
Roulette Fact And Fiction
Revised by a statistician and an ex-dealer
John Solitude
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Roulette Fact And Fiction
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'Le hasard ne favorise que les esprits préparés'
'Coincidence only favores the prepared mind'

Louis Pasteur 1822-1895

Preface

In May 2005 the first public version (v3_1) of the John Solitude Wheel Frequency Analysis was released on the internet. It soon spread to several websites and forums which continue to host the pdf-file as we speak. Extracts of the previous guide were even translated in Spanish and Russian. Due to the large distribution which occurred on different channels it's difficult to get an exact estimate on how many guides there were downloaded or send by e-mail, but the number has surely gone over 5.000 distributed copies in less than six months.

In the mean time the authors received many questions concerning roulette. It became very apparent that a lot of players have become victim of disinformation by internet scammers whose only goal is to take financial advantage of non informed roulette players. The rise in websites which sell roulette systems, - strategies and - devices is staggering and alarming. In the far majority seller websites contain misleading advertisement and disinformation concerning your chances to win on roulette.

In ALL occasions –no matter how 'professional' a website might appear- the sold information has one thing in common: it doesn't inform of the risk which is at hand WHENEVER someone decides to engage in roulette gambling. For the layman who doesn't know mathematics (probability theory and statistics) it is very appealing to be seduced by the statements of the seller and think one will be on a road to riches if one would only buy this 'certain win' roulette system, - strategy or - device.

The objective of this guide remains the same: to inform the roulette player about the risk he or she will be taking when laying down his chips on the roulette table.

The guide has greatly expanded since the previous version and now includes easy step-by-step explications to the mathematics behind roulette. In the chapters on standard deviation, sequential - and binomial probability you'll find everything you need to be able to calculate your chances yourself. The math phobic should not fear: you do NOT need any previous math knowledge to understand our layman's guide, only your attention, a pocket calculator or a spreadsheet like Excel will be needed. Any regular roulette player should try to master basic stats and probability theory to be able to have an objective view on his chances while gambling. In fact, these are the very same principals the casino's use against the player.

The only prior knowledge you need to follow this guide, are the basic rules of the roulette game.

We'll give you inside information from an ex-dealer who is sympathetic towards our project how casinos set up their business. Prepare for a thriller.

In the chapters on 'The House-Edge', 'The Psychology and Chemicals of Gambling' and 'The dealer is NOT your friend' we'll explain how casinos will do anything to increase the chance you'll loose, and in the best case turn you into a gambling addict. We'll give you clues how you can counteract the psychology the casino will deliberately use against you.

Finally we've added the chapter 'Scammers, conmen and roulette strategy sellers'.

We'll teach how to recognize a scam and what you can do to successfully pursue a scammer in case you already bought some system, - strategy or –device which didn't hold up to the false expectations the seller created.

In the chapter 'The Experiment' we'll discuss systems and strategies we've used ourselves and still continue to use on roulette tables. And, as we do not have to sell anything, we can also tell you plainly what the risk is, because despite to what some conmen might tell you: there are ALWAYS two sides on every coin.

In the 'Questions and answers' chapter we tackle some common misconceptions we've received since the previous guide.

What is the MAIN difference between this guide and much (often expensive and useless) biased roulette information which is sold out there? A huge difference is this guide is completely free: we have no financial benefit if you believe us or not, as such we do not have to mislead you into buying an (expensive) roulette system, - strategy or –device. We simply have no need to misinform you in order for you to buy something from us.

This guide, as the previous one, was born out of the initiative of some experienced roulette players, who thought it was high time to reach out a hand to fellow players and share knowledge for free. We have seen enough people lose large amounts of money in gambling venues or in the hands of scammers. After reading this guide you will never feel the urge again to pay for the crooked advice of some roulette strategy seller who's only goal it is to get rich by selling rather than gambling.

We do advise you read this guide chronologically: becoming a better informed player is the sum of all parts in this guide.

Any updates and questions can be found on our brand new website:

http://www.john-solitude.be

We continue not to charge a single dime for our extensive and elaborated free roulette guides, however please DO consider a small donation to pay for our expenses consulting a statistician, the annual registering of the web domain name and ftp-space, the drinks for our webmaster (whose eyesight became blurry after seeing all the information that had to be incorporated in the site) and plainly the huge amount of time several players invested to bring you this information to avoid you would become victim of a scammer.

Even a donation as small as 1 $ is proof for us you appreciated our huge effort.

For a 7 $ donation we will even throw in the spreadsheets our statistician (which we paid for) came up with, and the convenient tracking sheets we use ourselves (which you can print out time and time again for your own sessions). Refer to our website how you can make a donation.

For a 10 $ donation you become an honorable donator and we'll mention your (nickname) and place of residence on our hall of fame page.

All donations will only be used to further ensure our free service towards players.

Finally we would like to thank all players who continue to exchange their systems and experiences for free on the VIP-website , the moderator Turbogenius for doing an excellent job, Theo Rulte (for his fight against internet scams: we've only followed your example Theo), our statistician Bob R. for crunching the numbers, Bart G. for proofreading, Wim VM. and Rudi H. for sharing long hours at the tables, Myaz for his continuing support and to be the very first to promote the guide and StOrmOr (for the great support he's giving to members of the VIP-forum programming systems into Roulette Xtreme). People who never heard of Roulette Xtreme might check the recommended links on our website www.john-solitude.be to find out about the features of this excellent tool to analyze roulette systems –and plainly to avoid you would waste your money on some expensive roulette strategy).

Hope you enjoy, sit back and learn,

John Solitude's Team

Contents

1. WHAT IS STANDARD DEVIATION?

1.1 Introduction

To put it simply: standard deviation is why any roulette strategy that often seems to work out well during a restricted amount of time, suddenly can experience severe drawbacks.

Standard deviation is a statistical calculation to determine how far outcomes are differing from average expected outcomes. The calculation is used by casino's themselves to monitor the wheels concerning bias. Bias would mean not all numbers have an equal chance of appearing due to flaws in the construction of the wheel or insufficient maintenance. If there is bias, the wheel can no longer be considered random. Random results are purely depending on chance; as such each number should have an equal chance of appearing on each spin. A random wheel is by far the best option for the casino: if all chances are equal, there will be a high variety in outcomes, making it far more difficult for the player to cope with all the possible mathematical sequences of outcomes which can be expected. Bias decreases the amount of possibilities: some numbers or sectors will simply keep appearing at a higher or lower rate, making it possible for an experienced player to exploit the flaw.

The standard deviation calculation is used (however often misinterpreted) by wheel bias players and probability players to determine how close or far observed outcomes are from what is statistically expected. If the observed outcomes differ severely from what is statistically expected, a player might conclude there is bias on a specific table. If there is bias and the bias is severe enough, the best strategy would be to only play the numbers or sectors on which the standard deviation is positively higher than what is expected. However, if the standard deviation is only the result of random fluctuation in the outcomes and there is no bias present, the probability player will use the calculation of standard deviation to estimate the probability a similar deviated pattern might either continue or discontinue.

Only if the bias is correctly identified by the player and the bias remains, playing the same chances (numbers or sectors) which have been identified as positively biased (the chances appear more often than randomly expected) over and over using flat bets will result in profit on one specific table for as long as the bias is present.

Before you start jumping in the air with joy, it should be noted that these days respectable casinos have installed numerous countermeasures.

So called 'advantage' biased wheel play has been widely documented in gambling literature, so it would be very naive to think wheel manufacturers or casino executives are not a aware of this possibility and would simply allow players to take advantage out of it.

1.2 Countermeasures of the casino

The information on the countermeasures was directly obtained using our inside source: an ex-dealer who worked for several years in a European casino and still has contacts with active dealers and the management. It is very rare to find an ex-dealer who is willing to reveal what goes on behind the screens, because in most venues staff is submitted to sign a paper of non disclosure. We guess our guy just got fed up (like us) reading all the outrageous and misleading stories circulating on the internet.

a) Casino's have installed statistical monitoring themselves to analyze the outcomes in real time (in this case the statistical figures are updated with each spin) or on a regular sample basis (for instance on a couple of ten thousand spins) to check for bias. So at any time, the casino has a far larger sample of outcomes, making any statistical conclusion far more dependable than only a small sample collected by the player. You can find a screenshot of such a statistical software tool over here:

http://www.tcsjohnhuxley.com/products/TECHNICAL/TCSRouletteWheelAnalysis/en

b) Wheel technology has vastly improved in the last decennia, so most manufacturers do not longer produce professional tables with individually screwed in pockets (these where more viable to bias in the long run). Instead they installed continuous ring molds to separate the pockets. These molds can easily be replaced or rotated, even on a daily basis if so desired. Most historic roulette victories involving bias (for instance documented in 'Beat The Wheel' of Russell T. Barnhart –check out our recommended literature on www.john-solitude.be) refer to old types of wheels, which are now hard to be found in respectable casino's.

c) Even when a casino has no statistical reason what so ever to suspect bias on one of there wheels, they will as an extra countermeasure regularly switch wheels around in closing hours, replace or rotate the continuous rings around the pockets. A bias player who would come in on a second day, after a victorious first day, could find himself in a whole lot of trouble if the conditions of the wheel have changed in the mean time. Unsuspectingly the player would simply be playing a different wheel or a wheel on which the conditions have changed severely. So, even when one would think he has found a bias flaw in the game, chances are very slim he will be able to take advantage out of it for long. When the conditions have changed (a different wheel, a new mold, a rotated pocket separator ring, leveling the wheel), all previous calculations to determine the bias become statistically invalid. Any qualified statistician will agree if the basic conditions (in this case the construction of the wheel or maintenance) of a previous study have changed, it would be bad research to use previous stats for future predictions. Such research would be the equivalent of running an election poll while in the mean time the candidates have changed. We warn players it would be useless to buy information from the internet on particular wheels in particular venues, because this information does not take into account the maintenance that will have occurred in the mean time.

d) If a casino would detect bias and the bias is severe enough to be exploited by bias players, they will simply close down the table for maintenance or install a new ring mold or table. Although professional roulette tables are expensive, casino executives know by now it is far less expensive for a casino to invest in regular maintenance or a new wheel, than to risk being hit by high roller bias players. Applying maintenance and regular investment in new gambling equipment is simply a matter of good economics to the casino. Casino's have become high tech

business enterprises, so as any good business entrepreneur they know if they do not properly maintain the games they are offering, or would be sloppy in the security department, they would be a sitting duck for professional gamblers who will with high stakes relentlessly exploit any flaw they can find. The losses in a short period for the casino could by far exceed the cost of installing a new wheel.

e) There are different professional wheel manufacturers who compete with each other to produce the most random table there would humanly be possible. Each table is now tested extensively before it even ends up in a casino, and is statistically monitored while in the casino. Technology has come a long way since the beginning days, so we can reasonably expect that in this day and age, where engineers are able to send an unmanned spacecraft to Mars and drop a vehicle on a predetermined destination, we can reasonably expect wheel manufacturers (who often have decades of experience) can come up with wheels that are random enough for a sufficient amount of time to not pose a financial risk to the casino.

