to enter the market in the direction of the trend of the first hour of the trading day. Here, in contrast, we exploit the habits of the US market during the very last part of the trading day. The system "US last move" allows an entry into a new position only within the last 90 minutes of the US day session (Figure 1). It profits from the fact that during that time the volume usually increases. If in this phase a breakout occurs, then it goes along with increasing volume that supports that breakout. The system enters the market into the direction of the intraday trend. Entries are only allowed if the power of this final breakout during the trading day is strong enough and if the market trades near its high (in the case of a long entry) or low (short entry) of the day. Trades are exited with stops and targets that adjust themselves to current volatility conditions. If no exit point was reached, the trade is exited at the latest just before the close of the day session. Thus, we do not take overnight risk.

Let us have a look at the results of this trading system when applied to 5-minute data of the Mini S&P future day session in the period from November 1999 until December 2005. The upper part of Figure 2 shows the detailed equity curve of all trades that the system generated. You see that the result is positive and the equity curve grows upwards in the years 1999-2002. Afterwards however, on this market, the system completely loses its power and the equity-line becomes flat. The reason for this is the decreasing volatility (see lower part of Figure 2). The Average True Range indicator, which is a measure of market volatility, slowed down drastically within the last three years. This example shows how important the right selection of the markets is for day trading systems. The Mini S&P500 future with its high point value and volatility during the stock market bubble was well suited for any short-term trading systems. With the decreasing volatility of the last years and the market trading at values that are far away from the highs, even the best short-term trading systems lose their power. This means that you have to look for alternatives. There are other, lesser-known futures markets in the US where the volatility and absolute point values have not decreased so dramatically after the stock market bubble. We focus here on the MiniRussell2000 future. Another good market that we do not present here is the E-Mini S&P400 Midcap future. Let us have a look at the results of our system when applied to 5-minute data of the MiniRussell2000 future (Figure 3). You

see that although the system equity became a bit flatter the last 3 years, due to a slight decrease in volatility. Therefore, the system "US last move" is still tradable on that market.

If you have a look at the system figures for the Mini Russell future, you see that the system is only about 1% of the time in the market (Table 1). The average time in winning trades was 64 minutes. Losing trades were exited much earlier, in average after only 39 minutes. In the last 5 years, the system traded 426 times which means that you get about one or two trades per week. Of these 426 trades, 62% were profitable. Overall, the system gained $32,360 in 5 years without slippage and commissions. The profit is relatively equally split into long ($15,230) and short ($17,130) trades, which underlines the robustness of the strategy. Furthermore, a high profit factor of 2.43 shows the good profitability of the system. The trading system "US last move" is especially well suited for traders with very small accounts since it only had a small drawdown of $1,800 within the last 5 years. In addition, it is not exposed in the market for a long time and it does not keep any overnight positions.

European Markets:
The Day Trading System "EU Follows US"

Many European market participants have claimed for years that the European stock markets start to have their own life. They hope that European markets are strong enough to develop independently from the US markets. However, the reality is different. Europe's financial markets are more interlinked with the US markets than many Europeans like. When developing trading systems, you can profit from this interaction. Many day traders use it by building spreads between US and European stock index futures. For example, they open a position in the DAX or EuroStoxx future in the morning, and then, depending on the US market opening, add a Dow future in the other direction, according to the current market situation. Important for such spreads is the correlation and interaction of the markets. Here we do not want to focus on spreads, but keep it simpler and just look at the EuroStoxx50 future itself in order to build a trading system on it (Figure 4). Let us first have a look at the intraday volume since the

F3) Equity Curve: System "US Last Move"

MiniRussell2000 Future From Oct. 2001-Oct. 2006
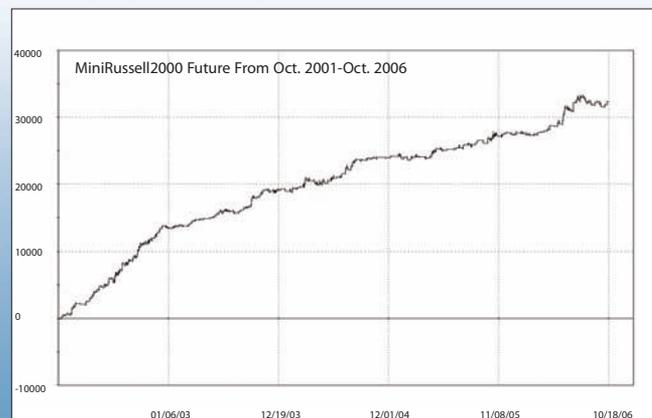
The equity curve is still steady for this market since it has not had such a decrease in point value and volatility like the S&P500 future.

