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BAKALÁŘSKÁ PRÁCE

Effect of emotional behavior on the efficiency of securities markets

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Prohlášení

Prohlašuji, že jsem bakalářskou práci vypracoval samostatně a použil pouze uvedené prameny a literaturu. Souhlasím se zapůjčováním práce a s jejím zveřejňováním pro účely výzkumu a studia.

V Plzni dne 20.5.2009

Petr Málek

Poděkování

Rád bych poděkoval PhDr. Petru Teplému za poskytnutí podnětných rad a připomínek, které přispěly k vytvoření této práce.

Abstrakt:

Vliv emočního chování na efektivitu finančních trhů

Tato bakalářská práce se zabývá efektivitou finančních trhů, zejména pak předpokladem racionálního chování investorů a spekulantů. Zkoumá, jaké podmínky jsou nutné k tomu, aby došlo ke změně cen, a jaký vliv to má na psychiku investorů a spekulantů v různých situacích. Následně předkládá hypotézy, které se pokoušejí vysvětlit, jak psychika a emoce ovlivňují další chování investorů a spekulantů, a tedy i pohyb ceny na trhu. Na podpoření těchto hypotéz uvádí několik různých příkladů konkrétních tržních situací, při nichž emoce účastníků hrály významnou roli a při nichž tedy nenastaly ani předpoklady, ani očekávané důsledky teorie efektivních trhů.

Klíčová slova: teorie efektivních trhů, emoce, případová studie

JEL klasifikace: D53, G11, G14

Abstract:

Effect of emotional behavior on the efficiency of securities markets

This bachelor's thesis is about the efficiency of securities markets, specifically about the assumption that all investors and speculators behave rationally. It investigates what conditions need to be met for a price movement to occur, and what effect it has on the psyche of investors and speculators. Furthermore, it states some hypotheses which try to explain how psychology and emotions affect the behavior of the other investors and speculators, and therefore also market price movement. To support these hypotheses, the work gathered several examples of specific market situations where emotional behavior of the market participants was present and where neither the assumptions, nor the expected outcomes of the efficient market hypothesis really happened.

Keywords: efficient market hypothesis, emotions, case study

JEL Classification: D53, G11, G14

Introduction

In finance, there is a so called efficient market hypothesis (EMH). It has three levels – weak form efficiency, semi strong form efficiency, and strong form efficiency. Weak form efficiency means that all information which can be extracted from historical price data is already reflected in the current price and it generates no advantage. In other words, there is no point in looking at past prices in order to try to predict what the market is going to do in the future. It also says that technical analysis is completely irrelevant. Semi strong efficiency means that that there is weak form efficiency plus that all other publicly available information about the security and everything that affects its performance is already reflected in the current price. In other words, there is no point in looking at any information related to the asset – not just technical analysis, but even the fundamental analysis is irrelevant. Strong efficiency means that completely all information (that means technical information, publicly available information, and even insider information which is known just by a few individuals and not by the general public) is reflected in the current prices. In other words, it does not make any sense even for the insiders with exclusive information to try to predict what the market will do in the future. (Fama, 1970)

Therefore, the efficient market hypothesis says that, taken from the perspective of a technical analyst (weak form) or technical and fundamental analyst (semi strong form) or anyone (strong form), the market cannot be outperformed on a consistent basis. It is impossible to consistently make higher returns on capital than what might be offered by some very long term growth of a stock index.

The theory says that the reason for this is that all investors gather the relevant information; they rationally assess them, and immediately act on them. It says that the average investor assesses the publicly available information the right way. The result of this is that immediately after some relevant information appears, the collective behavior of the investors is such that it causes a jump in prices in the correct direction, by the correct distance, everything in an instant. Therefore, before anyone is able to take advantage of that information, it is priced in and it is not an advantage anymore. Next price movement will be as late as when some other information appears – one that no one knows at this moment. It is not even possible to profit on some anticipation of good or bad news because again, this anticipation is based on some currently known information, and therefore it is on average shared by the other market participants as well, and therefore it is already priced in. If this

anticipation is fulfilled, there will be no price movement to profit from, and if there is price movement, it will be because the news was better or worse than expected – which is something that no one can possibly know in advance.

Another result of an efficient market is that price charts form no repeating patterns and that they follow a random distribution instead. The reason for this is self evident – if all information is priced in and any price movement stems from some new, unanticipated (and therefore random) information, it has to have a random distribution.

I.1 How is efficiency of financial markets measured

Efficient market hypothesis can be modeled using several models of random walk. Diviš, Teplý (2005) mention three such models. The first one operates under the assumption that every price change is attributable to a price increment (or decrement) which is at each occurrence an independent, identically distributed random variable, as can be seen from the mathematical formula:

$$p_t = \mu + p_{t-1} + \varepsilon_t \qquad \varepsilon_t \sim IID$$

where P_t is price at the time t , $p_t = \ln P_t$, μ is the expected price change, $p_{t-1} = \ln P_{t-1}$, and *IID* says that the disturbances are independent from each other and have a common distribution. The second model is based on the first one, omitting the assumption of identical distribution of the disturbances (i.e. the price changes). The third model is again based on the second one, further omitting another assumption – the independence of the random price changes. However, they are still uncorrelated.

There are many statistical and econometrical tests which are suitable for testing the reliability of these models. The simplest of the three, the first one, can be tested for example by the number of points of reverses or the run test. Upper point of reverse (or lower, respectively) is a realization of the random variable such that both the preceding one and the next one are smaller (or larger, respectively) than the current one. The test based on the number of points of reverses counts how many upper (or lower) points of reverses there are over the whole series of the random variable realizations. If it is correctly normalized, this statistic follows normal distribution and it is possible to test the hypothesis on certain significance level that the random variable is normally distributed. (Cipra, 1986)

$$\frac{r - \frac{2(n-2)}{3}}{\sqrt{\frac{16n-29}{90}}} \sim N(0,1)$$

Run test is equivalent to this. Each realization of random variable which is larger than the preceding one is assigned value 1, and each realization which is smaller than the preceding one is assigned a zero (or vice versa). When we take a sum of these zeroes and ones and normalize it in the proper way, the statistic will again follow normal distribution and allow us to test hypothesis about randomness. (Cipra, 1986)

$$\frac{r - \frac{n-1}{2}}{\sqrt{\frac{n+1}{12}}} \sim N(0,1)$$

These tests are suitable for testing the reliability of the first model. If we were to test the other two, one possible way to do it is a more sophisticated test based on the proportion of variances (Diviš, Teplý, 2005).

I.2 References to market efficiency scientific research

Besides the two efficient markets hypothesis references cited in the preceding sections (Fama, 1970 and Diviš, Teplý, 2005), many books and papers on this subject appeared during the 20th and the beginning of the 21st century. To name but a few: FAMA, Eugene F.: Efficient Capital Markets: II, *Journal of Finance*, 1991, vol. 46, no. 5, p. 1575-1617. CAMPBELL, John Y., LO, Andrew W., MacKINLAY, A. Craig, *The Econometrics of Financial Markets*, Princeton, NJ: Princeton University Press, 1997. DOOB, J. L.: *Stochastic Processes*, New York: Wiley, 1953. SPITZER, Frank: *Principles of Random Walk*, New York: Springer-Verlag, 1976. SHLEIFER, Andrei: *Inefficient markets: An Introduction to Behavioral Finance*, Oxford: Oxford University Press, 2000. FILÁČEK, Jan, KAPIČKA, Marek, VOŠVRDA, Miloslav: Testování hypotézy efektivního trhu na BCPP, *Czech Journal of Economics and Finance*, 1998, vol. 48, no. 9, p. 554-566. VÁCHA, Lukáš, VOŠVRDA,

Miloslav: An Energy Decomposition of the Financial Market, *Research Report 2171*, 2006.
VOŠVRDA, Miloslav, ŽIKEŠ, Filip: Application of the GARCH – t model on stock returns in emerging capital markets, *WEHIA*, 2003, p. 1-14.

I.3 The purpose of this thesis

The author of this thesis does not agree with the efficient market theory; or rather with its assumptions in the first place. He thinks that investors do not behave rationally – they rather follow their emotions and herd behavior principles. He also thinks that this emotional behavior is not random in nature all the time – there are times at which it is rather repetitive. He therefore suggests that at times, there are some market inefficiencies.

This work is not trying to prove the existence of such inefficiencies because, as will be described later, they are not (for the most part) quantifiable and therefore they cannot be statistically tested. The main purpose of this work is to give some theoretical reasoning to why they should be present and how they might work.

The paper is structured in four parts. Part one is called ‘What is a securities market and who participates in it’ and it describes how markets work, what conditions must be met for the price to move up, move down, or stay where it is at. Part two is called ‘Psychology of trading securities’ and it describes the most fundamental psychological aspects of trading. These first two parts which might at times seem unimportant are going to give us the necessary background for part three. Part three is called ‘Reflection of emotions in the markets’ and it is the most important part of the whole paper. It describes specific situations where market behaves differently than what random distribution would suggest – because of the reasons given in parts one and two. Part four summarizes the whole paper and concludes.

Part I: What is a market and who participates in it

1.1 What constitutes a securities market

A securities market is just a large group of people who exchange securities. These can be, for example, shares in large companies, private or government bonds, futures or options contracts of stocks or bonds, futures or options contracts of some physical commodities like gold, silver, oil, natural gas, corn, sugar, soybeans, and dozens more. It can also be futures or options contracts reflecting one of the many stock indexes like the S&P 500, and it can also be currencies (currency futures or forex). There are also securities which are much less popular, like for example the CME Snowfall Futures which is to be used (except speculators) by those who want to hedge themselves against too much or too little snow.

Regardless of what kind of security is traded, the market is always made of people, and if we restrict ourselves to markets with a high degree of liquidity, it means of MANY people (probably tens of thousands and more).

The term ‘liquid market’ means a market where relatively many people trade sufficient volumes at all times and at all market prices, making it possible for anyone to enter or exit a position of a reasonable size whenever they please, in a matter of seconds, and with small or no slippage. Enter a position means buy a security or sell it short, i.e. bet that it will go in a certain direction. Exit a position means to sell a security back (if one previously bought it) or buy it back (or to cover the short) (if one previously sold it short). If one first bought the security and sold it back later, it is called a long position. Long positions make money if the price goes up and lose money if it goes down. If one first sold the security short and then bought it back, it is called a short position where money is made if the price goes down and lost if it goes up. Slippage is the difference between what the market price was at the time one sent the buying or selling order and the price at which he actually bought it or sold it (i.e. at which his order was filled – at which he was able to find someone who would take the other side of the trade). We should also mention commission fees (or commissions). These are fees that one has to pay to his broker or to the security exchange itself for the service of handling the orders and finding the other side of the deal. In liquid markets, these commissions should be relatively small. (Nesnídal, Podhajský, 2006).

What is important here is that markets are made of nothing else but a large number of people who do not know each other and each other's intentions but they do know what others (or rather the majority of others) are doing. If the price is going up, they know that most people are buying, and if it is going down, most people are selling. We also have internet connection and media coverage which further contribute to the super-fast speed at which market related information travel around the globe. Therefore it makes sense to view the markets as a game, because 'game' is an interaction between participants who are conscious that their actions affect each other (Rasmusen, 2001).

Markets are most often a zero-sum game. If we restrict ourselves to futures and options markets, this always holds. Futures and options markets are in the end nothing but a place where many people place bets against each other about what the market will do next. If one goes long, he bets that the market will go up. If it does, his position will make money linearly to the distance the market traveled (as specified by the exchange's rules). If it goes down, his position will lose money in the same fashion. Short positions are the very same thing turned upside down. If one goes long, he also has to have the other side of the trade, i.e. at the same time and same price and same volume, someone else must be willing to go short. Otherwise we would not have two parties in agreement on the conditions of the trade and therefore the trade could not take place. This means that anytime a trade is made, there are two people who made a bet against each other about where the market is going to go. Whoever is right is going to make money, and the other one is going to lose that same amount of money. Whatever one makes, the other one loses. This is a zero-sum game and a bad news for an individual, because it means that he has everyone against him and no one with him. Perhaps we should mention also the possibility of having several people on one side of the trade and just one individual on the other, like for example a hundred traders going long one contract at the same time and price, and just one individual, going short one hundred contracts and thus taking the other side of the trade. This can happen as well – but the fact that we have a zero-sum game here still holds.

One can argue that it could very well happen that when trader A goes long, trader B who takes the other side of the trade and goes short might not be going short but he might just be selling his long position that he previously held in order to get flat. But we have to remember that this trader B, when he took his long position, must have had some other trader C who took a short position against him, i.e. there must have been a bet between trader B and trader C. What happened between trader A and B is that B transferred his part of deal to trader A. Trader B is now out of the deal with whatever outcome there was, and from now on, the

deal is between trader A and trader C. If the market was going up all the time, trader C lost money. Part of this money went to trader B and the remainder went to trader A. By the same token, if the market was going down all the time, trader C made money which traders A and B paid together. Therefore we can see that the game is still zero-sum.

Obviously in reality we also have to deal with commissions that all participants have to pay to brokers and exchanges that are merely providing the technical means to keep the trading process going but have nothing else to do with how the markets operate (they are not part of the game). This makes the game minus-sum and therefore for an individual, the matters are now even worse.

If we consider stock markets, the markets need not be a minus-sum game in the long horizon. If the long-term prospects of a company are good, its shares are probably going to go up to reflect the increasing future cash-flows. But given that even in the long run, the shares can be falling for as much as several years (average length of a cycle in the U.S. markets is 4 years (Elder, 1993)), we can see that we would have to take an extremely long horizon (probably at least a decade) to make the game anything more than zero-sum.

1.2 What is market price

At the most fundamental level, market price is not a reflection of any economic reality but merely the price at which the last trade between any two traders took place (Douglas, 1990). These two traders can be anyone. If someone decides to buy a hundred of shares of Microsoft Corporation at price twice as high as the current market price and someone else will be willing to sell at that price (which he will because who would refuse to sell what he has and buy it back immediately 50% cheaper), the trade will take place and the price will, for a brief moment, skyrocket to that particular level. This does not happen because it is in nobody's best interest to buy shares at prices higher than where all other trades are being made or sell lower than that. Yet it has happened by a mistake for example in June 2006 on Prague Stock Exchange in the Czech Republic. Despite the fact that at that time, the PX index was trading slightly below 1300 points, for a quick moment it rallied to 1432.8. It was caused by a trader who mistakenly bought shares of the ČEZ company at price 42% above the previous market price (Choděra, 2006). Therefore we have to keep in mind that it takes just two traders to make a trade at some price and this price immediately becomes market price, even if it was for just a few seconds.

1.3 What causes price movement

Again, at the most fundamental level, prices do not move because the news is good or bad. Prices move when there is a discrepancy between the number of people willing to buy and the number of people willing to sell at the current price. Obviously, the number of actual buyers and actual sellers (both weighed by the volumes that they trade) will be equal in the end – otherwise it would not make sense. But here we are talking about potential buyers and potential sellers. Whenever there is a discrepancy between the two parties, the one that is more scarce will take advantage of the situation and will only trade at prices that are more favorable than the current price. In other words, if there are more potential buyers than potential sellers, the sellers will offer higher and higher prices because it will make them more money. Higher prices will attract more sellers and drive some potential buyers away, and when the balance is reached, the price will stop moving. It can go the other way around as well. This is nothing else than normal law of supply and demand that applies to any free market.