The good part of continuing reading this chapter is, you will not only be able to get a general picture on what is mathematically expected regarding to outcomes, before you decide to engage in playing a game of roulette, you will also be able to calculate how large the standard deviation was on sessions you have played already.

Understanding what standard deviation is will result in knowing:

a) Why you shouldn't consider the presence of bias very lightly
b) Why any system you devise should be able to beat at very least 3 standard deviations, before you have a reasonable chance to make money in the long run.

1.3 How to calculate the expected standard deviation for a single number

Do not panic if you are a math phobic; we will take the calculation slowly and step by step, so any of those weird math symbols you might have wondered about will be explained. After a little attention from your side, you will wonder why you ever thought you would never be able to understand math and you'll be able to impress your fellow player with your decent statistical analysis of the game.

Here is the good news:

The expected standard deviation can be calculated for all the bets on a roulette table before even sitting down at a table. The expected standard deviation will give you a pretty good idea how far outcomes may differ from the average, as such it may safeguard you towards playing any system as if it were a certainty you would surely win the bet. You will be able to test systems on their endurance to cope with expected standard deviation.

The bad news is:

The expected standard deviation doesn't tell you in front on which specific numbers or combination of bets a deviation from the average will occur during the session (unless there would be a genuine bias). However, knowing the standard deviation figures that might be expected, will give you mathematical insight why a single number, a dozen or any other combination of bets you would prefer appears so many times more or less compared to the average you might subjectively expect in a single session.

First step:

You need the probability figure for a single spin for the amount of numbers you want to calculate the standard deviation for.

For instance, if you are playing a French roulette table (37 numbers = 1 zero + 36 numbers), the probability to hit a single number on a single spin is 1/37. If you are playing an American roulette table (38 numbers = 2 zero's + 36 numbers), the probability to hit a single number is 1/38.

Following is an example for the calculation for a French roulette table, for an American roulette table you'll simply have to switch all the '37' with '38' possibility figures.

Suppose we want to know if we would play 111 spins on a French roulette table (before even sitting down at the table), how much the outcomes of each number can differ from the average? (111 spins may seem a strange figure but this equals three full cycles on a French roulette table = 37 possibilities times 3, which makes the calculation easier to follow if you've never attempted this, but you can apply the calculation of standard deviation to any number of spins you wish to).

Our statistician however strongly advises never to use the calculation of standard deviation on a low amount of samples (for instance only one cycle). The reason being on a random independent event such as roulette statistical fluctuation (some chances turn up more or less than others) of the outcomes is expected all along and is quite normal (without bias being present).

As a general rule of thumb: the lower the sample of outcomes you use, the less statistical significance of the analysis. Statistical significance is needed to make a distinction between outcomes which have been produced purely by random chance, or as a result of bias. As such it is simply statistically impossible to identify bias in the short term, despite to what some internet scammers might tell you. Each qualified mathematician-statistician will agree on the previous statement.[1]

If you would ever consider risking high stakes, suspecting bias, we strongly stress NOT do this, unless you would have obtained statistical significance. The odds are high the casino will have noticed bias by then also, probably even very long before you did.

After this word of caution, let's continue with our calculation:

If you have never played roulette, you might think on a French roulette table each number will appear on average 3 times on 111 spins (111/37 = 3). If only this where true, we would be billionaires by now.

If you play 1 number out of 37 possibilities, your chance of winning obviously is 1/37, so your chance of loosing is 36/37 on each spin you play. This is pretty straightforward and logical right? If you agree with this, proceed with the second step.

Second step

To calculate the expected standard deviation you will need to find the square root symbol on your calculator or spread sheet. The square root is symbolized like this: √

If we want to know how large the standard deviation can be when we would be playing 111 spins on a French Roulette table, you'll need to do the following calculation[2]

Square root (111 * (1/37) * (36/37))

The first number is the amount of spins you want to examine (in this case 111), the second number is the probability of getting the bet right (if you are playing a single number this is 1/37), the third number is the probability of getting the bet wrong (if you are playing a single number this is 36/37).

So if we do all the calculations step by step, you just need to divide the probability figures for the next step:

Square root (111 * (0.027) * (0.9729)

Now, multiply the three results:

Square root (2.91)

[1] Without fully going into detail interested readers might want to expand there knowledge by learning about 'the standard error of the mean' which is apparent on low samples, and how to obtain statistical significance.

[2] To simplify the calculation for this example we only use four digits after the comma, however it is statistically advised only to round up figures on the final outcome. If you would be using a spreadsheet like Excel to do the calculations, simply use as many digits behind the comma as possible for a more accurate standard deviation calculation.

Now press the square root symbol on your calculator and you are done:

= 1.71

Now, this wasn't so difficult was it?

So, ok 1.71 is the expected standard deviation you might expect on a single number if you have 111 spins of the French roulette wheel.

You are probably scratching your head and thinking: how does it help knowing the standard deviation on a single number on 111 spins is 1.71?

Well, here is the magic:

If you have never played roulette you might think: 111 spins divided by 37 numbers, this makes an average of 3, so each number will appear on average 3 times within 111 spins. (If you ever find a table which throws out the numbers in such regularity, please let me know, and I'll immediately book a flight to wherever it is, and bring my whole life savings).

Knowledge about standard deviation gives us a completely different picture.

Let's start out with applying only one standard deviation to the expected average outcome.

The mean of appearance of a single number on 111 spins is 111/37 = 3

If we know the figure for one standard deviation (in this case, as we have just calculated this to be 1.71), we can now apply this to the mean to find out how much the variance in outcomes could be in 111 spins.

One standard deviation (positive SD) above the mean would be:

The mean + one standard deviation = 3 + 1.71 = 4.71

One standard deviation (negative SD) below the mean would be:

The mean – one standard deviation = 3 – 1.71 = 1.29

Which simply means a single number could appear up to 4.71 times on 111 spins, but it could also only appear 1.29 times. Of course the ball will not fragment to give you 4.71 or 1.29 appearances. If we round up the figures it will either be approximately 5 appearances or only 1 appearance.[3]

Now, hold your horses: if only one standard deviation was mathematically expected on 111 spins of roulette, we could still become millionaires.

The bad news is **at very least** 3 standard deviations are to be statistically expected on any given amount of spins you are planning to play.

[3] As mentioned before, when rounding up figures, always do this on the final step of your calculation, otherwise the rounding up error will increase the further you go.

In our example of 111 spins to calculate 3 standard deviations on a single number, we get:

The mean + three standard deviations = 3 + (3 * 1.71) = 8.13
The mean – three standard deviations = 3 – (3 * 1.71) = 0

So, we find on 111 spins a single number could appear up to approximately 8 times or it could simply not appear at all.

And, this has nothing to do with bias, even on a perfectly balanced table such outcomes can be expected all along on any 111 spins you would be playing on roulette: the number you are playing could simply not appear at all, or it could appear 8 times, and this is considered statistically quite normal.

Now, you might be thinking **how large is the chance a number would be only one, two or three standard deviations away from the expected average**?

Every qualified statistician will tell you the following:

There is:

A 68.26 % chance a number would appear within 1 standard deviation below or above the mean.
A 95.44 % chance a number would appear within 2 standard deviations below or above the mean.
A 99.73 % chance a number would appear within 3 standard deviations below or above the mean.

So in our example of 111 spins, approximately, there is

68.26 % chance the appearance of a number will be between 4.71 or only 1.29.
95.44 % chance the appearance of a number will be between 6.42 or only 0.42
99.73 % chance the appearance of a number will be between 8.13 or no appearances.

And, this would all be perfectly normal and due to expected statistical fluctuation on a random game such as roulette.

For those of you who have paid attention to the above figures: this still leaves a 0.27 % chance which is not accounted for, which means if a number would even appear more than 8 times in 111 spins (on French roulette), this could still be considered as a normal statistical fluctuation. **This is a very important distinction often left out in gambling literature:** three standard deviations can NOT be considered to cover all of the possible probability outcomes. So, if you would analyze outcomes it would not be correct to state: this particular number has a three standard deviation positive (it appeared far more than the expected mean), so there is bias.

Let's take it all the way up to 4 standard deviations (even such an outcome should not make you wink, because as seen above there still remain 0.27 % of outcomes which are not accounted for within the probability figures):

3 + (4 * 1.71) = 9.84
3 - (4 * 1.71) = 0

So, even when a number would show up approximately 10 times on 111 spins, there is no statistical guarantee what so ever the number would be biased.

The outcomes could simply be a matter of statistical fluctuation, because as illustrated above 3 standard deviations do not include 100 % of all the outcomes that can be expected, but only 99.73 %, which still leaves 0.27 % to be covered for within the normal expected standard deviation.

Now, here is the catch: although many gambling authors (such as Chris Pawlicki, author of 'Get the edge of roulette' –check our literature reviews on www.john-solitude.be) and internet sellers (or we rather call them 'scammers') will only mention three standard deviations (as such misleading the readers because the impression is given this would account for the maximum amount of deviations there are possible within the probability figures), if you expand your research and you do not need to sell books, you might find the correct full mathematical picture

(source: Mathworld Wolfram research http://www.wolfram.com):

range	CI
σ	0.6826895
2σ	0.9544997
3σ	0.9973002
4σ	0.9999366
5σ	0.9999994

As you can see, five standard deviations would cover for 0.9999994 of all mathematical possibilities. Although the probability of such a pattern occurring would indeed be very small (less than one in a million), if it would occur it could still be due to an extra-ordinary chain of random events. The only way to make a distinction between bias and random results would be to have a very large sample. Why is this? Well, if some awkward pattern only appeared once in millions of trials, just like mathematically expected, the result was obtained by pure remote chance and not bias. **This is a very important distinction**: a bias player only has a limited amount of observations (in any case far less than the total amount of outcomes on a specific table), so he can only make estimates based on the outcomes he observed, which in any case are only a very small fraction of all the outcomes on a particular table or all the mathematical combinations that could ever appear.

Suppose as a hypothetical example, you would have recorded millions of spins on a particular wheel (and conditions have never changed since the first spin, which would be highly unlikely) if a 5 SD event would come up only once within those millions of spins it would not be bias, but mathematically expected to happen within the probability figures. Although the probability of certain events might be very low, we can never state they are entirely impossible. Otherwise, it is not because the probability is very high it will certainly happen. The moral of the story: there is ALWAYS risk involved, no matter how low or how high it is, as such there can be no such thing as a 'certain win' system.