T1) System "US Last Move"

System "US Last Move"	Mini Russell, 5 minutes, 30.9.2001- 18.10.2006		
Performance Summary: All Trades			
Total Net Profit	$32,360.00		
	Long Trades: $15,230.00		
	Short Trades: $17,130.00		
Gross Profit	$54,920.00		
Total # of trades	426	Percent profitable	62.44%
Number winning trades	266	Number losing trades	152
Largest winning trade	$1,320.00		
Largest losing trade	($300.00)		
Average winning trade	$206.47		
Average losing trade	($148.42)		
Ratio avg win/avg loss	1,39		
Avg trade (win & loss)	$75.96		
Avg. Time in winning trade	64 min		
Avg. Time in losing trade	39 min		
Max intraday drawdown	($1,800.00)		
Profit Factor	2,43	Max # contracts held	1
Account size required	$1,590.00		
Return on account	1449.03%		
Percent in the market	0.98%		

T2) System "EU follows US"

System "EU follows US"	ESTX50, 20 minutes , (06/22/1998-12/30/2005)		
Performance Summary: All Trades			
Total Net Profit	$14,370.00		
	Long Trades: $9,110.00		
	Short Trades: $5,260.00		
Gross Profit	$26,630.00		
Total # of trades	260	Percent profitable	60.00%
Number winning trades	156	Number losing trades	104
Largest winning trade	$950.00		
Largest losing trade	($490.00)		
Average winning trade	$170.71		
Average losing trade	($117.88)		
Ratio avg win/avg loss	1,45		
Avg trade (win & loss)	$55.27		
Avg. Time in winning trade	129 min		
Avg. Time in losing trade	101 min		
Max intraday drawdown	($1,960.00)		
Profit Factor	2,17	Max # contracts held	1
Account size required	$1,960.00		
Return on account	733.16%		
Percent in the market	0.76%		

volume is again the key point for our systems' development. In Figure 4, you see a situation that is quite typical for the volume of European stocks and stock index futures. The volume starts high after the morning opening and then decreases until lunchtime. We saw this same behaviour on a "normal" trading day in the US markets. However, in the afternoon the situation becomes different. Volume is strongly increasing between 14:00 and 17:00 MET and decreases again afterwards. There are several reasons for this behaviour. First, 14:00-17:00 is the time when the US financial markets (Wallstreet, CME, CBOT etc.) open, and second, it is the time when in the US main economic figures are usually released (unemployment rates, housing starts etc.). After all the US markets have been open for some hours, and all economic figures are priced in, the European markets start to calm down again and the volume decreases until about 20:00 MET. 17:00-20:00 is the time when most European money managers have done the majority of their work for the day. They finish the management of the market positions that they took during the day and prepare to leave their offices.

Our day trading system "EU follows US" is designed in a similar way like the day trading system "US late move". It allows entry only during a small time window which we set to 16:00-17:00 MET. This is a time where most US markets have taken their decision in which direction to go, and most important, when volume in European stock markets is still increasing. The volume is needed to support the breakout. Our day trading system enters the EuroStoxx market in the direction of the trend of the last three 20-minute bars within that time window only. Instead of using 20-minute bars, it is also possible to work with 5-minute, 10-minute, 15-minute bars etc. or to use a different entry setup. The main point is just to use a setup that goes with the emerging trend. In case of a long entry, our system opens a position at the high of the last three 20-minute bars. A short position is initiated accordingly at the low of the last three 20-minute bars. Intraday moves

that start between 16:00-17:00 MET often last until 19:30 or 20:00 MET when the volume vanishes. As seen above in the discussion of the system "US last move," after that time period the volume within the US stocks usually starts to increase again. This increase leads in many cases to another change in market direction that we want to avoid. We want to capture just one move that keeps its direction. Therefore, our system exits at 19:30 MET, if not stopped out before by a combination of stops and targets which adjust themselves to current volatility conditions. Again, we do not take any overnight positions.