1.4 Main participants in the market

Participants in the market can be divided into two basic groups – hedgers and speculators (Dalton, 1993).

Hedgers (usually insiders) are very large players who trade very large positions. Their main purpose is not to make money by trading itself; their purpose is to hedge against some kind of risk that they are exposed to in some other business. One of the most common examples when it makes sense to use this possibility of hedging is the existence of exchange rate risk. A European manufacturer which exports part of its production to the United States is more competitive and profitable if the euro depreciates against the dollar and less so if the euro appreciates. In the long run the gains can give or take eliminate the losses but in the short run there is a high degree of uncertainty that could even drive the company out of business or cause some serious problems. Therefore the company can buy some Euro futures contracts which will mean that whenever the euro appreciates, the position will make money, and when it depreciates, it will lose money – immediately and exactly offsetting the impact of the exchange rate fluctuations on the company's competitiveness.

Hedgers and hedge funds are not individuals but usually large companies that have at their disposal teams of people well educated and experienced in risk management strategies. These people are directly wired to the exchange and pay small or zero commissions. They have the fastest computers and news feeds. They do not trade their own accounts; they are merely employees who are supervised and follow some established rules (Elder, 1993).

Because they trade very large positions, it takes a relatively long time to get into (or accumulate) or out of (or distribute) a position. It is also important that their orders are so large that they can temporarily manipulate the market price.

On the other hand, **speculators** (usually outsiders) are most often individuals and therefore very small players who, taken individually, have virtually no impact on what is going on. In liquid markets they can get into or out of a position within a second or two with small or no slippage. Speculators are usually people trading from their home using internet connection to communicate with their brokers to whom they have to pay commission fees for every unit of every trade they make. They can watch the close media coverage and get any fundamental news pretty fast today but they still cannot compare to how fast the insiders get the news. Their computers are ordinary user-friendly PCs. They usually do not have any deeper education or experience with the business of trading. They are all alone with no co-workers or supervisors who would tell them what to do. They have a complete freedom to do anything and it is all on their behalf. They trade their own money that they had to previously make in a regular job or enterprise, making them emotionally connected to the money. Or they could have borrowed it from a friend or from a bank, with the obligation to repay it later, making it unacceptable to lose it.

We are starting to see the most important differences among the two groups of people. Speculators have worse information, less human resources, worse technology, and higher costs. And they also have the worst disadvantage which is the lack of rules given from above. They can do literally anything they please – buy, hold, or sell at any times under any circumstances. They can make the stupidest trading decisions the world has ever seen and yet no one will hold them back; no one will give them puzzled looks, belittle them or anything like that. Quite the contrary, if it is a very bad decision for one individual, then, since we are playing a minus-sum game, it will be very beneficial to whoever takes the other side of the trade. Therefore the other traders will rush and will want to be the lucky one who gets to serve the other part of the deal (Douglas, 1990). This is very different to what people are used to encounter in any other area of human life. If one pulls his car over to the left side of the street with the intention to collide with the oncoming traffic, the drivers whom he is facing will try

to avoid the collision. Or, when he is at work, he is probably part of a team who will prevent him from doing something completely wrong because the team would suffer from the consequences too. It is just trading where no one will hold him back; where if it was possible, competing traders would even support his poor decision compatible with their best interests.

Part II: Psychology of trading securities

2.1 Two basic emotions of traders: fear and greed

When a person feels **fear**, it means that he is afraid of some kind of emotional discomfort; that the reality will have its way in such a manner that there will be a discrepancy between some expectations and beliefs about the future which exist in the trader's mind and the way the expectations and beliefs are (not) actually fulfilled (Douglas, 1990). In trading, this means that the trader is afraid that the market will do him some financial harm in a situation he was sure was a profitable one (if he was not, he would not have even considered the opportunity in the first place). It is completely natural and understandable that a trader feels some level of fear when entering a trade or managing it because his own money is at stake – money that he had to work so hard to make. Even more so if the trader has been on a losing streak for a while and wants to earn some money so bad.

Fear causes reluctance to enter a trade on time. The trader might decide to wait just a little longer to give the market the opportunity to reveal more of its future and make the buying or selling decisions afterwards. Or the trader might just freeze and not do anything at all for no particular reason – this is a common defense mechanism that many peoples' subconsciousness uses to protect them from making a decision that could later turn out to be poor. The result is that the trader often misses part of the anticipated move that he could have capitalized on. Being upset with himself, he might want to chase the market and get in as soon as possible to capture at least the little that is left to be made there, despite the fact that the risk is now higher and the potential for profit much lower. Another two scenarios deal with exiting a trade. If the trade has so far been a winner, i.e. it is in an open profit, the trader might be unable to deal with the existence of the possibility that it will turn around into a loss. He will fear the possible loss so much that he decides to take even little profit right now just to have some profit and avoid the feared loss. Since it takes time for any trade to make a profit to its full potential, whenever trader closes out a small winner, most often it will be a poor decision. If the market continues to go in the established direction, the trader will again be upset and will want to chase the market to get back in, unable to see that it is too late and too risky now, just as it was in the first scenario. Third case is as follows: the trader is in a losing trade. He might say to himself that the loss is just a paper loss and it only becomes a real loss

as late as when he decides to exit the trade at a loss. Until he exits, it is not a loss. Therefore he will wait and hope that the market will turn around to make the trade profitable, or at least to allow the trader to exit at break even. This could work in theory but in practice, many traders trade using a leverage and have to deal with margin calls that they might not be able to afford, and all traders (whether using leverage or not) also have their individual psychological thresholds of pain – some limits to their losses which, when exceeded, compel them to close out the trade no matter what because it just has been too much for them to take. At times the market really comes back but very often, before doing so, it hits one of the trader's limits and makes him take an unreasonably large loss, probably multiples of times bigger than what he would have ended up with had he closed out the trade as soon as he saw that it was not working out.

The second basic emotion is **greed**. Greed can technically be described as fear because greed is nothing else than fear of missing out – fear that the market will make a nice move but the trader will not participate in it.

Greed compels the trader to get into a trade too early. That means that very often he gets into a trade at a price which is worse than what would have been available eventually, decreasing the profit potential and increasing the risk. If the trader uses stop loss orders some fixed distance away from the entry point, premature entries make it more likely that the stop loss order will be unnecessarily hit because the market will afterwards go in the right direction. Stop loss order works such that when the price goes against us up to a certain point, the trade is exited at this pre-specified loss. It is a means to limit risk (Nesnídal, Podhajský, 2006). Another example of behavior affected by greed is when the trader gets into a trade which is too risky given its potential and where a rational trader would not trade. Third example is reluctance to exit a winning trade. Instead of feeling fear and closing out too early, some traders feel greed because they are not happy with how much money the trade has made so far and they want more, despite the fact that the trade's potential might have been exhausted. The market often turns around and they end up with a much worse outcome than what they would have had if they took the profits when they saw that it was all that there was to be made.

2.2 Markets are way different than any other environment people experience

There are four reasons that confirm such statement: (1) there is an unlimited potential for profit and loss, (2) markets are perpetual with no beginning or end, (3) markets are an unstructured environment (Douglas, 1990), and (4) markets are too big to be manipulated (Douglas, 2000).

2.2.1 Unlimited potential for profit or loss

Let us start with the first one – nearly unlimited potential for profit or loss. This is true especially for the futures and option markets, or even in the stock markets for that matter (if one trades with large leverage). Whenever a trader enters a trade, it always has a potential to fulfill his wildest financial dreams and nightmares as well. There is always the possibility that the market will go in the desired direction right away and keep going there for years, making a fortune. Or, on the other hand, it can in the very same fashion go against the trader, send him many margin calls, make him sell his possessions to have money to meet the margin calls, and in the end cause him to lose all he owns. However unlikely these possible developments might seem, they still do exist and it is still true that any trade can make or lose a lot of money in a short period of time, a combination such that is definitely impossible in any other area of human life.

This aspect is further enforced by the fact that we already mentioned, and that is lack of rules. This time we are speaking of money management (or risk management) rules. Hedgers and any other professional traders have strict money management rules. They know how much they can afford to lose to stay in business (both financially and emotionally). They know what kind of damage they will suffer if they experience a losing streak of X losing trades in a row. They know how distant stop loss orders to place, what volumes to trade, in what related markets. In other words, they know how to calculate their exposure to market risk, they know if they can afford it, and if they cannot, they have the discipline (or, when speaking of hedgers, the obligation) to not trade this time or to trade with lower volume. On the other hand, most individual traders do not have the discipline to follow such rules, or they might not have any rules at all, making them take too large positions in too risky situations, and making it only a question of time when they go out of business.

The most dangerous fact about the phenomenon of close to unlimited potential for profit or loss is that to achieve it, the trader does not have to do anything after he has entered the trade. If he wants the trade to go far (whether in his direction or against it), what he has to do is just sit on his hands and do nothing. This is dangerous especially when the trade goes against the desired direction. He has to actively participate to liquidate the trade, and he has to do nothing to stick with the trade (Douglas, 1990). He can even walk away from his screen, go to a vacation, or anything else to get away from the markets so that he does not see what is going on, with the intention to come back some long time later to see how much money he made. If we combine this with the natural reflex to freeze when the reality is not meeting our expectations, we get a very dangerous combination. In any other human endeavor, it goes the other way around – one has to keep making poor decisions to keep losing money, and do nothing to stop losing money. Even gamblers can only lose what they wager. If they are to lose more, they have to play and wager again and again. They have to do something to keep losing. If they freeze, they will stop losing. In trading, it goes the other way around.

2.2.2 Markets are perpetual with no beginning or end

Second reason is that markets are perpetual with no beginning or end. This is not very difficult to grasp. Markets are in motion all the time. Economic news is happening 24 hours a day, 7 days a week – especially now that we have internet connection and cable TV which make it possible for us to watch the news coming in from any part of the world that is not sleeping. Most markets are traded electronically and are therefore open even at the nighttime. During the weekends and national holidays the markets are closed but the news might still be coming in, psychology might still be at work in traders' minds as they spend the weekend figuring out what they will do on Monday when the markets open. Therefore, even in the weekends the price is moving; it is just that it is only in traders' minds and not at the exchange in form of some readable number. When the markets do open, the actual market price goes from the Friday's closing price to the level where the virtual price is within an instant – the buying and selling orders placed over the weekend reach the exchange the second when it gets opened. It almost never happens that the Monday opening price would match Friday closing price.

This second reason is important because it adds another dimension to the freedom that a trader has. It is only himself who specifies how many trades he will make per unit of time, or how long he is going to stay in them. It is himself who determines when the markets are

choppy and too risky to trade and when it is better to stay away from them. Again, he does not have to specify such rules and he might trade all the time – no one will hold him back and the markets are always going to be there for him.

2.2.3 Markets are an unstructured environment

The third reason is that markets are an unstructured environment. This is very important. Markets generate extremely large amount of information, be it information related to fundamental prospects of the security or information generated by technical analysis of the chart formations and technical indicators. In fundamental analysis, one can just take a look at any financial section of a newspaper – every single day, there are dozens of articles. News services might be able to provide up to hundreds of flash news items during just one trading session. In technical analysis, there are again tens or rather hundreds of computerized technical indicators to be used, each one of them having hundreds of different settings. If we take a look at a pure price chart with no indicators, we can view it in tens of possible time frames. There are hundreds of trends, corrections, consolidations, spikes, and other formations every day, big or small. All it takes to see them all is to just zoom in the chart enough. Trades can be held anything from a few seconds to many years. They can be traded in an all-in-all-out manner, or one can use scaling in our out (getting into or out of a position step by step). One can use large stop losses and small profit targets or small stop losses and large profit targets, or anything in between.

To demonstrate this, we can take a look at how the March 2009 expiration of the CME E-mini S&P 500 Futures closed on Friday, February 13, 2009:

Figure 2.1: 60-minute chart

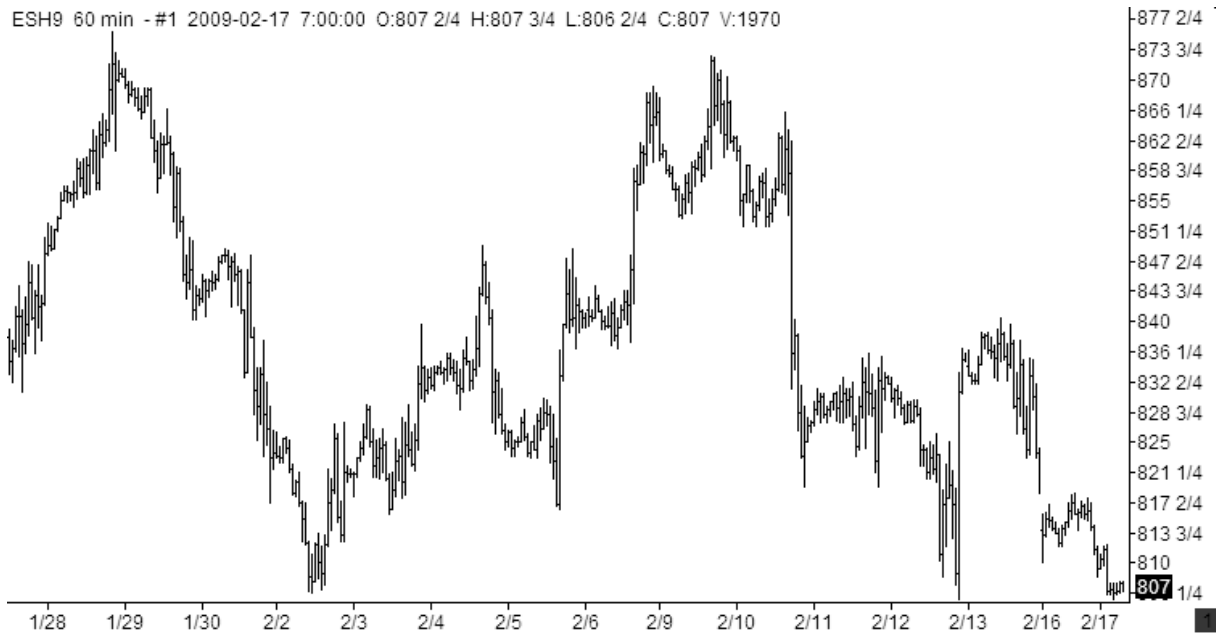


Figure 2.2: 3-minute chart



Figure 2.3: 15-second chart

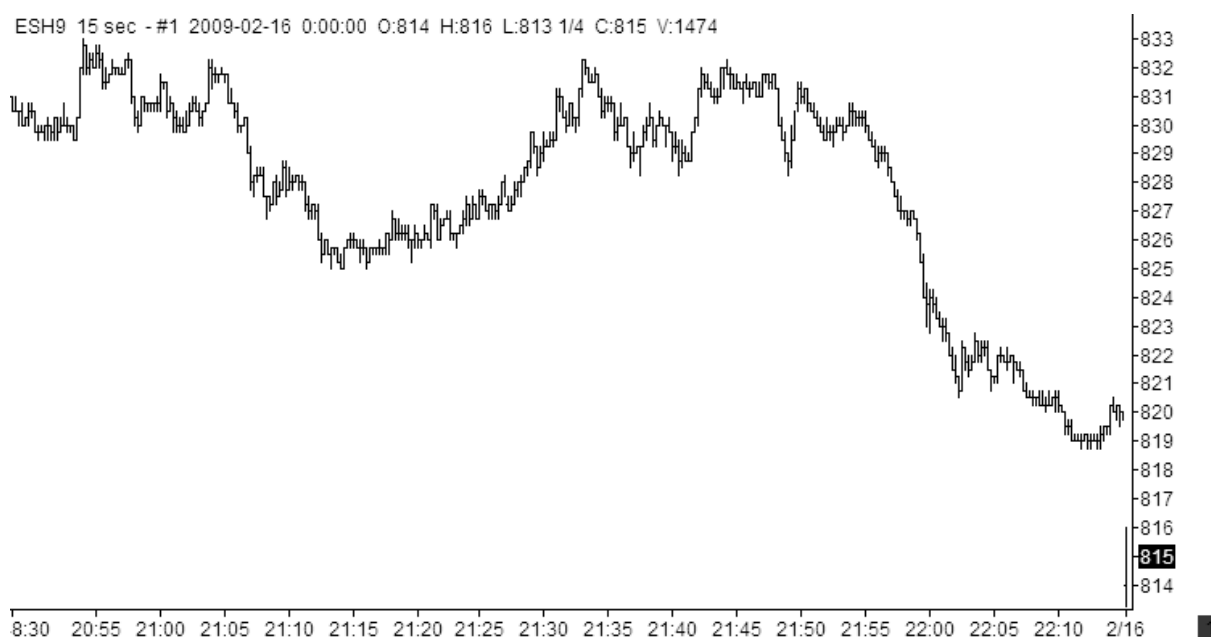
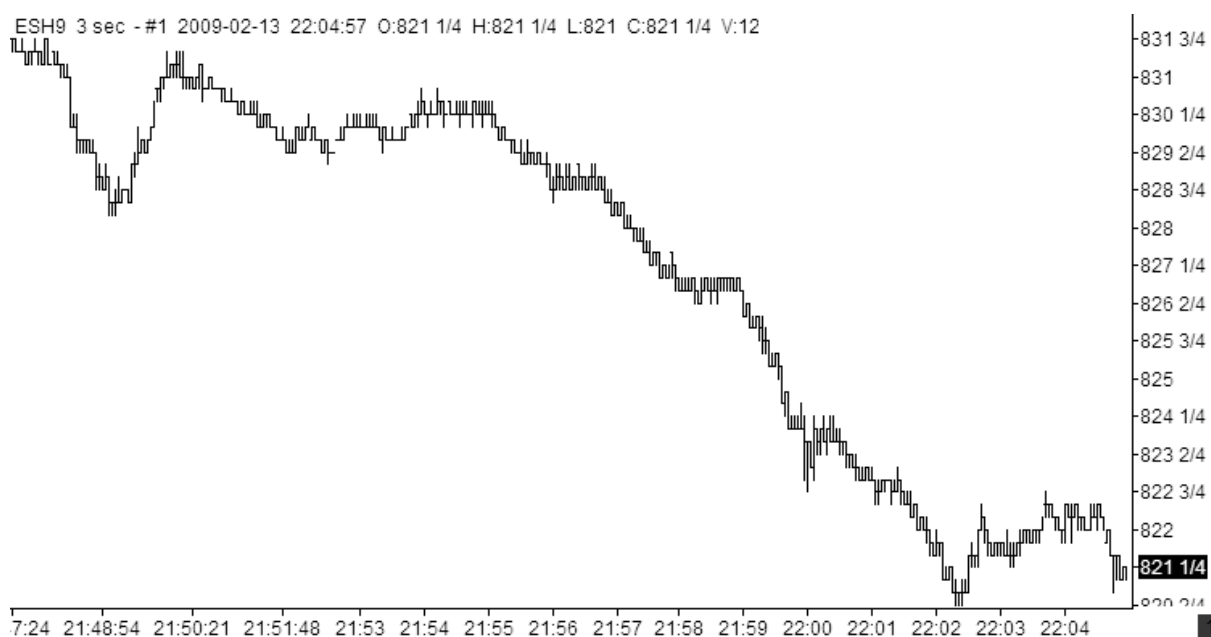


Figure 2.4: 3-second chart



(Charts courtesy of SierraChart and TransAct Futures.)

We examined four different time frames: 60-minute, 3-minute, 15-second, and 3-second, each number reflecting the duration of one green bar in the chart. For example, a 3-minute chart means that every vertical bar shows the range where the price was during a 3-minute interval, starting at the time on the X-axis. Taking a look at the very same security during the very same time, we can see that there are many trends, consolidations, and

corrections that we could take into account if we wanted to trade the downtrend. The charts do not look alike – the relative sizes of the formations are different. Not to mention that we could zoom further in or out, add some indicators, economic news and so on. As far as the indicators go, Investopedia.com in its Technical Analysis section mentions about 310 patterns and indicators. As far as fundamental analysis, one can check Bloomberg.com, one of the most popular financial news sources. In its Markets section, at the time of writing this thesis, the site displays 81 articles dealing with stocks, bonds, commodities, currencies, energies, and funds - markets that are all linked and affect each other. Also, as Mark Douglas (2000) points out, if we combine bond futures, bond options, and cash bond markets, we get about eight billion possible spread combinations. Not to mention countless possibilities of timing, position sizing, and also other markets besides bonds.

As we can see, there really is a countless number of possible strategies that can be followed and countless pieces of information, time frames, indicators, and other things to pay attention to. It is completely beyond capabilities of any human being to follow all the information, not to mention the fact that very often, these information contradict each other. There are also countless ways how to treat the markets from the timing point of view that we discussed two paragraphs ago. This all makes the environment completely unstructured and virtually infinite.

This implies two things. One we already talked about in the chapter on who the speculators are. It is that they have complete freedom to act in any way, making it possible to make the poorest trading decisions available with no one holding them back, but rather with competing traders rushing to be the one who takes the other side of the trade. Second implication is the possibility of twisting the facts. With such an overload of conflicting information, it is impossible to use them for making a decision without using some kind of a filter which would uplift the few most important and soundest information. One of these filters, which is encoded in our minds, is twisting the facts to confirm our prior beliefs about the future. Just as our subconsciousness may cause us to freeze and not make any decision because it is afraid that the decision will turn out as poor, the subconsciousness is also able to distort information coming in. Whenever we have high expectations and beliefs about favorable future and our brain starts to receive information that suggest otherwise, the subconsciousness wants to ‘protect’ us from dissatisfaction and causes us not to see the unfavorable information, and at the same time uplifts any traces of favorable information that would confirm the beliefs (Douglas, 1990). This phenomenon can be seen everywhere in life and it makes sense that the more complicated and unstructured the environment is, the more

often this distortion of information will be happening. The trading environment is one of the most unstructured environments one can encounter and therefore the information distortion is present all the time.

2.2.4 Markets are too big to be manipulated

The fourth reason that markets are somehow different than anything else is that they are too big to be manipulated. Any other area of human life works in such a way that we are the better off, the better we are able to manipulate the external environment around us. When something does not work, we fix it. When someone causes us trouble, we use the power we have to make him behave according to how we want him to behave. If it cannot be done, we seek someone else over whom we have more control. There is always something additional around us that we can do to make the environment better fit our desires. In trading, the exact contrary is true. Recalling the beginning of this work, if one is a speculator, he is too weak to be able to manipulate prices. He just does not have enough money to pump into the markets to make them do what he wants. He is just a small drop in a big ocean. No matter what he wants and what he eventually does, it will not (most likely) have any marginal effect on the behavior of the market. Market will always have its way no matter what a single trader might think or do. Now this is very easy to understand on the conscious level. However, for the subconsciousness, it is much harder. And it is not surprising – manipulating with the external environment is something that we have been doing ever since we were born, in virtually every aspect of our lives. It is not easy to reprogram our subconsciousness overnight.

2.3 Psychological aspects of trading

2.3.1 Memories, associations, and beliefs

Every human being's psychological makeup includes many features that help it deal with the complicated world around us. These are for example memories, associations, and beliefs (Douglas, 1990). Memories are traces of something that has happened to us in the past. Association is a process by which our subconsciousness organizes the countless information flowing into the brain. It is designed to look for similarities so that we know in an instant under what category our present experience falls. Belief is basically some image of how

things are that we shape within our minds based on our experiences, memories, and associations that we have acquired. We could say that when one has a belief, it is in fact his version of truth about how things are. Everyone shapes his idea about the truth by learning and going through experiences, making distinctions, associations, and forming memories. How our beliefs look like is also very much affected by our current emotions like fear and greed.

Mark Douglas (1990) shows a very clear and simple example of a belief. He mentions a TV show (probably with a hidden camera). There was a man standing in the middle of one of the busiest streets of Chicago, and he was equipped with a large amount of cash. He was supposed to approach people and give them money – for free and as much as possible. The result was that during the whole day, there was not one single person who would take the money. Everybody thought that the man was crazy and they quickly walked away without a word. They had this belief that no one in his right mind would be so stupid to approach people and give them free money, and if so, he is probably mentally ill and should be avoided. Another example that he shows is a superstition seen at the Chicago Mercantile Exchange – in one of the exchange's rest room, there was a urinal that had a penny in it. The traders (many of them probably managers of multi-million dollar funds, and therefore big market players) seriously believed that whoever used this urinal with a penny in it, would have a very bad day and lose a lot of money in the trading pits.

In securities markets, basically everything comes down to beliefs. All traders are buying or selling because they have formed some belief (best possible version of the truth from their point of view) about the internal value of the security. If they see that the real market price is lower, they buy, and if it is higher, they sell. For example, when a trader experiences a losing streak, he feels offended. No one likes to lose money. He creates bad memories and associates them with the situation in which he acquired them. When another situation appears – one that is different but yet shares some similarities with the previous one, fear kicks in, filters away any differences between the two situations, and brings up any similarities (this is the process of information distortion described in previous section). This will cause the trader to act impulsively and quickly view the situation no different from the previous one that cost him a lot of money. He will naturally avoid making a trade and he will feel relieved and therefore also elated about what a 'good' decision he made.

The reason that he will feel elated is the following. One problem with beliefs is that they are very hard to get rid of. They work in such a manner that they get reinforced every time they affect our behavior. We said the trader felt relieved. He did not want to make that

trade – not because it did not have a good potential for making money (because it could have had) but simply because it resembled the painful past too much and he did not feel comfortable making the trade. Distorting the market generated information, finding a good reason to avoid the trade (consciously or not), and forming a belief that it is not the right time to get into the market was very comfortable because it was in accordance with his emotions and painful memories. He will feel like he was smart enough not to let the market hurt him. Therefore he will feel elated, which will further enforce the belief. One could object that if the trader later saw that the opportunity was profitable and his decision to stay away from it turned out to be bad, the trader should learn from his mistakes and should not repeat the mistake next time. This is true; the problem is that in such an unstructured environment, no two situations are completely alike. Markets are too complicated and offer too many combinations to produce some significant odds that two separate situations would look completely alike. And whenever the situation is unique, there are always some unknowns, and therefore there is always room for forming individual, emotion-affected beliefs, and for twisting the objective market-generated information to be in accordance with these beliefs. Also, from the trader's perspective, time passes very slowly. Even for the 'fastest' trader, which would be the day trader – short term, minute-to-minute development of the trading day is what he experiences most, leaving little or no room for concentration on the long term development and most importantly on the similarities in his behavioral patterns and failures. Maybe the trader could learn to recognize this behavior of himself, try to get rid of it, and start acting more rationally, but experience shows that this takes months to years – and with such irrational behavior it takes just days to weeks to lose a few thousand dollars, which is about the maximum that most people are able to set aside as their trading capital.

2.3.2 The need to be right

After memories, associations, and beliefs, we have another aspect: the need to be right (Douglas, 1990). People love to be right and hate to be wrong; to make mistakes. This needs to be so because we are all brought up that way. A little child, if he is being bad, gets slapped by the parents who are trying to correct him. Or they might not buy him a new toy. At school, we are rewarded by good grades for following the rules of the game and a little humiliated in front of the entire class if we do not follow the rules. At work, we are obviously to follow the instructions given to us by our boss and get punished if we do not. The problem is that in trading, this mindset that we have is very problematic. No single trader knows the future. The

market is too complex to be outguessed with 100% certainty. We have already seen that it takes just two traders trading at an unforeseen price level to make the price do what we thought 'it just could not do'. All traders, even the best ones, must have losses – it is an ordinary part of the business, just like running costs, salaries, and investments are an ordinary part of any other business. (Elder, 1993) The problem is, in any other business it is easy to link these expenses with what the company needs to keep operating and making money in the long run. But in securities markets, it is easy to consider every trade separate. It is difficult for the trader to see how making a losing trade keeps his 'company' operating. Instead, people tend to personally attach themselves to the trades they make. They consider the outcome of the trade (profit or loss) to be the reflection of how good they were at predicting the market. In other words, it tells them if they were right (which is what they like) or wrong (which is what they hate). Therefore, when trading, besides worrying about the financial outcome of the trade, people also worry about the mere fact if they are going to be proven right or wrong. There is an informal term describing this phenomenon, and it is 'getting married to trades'.

This all results in traders trying to avoid losing trades, which we know cannot be done. Yet the urge is so strong that traders attempt to do it. Failing to take a trading signal, closing out a winning trade too early because of fear that it will turn into a loser, making the trader 'wrong', or sticking with a losing trade for too long, hoping that it will come back into profit and make the trader 'right'. We discussed these situations in the section on fear. The urge to be right and avoid losing trades is just another reason why traders tend to behave this irrational way.

2.3.3 The comfort of having a leader

The third aspect we are going to talk about in this section is the comfort of having a leader (Elder, 1993). This is probably not very difficult to realize. It is a common knowledge that people feel comfort when they are doing something that other people are doing or at least something that other people approve and support. Or this 'other people' could very well be substituted with one trusted person or small group of people. Let alone in trading – that means, in an environment which is, as we have already seen, an unstructured one; with so much freedom that people are not even comfortable with it. The leaders could be trusted because they are close acquaintances, they could be considered experts in their field, they could have a good track record of predicting what the market will do next, or they could simply be able to look reliable in the eyes of other people. It could be a contributor in a

financial magazine, and it could very well be the trader's broker. Either way, most people hate to go against the crowd and love to go with it. Also, having a leader brings them a tremendous relief – if things go wrong, they have someone to blame. We already mentioned that people loved to be right. Well if they are not right, the only way to avoid feeling guilty about the poor decisions is to blame the failure on someone else. Now that traders do not have any responsibility over their trades, they will not mind following other people's ideas, no matter how stupid.