However, if a 5 SD event came up while you were on the table you could compare this to winning the lottery: just because your combination of six numbers is right (one chance in

millions, depending on the total amount of numbers, and the combination you need within your lottery game) it doesn't mean the outcome of the lottery was biased towards the numbers you were playing: you simply were a lucky son of a gun or very unlucky if you would have decided to bet against the appearance of a 5 SD event while you were at the roulette table.

This is a major problem with analyzing roulette outcomes: you never know which outcomes there were since the very first spin on a particular table, nor will you know which outcomes there will be when you leave the table. Only the casino has such extensive information. Even if you analyze thousands of spins, this only remains a very small proportion of all the possible outcomes that are to be expected.

Add to this, unless you know someone from the inside, you have no way of knowing when maintenance was applied which makes previous interrupted analysis per definition invalid.

Most often occasional players will apply the empirical probability rule: it is they are subjectively convinced the minimum and maximum amount a number or combinations of bets would appear within a given amount of trials, is confined to the minimum and maximum they have personally observed in previous sessions (which is only a very small fraction if you compare it with the total amount of outcomes on a specific table).

The larger the amount of trials one observes, the higher the degree of probability you will be confronted with outcomes which differ severely from what you may have observed in previous sessions. This also explains why, if you would choose to use progressions you NEVER should increase the bet after a certain threshold you have predetermined and which is reasonable to your financial situation. At this point it is a much wiser (and in the long term a far less expensive) decision to cut your loss if your numbers do not drop within your bankroll or table limits. You must fully know and accept the fact that the streak you might be playing could still go far beyond what your bankroll or table limits might support.

Now, suppose you would have such an outcome in which a single number turns up 10 times on 111 spins, this is far from sufficient long term statistical proof it would actually be bias, because this fluctuation, although remote, is still expected within the probability figures. The same number which came up so many times on the first 111 trials could simply on the next 111 trials, not turn up at all or only a couple of times.

Bias - and system players often go into fierce debate with one another in gambling forums on the internet. Often the first group accuses the latter group numbers will not turn up because they are 'due' (did not appear within x amount of trials), but the same misconception holds for the first group: a number will not simply keep on appearing in a higher rate than expected because the number turned up with a positive 3 standard deviation (= far above the average) in the previous cycles.

In fact, if the table is relatively balanced[4] the probability odds are against it a 3 standard deviation event would be followed by another high SD event due to the law of large numbers.

[4] By which we mean it's still a human made device, so as such it can theoretically never be 100 % accurate but more than accurate enough the bias would by far not be sufficient enough to even statistically be noticed with advanced calculation, and as such it can not be identified, nor would it be profitable if there was only a very small degree of bias.

The 'law of large numbers' (or sometimes called 'the law of averages') is a widely accepted mathematical law which states that in the long term empirical results are more likely to coincide with the mathematical expected probability laws. What does this mean? If for instance you would track hundred thousands of spins on the same wheel, you'll find that during the entire event some numbers will be in the lead at some times, others will drag, and this will fluctuate during the event, but in the end all the possibilities will end up within standard deviation distance of the expected mean. However, the larger the amount of trials (for instance 500.000), the larger the differences could be in absolute values (hits).

To prove this, we'll apply the standard deviation to 500.000 outcomes on French Roulette, no rounding up, five digits behind the comma, to determine how much a single number could divert from the mean (500.000 / 37) without even becoming suspicious.

= Square Root (500.000 * (1/37) * (36/37))

= Square Root (13148,28342)

= 114.666

Let's immediately calculate 3 standard deviations from the mean to prove how far randomness could go, without even having to consider bias.

Mean = 500.000 / 37 = 13.513,51351

SD3 + = 13.513,51351 + (3 * 114.666)
SD3 + = 13.857,51141

SD3 - = 13.513,51351 – (3 * 114.666)
SD3 - = 13.169,51562

If you did not get dizzy yet, here is what the above calculation implies:

On 500.000 trials on French Roulette, within expected 3 SD fluctuations, a number could finally turn up approximately only 13.169 times (a 3 SD negative) or 13.857 times (a 3 SD positive). You'll notice there is already a difference of more than 700 hits between the lowest appearance and highest appearance and still this remains statistically acceptable and has nothing to do with bias.

And, as we pointed out earlier a 3 SD positive or negative value does not cover the 0.27 % probabilities, in which the difference between lowest and highest amount of appearances, could even be far higher and still remain within the probability figures. So, the more trials you record, the higher the mathematical probability becomes at one time or another you might even observe a 4 SD event at a certain stage of the game, but if this event was as rare as it should be in a very large sample-amount and not persistent, it would be statistically expected fluctuation not bias.

Bias players often do not realize how much spins one would need to observe in one straight session (to make sure the conditions of the wheel have not changed severely when one would take interrupted sample observations) to determine bias in a statistically dependable way.

Casino's actually use two statistical tests in combination: standard deviation and the chi square test[5] to monitor for bias.

If the observation sample is too low, the winnings of playing misidentified biased numbers could also be due to plain luck and not a real advantage. Because in the short term, the numbers you have chosen could simply (without bias being present) turn up above the average, resulting in a win. This also holds for other so called 'advantage' techniques: because 3 SD events are commonly expected within roulette, it would need a large amount of trials to distinguish between luck and having an edge.

To make it clear: nor a bias player, nor a person who argues he's able to visually determine where the ball will land could ever prove in the short run they really have an edge. Even if you apply no playing strategy what so ever you could also end up with a profit, even after 100.000 trials depending on your bankroll, the strategy and luck.

Suppose you would walk into the casino pick only one number and play it flat bet for days on end: if the standard deviation would by chance go with the player (this particular number appears well above the expected mean) it would still result in a profit. The result however would not be due to an advantage but luck.

To actually prove one has an advantage, one would have to be able to consistently beat at least 3 SD events in the long run because these occur regularly in roulette. Because in French roulette the house edge is 2.70 % (check the chapter on The House Edge) and the standard deviation will fluctuate all along during the trials (in favor or against the player depending on his bet choice), even a non experienced player with a large bankroll, using well thought out money management has a reasonable chance to win in the short and medium run without having any edge what so ever due to the expected statistical fluctuation in wins and losses.

This aspect of the game might be very confusing to players: often one can wonder why a certain approach to the game, may work well for weeks or even months on end, then suddenly severe losses are experienced (in the case one would be playing aggressive progressions): the answer is always standard deviation.

Most often bias players will flat bet the same chances over and over (without using any progressions). This also reduces the amount of capital exposed to the house-edge compared to using progressions. Playing the same chances over and over also mathematically makes sense according to sequential and binomial probability theory (which we'll cover in the following chapters), because the more trials one can buy, the higher the probability at one time or another one of your picked numbers will show up. The fluctuation in the standard deviation (over which the player has no control what so ever) will determine if your numbers turn up at a higher or lower rate than expected, within or out of the reach of bankroll and table limits.

The amount of trials you would need to get very near absolute certainty will be in any case far more than any bankroll or spread would allow if their is no bias.

This explains why aggressive system betters (if they are lucky the remote unfavorable patterns they are playing against do not show up while they are at the table – for instance 20 the same even chances in a row) can prolong their wins for weeks, even months depending on the amount of spins one plays, because there bankroll allows them

[5] If you are interested in information how to calculate the Chi Square Test for roulette, please go to http://www.mathproblems.info/gam470/games/chi-sqr/chi-squared-test.html

to battle with the fluctuation of the standard deviation. If they are lucky the standard deviation will remain within the grasp of the bankroll during the sessions they play.

A higher bankroll allows buying many trials, and the more trials, the higher the mathematical chance becomes of a success. However, at one day a remote unfavorable pattern could show up right away resulting in a severe loss if the player would choose to play aggressive progressions like for instance the Martingale (double up on the even chances after a loss, return to 1 chip stake on a win).

The probability an unfavorable remote pattern will show increases the more spins are played. And, we should never forget a roulette wheel has no recollection whatsoever if you have won or lost the day before: so wins and losses can fluctuate highly.

If however there would be genuine bias (and as we have sufficiently proven the odds are highly against it due to the countermeasures and high tech technology), bias playing is as a sure win technique of playing as long as the bias remains and is severe enough (and the casino doesn't notice what is going on).

Suppose a bias player would have identified a number which in the long run would show up at a rate of 1/36 in stead of 1/37 on a French Roulette table.

This would not even be sufficient bias because even if a player would flat bet:

1 win	* 36	=	36 chips (35 chips net profit)
35 losses	* 1	=	35 chips (35 chips net loss)

At this point, in the long run the player would only be able to break even, not even gain profit.

It is also often (deliberately) forgotten by bias players historically documented victories using bias 'advantage' always involved making thousands of observations (without playing), to avoid statistical fluctuations and miscalculations that will always be apparent on low amount of samples. In most cases, the observations were done not by an individual but by entire teams (also known as 'gambling syndicates') to avoid being detected by the casino. Individually monitoring thousands of trials without even playing would surely draw attention on the part of the casino. Although it is not illegal to 'clock' (note down) roulette outcomes, it will alert security if it would be done during a large amount of time (without playing) by an individual. And, a casino could never be forbidden to close down a table when they suspect there is a flaw in the game.

One of the most famous bias players, **Joseph Jaggers**, an English engineer and mechanic broke the bank at Monte Carlo in 1873 (!), BUT only after hiring six clerks who observed all the roulette tables during five weeks (!).

Only one of the wheels examined showed sufficient bias for Jaggers to have a successful go at it with high stakes. After a winning streak this alerted the security personnel who switched the wheels around at night, resulting in a severe loss for Jaggers on the second day he came back to (unsuspectingly) play a different wheel.

Jaggers only found out he was playing a different wheel after a severe loosing streak, suddenly realizing a scratch on the wheel he was playing the day before wasn't there anymore. Jaggers looked around and found the wheel with the scratch, again resulting in a victorious win. The wheel manufacturers who had been called in by the casino knew by

now what was going on, resulting in switching and replacing the pocket dividers. Finally Jaggers gave up, however leaving the building with a net profit of 325.000 $.

We should add we couldn't find any dependable sources stating how high Jaggers initial bankroll was (this is often left out in gamblers all-time-spectacular-victories for obvious reasons). When reading about spectacular winnings, readers should always wonder how high the initial bankroll was one started out with, to put matters into perspective and context. The higher the initial bankroll, the more relative the wins become, because the higher the bankroll the more trials one can buy for a success, as such for at least a while, one can defy the variance in outcomes which is to be expected.

If the player is lucky, the variance in outcomes will remain relatively low (as such the punter is able to make a profit by playing the same chances over and over using money management of which the objective is to have a small gain on a success), if the punter is unlucky a high standard deviation could manifest itself right away from the very first session, resulting in a loss.