You can apply the system logic to any European stock index future like DAX, CAC40, and FTSE100 etc. with the same parameters and you will get similar results. As an example, we show here the application of the system to the EuroStoxx50 future.

The equity curve on this market is steady, but it suffers again from

F4) EuroStoxx50, December 2006 Future

The highest volume increase takes place in the afternoon Mid-European Time (MET) when the US markets open. This is the time when the day trading system "EU follows US" enters the EuroStoxx market in the direction of the trend of the last 3 bars. Entries take only place between 16:00-17:00 MET and exits at 19:30 MET, if not stopped out before.

F5) Equity Curve: System "EU follows US"

ESTX50 Future from March 1999-December 2005
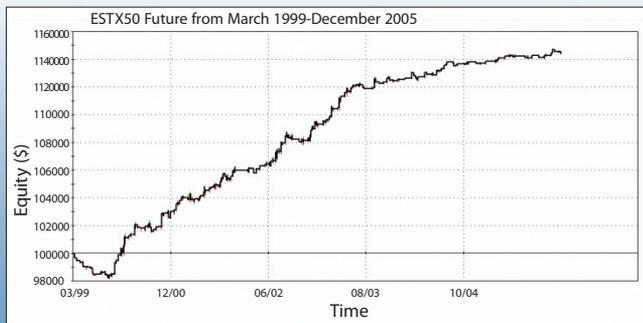
The equity curve is still steady for this market, but is becomes flatter after 2003 since the volatility became smaller.

References

[1] Toby Crabel:
Day Trading with Short-term Price Patterns and Opening Range Breakout, Greenville 1990.

[2] Emilio Tomasini, Urban Jaekle:
Developing Exit Strategies, Part 1, *TRADERS'* April 2006.

the decreasing volatility of the last 2-3 years (Figure 5). However, the good point with this very short-term system is that even in such low volatile market phases, like the last years, it keeps the drawdown small. From the system's design, it is clear that if the market is just not moving much during the day it cannot make huge profits. On the other hand, it will not lose much money in such phases either. The chance is good that after the volatility will comes back into these markets the system is able to make higher profits again.

The system figures are very similar to the one of the day trading system on the US markets, which was presented above (Table 1). Again, the profit factor is high (above 2) and the maximum intraday drawdown is very small (less than € 2,000). 60% of the 260 initiated trades are profitable with a ratio of 1.45 of average winning/average losing trade. A small difference to the system for the Mini Russell, where the "US last move" was applied, is that this system for the EuroStoxx50 is longer in the market. It keeps winning trades around 130 minutes and losing trades 100 minutes on average, which is more than double that of the system for the US markets. This system trades less often. Only 295 trades are taken in 5 years, which means about one trade per week. This leads to the fact that, similar to the "US last move" logic, the overall time the system is in the market is less than 1 percent.

Conclusion

We have shown that time is a key element for the market behaviour during the trading day. The business day in the US markets and in the European markets has its own special structure of volume and price activity. When trading, or when designing mechanical trading systems, it matters in which time window of the day you enter your positions. It is important whether you trade in phases of increasing volume to enter into a big move or if you take a position in a staying market.

The two systems that we presented here capitalise on this time-dependant market behaviour. The system "US last move" profits from the final price move that often takes place in the US markets near the closing bell when many European market participants have closed their books already. The system "EU follows US" exploits the fact that European markets tend to move into the direction that the US markets preset.

Since the two systems trade only in a short time window, their

exposure to the market is very low and, therefore, the risks are limited. As a result, both systems can be traded with very small accounts. Furthermore, the two systems can be very well combined since they are 100% uncorrelated because they never hold a market position simultaneously. When the system "US last move" initiates a position, the system "EU follows US" has already closed its trade.

The two presented day trading systems are just a starting point for system development using different intraday time windows. You can think of different systems that use different time windows to initiate trades. Furthermore, it would be interesting to check such short-term systems on other market groups like bond futures, currencies or selected liquid commodity futures like Light Crude Oil or Gold. It is clear that these markets also have special time-dependant market patterns or volume-based effects that could be exploited by short-term systems. You can find them by close observation and proper experimentation.

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