We have to mention that this leader could be the market itself. People might see a tremendous move up and then start buying because everybody is buying. Usually, at this time also other leaders kick in, like magazines and newspapers giving ever more optimistic forecasts just to get the spotlight. The need to have a leader therefore causes impulsive behavior of traders, one that is relatively primitive. After all, this is how stock market bubbles work, as will be discussed later in part three.

Leaders could also take the form of trading strategies. There are trading strategies that have such a good promotion that they make a lot of people believe in them. Now people make their own trading decision but only as far as the strategy dictates. If anything goes wrong, the strategy is to blame. The strategy does not need to be a profitable one. There is a technical trading strategy called WoodiesCCI available on the web for free. It has been programmed into an algorithm which has been extensively tested on historical market data and it is said that the strategy was consistently losing money. Yet more and more people join the community around this strategy, learn it, discuss it, trade it, and most likely lose money. As weird as it might sound, the comfort of having a leader seems to be more important for most people than making money. WoodiesCCI was just one example – there are many more: other technical indicators, Fibonacci retracements, Elliot waves, Gann fans, Hurst cycles, pivot points, etc. Most of these have been invented by some market guru who was lucky to get on a winning streak, predict a few market turns, get the spotlight and publicity, and then have many people blindly follow his advice (usually for a decent fee). After losing a lot of money (because that is what usually happens after a winning streak of a poor trading strategy), people blame the guru and either give up trading or go on to another guru who emerged in the meantime. And this goes on again and again. A guru's fame tends to last for 2 to 3 years (Elder, 1993).

2.4 Conclusion

We have described several pieces of the puzzle. These are: (1) most traders quite naturally feel two basic emotions, fear and greed. That might cause them to enter or exit their trades too soon, when the market ‘just cannot go any further’, or too late, when the market ‘finally gained the momentum’. (2) Markets are way different from any other environment people usually get to experience. To be exact, there is an unlimited potential for profit and loss, markets are in perpetual motion with no beginning or end, and markets are an unstructured environment. This means that whenever people follow their natural tendency to apply to markets the methodologies that worked for them in their earlier personal and professional lives, these methodologies usually do not work out. (3) There are several important psychological aspects of trading, namely memories, associations, and beliefs. These are driven by experiences and emotions and play the most important role in making a buying or selling decision. The ways of using the emotions for forming the beliefs is rather repetitive and primitive from an independent observer’s standpoint but on the other hand very difficult to recognize and break from the trader’s perspective. We also have the need to be right – another thing that causes impulsive and primitive behavior as a result of traders’ everlasting struggle to trade without losses or any other mistakes, which is impossible. Last but not least, we have the comfort of having a leader – the fact that it is natural for traders to seek some individual or group of individuals whose advice they could follow to avoid the hard work of learning how to trade, and, at the same time, on whom they can put the blame if things go wrong.

Our conclusion so far is that all information which has anything to do with the market (be it fundamental or technical analysis) is heavily distorted by most traders’ subconsciousness as a result of their emotions and other psychological makeup. Since it is traders who send the orders to the exchange and thus move prices, it is inevitable that their emotions affect the behavior of prices very much – probably even more than the fundamental information that uncover part of the probable future of the underlying assets.

Part III: Reflection of emotions in the markets

3.1 What emotional behavior has to do with what the markets do

When people act out of their emotions their behavior gets extremely primitive. They watch the screen to see every tick up or down that the market makes. They will feel very good whenever the market ticks in their desired direction, and they will feel very bad whenever it goes a tick against them. All of the emotions that we described earlier get into play and cause impulsive behavior when managing an existing trade.

3.1.1 Reasons why many traders could have similar behavior

We could assume that most traders are give or take alike. As humans, we are all unique, yet when we are under stress and time pressure, playing simple games like the markets, and having our life savings at stake, we tend to behave in a very similar fashion (Douglas, 1990). All traders trade for the same reason – making money. Within our time frame perspective, we all see the same or similar chart. Our screens are of similar sizes, making us looking similar distance back into history when checking important price levels at which we place our orders. We have the same sources of financial news available. We all have a tendency to like round numbers. No beginner in his right mind would probably place an order at 1459.6 instead of 1460. We have similar perception of how much is a lot and how much is a little. Markets will most likely never appreciate or depreciate by 50% in one day. On the other hand, it will not happen very often that they would move by just 0.1% in one day. For every market in every economic cycle, there are some general boundaries in terms of percentage points in which the markets tend to stay for the most part. All people see it, all media cover it, and therefore all people have very similar measures to what is ‘a lot’ and what is ‘a little’. This again has some impact on the ways they place their orders, or for how long they wait for the trend to reveal itself to consider buying into it, etc.

It is also useful to look at the most popular technical indicators. There are many of them; they have fancy names and a lot of parameters to configure how they transform the price chart into some other chart. Yet the experience shows that generally they give very similar buying and selling signals. Most trading strategies are trend following, and they

usually follow the advice to wait for a consolidation or correction to take place after some visible trend, and then get in. If one wants to find an indicator to give him signals that would satisfy these requirements, there are not all that many indicators and settings that would be suitable. Most people who create trading strategies arrive at similar indicators and similar settings because within one time frame, they all seek the exact same trends and exact same consolidations to guide them. If they increased the smoothing effect, they would get too few signals given their desired time frame and they will miss a lot of moves. If they decreased the smoothing effect, they would end up getting too many signals, resulting in too much work, too much money paid for the commissions, and too many losing signals which are completely out of sync with the market (because that is what must happen when the smoothing effect is smaller). Therefore there is not much room for many different settings. If we take some other indicator, the resulting mathematical curve on the chart will be different, the settings will be obviously different, but it will again hold that there will be just a small window for sensible settings, giving buying and selling signals of satisfactory frequency, and in the end closely coinciding with those that the preceding indicator was giving. If we were to put it into one sentence, we could again say that people have similar perception of what is too much and too little in their time frame perspective, and therefore choose indicators and settings which generate trading signals at similar points.

Furthermore, most people hate to go against the crowd, as we already mentioned. We said that most trading strategies are trend following, so they are going with the crowd. That is true, but we have to distinguish between different levels of trends. They might follow the overall trend but we said that they usually have to wait for a consolidation or correction to take place. This correction, meaning a movement against the established direction, is a little trend by itself. It is a smaller trend than the overall one; it is one level below. But it is still a trend, it is a distinguishable movement of a size that is not negligible, and if people were to blindly enter the market in the direction of the overall trend during such consolidation, they would be going against this short term trend. This might not sound like a big deal but in reality, the experience shows that it is extremely difficult to put money at stake and go against the flow (no matter how short term flow), hoping that the market will turn around and go in the desired direction. The comfort of having a leader is too tempting. Therefore, most of them design their trading systems so that they might get some kind of a clue that the consolidation is over before entering the market in the overall direction. They want a 'sure thing' – they want to avoid going against the crowd, they do not want to confront the possibility that the market might make them wrong. They need to be right. And, for the people who are new in

this business, what better clue could one want than seeing that the market is starting to turn around; that it made some little movement against the direction of the consolidation and in the direction of the overall trend which the trader wants to follow. For example, they could want one bar in their direction and enter at the close of this bar. Or they could want a ‘hook’ on their indicator line as a clue that the market is turning around, and they could plan to enter at the close of the bar which created the hook. Since, as we have seen, all indicators and settings suitable for one time frame give pretty much similar signals, they also create these hooks at an almost same time. We might want to clarify why waiting for a bar to close is so popular. It is because it gives people exact times at which a trade might be made. If they trade a 3-minute bar chart and they do not worry about closes, they might need to trade at any time. On the other hand, if they only trade on the close of a bar, they can only get signals at 15:30, 15:33, 15:36 etc. Since buying and selling decisions have to be made split-second, it is good to know when it might be coming. Otherwise it would be necessary to watch the chart every single second since the signal might come anytime. Entering at the bar’s close is also suitable for back testing the strategy on historical data. People are too lazy to replay the charts second by second. Rather, they take the finished chart which only shows how it looked like at each bar’s close and not what it did while the bar was forming.

Figure 3.1: Where technical indicators trigger



(Chart courtesy of SierraChart and TransAct Futures.)

3.1.2 The question of consistency

It is also important to take a look at traders' consistency in following their trading strategy, whatever kind of trading strategy they have. Every strategy has losing trades and there are always losing streaks. The more experienced the trader, the more exceptional this might be. But first of all, there are very few experienced traders, and second of all, it still holds that even they get losing streaks from time to time. Now if a trader gets two or three losing trades in a row, he will be compelled to avoid trading the next opportunity because of fear and resulting belief that the next trade is going to be a loser as well. How this operates has been described above. After seeing that this one would have been a winner, the trader will start creating non-existing trading opportunities in their minds, trade them in an urge to substitute for his recent costly mistakes, and lose even more money on them. If, on the other hand, the trade he avoided was a winner, he will feel that he has some kind of a gift of being able to outguess the trading strategy. He will get reckless at trying to outguess his strategy and therefore will again start finding non-existing opportunities which will cost him money.

Another source of reckless trading of non-existing opportunities is the subconscious illusion that markets can be manipulated, as discussed earlier. It is not that people would think they can move the market right now – hopefully very few are so insane to actually think so. It is that people think that the market just has to prove them right. This time they are not being driven by fear or greed. They are driven by the illusion that they know for sure what is going to happen next. They feel strong that they can outguess the market, that they are better than it, and that this time they are going to take revenge for the losses they made earlier due to the market doing the wrong thing. And they get so addicted to this idea that it is difficult to let go of it. They think that they can move the market and make the 'bastard' do what will bring them money and satisfaction of being right. They do not think they can move the market with their orders because everyone knows it is impossible but yet they keep trying to move the market with their minds and perseverance. They think that if they keep struggling for long enough, it will be proven that they have been right all along (a kind of 'I told you' attitude) and the market will be proven wrong and finally start to do what is in accordance with their interests. Only after some heavy losses will they find out that it does not make any sense. Markets are too big to be manipulated. This 'making the market do what it is supposed to do' has cost many people a lot of money. (Douglas, 2000)

So this is why traders will slip into reckless trading time and time again. This will usually be bad for them. The reason these non-existing opportunities cost a trader money is

that he is driven into them by emotions alone. Markets are perpetual and unstructured, and therefore there will be a lot of room for making even more trades based on momentary emotions. The trader will try to go wherever the market seems to be going. Therefore it will be very easy for his hidden competitors (whose sum total equals the market in general) to trick him into very unprofitable trades. Now if any strategy can make money trading, then it needs to be followed consistently in order to actually make the money. But it is very difficult to be consistent, and therefore no matter how good a strategy a trader might have, he will very often stop following it at some point and start following his emotions. That will cost him money and cause him to seek some other trading strategies, which he will not again be able to follow, and this vicious circle will continue until the trader is out of business (Douglas, 2000). This is a guarantee that there will always be many traders following their emotions, and whose behavior is likely to be predictable to some extent.

Lack of consistency at following a trading strategy has yet another important implication. It means that very often, the major trends occur after some really choppy consolidation, one that generated one or more losing signals to most trend following traders. This happens for a reason: if a major trend is about to occur, it means that there must be relatively few unexperienced traders capitalizing on it right from the start. If there were many such traders right from the beginning of the trend, the fear and the need to be right would compel them to take their profits quickly, meaning a lot of orders against the trend, making it likely it will be reversed. On the other hand, if there are just few novice traders right from the start, the risk of reversal will be lower because there will be fewer people who will rush out of their positions. Quite the contrary, many such traders will have been waiting on the sidelines, and when they see such a nice move, their greed will compel them to jump on the moving train. These orders will be supportive to the trend and they will make it go even further. It is clear that if a large move is coming, most novice traders must be waiting on the sidelines and must not be in the market when the move starts (Williams, 2005). One of the good indications that novice traders will not be trading in the beginning is if we have seen a choppy, ranged market with several false breakouts which caused many traders lose a lot of money, start feeling an emotional pain, and submitting themselves to fear of trading the next breakout.

3.2 Why markets have memory, unlike a coin toss

A lot of people think of market behavior as completely random – one where the odds of the price going up or down by a certain amount is exactly 50:50. It is said that if we were tossing a coin and we would move the chart up by a tick if it came out heads and down a tick if it came out tails, we would get a chart that would resemble those that we see in real securities markets. The author of this paper thinks that this is not entirely true. There are several reasons for this.

3.2.1 Trends need to consolidate because there is profit taking

When a major trend emerges, people who have been in a position in accordance with the direction of the trend have made some decent profit. Many of them will choose to cash in on this profit and therefore send many orders against the trend, causing the trend to (at least temporarily) reverse. Whether it will be enough to end the trend, or whether the trend will be so strong so that it will continue is another subject but it still holds that at least some small, temporary reversal will occur because of profit taking. As far as people who were on the wrong side of the market (against the trend), these are probably out of the market by now because we are talking of a major trend which is sure to be beyond most people's threshold of pain. Therefore these people are not in the market by now, and their exiting orders have already been filled (perhaps they contributed to the strength of the trend).

3.2.2 There is not unlimited number of buyers or sellers

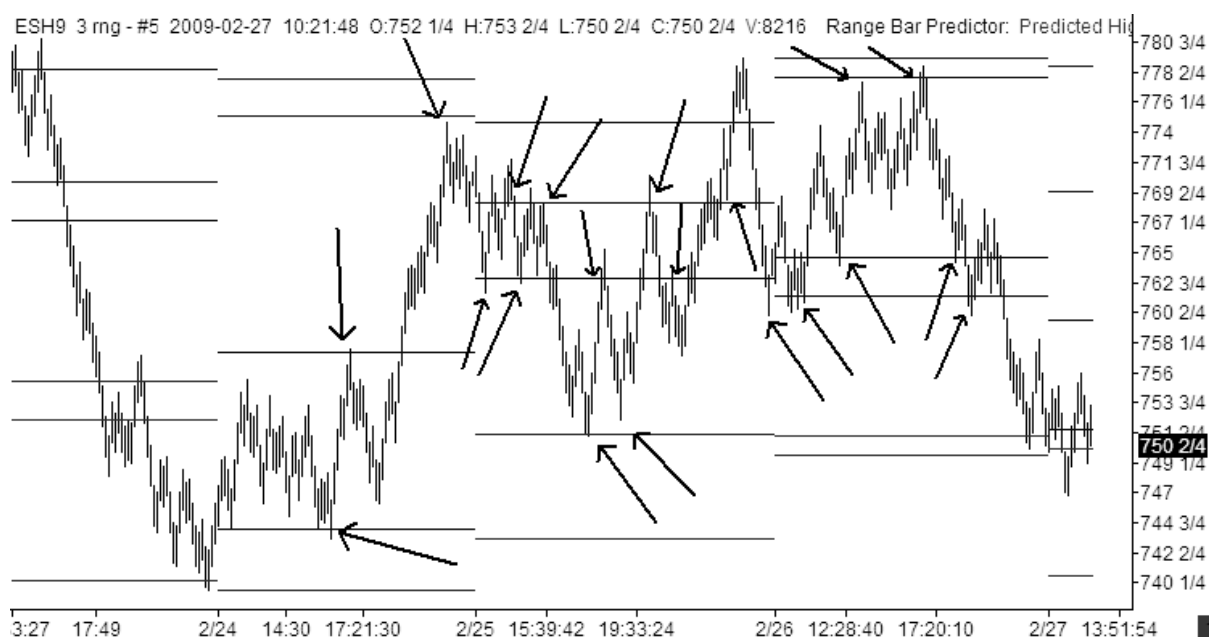
Even if there was not any such thing as profit taking, the trends would still have their limits to where they can go before correcting, regardless of what normal distribution would suggest. The reason is that there is not unlimited number of buyers or sellers. When a major trend emerges, at some point in time it has gone so far so that even the least experienced trader has spotted it and joined it. When the least experienced trader does it, everyone else must have done it already. Since there is limited number of people participating and potentially willing to participate in the market, at this point the source has been exhausted and there is no one else left to buy (if in an uptrend) or sell (if in a downtrend). We already know that price can move only if there is a discrepancy between the number of potential buyers and potential sellers. Right now we have some unknown positive amount of potential sellers (or

buyers) and zero potential buyers (or sellers). Therefore, the trend will at the least stop, and more likely it will quickly reverse. More investigation into this subject will be done in chapter on stock market bubbles and their bursts.