This also proves why 'hit and run' strategy only provides in a false sense of security: if one plays a system of which the probability is high one will have a winner within the bankroll and table limits, it's only a matter of time one of the streaks which are lower in probability will manifest itself from the very start of the session resulting in a loss. Again it is advised if you play 'hit and run' sessions (it is leaving the premises as soon as the win goal is reached) if you would have a bad day to never be tempted to raise the stake.

In the case of Jaggers, a profit of 325.000 $ is indeed very high, but as discussed winnings are very relative to the amount of the starting bankroll and the values of the chips one is using. If (hypothetically) the bankroll in Jaggers case would for instance have been 100.000 $, the victory is already far less spectacular, in fact it could also have been reached by plain luck.

Unfortunately for the bias players, the victory of Jaggers and other documented victories concerning bias play resulted in increasing countermeasures (see introduction to standard deviation) from the casinos. This might explain why many bias players have now retired, or are dependent in becoming sellers to still make an income (be it by writing gambling books or expensive guides sold on the internet).

Probably most of these authors know, bias play has become like looking for a needle in a haystack. Or most of them have lost serious amounts of money after noticing their calculations did not take into account the statistical significance needed before one can statistically accurate determine bias (meaning in all cases a large amount of observations is needed). The fact that Jaggers also with flat bets lost a serious amount of money, being under the false impression he was playing a biased wheel, should caution readers to not take presumptions of bias very lightly.

1.4 How to calculate the expected standard deviation for a dozen

Let's do this exercise for an American wheel (38 possibilities = 36 regular numbers + 2 zero's). (If you want to adjust this exercise for a French roulette table, just switch the '38' possibilities by '37' possibilities and adapt all the following calculations).

Suppose you would be planning playing 6 full cycles (= 38 * 6 = 228 spins) and you want to know by approximation in advance how large the standard deviation could become on a dozen of numbers. (This would not necessarily have to be a regular dozen bet, but could be any of a combination of 12 numbers you wish to choose).

First step

Determine the probability of winning and loosing the bet for one single spin.

On an American wheel, the probability of winning a dozen bet on a single spin is 12/38, the probability of loosing is 26/38.

The mean of this particular combination of 12 numbers (if a roulette wheel would throw out all chances in perfect regularity, of which as we have discussed before the chances are very slim), would be

228 spins * (12/38) = 72

Second step

Apply the calculation as previously discussed in the former example adapting it as follows:

Square root (228 * (12/38) * (26/38))

As you can see, when you refer to the previous example, the formula remains the same, only the amount of spins (228) and the probability figures (12/38 and 26/38) have been adjusted.

This gives us by approximation[6]

Square Root (228 * (0.3157) * (0.6842))

Square Root (49.2484)

= 3.94

Third Step

To obtain the expected amount of shows during 228 spins for a dozen, with regards to standard deviation, simply subtract or add the obtained figure (3.94) from the mean.

If we do the calculations in full, with respect to 8 digits behind the comma, you'll find the following:

[6] Please note once again for layout reasons we only print up to four digits behind the comma. It is however advised if you use a spreadsheet like Microsoft Excel you use as many digits behind the comma you like, only rounding up the final figures on the last step to obtain the most accurate results.

1 SD	75,94420926	68,05579074
2 SD	79,88841852	64,11158148
3 SD	83,83262779	60,16737221
4 SD	87,77683705	56,22316295
5 SD	91,72104631	52,27895369

Below, for reference regarding to the probability figures, we once again print the previous confidence intervals regarding to probability you might find a dozen appearing within the the previous standard deviation intervals.

range	CI
σ	0.6826895
2σ	0.9544997
3σ	0.9973002
4σ	0.9999366
5σ	0.9999994

To make sure there are no misinterpretations regarding how this graph should be interpreted when you combine both, here are some examples.

There is a 68.26895 % chance a dozen will appear between approximately 76 or 68 times if you will observe an American roulette table for 228 spins

In 99.99994 % of the cases a dozen will appear between approximately 92 or 52 times if you would observe an American roulette table for 228 spins. The utter most regions (92 times or 52 times) would equal an appearance within 5 standard deviations.

To avoid misinterpretations (if you would not have read fully thru the previous example) we state once again a high standard deviation doesn't necessarily equal bias. This is a common misconception, especially when only small samples were used to do the analysis. At this time one could only reasonably say, the probability was low such an event would occur while you were at the table (and for instance you only observed 228 spins). But if you would have collected a much larger amount of sample spins on this table, and this scenario only happened on this very exclusive occasion, it is not bias.

However, we can logically state if an outcome would not be contained within three standard deviations, the lower the probability is becoming these outcomes would repeat themselves on a non biased table.

If an outcome would not be contained within 5 SD there are two possible explications:

You are witnessing a random (not biased) event, of which the probability is incredibly low but you just happened to be there (due to luck or bad luck, depending on your playing strategy). In fact, the more spins you observed in your life, the higher the probability became at some day you will witness an extra-ordinary event when compared to probability and standard deviation.

This table is possibly biased, and you could decide to flat bet the chances which have appeared (at least) within 4 SD figures. At this time the philosophy is rather, it's better to be safe than sorry.

From personal experience we would not even consider thinking of bias for any outcome which is contained within four standard deviations, although one can already start to closely monitor these particular outcomes. You'll find if you are a regular player and do enough observations 3 SD events are quite common in roulette. Add to this the countermeasures of the casino discussed in the previous example, and we could say the objective odds you are playing a random table are far higher, than you would be playing a biased table.

This example might explain the common player's myth 'it would always be better to play the table outcomes than against it'.

Suppose there is no bias, it would do little harm in the short run, to play (for low stakes and preferably flat bet) the chances you would suspect of bias. If the bias isn't there this wouldn't make any sense. Because, the bad news, according to binomial probability (which we'll explain in a later chapter), if the table would not be biased, the probability is very slim, the chances you've misidentified as being biased, would keep on appearing at such a high rate. If the table is not biased you are playing against the probability a number would keep on appearing at a higher rate than expected. If you would put high stakes on the table, convinced a particular combination of bets would be biased and this isn't the case, it could even prove a very costly mistake.

So, please do take care before applying this knowledge. Randomness can go a very long way, and this is the most underestimated part of the game. As a result a lot of myths have surrounded the game, disinformation has spread, and uninformed players are being exploited by sellers and gambling authors to the expense of the player.

And as usual we can already suspect a lot of sellers coming after us, or slaying this guide because if players are better informed, it is bad for the business of ripping people of.

1.5 How to calculate the observed (empirical) standard deviation for the total amount of outcomes

I hope by doing the previous exercises, your appetite for statistical analysis hasn't faded into despair yet.

In fact, things will now become even more interesting because we'll try to teach you how to accurately calculate the observed versus the expected standard deviation (see previous) on any of the given sessions you have played yourself.

In this way, you can for instance analyze how large the difference was between expected and observed outcomes, and you will no longer be the victim of players who often make subjective remarks like 'this number has turned up far more than others, so there must be something wrong with it', which may alter your betting strategy in full battle for the worse.

Especially automated wheel - or 'rapid roulette' players may find this calculation useful as a reference for the particular make of table they are playing. We have reason to believe, that the fluctuation in the variance of outcomes that can be expected, will differ from manufacturer to manufacturer. On numerous roulette sessions, before they started out with their 'experiment' (see chapter 'The Experiment') the authors of this guide analyzed and compared standard deviation between three different manufacturers of automated roulette tables, and found the obtained variance figures seemed to be related to the type and manufacturer. To avoid misinterpretations: we do not state wheels of some manufacturers are more likely to be biased, we think (but this is a hypothesis[7]) it has rather to do with the amount of randomness (or variance in outcomes) automated tables can produce, being limited with a predetermined amount of automated launch velocities and wheel rotation speeds.

A hypothesis which could explain this phenomenon is: a human dealer can apply nearly an infinite different amount of velocity speeds to the launch of the ball and wheel rotation speeds. The human hand is a very complex organism compared to automated roulette tables which use predefined settings, which will be randomly applied to determine the (air) launch and / or wheel speed on a particular spin. In any case, we can reasonably state the amount of different launch velocity and wheel rotation speed possibilities will be lower in the automated case. However, this is not the same as stating an automated table would not be able to create sufficient randomness for a player to still loose in the long run.

Again, these kinds of interpretations should not be taken lightly: we suggest from now on you start collecting samples of outcomes from different manufacturers of automated tables, and apply the calculation to the outcomes you've collected after playing each session[8]. Again, the more samples you collect, the more confidence you can have in the conclusion.

What you will be looking for is how far the obtained figures of standard deviation for the total table from each session, from wheel x from manufacturer x, compare to wheel x

[7] A hypothesis is a speculation, as such it is not proven a fact but a possible interpretation which may prove right or wrong.

[8] For good statistical measure you shouldn't compare for instance a sample of 200 spins with only a session of 100 spins from a different manufacturer. Needless to say you shouldn't compare an automated French roulette wheel to an automated American roulette wheel, because how larger the amount of possibilities, the higher the statistical fluctuation can become.

from another manufacturer. Only if you would find in the final data comparison, the figures are closely related to the particular manufacturer of the table, you could anticipate your playing style towards the make of automated table you will be playing. In statistical terms this would be examining the empirical[9] standard deviation that may occur on this particular wheel. Once again: we caution just because you didn't witness a high variance in outcomes yourself, this doesn't mean this can't be the case in future sessions; it still remains a risk unless one would have access to a very large sample.

As a rule of thumb, the higher the figure you obtain, the higher the variance in outcomes, the more outcomes of each number will differ from one another, the more difficult it is to successfully apply a system based on probability theory. The lower the final figure, the lower the variance in outcomes, the more outcomes of each number will be balanced to the mean, the better your chance to beat the table with probability theory when using a sufficient bankroll and a large spread.

Again we caution the reader: empirical compared to theoretical research has its plusses and minuses. Once you get the grasp of it, **theoretical research** (as we've have seen before in the previous calculations) can easily be applied to an infinite amount of spins to obtain a theoretical prediction what could happen. The obtained result however, is always an abstract definition of what could happen in reality.

Empirical research, on the other hand, derives the data directly from reality; with as a minus it needs far more time from the player to collect a sufficient amount of spins, and no matter how many spins he collects, it will always be far less than theoretically possible. Just because a certain remote possibility didn't happen while you were out there collecting data, doesn't mean it could not present itself in the future.

You should never go out playing as if it were a certainty you would win based on empirical data you have collected previously. Always remain cautious of the fact that empirical research only makes predictions towards the future, based on a per definition insufficient amount of samples you collected in the past.