3.2.3 Behavior of traders gets very primitive and pretty much the same

In the previous section we saw that there were situations in which emotional behavior of traders gets very primitive and pretty much the same with respect to other traders (and therefore to some extent predictable). People end up entering the market at similar times, under similar circumstances. They put their stop and limit orders at similar levels. Therefore, when the market reaches these levels, the orders get triggered. Very often they are so numerous to cause some, at least temporary, move in the particular direction. As an example, we could take important support or resistance levels, recent highs and lows, historical highs and lows, etc. Or we could take some levels that are derived by some mathematical formula, like pivot points or Fibonacci retracements. Very many people believe in these, and therefore very many people put their orders at these levels. The price will very often (though not always) bounce off of them and make at least some short term correction. If there is a confluence, in other words if several different technical levels happen to be close together, the impact is higher. If it is a multi-timeframe confluence, in other words if an important level for a higher time frame happens to be at the same price like another important level of the reference time frame, the impact is again higher. It is all because more important levels at one price mean more orders of the same direction stuck within a small price range, and more soil for a self-fulfilling (or at least partly fulfilling) prophecy.

Figure 3.2: Popular technical levels



(Chart courtesy of SierraChart and TransAct Futures.)

3.2.4 Theory of auction

Another part of market behavior can be explained by a theory of auction, as presented by Dalton (1993). He claims that price will always go in the direction of the least resistance. As in any other auction, or in any other free market with laws of supply and demand for that matter, the market price will always go in the direction of the least resistance. That is the only way to restore the equilibrium. If the volume of the traded merchandise is falling, the price will have to move in some direction and see if it is getting better the more it moves. If not, it will reverse and do the same thing to the opposite side, and if it is getting better, it will continue to move in that direction until the equilibrium is restored, which is again as soon as further movement in that direction stops bringing the volumes up. We can see this everyday in any free market of any goods or services, and there is no reason that it should be different in financial markets. Let alone when financial markets are the fastest and least regulated markets around (taking it from the perspective of how well and how fast the supply and demand laws work).

In financial markets, it will function in such a way that the price will explore different price levels, test them, and see if there is any interest (trading volume) beyond that price level. If there is, the price will go beyond that level and the process will continue over again with the next price level. Therefore, once the price 'takes root' beyond one price level, it is likely

to at least test the next price level in the near future. If there is little or no interest, the price will reverse and will at least test the next price level on the other side (Dalton, 1993). This could be seen on the previous chart.

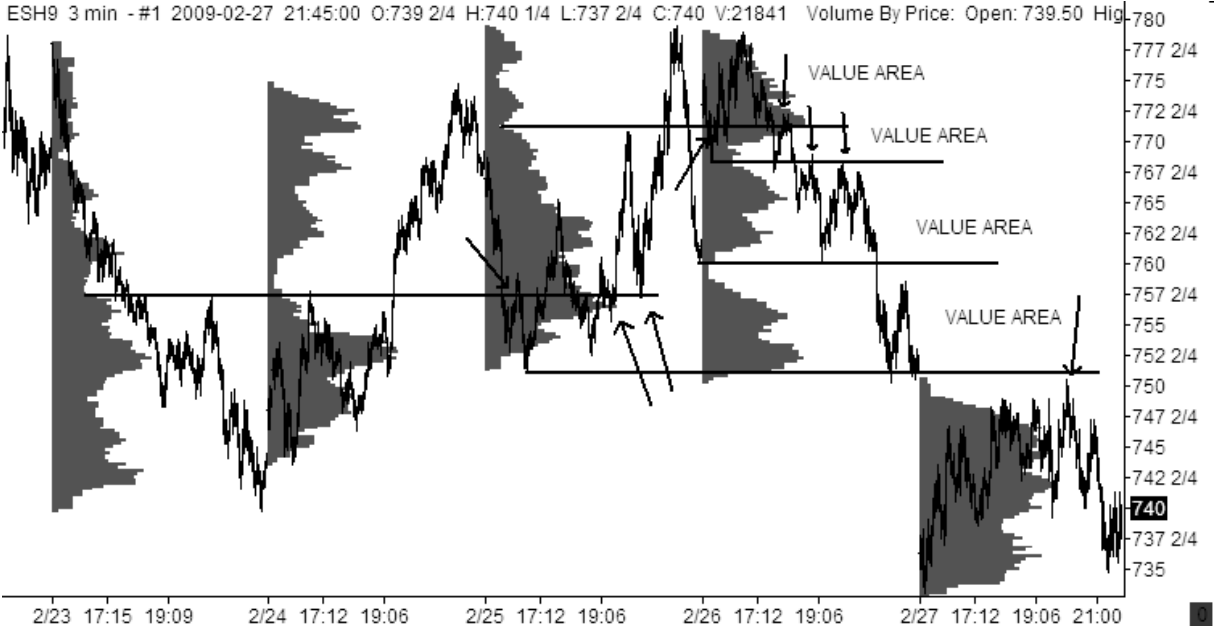
To make the picture complete, we should also mention what a price level is. We have already seen that it can be a support or resistance – a place where the price recently reversed. It could be a recent or historical high or low, etc. But this is an explanation taken from the psychological perspective – people think that the market ‘just cannot go beyond these levels’. If we were to take it from the most fundamental perspective, we should first speak of a value area instead of a price level. Value area is a price range where some big portion of volume has been traded (Dalton, 1993). Supports and resistances (price levels) are the exact opposite – levels at which negligible amount of contracts has been traded. Earlier we considered them levels at which price turned around. Therefore we have an identity: if the price quickly turned around there, not many trades could have been made there, and vice versa. Supports and resistances are also boundaries between two neighboring value areas.

Now we have several value areas (price ranges where a lot of trading has taken place recently), separated by supports and resistances, where little trading has taken place recently. Therefore, we have several areas where there has recently been a lot of agreement between traders that those areas reflected the true intrinsic value of the asset as perceived by the traders. And these areas are naturally separated by levels at which there was very little agreement that the level would reflect the intrinsic value (because very little trading took place there and the price moved away from the level very quickly). As of now, with a high degree of reliability, it can be said that if the price breaks out to another value area and is accepted there, it will spend some time there and most likely will relatively quickly test the opposite side of the new value area. On the other hand, if it is rejected and goes back to the old value area, it will spend some time there and most likely will be quick to test the opposite side of this old value area. The following chart demonstrates this phenomenon. The gray histogram is Volume by Price indicator, showing how much volume took place that day on that level. ‘Peaks’ on this indicator show value areas (a lot of trading), and ‘valleys’ show support and resistance levels (little trading). If we were to try to quantify these terms, a good approximation could be to take the maximum reading of Volume by Price indicator for a day (i.e. how busy was the busiest trading level of that day) and divide that value by ten. Any level at which there were some trades during that day and which has the reading of Volume by Price indicator smaller than or equal to the tenth of the maximum would be a price level (or equally support or resistance level, depending on whether the current price is above or

below that level. As for the levels formed on the current day which is not over yet, we would use the same approach; except that we would not start the calculations until about a third of the trading hours are over because if we want significant price levels, there needs to be some significant price action on which we can base our calculations. Obviously, if our time frame was different, also this condition would be different. Last thing which is missing from our calculations is that whenever one day gives us some price level and on another day (which came later than the first one) this price level is erased (meaning that the calculations on the latter day do not consider that level to be a valid price level anymore), the latter day takes precedence and the unconfirmed price level is not a price level anymore.

Going back to our example, the arrows show where the price broke to another value area, got accepted there, and usually stayed there for a long time. The last arrow shows a failed attempt to find value above 752, and then auctioning lower to find value there.

Figure 3.3: Value areas and their rejection



(Chart courtesy of SierraChart and TransAct Futures.)

Maybe we should also give some reasoning to why the price is likely to test the next price level after successfully getting past one. The testing will be done because of the hedgers we introduced above, who take advantage of the speculators’ emotions. Hedgers have the power to temporarily move the market. There are always at least some hedgers in a position. If they want to unload the position, they cannot just go ahead and do it because the market is not liquid enough to provide so much liquidity for their extremely large positions. They must

wait for a moment when the liquidity goes above its average. The best way to do this is as follows: while the price is still in the middle of a value area, it lacks conviction and momentum. Value areas are areas of high trading volume in total but if we look at momentary trading volume per a unit of time, it is in fact very small. It has to be – price is in equilibrium, there is no need for the market to move quickly and therefore there is no need for a high trading volume to move the market. Under these circumstances, it is easy to move the market. There is small volume, meaning that whatever this volume does, it is easier to overpower it. It is easier to tilt the market to either side. It is like a vehicle on a top of a hill which can be set in motion to either side with very little expended effort. Therefore an insider who needs to unload his position will use his tremendous power to temporarily move the market to the next price level. Because price level, as described in the previous paragraph, is a psychological level – it is by identity a support or resistance. There will be a lot of orders and therefore a lot of liquidity there. Again, earlier we said that these levels have very little trading volume in total but measuring it over time, they get very liquid. When the insiders manage to push the price there, the speculators' emotions trigger, a lot of liquidity enters the market, and the insiders can unload their position, or at least a significant part of it. We have been talking about unloading an existing position but obviously the same principle holds for accumulating a position by an insider. We have to keep in mind that for an insider, it does not matter which way the market is going. His main purpose is to hedge against risk and not making money on price movement. But he still has to accumulate and distribute large positions and the best way to do it is to take advantage of emotional behavior of small speculators.

3.3 Specific examples of how emotions affect market behavior

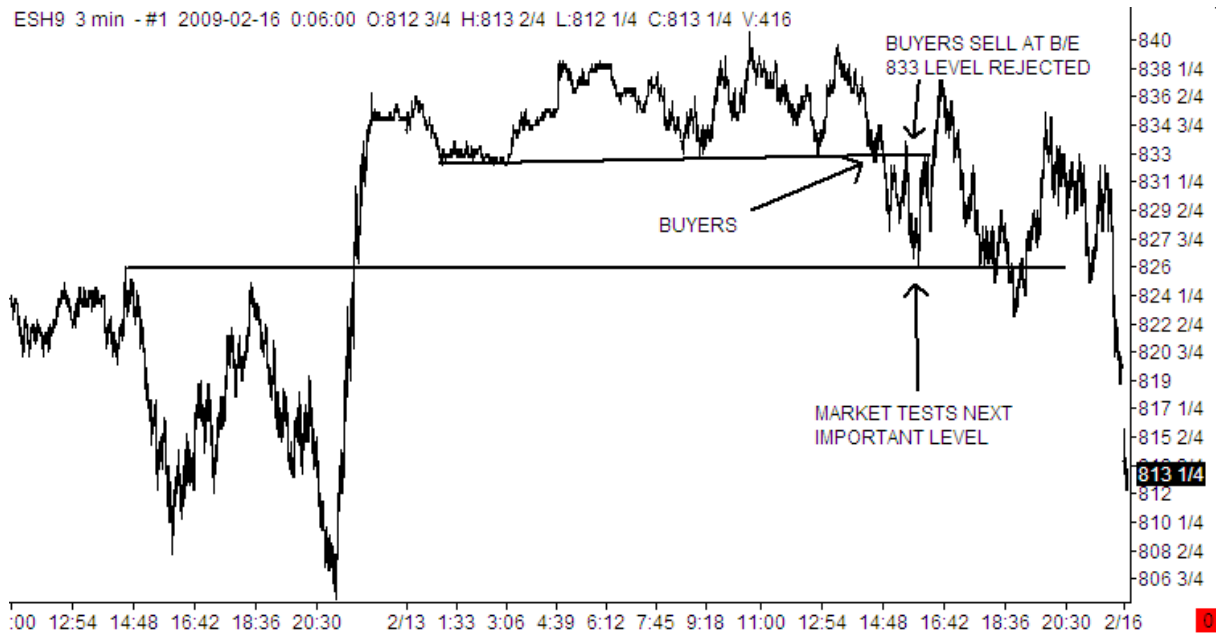
In this section, we are going to take a look at some real price patterns which emerge because of emotions that are present in the market. We have already seen some (bounces off of pivot points, daily highs and lows, and value area boundaries) within the context of the preceding section. Now we are going to add some more.

3.3.1 Role reversal

The first one is the so called role reversal pattern. It describes the phenomenon where support becomes resistance or resistance becomes support. It can be seen on the previous

chart. The lines, which are boundaries of value areas, are by identity (as explained above) support and resistance levels. In the preceding picture alone, one can find several occasions where the price breaks up through a resistance, then comes back, touches the resistance level back from above, and then continues on. Or it might be price breaking down through a support, coming back, touching, and then continuing down. The idea behind this pattern goes hand in hand with the auction theory. Breaking through a support or resistance means that the price got accepted in a new value area. Coming back and failing to break back to where it started from means that it wants to stay in the new value area, and that the old value area is really rejected. Therefore it is likely the price will stay in the new value area for some time, and very often it will at least test the next support or resistance in the way. Therefore it is no surprise that after coming back to the old support or resistance area it will bounce off and continue in the established direction for at least a short while. There is also another explanation for this (complementary rather than alternative), presented for example by Mark Douglas (1990) or John Murphy (1999): When the price was still in the old value area, the support or resistance which later got broken must have been formed by one or probably more matching lows or highs, respectively. This means that many people will think that the price just cannot go beyond this important level. They will see that the price bounced off of it two, three, four times, and therefore it is probably going to bounce again. It is nothing else than the famous comfort of having a leader. When everybody is buying, it is good to buy too. When everybody is buying at a support level and making money every time, it is good to go for it, too. Now when the support does not hold and the price breaks through, these buyers at the level will feel emotional pain. They will feel betrayed because something that has worked like clockwork till now suddenly failed them. These people will be praying for the market to come back at least to the entry point so that they might sell there and end up at least at break even. They could hope that the market will go even higher but we already know that people hate to be wrong and when given an opportunity to sell at break even and therefore avoid being wrong, or waiting for the market to go higher and therefore risk that it will turn back down into a loss, most of them will choose to get out at break even, which is at the old support level. These orders, combined with the momentum of the newly established downtrend, will usually be enough to turn the market around at the old support and new resistance level, making the role reversal pattern work. The same principle holds for a resistance becoming a support.