We're not going to frighten you with complex mathematical formulas. We will explain step by step how to proceed with the calculations.[10]

To calculate the standard deviation on a sample, statisticians will make use of a 'frequency distribution' table. This is a complicated word to state we will devise a table which allows us to compare the expected mathematical results versus the observed results. In this case we'll do the calculation for each of the possibilities (each number), finally obtaining a figure which tells us how high the standard deviation was on the sample you collected from a particular wheel.

On the following pages you'll find the calculations in full from a session we actually played ourselves for real cash. If you didn't do this earlier, the calculation might seem intimidating, but actually the calculations needed are only a matter of being accurate like a bookkeeper and making some calculations in a predefined order. Although the

[9] Empirical as compared to theoretical, means you derive data from practical research, as compared to derive data from theoretical expectations.

[10] Readers who have a background in statistics will notice we use the classic formula to determine the variance, not the 'raw score method' for educational reasons. Readers who do not have a background in statistics should be aware there are different methods to calculate empirical standard deviation; however the results will be exactly the same or very closely related, depending on the rounding up.

calculations can be done using a pocket calculator, learning how to use a spreadsheet like Microsoft Excel or S.P.S.S. is highly recommended.

If you didn't print out this guide, it is advisable to print the following pages, so you can easily compare the table, with the explication of the table itself on the following pages.

The John Solitude Wheel Frequency Analysis

	O		O	EXP	OBS - EXP	(OBS - EXP)^2	((OBS - EXP)^2)/EXP	SD
0	3	0	3	5,72972973	-2,72972973	7,451424397	1,300484447	-1,156118080
1	7	32	6	5,72972973	0,27027027	0,073046019	0,012748598	0,114467137
2	6	15	5	5,72972973	-0,72972973	0,532505478	0,092937277	-0,309061269
3	8	19	6	5,72972973	0,27027027	0,073046019	0,012748598	0,114467137
4	2	4	2	5,72972973	-3,72972973	13,91088386	2,427842937	-1,579646485
5	5	21	4	5,72972973	-1,72972973	2,991964938	0,52218256	-0,732589674
6	7	2	6	5,72972973	0,27027027	0,073046019	0,012748598	0,114467137
7	3	25	5	5,72972973	-0,72972973	0,532505478	0,092937277	-0,309061269
8	5	17	7	5,72972973	1,27027027	1,61358656	0,281616522	0,537995542
9	5	34	8	5,72972973	2,27027027	5,1541271	0,89954105	0,961523948
10	7	6	7	5,72972973	1,27027027	1,61358656	0,281616522	0,537995542
11	6	27	10	5,72972973	4,27027027	18,23520818	3,182559918	1,808580759
12	4	13	8	5,72972973	2,27027027	5,1541271	0,89954105	0,961523948
13	8	36	2	5,72972973	-3,72972973	13,91088386	2,427842937	-1,579646485
14	7	11	6	5,72972973	0,27027027	0,073046019	0,012748598	0,114467137
15	5	30	3	5,72972973	-2,72972973	7,451424397	1,300484447	-1,156118080
16	4	8	5	5,72972973	-0,72972973	0,532505478	0,092937277	-0,309061269
17	7	23	3	5,72972973	-2,72972973	7,451424397	1,300484447	-1,156118080
18	6	10	7	5,72972973	1,27027027	1,61358656	0,281616522	0,537995542
19	6	5	5	5,72972973	-0,72972973	0,532505478	0,092937277	-0,309061269
20	7	24	5	5,72972973	-0,72972973	0,532505478	0,092937277	-0,309061269
21	4	16	4	5,72972973	-1,72972973	2,991964938	0,52218256	-0,732589674
22	8	33	5	5,72972973	-0,72972973	0,532505478	0,092937277	-0,309061269
23	3	1	7	5,72972973	1,27027027	1,61358656	0,281616522	0,537995542
24	5	20	7	5,72972973	1,27027027	1,61358656	0,281616522	0,537995542
25	5	14	7	5,72972973	1,27027027	1,61358656	0,281616522	0,537995542
26	12	31	7	5,72972973	1,27027027	1,61358656	0,281616522	0,537995542
27	10	9	5	5,72972973	-0,72972973	0,532505478	0,092937277	-0,309061269
28	7	22	8	5,72972973	2,27027027	5,1541271	0,89954105	0,961523948
29	5	18	6	5,72972973	0,27027027	0,073046019	0,012748598	0,114467137
30	3	29	5	5,72972973	-0,72972973	0,532505478	0,092937277	-0,309061269
31	7	7	3	5,72972973	-2,72972973	7,451424397	1,300484447	-1,156118080
32	6	28	7	5,72972973	1,27027027	1,61358656	0,281616522	0,537995542
33	5	12	4	5,72972973	-1,72972973	2,991964938	0,52218256	-0,732589674
34	8	35	4	5,72972973	-1,72972973	2,991964938	0,52218256	-0,732589674
35	4	3	8	5,72972973	2,27027027	5,1541271	0,89954105	0,961523948
36	2	26	12	5,72972973	6,27027027	39,31628926	6,861805201	2,655637570
								0,000000000

T	212	**Variance Tot >**	165,2972973
Most Obs	12	**Variance >**	4,591591592
Less Obs	2	**SD Observed**	2,142799942
Modus	5	**Chi Square Tot**	28,8490566
Median	6	**Chi Kwadraat**	0,79560284

Mean	Mean Error	Chi Toets	0,79560284	
5,72972973	0,162162162	Confidence	79,56028399	Pass
Mean 6		Square Root Sample	14,56021978	
34,37837838				
			Expected	Observed
		SD Expected 1	2,361116721	2,142799942
		SD Expected 6	5,366889808	
		SD Expected 12	6,815956872	

Step 1

As we can see, in the **utter most left column** of the spreadsheet our statistician set up, the example is taken from a French roulette table: there are 37 possibilities chronologically ordered from the number zero up to 36.

Readers who would be interested in obtaining this custom made spreadsheet (available as well for double zero tables), allowing you to automate all the calculations –just like casino's do- can do so by making a 7 $ donation on our website www.john-solitude.be . Donations will be used to reward our statistician, for maintaining the website (annual registering of the domain name, fee for the ftp-space and the drinks for our webmaster) and future free roulette guides.

In the **second column**, right next to each number, you'll find the total amount of appearances of each number in this particular session. When you look at the table, you can see number zero appeared three times, number one appeared seven times. So, to calculate the standard deviation the first thing you should be thinking about is accurately keeping track of how many times each number appeared within the total amount of spins you observed.

In the **third column**, you'll find the 37 numbers of a French roulette, however this time not chronologically ordered like the betting lay-out, but as the numbers are situated on the wheel itself. As discussed in the previous guide (The John Solitude Wheel Frequency Analysis version 3_1 –available from our website www.john-solitude.be), it is far more interesting in any case to know how the outcomes are situated on the wheel itself, not on the betting lay-out.

So, to ease up things, towards the final analysis, in the **fourth column** next to each number you'll find how many times each number appeared (this is the same amount of appearances as in the second column, however for convenience they are now ranked next to the numbers as they appear on the wheel itself.

So, the first step can be summarized as: total the amounts each particular number appeared within a session next to this specific number. Yes, it's that simple really.

For convenience, the spreadsheet totals the amount of observations below the second column. In this case we have a sample of 212 outcomes.

Step 2

Now look at the **sixth column** below 'EXP' (abbreviation of 'Expected'). Each number has the same figure, in this case 5,72972973. Although this might seem very complicated,

it's only the mean of the total amount of spins you observed during a session divided by the amount of possibilities.

For instance in this session we recorded in total 212 outcomes. When you divide 212 / 37 you get 5,72972973. As the spreadsheet was constructed in Excel, we chose to not drop the digits behind the comma, but let the computer processor do the work.

Pay attention if you would be doing this calculation for an American roulette table. You should always divide the total amount of spins by the amount of unique possibilities in the game. In French roulette this is 37, in American roulette 38.

Step 3

Let's go on to the **seventh column** below 'EXP – OBS' (abbreviation of 'Expected – Observed').

The expected amount of appearances is the mean (the total amount of spins observed divided by the total amount of possibilities). The observed amount is the amount of times a number appeared within a session.

In this case number 0 appeared 3 times in 212 spins.

So, we get the following calculation:

3 - 5,72972973 = -2,72972973

Obviously number zero appeared less than the expected mean.

You have to do this tedious task for each of the numbers, so this explains why the casino automates this complete process. (And, do not despair, if you have Excel on your computer, there is actually even a far quicker way to do this, but as for now we show you the complete process for educational reasons).

Take care you never do it the other way around: first take the observed amount of spins, then subtract the mean, so finally for each number you'll end up with a positive or negative value.

Step 4

You should now be looking at the **eight column** which states (OBS – EXP) ^ 2

In case your calculation skills have not been exercised since high school you might be wondering what the symbol ^ 2 represents? The full phrase is 'multiply by the second power'.[11]

It's simple really (but mathematicians always introduced many different abstract symbols for convenient expression, so a layman is often wondering if this might be Chinese or a tax bill coming in).

[11] There is also another way of representing this, in case you have for instance the 9 ^ 2 it could also be written as 9^2 and the result would be exactly the same being 9 * 9 = 81

Suppose, as an example when you would have the subtraction 5 – 2 = 3

Now, 3 ^ 2, would mean, take the first number (3) and multiply it once with the same number. In this case the calculation would be 3 * 3 = 9

If the symbol would have been ^ 3, then you would have to apply the multiplication three times in which case you get 3 * 3 * 3 = 27

To calculate the standard deviation for roulette we only need the second power (^ 2).

So, referring back to the appearances of the number zero in this case, we get

3 (OBS) - 5,72972973 (EXP) = -2,72972973

Now you have to take the result and multiply it with the second power.

So, in full this becomes: -2,72972973 * -2,72972973 = 7,451424397

You might be wondering how it's possible if you multiply two negative results with one another, you finally end up with a positive result. Well, we've wondered about this many times ourselves, but it's the same as asking why the clouds do not fall down. It is sufficient to say this is a mathematical rule. When you multiply two negatives with each other, in all cases, no matter how negative the previous numbers you ALWAYS end up with a positive result, if you like this or not. Unfortunately if you would multiply your losses on roulette, you would not end up with a full wallet.

So, just accept the mathematical rule that (-3) * (-3) equals + 9.

The bad news is, you'll have to do this calculation for each of the numbers on a roulette wheel. That's why we should be at least be grate full to Microsoft for creating a virtual monopoly in office software applications, since the spreadsheet Excel is now available on a large majority of office and home computers.

Step 5

As if this wasn't enough (sometimes we wonder how statisticians ever came up with calculations as these, they must have had too much time on there hands, although our statistician denies this), we'll now going it to take towards the final level.