Figure 3.4: Role reversal



(Chart courtesy of SierraChart and TransAct Futures.)

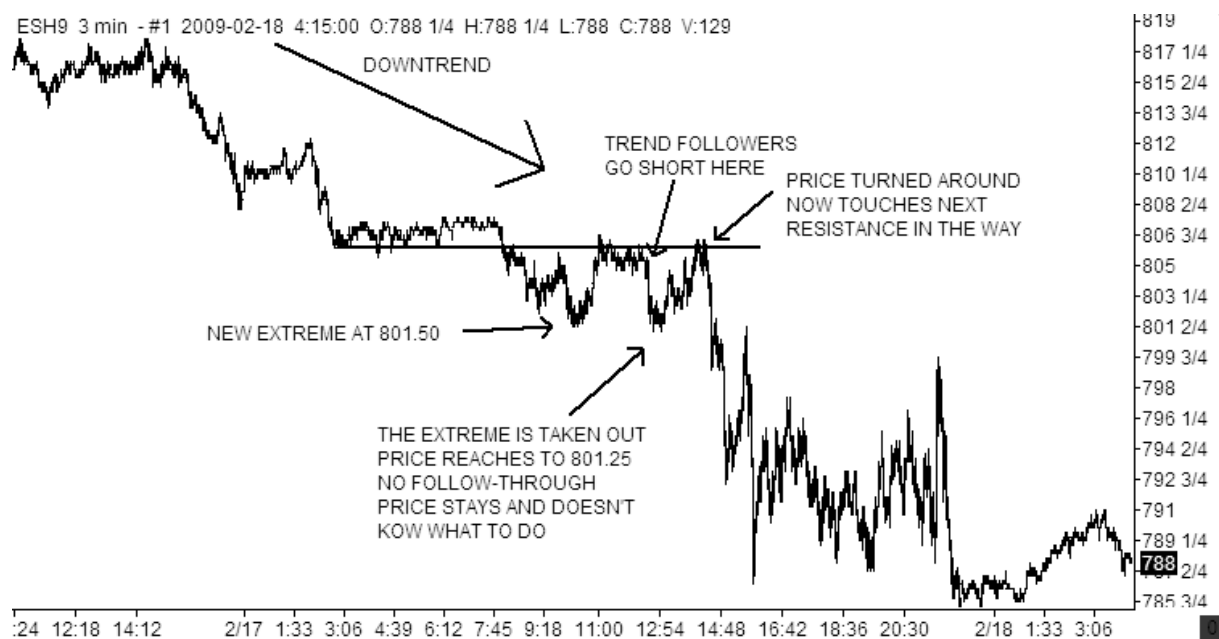
As for the quantification of this pattern, we can use the Volume by Price indicator approach described above to find supports and resistances. To calculate when a breakout has occurred, we would require the price to cross the price level and remain on the other side for several (for example three) price bars as given by the trading time frame, without coming back to touch the price level. By this time the price level is considered broken and when the price comes back to it now it will most likely bounce off and continue in the established direction to challenge the next price level.

3.3.2 Double top or double bottom

Next pattern we are going to talk about is a double top or double bottom (Bulkowski, 2005). It could obviously be a triple, quadruple, or any multiple top or bottom. These usually occur after some substantial trend. If they occur after some substantial trend which was just a correction of some even more substantial trend, they are reinforced because the momentum of the longer term trend is on their side. Double top or bottom again works by psychology, emotions, and value acceptance or rejection. We said that a substantial trend must emerge. This trend will suck in a lot of poorly experienced people who are willing to follow the lead wherever the market goes. Some of them will enter the position after the retracement, and some will enter as late as when the price approaches the newly formed extreme (when the

second leg of double top or double bottom is formed). Sometimes the trend is really so strong that it continues and these people will make profits. Other times it does not. It breaks out the new extreme but fails to continue; it rather stays where it is; not knowing what to do. Or it might even come back to where it was. This is an indication that the price did not find an acceptance in a new value area (one that is below the newly formed extreme) and that it likes the old value area better. If it was otherwise, the move should be rather quick after taking out the newly formed extreme. Emotions and panic should kick in and the price should rocket without looking back (except maybe for a quick role reversal). But if the price just sits there, does choppy moves, and does not know which way to turn, it usually means that insiders are just taking advantage of the liquidity, and a reversal of the trend is about to happen. We also have to think of the traders who followed the trend and got into a position earlier. Now that the market came back by a significant amount, the trend followers have gotten into a paper loss. Since just a few minutes ago they were in a paper profit, they will feel emotional pain which will at some point, sooner or later, become unbearable and it will cause them to close out their positions. These orders will reinforce the counter trend move.

Figure 3.5: Double bottom and top



(Chart courtesy of SierraChart and TransAct Futures.)

An idea of an algorithm which could find this pattern would first have to find if we are in a trend. This could be done for example by an exponential moving average with the period set to 50. The formula would go like this:

$$EMA_{50}(t) = EMA_{50}(t-1) + 50(price - EMA_{50}(t-1))$$

If the price is below the exponential moving average, we have a downtrend and are searching for a double bottom, and if it is above, we have an uptrend and we are looking for a double top. To find it, we need to see two legs which are enough distance apart because otherwise the pattern would be too small to have any meaning. One possible way to do that is use the Zig Zag indicator set for example to 0.7%. The Zig Zag indicator with such setting neglects all price movements which are in distance less than 0.7% of the asset's current market price. What is left are the waves which are greater than or equal to that size. Double bottom would be formed whenever there is a wave down, up, and down again to the low of the previous down move.

3.3.3 Triangle

Price sometimes forms a triangle (Bulkowski, 2005). When we say triangle we mean the following situation: price establishes a trend, after which a correction occurs. This correction forms some microscopic highs and lows. If we connect the highs with one line and the lows with another and these lines happen to run towards each other, we will get a kind of a triangle, one that we are talking about right now.

Figure 3.6: Ascending triangle



(Chart courtesy of SierraChart and TransAct Futures.)

The fact that such a triangle has been formed is an indication of some development in the mind of the market. If we narrow our attention on the chart provided above, there has been a downtrend, which means that the momentum still favors direction to the downside. After that, a correction took place, which we know is quite natural for any trend, even if it is to continue in the established direction. The fact that the lines connecting the lows and the highs of the correction run together means two important things: first, there is an effort to turn the market around, and this effort is getting stronger – because we are getting higher lows along the lower of the two blue lines. On the other hand though, the result of this effort is getting poorer and poorer – because although we are getting higher highs along the upper line, the rate at which these go higher is slower than on the other side of the triangle. We know that because the upper line is flatter than the lower one. Therefore we have a correction, where the effort of making it into a reversal is pretty high, but the result of that actually happening is very poor. Often, this triangle pattern will be accompanied by falling volume as the correction takes place – another indication of no interest to the upside. Therefore the chances are high that the market will continue lower after breaking out of the triangle. Let us also not forget the lack of consistency phenomenon. Triangles are formed of several swings which are likely to have provided several losing signals for trend-following indicator traders. Therefore it is likely that a big portion of them will stop trading for a while until they see some big move. This is the best time a big movement can occur. Whatever the reason, same principles hold for a triangle in an uptrend. Sometimes we get another kind of triangle – one that is horizontal, as can be seen in the next picture. Here, the principle is again the same, except that now the effort of pushing the market down gets even worse result than in the previous scenario – the result is nil. Chances are high that the market will continue going up.

Figure 3.7: Horizontal triangle



(Chart courtesy of SierraChart and TransAct Futures.)

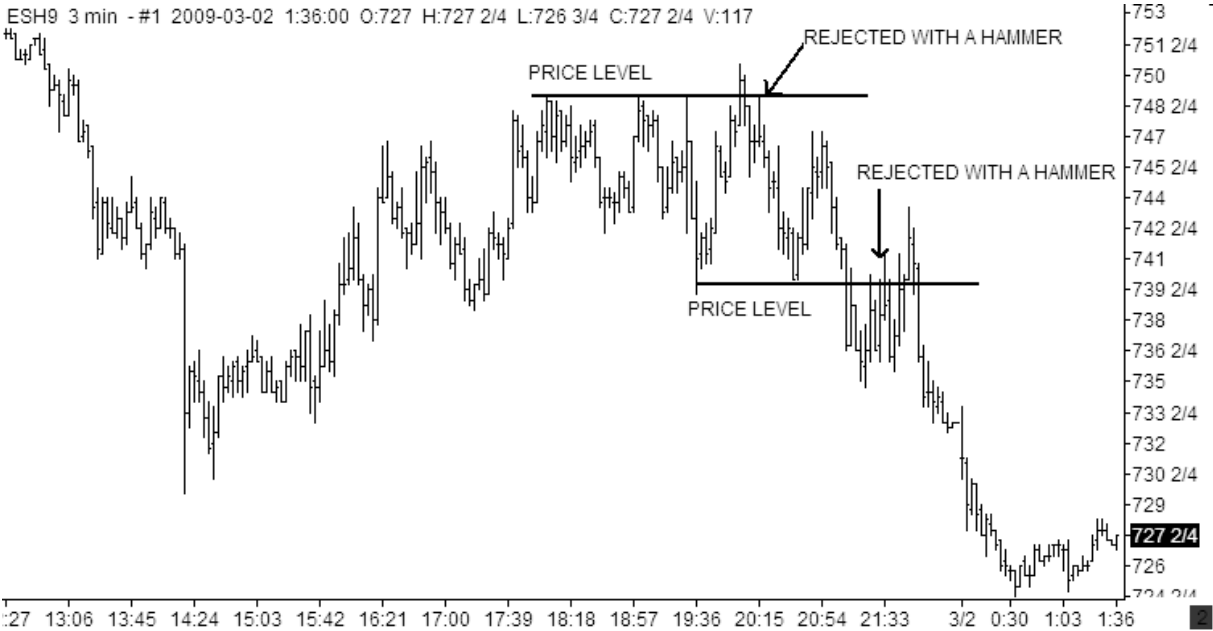
Unfortunately, we are probably not going to be able to give an idea as to how to quantify this pattern. There are very many ways in which a triangle can appear and they are all highly visual.

3.3.4 Hammer

Another interesting pattern worth researching is a so called hammer or hanging man, depending on if it occurs after a downtrend or an uptrend, respectively (Nison, 1991). Further on, for the sake of simplicity, we will just call it hammer no matter what kind of trend preceded it. Hammer is an expression for a price bar which has its opening and closing price some relatively small distance apart, and both some relatively small distance away from either the bar's high or low. Example is provided on the chart below. For such a bar to form, the price must have traveled from the open in just one direction (either only up or only down), stop there, and come back to where it started from. All of this must have happened in a relatively short time because the movement is contained within the period of just one bar. If it had taken longer, the pattern would have spanned over several price bars. Therefore it is an indication that price went somewhere and it quickly got rejected there and came back. It shows us no interest at the price levels where it attempted to go, i.e. where the tail (that end of the bar with no open or close) is. It was probably just some speculators getting trapped into a

losing position. The market is likely to reverse there and test the nearest price level on the opposite side of the value area. The most important hammers have two properties. First, they are relatively long – meaning that within the period of one bar, the price has been quickly rejected after a pretty strong attempt in one direction. Second, they should occur at some visible price level. There must be some value area visible so that it is clear what value area has been rejected. If they are not accompanied by this information (they just ‘hang in the air’, so to speak), they are of more limited usefulness.

Figure 3.8: Price levels and hammers



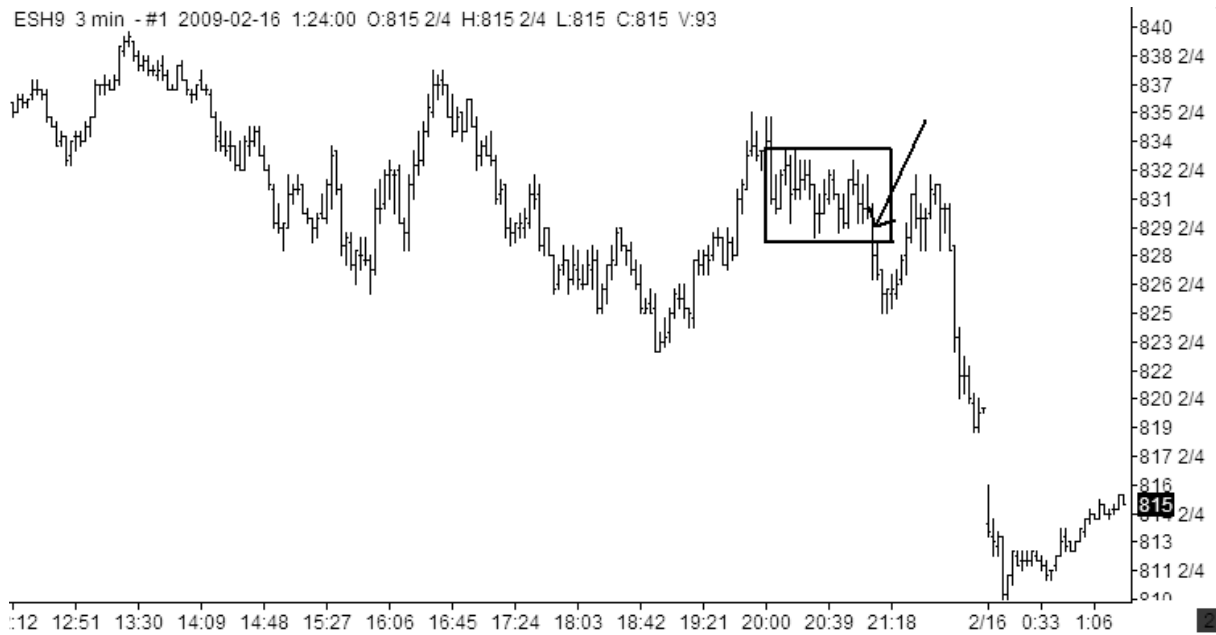
(Chart courtesy of SierraChart and TransAct Futures.)

An algorithm for finding hammers would probably be pretty easy. All we need is a bar with its open, close, and one of the extremes close together. They should all be located within a range of some predefined size, which could be for example 20% of the range of the bar. Depending on if it is the upper or the lower 20%, we would get either bullish or bearish hammer, respectively. Next, we would apply the same conditions we applied earlier for finding price levels. The hammer should touch the price level and not exceed it by more than, say, 50% of its own range.

3.3.5 Congestion

Congestion is a place on the chart where the price has accumulated into some relatively tight, rectangle-looking trading range. They should have several highs along the upper edge that are roughly matching each other and they should have several approximately matching lows along the lower edge (Ross, 2000). Obviously this comparison to rectangles might be a tricky one since it is possible to change the scale on one axis of the chart and not on the other. Therefore, what looks like a perfect congestion in one view does not have to look all that great in another view. But when we take a look at a chart ex post, these congestions do appear and they do have some meaning. For most breakout traders and trend-following indicator traders, these congestions provide many false signals. Again, this is supportive of some big move coming soon. Next, the congestions by definition create some small, minor value area. This means that a lot of trades have taken place – many people entered their positions. Many might have exited their position as well but it still holds that they made some decision after which part of them will be proven right, and another part will be proven wrong and suffer emotional pain. Therefore, those who entered a position will have placed protective stops in the vicinity of the congestion, and those who exited a position will be likely to jump on the moving train after having exited it and eventually seeing that it keeps going. One way or the other, there will not be much happening when in the congestion but once the price finds its way out, it will trigger a lot of orders in that direction and the chances will be high for a big move. Congestions are often accompanied by falling volume per a unit of time while the price is still trapped there. This means that the interest is falling and the price will have to move, as per the theory of auction mentioned in the previous text. Congestions are not as powerful as triangles though; triangles give the evidence of the price being trapped in a narrower range, which makes them more powerful.