All the previous results you obtained from each number should now be totaled.

When you look at the table, below the column (OBS – EXP) ^ 2, you'll find the cell 'variance total'. Next to it is the total of all the previous calculations, in this case 165,2972973.

Nearly there: to obtain the sample variance calculation you'll have to take this total and divide it by all the possibilities on your roulette wheel minus 1.

Again we could go a long way to prove why it is N (the total amount of possibilities) – 1 you need and NOT N only by itself (again a common mistake), but this would take us far beyond this scope of this hands-on guide.[12]

So on a French roulette table this becomes 165,2972973 / (37 – 1) = 4,591591592

Be aware if you would apply this calculation for an American roulette table you should divide the total of all the calculations by (38 – 1) instead of (37 – 1).

You might be wondering why this is called 'variance' not 'standard deviation': to calculate the standard deviation of empirical samples, the mathematical formula first determines the variance. The 'variance' figure for humans is way too abstract to comprehend. Even for highly skilled statisticians, the standard deviation figure makes much more sense because it will give us a figure in the units of the original data set: in case of roulette this is spins (or trials if you want to use stats jargon).

We have to agree, it's not straightforward, but if you want to call yourself a sophisticated roulette player, there's no way to achieve this then to learn how to calculate standard deviation. Now, you can actually say you have the same statistical tools as the casino has to analyze the results.

Back to our example: in our case the variance figure is 4,591591592. In statistical literature you may find variance is symbolized like this: s^2

Do not ask us why someone came up with this symbol; probably a whole lot of expensive conferences where organized before someone raised the glass and stated 'from now one we shall agree that s^2 means variance', and all of you common folks will have a bloody hard time to decrypt our secret language.

Well, now you actually know what is meant by s^2 . In human language this would simply be: the variance of the sample equals 4,591591592.

Step 6

To obtain the standard deviation, the quest of this incredible journey, you only need to take the square root of the obtained variance figure. Remember, the square root which doesn't represent a vegetable at all but is symbolized like this √.

So √(4,591591592) = 2,142799942

If you want to blow someone of their socks with your newly acquired sophisticated statistical knowledge you could even replace the word standard deviation by simply writing s., and surely no common man would know what you were talking about.

s = 2,142799942

[12] If you would like to look up on this, in statistical handbooks compare the variance formula for a sample (which we are doing in this case), to the formula for a population. It is a common mistake to use the population formula for sample outcomes of roulette sessions, as we have more than enough evidence enough to state not all of the mathematical outcomes possible would present themselves in this small sample session. Only when you would have a complete population (for instance all the exam results of one particular class) one can use the population formula which would determine how high the variance is in exam results between the population of a particular (complete) class.

And, best part is, if you have Excel on your home computer (or any other spreadsheet program which includes tools to calculate the standard deviation), you shouldn't even bother going thru all these steps by hand. But if we would have told you this before, you would probably have skipped the previous text and wouldn't have a clue how the calculation is done.

In Excel you could simply make a column as we did, on each row you have a separate roulette number, next to it the observed totals for the session.

Following in any cell you fancy you simply write the formula (in the case of Excel):

= STDEV(n1,n2,n3, …)

and you would obtain the exact same result (you can check this for yourself if you don't believe us) as we have just calculated step by step.

The n's between the brackets should obviously be replaced with the cells you are referring to. So for instance, if you have 38 numbers (American Roulette) and you filled in the totals of the appearances in the column B on rows 1 to 38 you should simply write (in any cell you want):

= STDEV(B1:B38) and Excel would do all the previous calculations for you.

That's why now many people are out of jobs: in the early days, these tedious calculations were done by hand and still we long for the good old days.

In this case, the standard deviation for this particular sample is pretty sweet: if you check our sample you'll see all the numbers appeared within 212 spins. The most observed number was 26 with 12 appearances; the lowest observed numbers were numbers 4 and 32 with each two appearances. Now, a lot of the less experienced players could probably be thinking: this game is fixed, how is it possible on 212 spins, two numbers only show twice? Well, mathematically this is expected all along and up to this point there is no reason what so ever to think anything out of the ordinary has happened.

The standard deviation of the sample we have just calculated tells us how much dispersion (or fluctuation, or difference to use common language) there was between the appearances of each of the single numbers compared to the mean.

The mean in this case was 212/37 = 5,72972973.

In this case the standard deviation is pretty modest (despite the low sample we used). Trust us, after certainly doing over 500.000 observations, we can tell you the standard deviation could even go much further for instance with several numbers not appearing at all in 212 spins.

Remember in our first example we calculated in front how large the standard deviation could be for a single number?

In this case for 212 spins the calculation would be (212 * (1/37) * (36/37)

The previous calculation would give you 2,361116721.

Now, even the most math phobic person should agree observed (= 2,142799942) and expected (= 2,361116721) are pretty close to each other.

Now, isn't that impressive: in the expected (theoretical) standard deviation calculation we obtained already a pretty good prognosis on what would happen before we even played a session.

But agreed, for the skeptics or bias hunters, this general standard deviation we've just obtained only gives us a general idea about the observed standard deviation of all the numbers in total.

We'll have to take it one step further: to blow your mind completely we will now figure out how high the observed standard deviation was on each of the single numbers.

1.6 How to calculate the observed standard deviation for a single number (the story of the blind man)

Now it gets really interesting: forget those punters who shout at 'unbelievable, not again' when some number turns up more than others. We'll give you the tools to objectively analyze how much in statistical terms a numbers appearance really differed from the expected mean.

As such, you'll be able to say 'man, you'd better get your math straight because the number you are blathering about only has a 2 SD figure'.

Remember, earlier we've stated that you shouldn't even blink if you see a number reach a 3 SD figure, and certainly not if you are only working with a very small sample. If you get a 4 SD figure, you could reason it's better to be safe than sorry and start flat betting the particular number only using small stakes. However even a 4 SD figure happening within a small sample is far from statistically significant. Meaning, you have no certainty what so ever the number would actually be biased, it could still be a fluctuation and fluctuation is exactly what roulette is all about. It's why casino executives drive Ferrari's instead of Toyota's.

You may ask: well then, how many observations should I actually collect before I can determine anything with statistical significance? And, what does this fancy term mean anyway?

As we have discussed earlier a roulette wheel has no memory what so ever. If you fully accept this fact, you also have to accept the consequences: on each spin there are exactly 37 or 38 empty pockets waiting for a ball to be received, and the amount of possibilities is NEVER reduced no matter what the previous outcomes.

This explains why **Blackjack** is still a favorite choice amongst professional gamblers: due to cards disappearing from the deck after each hand (especially if these are low value cards), the mathematical odds for each following hand are either decreasing or diminishing to obtain a combination in which the dealer goes bust, but despite the odds for the dealer going bust the pay-out remains the same. So, an experienced card counter can determine that the probability for a good combination is x, while the pay-out is fixed, and if the probability is high he'll increase the stakes depending on the probability.

In case of roulette the possibilities are the same for each consecutive spin, the amount of possibilities never diminishes in contrary to Blackjack after each hand that has been dealt there are fewer cards in the deck. And in case you are wondering, experienced players in Blackjack are not betting on the fact if they'll come close to 21 (which is a bonus of course), but they're betting if the dealer has a higher or lower chance to go bust. The probability for the dealer to go bust is increasing with certain combinations of cards left in the deck, because the dealer is forced to draw until a predetermined value for the total amount of cards in his hand has been reached (despite if this would be a wise decision or not depending on the cards that are left in the deck).

In case of roulette the only thing you can do mathematically when you approach the table is to assess the probability that for instance a number would drop for instance 5 times in a row or some other uncommon pattern could be observed. Exactly because a roulette wheel has no will power what so ever, we can calculate what is more or less likely to happen. However, on a small sample, the estimation will be no more or less than a well calculated guess, and it's far from certainty because we can not calculate exactly when combinations of which the sequential odds are low will occur.

We can only state: on x amount of spins, the probability for sequence x appearing is such and such. But of course, you'll be only attending the outcomes of a table for maybe a couple of hundred spins so the amount of outcomes you will observe is only a very small proportion of all the spins that were ever played before you came in, or all the spins still left after you leave. The more spins you observe (or play), the higher the probability becomes you will see patterns of which you thought previously they were very unlikely. Exactly because some patterns are more likely than others, it can take some sessions before you will see the awkward patterns (or they can appear immediately if you are unlucky).

To make this clear: (without intending disrespect towards blind people) you could compare this to a **blind man centered in an arena**, throwing a pole towards a very distant target. The blind man never saw the target, nor can he estimate where the target is, what the distance is or how large it is. For this example, we hypothetically agree the blind man will not apply any strategy what so ever, he'll just throw the pole in any direction with any strength he fancies until a hit of the target occurs. As such, it would only pure chance which will determine how long it will take before the target will be hit.

Even when the blind man would get no instructions what so ever on how close he was to the target after each attempt, we can reasonably state the more trials, the higher the probability becomes by chance one of his attempts will be successful. Even if the probability is very low he would get it right on his first attempts, we can never state that he couldn't hit the target by remote chance.

You can compare this to roulette: if you have calculated that the probability is very low a certain sequence of outcomes would happen in x amounts of trials (spins), this doesn't mean it could not happen right away, even immediately when you sit down. We can only reasonably say the chance is remote.

Hit and run style of playing could be compared to the blind man taking a break to go the toilet or taking a nap. When he comes back to randomly throw poles around, the conditions haven't changed: the target remains unseen and as before he has no idea if his previous attempts were close or far away. He'll just keep throwing the pole randomly in each direction until by chance he has a success. But we can reasonably state: the more he tries, the higher the chance becomes one of his attempts will succeed.

Hit and run style of playing to avoid remote negative patterns is no solution: the amount of trials (spins you are playing) just keeps adding up and it's only a matter of time before a pattern of which the probability is remote will present itself. When exactly: if only we knew, but we can reasonably state that it would be unlikely that an unusual event (when it comes to probability) would be immediately followed with another unusual event: it is unlikely, but never certainty. You could compare this to the blind man who would hit the target two times in a row: if the probability is low he would get it right in one shot, the probability is even lower it would happen twice in a row. But, because the probability is there, we can NEVER state it would be completely impossible, only the odds are (very) remote.

As such, the more trials you play, the longer you are exposed to risk because even the improbable will happen occasionally. You could be betting the blind man, will never hit the target, and you could be right for as long as you attend his attempts, but suddenly out-of-the-blue the blind man, after thousands of attempts, could by chance hit the target while you are attending the event.

Now, suppose you didn't attend all the previous trials of the blind man: you would find it quite remarkable the event appeared when you just came in right? But it would already seem far less extra-ordinary if someone would tell you the blind man already threw thousands of poles around without being successful.