Figure 3.9: Congestion area



(Chart courtesy of SierraChart and TransAct Futures.)

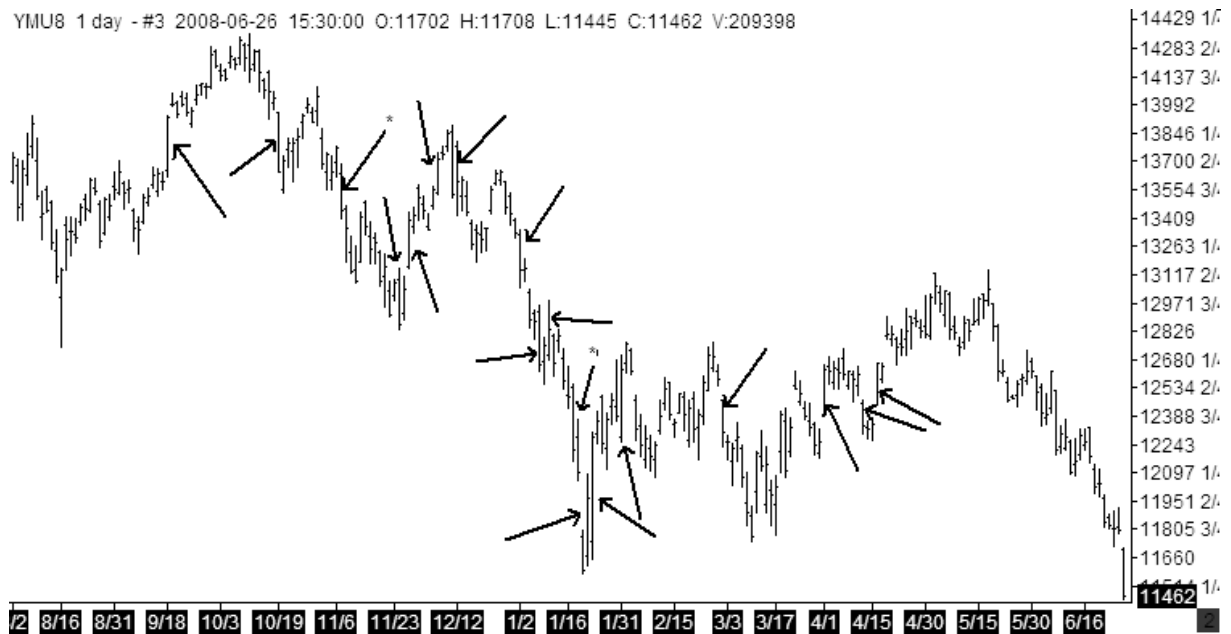
Like the triangle, a congestion is a highly subjective pattern and difficult to recognize algorithmically.

3.3.6 Alternation of daily ranges

Next important pattern is a large-range day following several low-range days and vice versa. This has something to do with what has been discussed in the chapter on why markets have a memory. Williams (1999) claims that there are few occasions when several large-range trend days would occur consecutively. Whenever there is a day on which a big move occurred, the market seldom continues in the established direction and rather makes a correction or consolidation. By the same token, whenever there are several days with very small ranges, chances are high that a large-range day will occur very soon. The reason this happens is that whenever there is a big move, the probability is high that most people who consider following that move have already done so; otherwise the move would not have occurred. All media have covered it with the headlines and since most people are comfortable doing what everyone else is doing, in other words buying when the market is going steeply up or selling when it is falling down, this is the best opportunity for them to do so. Now that most of them can and do enter and manage their positions through some computerized platform and have the access to internet news, both of which they can use during the day even

if they are at work, whenever is ‘something big’ happening in the market, most of them will follow. After such a day occurs, it is very risky to consider following the established trend. We already know that there is limited number of potential buyers or sellers, and we know that chances are high that this number has for now been exhausted for the most part. Also, many people who were lucky enough to have been in a position since the beginning of the move have made some decent profit. Many of them will be greedy and will want the market to give them more because they have just seen how easy it is to make quick money. But there will still be some who will want to take their profits and see what happens. It is clear that most likely the market will pause for at least a short while so that part of the traders participating on the move will be shaken out and the market will have a fresh supply of ‘fuel’ which will be necessary if the market is to go on in the established direction. Why it is necessary to have some traders waiting in the sidelines so that they can push the market later has been explained a few pages ago. In the following daily chart there are 16 examples of big moves which were not followed by another big move but rather by some kind of a consolidation or reversal. There are just two days (marked with a dot next to the arrow) when a big move occurred and the momentum was strong enough to keep the market going and make yet another large-range day. And even these two days were a kind of cumbersome – the first one was another large day succeeding the first one but it did not manage to close at its lows – it formed what we referred to earlier as hammer. In other words, the net close-to-close difference was rather small like in the other examples. The second red arrow shows two succeeding large range days but again the second one had to have a large night trading retracement before it could happen.

Figure 3.10: Alternation of daily ranges in the \$5 Dow Jones Industrial Average futures



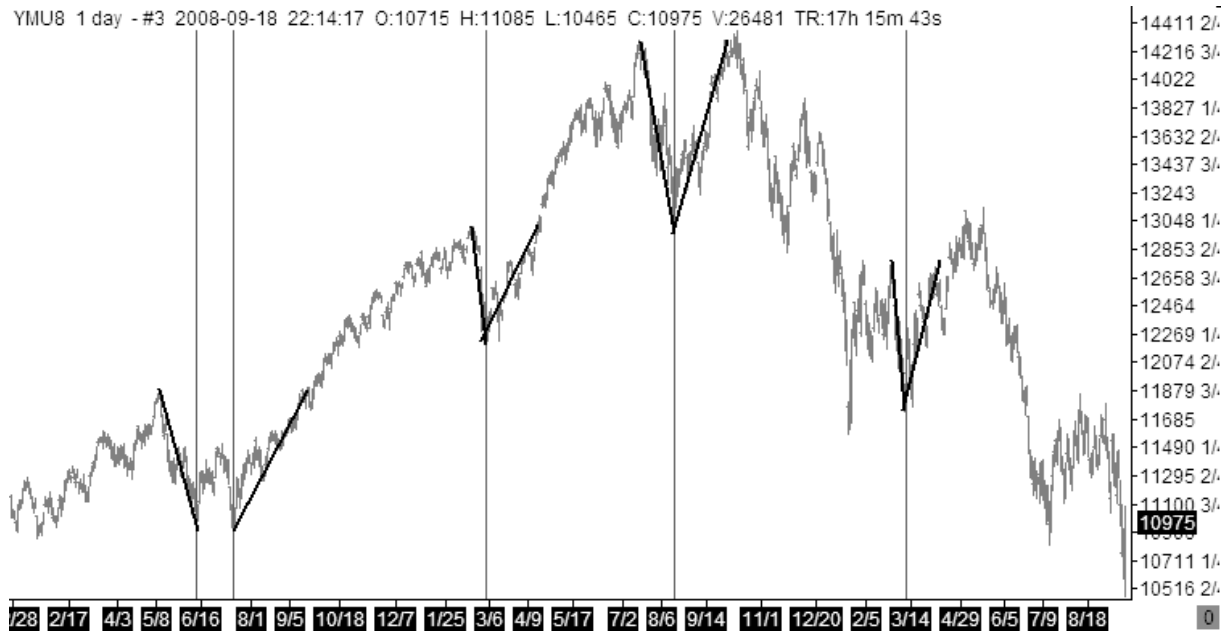
(Chart courtesy of SierraChart and TransAct Futures.)

A large range day could be one which has range at least twice as wide as the average range of past 5 days, and a narrow range day could be one which has range narrower than a half of the average range of past 5 days.

3.3.7 Markets fall faster than they rise

The last thing we are going to talk about in this section is the fact that markets fall faster than they rise. Common sense would dictate that there should be no such bias – whatever the markets reflect, there is no reason for them to behave differently in one direction than in another. However, the reality is different. On the provided daily chart, trend lines have been drawn so that one can compare their slope when the market was moving up and when the market was moving down. The vertical lines are there just to make the comparison of the slopes visually easier. It is clear that the moves up are almost always much slower than the moves down. Whenever the market loses ground, it almost always takes relatively more time to rebound. The lines show some major moves but one can easily see that most of the time, this applies even to the small corrections. Whenever it is a correction to the downside, it is often a quick fall with little or no micro-corrections. Whenever it is a correction to the upside, it takes more time and there are more micro-corrections present. The move usually resembles waves.

Figure 3.11: Fast drops and slow rebounds in the \$5 Dow Jones Industrial Average futures



(Chart courtesy of SierraChart and TransAct Futures.)

One way to measure this could again be to use the Zig Zag indicator to separate the major waves and turning points of the market, and then compare the durations of the waves in proportion to their sizes.

The reason this phenomenon is present is most likely again the emotions. Most people who only trade part time so that they can have their savings at work, even those well educated, have a hard time grasping the concept that it is possible to sell something that they do not own and then buy it back later. Therefore there are a lot of people who only trade long positions. Or they might be interested in the physical commodity or they might just not know that the futures markets allow them to take short trades as well. Many of them trade just stocks where shorting is possible but it is not as easy and cheap as in futures or options. These unexperienced traders are also very likely to be affected by their emotions. And that is probably the reason why markets fall much faster than they rise. When they rise, people probably want to wait and see what happens before they jump on the moving train. They try to do a lot planning before they act. On the other hand, when the markets fall, they are driven by the panic. News articles start to paint the future very dark, competing in who will make the most pessimistic forecast. People are afraid of losing, they do not have their risk defined and therefore when a big move to the downside occurs, it starts to get beyond people's threshold of pain and they are forced to close their positions in panic. Many could also trade leveraged

positions without thinking through in advance what will happen if the trade does not work out. This makes the panic even more severe. Therefore it makes sense that the markets will fall like a rock, after which it will take a lot longer time to regain what has been lost. Where this observation might not apply is for example the forex market. Here, the traders trade currency pairs, i.e. one currency against each other. If they go long in EUR/USD, it means that they are long in the euro and short in the dollar, and vice versa. Therefore there is no reason for any particular group of traders to only trade longs exclusively. The following chart suggests that in forex markets, there is indeed no correlation between the direction of the market and its conviction. Sometimes they rise slowly, sometimes fast, sometimes they fall slowly, and sometimes they fall fast.

Figure 3.12: A forex daily chart (EUR/USD)



(Chart courtesy of FX Direct Dealer and MetaQuotes Software Corp.)

3.4 Evergreen example: bubbles and their bursts

Probably the most famous pattern that happens over and over in the markets is a bubble and its consecutive burst. It happens time and time again that buying frenzy infects the whole world. Everyone can see how much money he would have made had he bought the security a year ago, etc. When a market is exploding, it is not unusual to see annual gains in tens of percent; and this can go on for as much as several years in a row. If one wanted to invest, say, \$10,000 expecting that this skyrocketing market (let us say, 25% a year) will continue forever, he is expecting that he will make \$2,500 the first year, \$3,125 the second year, etc. After about eight years, the absolute annual monetary return will be enough to

compensate for salaries in most jobs. Therefore, it is easy to see how attractive these buying frenzies are. One would invest some reasonable amount of money that he can put aside, do nothing, and earn a lot of money. Again, this frenzy is further reinforced by the media coverage and by the fact that they compete in who will be the first one to release the wildest optimistic analysis of the time.

For some reason, most people have a very short memory. They do not even seem to be able to take a look at the historical price data to see how long was the average downtrend in the history of the index or whatever else they might be investing into. The downtrends keep coming; it is a normal occurrence that has been there since securities markets exist – possible explanations why this happens are given above. The downtrends have been there and they will always be there; and most of them lasted at least several years. This means that if we took the most unlucky investor who bought right at the point which later turned out to be a major top, he would probably have to wait several years only to get back to break even. It seems that very few people think this way – it could happen to them that they would lose a lot of money and would have to wait years to win it back. It is much more compelling to follow the leaders and do what everyone else is doing, and thinking that the markets will not just reverse all of a sudden.

It is not just people investing into stocks alone. It is also the mutual funds which in such nice trends make nice returns for their clients. It is difficult not to make any profit when all stocks or anything else are going up. In free market societies, it is very easy to put savings into a mutual fund and join this frenzy, further fueling it. After all, it is very easy to invest into outright securities as well. Mutual funds and brokerage companies put up newspaper ads and billboards, bragging how well they have been able to manage their clients' money because again, who would not be able to make at least some money when everything is skyrocketing.

And it is also the general good news from the economy. According to the common sense, these exploding uptrends occur when the economy is doing well. The unemployment is low, people have more money to spend and very few things to worry about in the future, and one of the things they can spend it on is the securities.

As a result, virtually everybody is buying, causing what used to be just a regular and relatively short uptrend to become an exponential uptrend – one, when projected onto a price chart, really looks like an exponential (sometimes rather even quadratic) function (Shipman, 2006).

But, as we described above, there is one problem to all of this – the number of potential buyers is limited. One day, even the less knowledgeable investor will have spotted the opportunity to make a lot of money, buy the security, and there will be no one after him (Shipman, 2006). When there is no one else left to buy, the price will not have any reason to continue going up. Just staying where it is, is something new for everyone because they have been used to a growth which nearly never even paused (except for the small ordinary retracements due to profit taking which are present even in this tremendous uptrend, yet they are really very small in magnitude and time duration). Just the fact that it is not going up will cause the more conservative traders to sell their positions with the intention to wait and see what happens. This will push the price down. Price going down will trigger the following, a little less conservative group of traders to panic and close their positions to protect at least something, and see what happens. This will continue on and on as a domino effect. Many unexperienced traders will want to stick to their positions because of what we described above as the need to be right. Their subconscious mechanisms will make the losing position invisible to them and will direct their attention to any information that might be telling them that the market will turn around and make them right. The price will be ‘oversold’ in the eyes of the general public because after such a boom, basically any correction is a kind of unusual and therefore ‘unreasonably deep’. They say to themselves, now that I have managed to be brave and withstand such a drop, I would be a fool to quit now and then regret that I did not participate on the move up which is just around the corner anyway. The lower the market goes, the more convinced they are about this. But as has been described above, everyone has their threshold of pain. If it is a true burst to a true bubble, the market will not turn around and will eventually trigger most people’s thresholds of pain, or financial thresholds of where they are not able to meet the margin calls, if they are trading with leverage. That will cause the final collapse of the market, one that will be written in the history, and after which some major rally, if not a complete reversal, will occur as a result of profit taking on the short side of the market, and also as a result of some bargain hunters being able to overpower the panic sellers.