This is why statistical analysis only makes sense in the long term, when we can compare a large amount of observation data with mathematically expected figures. As such we can make sure, the events you observed are more likely to have been formed randomly as opposed due to bias.

In the case of the blind man, we could say the probability is low he would by chance hit the target very early on. If it happens anyway, it could be just plain simple ordinary luck. But the more trials we observe, the less likely it would become the blind man keeps on hitting a very distant target (which after each successful trial would be placed to another location) of which the probability is remote he would hit it anyway. The more data we collect the more we could reasonably say: hey, maybe this guy is fooling with us; maybe he isn't completely blind at all. Maybe the probability in which this event occurs is too high to occur by chance.

In case of roulette it means the same: because there are so many mathematical possibilities in which certain patterns can evolve and the probability on each trial remains always the same, we need a very large amount of data to be able to reasonably test the hypothesis if the observed patterns only appeared by chance or due to bias. Earlier we already stated that we can reasonably expect that the probability of you playing a biased wheel (or sufficiently biased so you could take an advantage out of it) is very low due to the countermeasures of the casino.

In statistical terms this is called obtaining statistical significance. It is all about gradually eliminating the possibility of statistical fluctuation in our data (which is expected all along due to the randomness of the game), and acquiring a reasonable amount of certainty to state: it is more likely to be a balanced (all chances are equal) or biased wheel (some chances have a higher or lower possibility of appearing due to mechanical flaws in the game). The more data we can examine, the more reasonable our conclusion can be.

To make matters even more difficult: sources disagree on the amount of observations one needs to collect to acquire enough statistical significance.

Why do sources disagree, you might ask: well, this is because they set different levels of confidence they would like before making the rather daring statement the wheel would be biased.

Chris Pawlicki, author of 'Get the edge at roulette'[13] – check out our review on www.john-solitude.be (as he mentions himself 'after consulting with several experts') recommends a sample of 10.000 spins to acquire enough statistical significance before concluding a single number could be biased. Unfortunately he doesn't mention if this is for a French or American wheel, but taking into account he's an American we'll suppose this would be for a double zero table. And, although Pawlicki published his book with an inviting title (as usually is the case with gambling authors), it's rather strange Pawlicki doesn't include the calculations for obtaining statistical significance, nor which confidence level he or the 'several experts' chose to simply state '10.000' spins for one number.

[13] Chris Pawlicki, Get The Edge At Roulette, pg. 156, Bonus Book Inc., 2001

As a rule of thumb, the higher the amount of numbers (for instance a sector or even a complete quarter or half of a wheel) you would plan on playing, the lesser amount of spins you would need to check if there is sufficient bias on the numbers of the sectors to be profitable. According to Pawlicki, a five pocket sector would need about 4.300 spins and a nine pocket sector about 2.000 observations, before one can start eliminating the possibility outliers in the standard deviation, were more likely the result of bias and not being the product of randomness.

Alan Krigman of the website 'Casino City Times'[14] has a far more realistic approach: if there is bias, it's reasonable to accept the bias will only be very small (if it were large, these days the casino would spot it much faster than a player who in any account always has far less data to examine than the casino). According to Krigman, if a single number would show only a 0.37 percent increase in probability, it would need roughly 71.000 spins to only obtain a 95 percent confidence level. A 99 percent confidence level would require about 122.500 spins.

So, for the bias player there is always the same (unsolvable) dilemma: the lower the probability increase of a number showing due to bias, the larger the amount of trials one needs to identify it (and the less or even non profitable), the higher the probability increase of appearance due to bias, the lower amount of trials one needs, but –what bias promoter sellers never tell you, because they have to promote their products- the higher the reasonable assumption the casino itself will have noticed this flaw also, resulting in shutting down the wheel for maintenance or simply replacing it with another wheel.

Bias hunting in any case, is a very time consuming activity, which isn't very appealing if you are not part of a team to reduce the amount of time needed to collect the necessary data. Playing the wheel, being in the false assumption of bias, could still prove profitable but then the result is not due to an edge but plain simple luck. As such it's a reasonable assumption to state that many 'bias' victories had nothing to do with correctly identifying bias or applying a super sophisticated technique: the result was due to luck but it only appeared as if one had an edge.

This is a phenomenon which makes it's very hard for players to not be fooled by sellers: one can simply not statistically determine reliably in the short term (for instance a couple of hundred played spins), if a certain approach to the game will provide in long term positive results, or was only due to luck the variance of the game did not exhaust your bankroll within those observed spins. It is NOT if one would calculate the mathematical probability odds for a certain player winning x amount of spins is very small (for instance 1 % chance) and the player does win the bet, the player HAS an advantage.

And, to make matters even worse: there is no guarantee if you would have found a small amount of bias enough to be profitable, conditions will not change in closing hours, so if you would add up all the hours invested in observation, analysing, finally heading to the casino to play this particular wheel, you simply –like Jaggers we referred earlier to- could be playing a different wheel by then.

After this word of caution, to avoid the following calculations would be used in a wrong way which could lead to serious loss, we'll proceed with calculating the standard deviation for one individual number.

[14] http://krigman.casinocitytimes.com/articles/5393.html

Referring back to the table of the spreadsheet, in the fourth column you'll notice number 26 appeared 12 times in 212 spins. You may be tempted in thinking if I divide the total amount of spins (212) by 12 appearances, this is an average appearance of 17.6 spins, so let's roll out the red carpet and bring your savings. This would be a very dangerous route to travel, because 212 observations in any case would be far too less to make such conclusions, and the standard deviation figure will show you a completely different picture.

How do we obtain the standard deviation of this specific number?[15] If you have skipped the previous chapters, you might want to read them now anyway, because I'll assume you have done so.

Step 1

First you need to calculate the expected standard deviation for a single number on a given amount of trials.

In this case, with a sample of 212 spins, the calculation for the expected standard deviation would be (for a French roulette table):

$s = \sqrt{(212 * (1/37) * (36/37))}$

$s = 2.36117$

Step 2

Determine the mean of the sample for a single number on the given amount of trials.

212/37 = 5,72972973

Step 3

Subtract the mean from the amount of observations of the number of interest. In this case number 26 appeared 12 times.

So:

12 - 5,72972973 = 6,27027027

Step 4

Divide the previous obtained figure (step 3) thru the expected standard deviation (step 1):

6,27027027 / 2.36117 = 2,65563757

[15] Readers who have a background in stats will notice we'll use the normal probability distribution as a approximation for the binomial distribution. In general however, the lower the sample amount the less accurate the calculation.

The figure gives us an indication how low or high this specific number has diverted from the expected amount of appearances during the amount of observations. As you can clearly see, although the amount of appearances (12 in 212 spins) might look promising on first sight, objective analysis gives us a completely different picture; the figure isn't even reaching the 3 standard deviations zone.

So, at this time, a statistician would certainly not assume this number would be biased because:

a) the used sample (212) is far too low anyway, to acquire any statistical significance
b) the standard deviation for this specific number is not even reaching 3 standard deviations which are expected to appear anyway, without any bias being present

But, our investigation isn't finished yet.

As discussed earlier, determining bias on a single number would need a very large amount of trials to obtain statistical significance, but we can lower the amount of trials needed, if there would be any groups of numbers which are appearing at a far higher rate than expected for a prolonged amount of time.

So, most bias hunters will not focus there attention on a single number, rather on a group of numbers, most commonly situated in the same sector because it is believed a bias would rather present itself in a certain section due to the wheel construction.

1.7 How to calculate the observed standard deviation for a group of numbers

As you may have noticed already: we usually start out with a word of caution.

In the previous chapters we have already gone to great lengths to prove finding bias on today's modern tables, using a correct statistical analysis should not be taken light heartedly. If you are thinking of playing a group of numbers, to ensure a winning streak, you are also supposing all of the numbers would be biased.

You will need a larger bankroll at your disposal, because you are increasing the amount of capital (chips) played on each spin. Let's suppose we would select 9 numbers: if you are flat betting you already need a consistent average hit rate on one of your numbers of 1 in 3. One in four wouldn't do the trick because:

Loss = (3 * 9) + (1 * 8) = 35 loss
Win = (1 * 36) = 35 win (you should never forget your initial chip placed is not to be considered net profit: you'll receive 36 chips on a straight hit, but only 35 of those add to your capital, the first one is your own investment)

Do we need to add if you are playing a dealer operated table, you are also supposed to regularly donate a chip to the dealer … You can read about the scam with the 'dealer' tips in the chapter 'The dealer is NOT your friend' later on.

Now, how do we continue if you would plan on playing a group of numbers? The most reasonable way to continue is to look deep into your sample data, searching for sectors which came up above average for a prolonged amount of time, then calculate the standard deviation for these numbers.

Some bias hunters believe due to the construction of the wheel, bias is more likely to occur in a section, rather than isolated numbers. The hypothesis[16] is that the cone head or the wheel itself could be slightly 'warped', which would lead to a situation where several numbers adjoining to each other have a slightly higher probability to appear than other sections.

If we go back to the spreadsheet presented earlier, let's as an example, take a look at the section 17 > 13. These five numbers are adjoining and each one of them has appeared at a higher rate than the expected mean (5,72972973).

17	7
34	8
6	7
27	10
13	8

[16] At this point it may be suitable to point out the difference between 'hypothesis' and 'theory'. In science a hypothesis is a presumption which isn't proven: it's an opinion which needs further examining using empirical data (data derived from extensive testing). If the 'hypothesis' proves valid (in this case, this would be 'confidence level' within a certain 'confidence' level obtained by numerous tests) we can use the word 'theory'.

The following is only an example: you might want to repeat this exercise for other groups of numbers or sections. For those of you, who have skipped the previous pages, we repeat the first thing you should have noticed by now is, the sample is far too low to validate any serious statistical conclusions.

In this case our sample is only 212 spins, so whatever result we may obtain, a statistician will argue the sample can not be held sufficiently representative for the entire 'population'. What does this mean? If you are playing a game, in which the amount of mathematical combinations possible is of such magnitude as roulette (as such also the fluctuations will be in the outcomes), one can simply never state any conclusions based on only a very limited amount of observations. It would simply be the same like making a prognosis 'president x' will win, after only interviewing the members of one family. Refer back to the previous for recommendations of Chris Pawlicki and Alan Krigman.

Step 1

Determine the expected mean for the group of numbers you want to analyze.

In our example we have five numbers and our sample is 212 spins.

212 * (5/37) = 28,64864865

Take care if you would be analyzing a double zero wheel: in such a case you should divide by 38 in stead of 37.

Step 2

Total the amount of hits for the section you are analyzing.

7 + 8 + 7 + 10 + 8 = 40

Step 3

Determine the expected standard deviation for the amount of numbers you are analyzing.