The phenomenon of bubbles and their bursts has been present for a very long time now. Mark Shipman (2006) gives several examples of this behavioral pattern: the Dutch tulip mania in 1634-1637, when investments into tulip were giving unforeseen returns. After the burst, they were worthless and no one wanted them. In 1719-1720, there was the South Sea bubble. In that time, there was a company called South Sea which for some unknown reason became popular among the general public, despite the fact that its prospects, due to the geo-

political situation of that time, were not good at all. The stock went up and even the government encouraged people to buy the stock. It was a poor decision, yet the greed of the public was stronger than reasonable thinking and everyone wanted to participate on the move. In those few years, the stock grew almost ten fold. When the bubble burst, the stock fell by about 80% in just three months. Another example is one that everyone is familiar with – the roaring twenties 1920-1929 and the stock market crash which is believed to be what sparked the Great Depression. In 1980-1989, there was the Japan's asset boom, and in the years 1993-2000, there was the so called dot-com boom. Since Mark Shipman's book was published in 2006, it does not record what we know today – the current crisis which started as mortgage crisis in 2007, got more severe and became a general financial crisis in 2008, and then infected the real economy and became a global economic crisis in 2009, the biggest since the Great Depression. Coupled with the financial crisis of 2008, there was also the big drop in oil prices. The top was at about \$147 per barrel, and everyone saw the oil and gas prices going up all the time. Today, oil is trading at a fraction of this price.

3.5 Other evidence of emotion based behavior

3.5.1 January effect

Another very famous indication of some bias in the markets is the so called January effect. The stock markets tend to consistently show higher monthly returns at the end of January than in any other month (Krištoufek, 2007). There are other months in which the returns are higher than usual (December) but in January, this effect works best. On the other hand, there are other months in which the returns tend to be poorer – May and June. There is even a saying in the investing community: 'Sell in May and go away.' There have been some studies made which try to give reasoning to this bias, like for example tax reasons and so on. It could also be a self-fulfilling prophecy. Either way, the effect is present and statistically significant, which is in a conflict with the markets being efficient. Larry Williams (1999) carried this concept further in the way that he tested different markets (stocks, bonds, commodities, currencies, etc.) for their returns in specific months over some broad set of data. He figured that in every market, there are months which are consistently biased to the upside or to the downside, respectively.

Larry Williams (1999) also tried to apply the same approach to daily data. Again, he found that for every market he investigated, there have been days with bias to the upside and days with bias to the downside. There are also days with higher high-to-low or open-to-close range than others. This applies even to the most liquid markets around where one would expect the highest degree of efficiency, namely S&P 500 and T-Bonds. Again, there are many explanations why this inefficiency should be present. First, there are some specific rules as to on what days of week different statistical data are released. For example, the FED interest rate statement is always made on Tuesdays. Perhaps there are days of week on which the releasing of statistical data is more frequent than on others. This would explain why daily data inefficiencies could be different across markets (like most volatile day of week in stock indexes might be different from that in the bonds). Markets are interconnected but still some news affect some markets more than others, and other news the other way around. Next, long term investors might be in different mood every day of week. On Monday, they might not be very active because they have just had a rest during the weekend and after coming to work on Monday, they might just be checking out what is new, what happened in the markets over the weekend, and thinking about what investing approach to take. They could also want to see how the markets open after the weekend and what they will do first – they want to wait and see and not jump the gun right from the start. In this case, they would not take any specific actions, and the markets would be less volatile. On Tuesday and Wednesday, they might be collectively acting on what they thought of on Monday. Also, some news might have already come out which could have further fueled the decision they have already made. All of this would make the market more volatile. Thursday and Friday might be calm again. Maybe except for late Friday afternoon because many traders do not want to be in a position over the weekend when the markets are completely closed and therefore they close out their positions. These are again orders coming into the market, causing some sudden moves in the afternoon hours.

We do not know what specifically goes on in the markets but it still holds that there are rational reasons people could behave differently in different days of week, and therefore there are reasons why markets could tend to move up, down, or just be more volatile in either direction, on different days of week.

3.5.2 Frequency of occurrence of different daily ranges

Another interesting anomaly in the financial markets is the frequency of occurrence of different daily ranges. It will be demonstrated using the spreadsheet in Appendix A. This spreadsheet was constructed the following way. For each month M from 1987 to 2009, we take one day D_M (it is always the same day of month). From that day, we subtract X days and get another day, let us call it D_{M-X} . We take the closing market price for the E-Mini Russell 2000 futures on D_{M-X} and measure the maximum deviation from that price till D_M – both to the upside and to the downside. This deviation is in percentage points. We do this for every month of the examined period. Then, for each possible length X , and for each possible maximum deviation Y , we compute how many times we had a month M such that maximum deviation from price at D_{M-X} during the period from D_{M-X} till D_M was Y . We put this number to the coordinates $[X,Y]$ of the spreadsheet.

We would naturally expect that the longer the X , the longer the series of numbers along the Y dimension because the more time the market has, the higher the chance of reaching any deviation during that time, and the more times it should actually manage to do so. But the spreadsheet shows that this is true only for X between 1 and about 60. For X 60 and above, the empirically found maximum deviations are practically constant. The reason is again that whatever the random distribution principles would dictate, markets cannot do anything and from certain point it is nearly guaranteed that they need to do a very major consolidation due to massive profit taking and numerous bargain hunters.

There is another interesting thing to notice about the spreadsheet: the deviations to the downside (negative percentage points on the Y axis) tend to be larger than those to the upside (positive percentage points). This confirms our statement made earlier in this chapter that markets tend to fall faster than they rise.

3.5.3 Financial crisis of 2008

As the very last situation, it is interesting to take the advantage of the fact that at the time of writing this paper, there is the well known economic crisis going on. This global economic crisis was preceded by a financial crisis and credit crunch in 2008 when stock markets fell like a rock and when many banks and financial institutions went bankrupt. This was further preceded by the so called mortgage crisis in 2007 when it was discovered that a lot of people in the United States overestimated their economic situation and found

themselves unable to pay mortgages that they took earlier. This led to the fact that banks had assets whose price was going down, and that was what sparked the financial crisis and the whole spiral.

Now when we take a look at the housing numbers that were coming out in the beginning of 2007, we find that it was possible to foretell some problems as early as at that time. In March 2007 it was a publicly known fact that during that month, the new home sales dipped by 3.9%. On year-to-year basis, it was an 18.3% drop. Such numbers are certainly alarming (Kohout, 2008). While it is difficult if not impossible to foretell such a big economic crisis in advance, such poor housing numbers could definitely foretell at least some small economic problems, small problems in the banking sector, and at least some small drop in the stock market.

What really happened is much different. The market did not take these numbers into account at all, although they were publicly known. The S&P 500 index appreciated by additional about 7.5% in next three and a half months (which one can easily see is a lot). Then, in the middle of summer, it lost most of this gain but was able to regain it again and make a high at 1561.80 in just two and a half months. After that, the market was going down all the time. This high was made on October 12, 2007 – about half a year after the very bad numbers in housing started coming out. During this half year, the market was going up at a steady pace with minor corrections, thus disregarding what was already known to every rational investor.

Kohout (2008) also points out that at the time his article was written, the stock market waves had been about fourteen times as big as the swings of the real economy, and that the fall of the stock market at that point had been in 90% attributable to psychology.

Part IV: Conclusions about securities markets efficiency

4.1 Markets are most likely not efficient

Based on what we have discussed so far, it seems that some assumption of the efficient market theory probably does not hold – namely the assumption that all investors and speculators behave rationally. In parts two and three, we gave reasoning to why traders should feel emotions and why these emotions should affect their behavior, thereby affecting the market price movement. We also took a look at some specific market situations in which this emotional behavior might have been present.

One could object that emotional behavior does not have any effect on the markets' randomness because just as much as the underlying fundamental information is random in nature, also the emotions of traders are randomly distributed, giving no bias to either side in any specific situation. We have to remember that it is also likely that people tend to give in to their emotional pressures in similar ways. We discussed the reasons for this above.

This paper's purpose is not to test markets for specific inefficiencies. Most of the inefficiencies discussed along the way have been ones which cannot be modeled mathematically, and therefore they usually cannot be subject to any statistical or econometrical test of significance. For some of the patterns, we tried to give an idea of how to go about programming them into a computer but these ideas will probably not be enough to substitute a subjective judgment of a human eye. There is probably no way of programming a computer to be able to recognize a valid triangle just like a human eye would, or any other pattern for that matter. Let alone the general circumstances and setup of the overall market situation in which the pattern is supposed to occur to have some significance. Also, what drives the patterns and their outcomes are emotions and emotions cannot be measured or put in terms of real numbers or whole numbers. It cannot be said that trader A feels by X units more fear than trader B. There are some which can be put into a mathematical formula, like for example the biases in specific months or days of week. Here, the inefficiencies have been really found (although these tests themselves have not been part of this work). But for most of the patterns, the statistical or econometrical tests cannot be done if we want the outcomes to be reliable. The purpose of this paper is to rather give some possible explanation to why the inefficiencies (whether possible to be mathematically modeled or not) should be there.

Sometimes it is said that the inefficiencies cannot be there because there is simply no reason for them to be there. This paper is trying to give some possible reasons.

4.2 Why the markets sometimes look random and efficient

It is because most studies that have been done probably do not go deep enough into the forces that drive the market. There have been some empirical tests which confirm that markets are efficient – for example, tests which try to find some statistically significant relationships between price of each day and prices of the days which preceded that day. From this point of view, the markets might really look random in nature. The problem is that this is most likely not how they work. As was described above, the markets probably move based on emotions of investors and speculators. Sometimes these emotions contradict each other, which causes that markets are generally in balance. That means that prices do not move and the result is a congestion area or value area or whatever other name one could use (see above). During this time, the markets are probably really going to look random to most of the observers. (However, if one used a shorter time frame, i.e. zoomed in on this congestion area, he would again see trends and consolidations and could probably find some small inefficiencies there too. But he is not going to do that because this view is too small given his investing horizon.) But other times the emotions do not contradict each other; they rather confirm each other. There are times at which some strong imbalance occurs in the market, and that causes a price movement which can be anticipated. In other words, the inefficiencies occur only sometimes. Most of the time, the markets just wander around with no clear conviction. When all these situations are put together and subjected to a statistical test which is not able to recognize which of these two scenarios is happening at each moment, the results might come out as random. To demonstrate this better, let us use an example. We have at disposal two coins which are biased. One of them gives heads 60% of time and tails 40% of time, and the other coin has the odds exactly opposite. Everyday we choose a coin, toss it once, and write down the result. On odd days we take the one where heads come more often, and on even days we take the one where tails are more frequent. This way, over some long period of time, the outcome will be about 50:50 – we used biased coins but the biases contradicted each other, each was used 50% of time, and therefore they cancelled each other out. By the result of an econometrical test, the coins look identical and ordinary, and therefore unpredictable, although they are not. It is because there is some variable in the system which is not taken into

account by the econometrical model imposed on the data. The missing variable is the actual distribution of emotions among market players.

As was mentioned above, most of the inefficiencies which are present in the markets cannot even be put into any reliable mathematical formulas, and therefore these variables could not have been part of any tests which have ever been made. Some of them can be, like for example the days of week biases, or the month biases. These have been tested and have been proven right (as described above).

Also, it is valid to ask ourselves the question: if the markets are really at some points inefficient, why does not anyone take the advantage of it and negate the inefficiency by the way arbitrage works. There are several reasons why. First of all, again, they cannot usually be put into mathematical formulas. Human eye has to judge them correctly in real time and this is a skill very few people have. On a complete chart it can easily be seen. It can be seen even on a real time chart when the future is not visible but the problem is that it is not that self evident. Also, there is limited amount of time to think about the opportunity before it is gone. Second of all, there is the thing we have been discussing very extensively – the emotions. It is easy for anyone to write down his trading strategy (technical or fundamental) which will point the situations he believes are inefficiencies to him and say to himself that this is how he is going to trade it. It is much harder to actually do that. Any loss, any drawdown, anytime he is proven wrong will lead to bending rules, premature or delayed action, and so on – as discussed in this work. This is after all what creates the inefficiencies in the first place. We are arriving at an interesting phenomenon – there are people who believe that the market is inefficient because of emotions of most of other participants, but when trying to take advantage of these inefficiencies, they make emotion based errors, thereby just contributing to the already existing inefficiencies. There is one more reason why it is not easy to take advantage of the inefficiencies – money management and risk management. It is not sufficient to find an inefficiency in a market. Every trader has some limited amount of capital with which he can speculate. Some inefficiencies might require him to risk too much of capital and if he caught a series of losing trades (there will always be losing trades because inefficiency gives a probable – not guaranteed – outcome) might drive him out of business. Success of inefficiency is a question of the long run, or theoretically even infinity. In real life, it is necessary to see how long this long run or infinity is, and what is the worst that can happen before one gets there. This is why it is necessary to determine how risky any inefficiency is and how one is supposed to trade it to minimize the risk of wiping out his trading account. This applies especially to traders with some very small edge (and since only professionals can

be assumed to be able to have a large edge, we could say that this applies to most starting traders). Probably the last of the most important parts which is missing is the question of exits. It is not sufficient to find a good entry point – it is as important, or (given the risk management limitations) maybe even a bit more important to find a good exit point, or a good way to scale out of the position on several points.

4.3 Conclusion

Our investigation suggests that there are reasons why some large groups of market players are likely to behave according to their emotions rather than rational thinking. It is also likely that emotional behavior of different traders is at some specific times not randomly distributed but rather in accordance with the emotions of other traders, which breaks one of the assumptions of the efficient market hypothesis, and this assumption is common for all of the three levels of efficiency. Therefore at these times, it is likely that there is a better chance of one thing happening over another and therefore liquid markets are at times most likely not efficient.

However, for most of these inefficiencies we have not been able to erase the word ‘likely’ – the statement cannot be proved because most of the inefficiencies cannot be mathematically modeled and statistically tested on a large set of data.

Appendix A

(Spreadsheets courtesy of Pavel Málek & Miloslav Kubát.)

The image shows a large, dense spreadsheet table oriented vertically. The table has many columns and rows, with a central column highlighted by a thick border. There are several dashed vertical lines on either side of the central column. The data appears to be numerical, with some text interspersed. A small square icon is visible in the right side of the table. The table is oriented vertically on the page.

Since the numbers are probably too small to be easily readable, we suggest that the reader takes a look at the original XLS file provided on the disclosed CD. But anyway, the numbers don't really matter that much because what is most important is whether any particular level was reached or not.

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Historical price data for futures used in the charts have been downloaded from the data feed of TransAct Futures (www.transactfutures.com) and displayed using the charting package SierraChart (www.sierrachart.com).

Historical price data for forex used in the chart have been downloaded from the data feed of FX Direct Dealer (www.fxdd.com) and displayed using the charting package MetaTrader by MetaQuotes Software Corp. (www.metaquotes.com).

The macro algorithm for generating the Microsoft Excel spreadsheet table in Appendix A has been borrowed from Pavel Málek and Miloslav Kubát.