= √ (212 * (5/37) * (32/37))

= 4,977671106

Step 4

Determine the observed standard deviation for the sector.

Subtract the mean for a group of five (step 1) from the total amount of hits in the sector (step 2).

40 - 28,64864865 = 11,35135135

Step 5

Divide the previous obtained figure (step 4) through the expected standard deviation (step 3):

11,35135135 / 4,977671106 = 2,280454275

Once again we have to conclude, although the initial figures looked promising (40 hits in stead of the expected mean of 28,64864865) the objective figure concerning standard deviation isn't quite as spectacular: it's only 2.28 instead of the 3 standard deviation figure we are looking for as a first threshold to be breached, before we would even statistically consider bias to be present.

Any statistician will conclude at this point:

a) First of all the sample (212 spins) is absolutely not high enough to rectify any serious statistical conclusions what so ever
b) The standard deviation in this case is 2.28, well within what can be mathematically expected

Of course some roulette strategy sellers would argue if you would have walked in and decided to play this particular sector it could have proven profitable. But, without the preliminary groundwork needed (collecting large amounts of spins before even playing), it would only be a wild guess which specific sector would deviate enough from the expected mean to end up with profit. In fact, without the serious statistical analysis, exactly the opposite could happen also: the numbers you picked end up being far below the expected mean (negative standard deviation). If you choose to ignore our well meant advice and will not go the trouble of collecting large amounts of observations before making any conclusions what so ever, it's only a matter of time before you'll end up with a loss.

You could also be lucky you've picked numbers which will deviate enough to make a profit, but this could not be considered advantage, but only pure chance. What promoters of bias playing do not tell you is: if you would have picked 5 numbers at random, and play the same numbers over and over only using flat betting on each trial, according to probability theory you would also have a pretty good chance of hitting any given one of them numerous times, and the standard deviation could as well be by chance in favor or against the player. And, because you would be flat betting your bankroll would allow to buy numerous trials, while at the same time the capital subjected to the house-edge (on each spin 5 chips if you pick 5 numbers) would be relatively low.
However, without any bias being present, playing the same 5 numbers on each given session, only using flat betting on each trial, after a longer amount of trials (we're talking at very least 10.000 trials) will normally start fluctuating on average towards the loss expected by the house-edge, so you should consider yourself relatively lucky in your betting choice.

Our point is, which you should be fairly convinced of by now: in the short run, it is simply impossible for anyone to prove one has an advantage, although roulette strategy sellers might often try to prove the opposite, to endorse a product.

As a general rule of thumb: the less numbers played on each spin, the less of your bankroll is being exposed to the house-edge, the more trials you can buy, the longer it would take to reach any viable conclusion if the method offers an advantage or not.

On the very opposite side: using very large progressions on a very limited amount of numbers picked at random (for instance let's say you would only pick one number at random, start out flat betting, increasing the progression only very mildly to assure a very small profit on a hit) would also take thousands of trials, before one could reasonably state this was a good approach to the game or not. The more trials one can buy, the longer one can play the same chance over and over, the higher the probability of a success becomes within successive trials. It is however the fluctuation in the standard deviation which will determine if you end up with a profit (positive standard deviation on the numbers you picked) or a loss (negative standard deviation on the numbers you picked).

Now, suppose you would have been camping a week in the casino, each day collecting observations without playing, and on the sixth day, after statistical analysis (all the while hoping conditions haven't changed in the mean while) you come to the conclusion this 5 pocket sector is worth the bet because in previous sessions persistent deviation occurred on this particular 5 number sector.

The thing on everyone's mind is: how would this reflect in winnings if we played the 212 spins we took as an example? Bias players will in a great majority of the cases never play progressions: if they are relatively sure they can expect a decent better than average hit rate, there is no need what so ever to play progressions.

So, in this case we suppose you would be flat betting:

a) 40 (hits) * 36 (chips returned on each hit) = 1440 chips
b) 212 (spins) * 5 (chips invested on each spin) = 1060 chips

Net profit = a – b = 1440 – 1060 = 380 chips

By the way, there is also an interesting shortcut to quickly calculate by approximation where your break even point would be.

Number of spins (212) * Amount of numbers played on each spin (5) / 36 = 29.4

Let's check this using the previous calculation, obviously we'll have to round up the figure because it would be impossible to have 29.4 spins exactly, it will either be 29 or 30. You are advised to ALWAYS round up the figure, if you use this shortcut, otherwise the result might be below the breakeven point.

a) 30 (hits) * 36 (chips returned on each hit) = 1080 chips
b) 212 (spins)* 5 (chips invested on each spin) = 1060 chips

Net = a – b = 1080 – 1060 = 20 chips profit

Suppose, you wouldn't have followed my advice and didn't round up the figure

a) 29 (hits) * 36 (chips returned on each hit) = 1044 chips
b) 212 (spins)* 5 (chips invested on each spin) = 1060 chips

Net = a – b = 1044 – 1060 = -16 chips loss

So, as a matter of fact, if you would be planning on going to the casino and playing the same numbers over and over in any case you can calculate in advance how many hits you need within a certain amount of trials to end up with a profit.

2. WHAT IS PROBABILITY THEORY?

2.1 Introduction

Those of you, who managed to plough through the standard deviation chapter, might wonder if there aren't any shortcuts to figure out which outcomes can be expected in the short term.

The French philosopher and mathematician **Pascal Blaise**, received the same question by a seventeenth-century French gambler named **Chevalier de Méré**, who had been losing money on a dice game, after which he decided it was time to seek mathematical explanation for his losses.

This very question led to a correspondence between Pascal Blaise (1623-1662) and the French mathematician **Pierre Fermat** (1601-1665). This meeting of minds is considered a milestone in mathematical history because it signifies the origin of probability theory, which by now has spread thru all fields of science when dealing with uncertain events.

Yes folks, the very roots of probability theory lie within a question about gambling itself, so if you are a player choosing to rely on probability theory to analyse your risk, you can give yourself a tap on the back, because you belong to the offspring of impressive godfathers.

However, using probability theory in a incorrect manner can pose a serious thread to the player. Misuse might lead to a wrong sense of security one would certainly win the bet if a player would only stick to the calculated figures for whatever bet he fancies.

This chapter is dealing with the fact probability theory in relation to roulette, can only be used to calculate estimates which outcomes would be more or less likely, but one can't nor would ever be able to use probability theory to make exact predictions when a number or combinations will be hit.

'Probability figures':

1) should ALWAYS be considered estimates, the event itself remains uncertain until it has appeared

2) refer per definition to a theoretical abstract perfect world, while gambling devices are man made, and as such can never be completely perfect (but we assure you, pretty close enough to perfection you wouldn't be able to exploit flaws, unless the security and maintenance would be sloppy which in respectable casino's is hardly the case - despite numerous sellers and scammers who might try to convince you otherwise: we have acquired more than enough inside information to state without a reasonable doubt sloppy maintenance and security in respectable casino's are a thing of the past.

3) should never be rounded up, and if rounding up is applied for matters of convenience in calculation, one should always be fully aware, especially when using sequential and binomial probability (of which we will cover the principals later on), the obtained figures can only reach numbers like 0.99999999 or 0.00000001 into infinity, NEVER 1 or 0 (which would be needed to acquire absolute certainty something will surely happen or not)

Many roulette strategy sellers will come up with mathematical systems, in which probability theory is misused to sooth you into a false sense of security while playing. Often the figures presented are rounded up to (mislead) a player into thinking one would have absolute certainty of winning. We will prove beyond any reasonable doubt one could never obtain absolute certainty of winning in roulette using probability theory because this would be a paradox in itself.

We hope sincerely when you're done reading this chapter, that you'll be able to use probability theory yourself to analyse the risk while playing roulette, or on any other 'independent' game as a matter of fact. If anything can be learned from probability theory in relation to roulette it is if you choose to gamble, you have chosen to take a risk.

2.2 Some basic arithmetic

Working out the percentages

In roulette there are either 37 (French) or 38 (American) possibilities on each trial. So, what is the absolute probability one of these chances will appear in a single spin? This is a simple one: 1/37 or 1/38 because we know for certain it will be one out of 37 (French) or 38 (American roulette) possibilities –unless the ball drops on the floor.

When you divide 1/37 = 0.027

When you divide 1/38 = 0.026

The first thing you should be aware of is that we have chosen to only display four figures behind the comma, but this is already a first compromise for layout reasons. Obviously when you divide 1/37 or 1/38 you'll end up with several figures behind the comma depending on the amount of digits your pocket calculator can display or the options you've chosen in your spread sheet. In some cases the digits behind the comma could show a repeating pattern, in other cases there can be a string of different numbers into infinity, in the best case after some digits you end up with zero's. For instance ½ would give you 0.50000 in which case it wouldn't be of much use to display 5 figures behind the comma because all the figures behind the 5 are zero's into infinity.

If we had chosen to display let's say 9 digits behind the comma, one might find something like this:

1/37 = 0,027027027
1/38 = 0,026315789

What's the importance of acknowledging this problem?

When doing complex calculations which involve several steps to obtain the final result, we always advise you to use as many digits behind the comma as possible (unless you end up with zero's) and only round up or down the figures in the final stage of whatever probability figure you wish to calculate. The more rounding up or down occurs earlier on, the more distorted and the less dependable your final figure will become.

Now, only be doing this simple exercise 1/37 or 1/38 there is already one thing which comes to mind, beyond any doubt.

In American roulette, on any occasion your chance to hit a single number within a single trial will always be smaller (0.026) than on French roulette (0.027).

You may be thinking, what the heck does this represent anyway 0.026 or 0.027?

Well, if you want to make it easier on yourself and represent the figures in a denomination which is easier to understand, you could multiply these figures by 100 and as such you obtain the probability percentage of a success for hitting a single number in a single trial.

American roulette : 0.026 * 100 = 2.6 %
French roulette : 0.027 * 100 = 2.7 %

If we know the probability for a success, it's easy to work out the probability of failure: it's the very opposite. If we know the probability of success is 2.6 % on an American roulette wheel to hit a single number on a single spin, the probability percentage the ball will not come to rest on the number you are playing is simply:

American roulette : 100 % – 2.6 % = 97.4 %
French roulette : 100 % – 2.7 % = 97.3 %

Now, that wasn't so hard to figure out, was it? Let's continue by finding out what the difference is between games which are mathematically defined as 'independent events' or 'dependent events'.

2.3 Dependent vs independent probability

Failure to understand the implications of the following is probably the main reason why some persistent players managed to bankrupt themselves while playing roulette.

What is an independent event?

A roulette wheel has no conscious what so ever, which number came up in a previous spin. Nor will the previous number which came up affect which number will show up on the next spin. Nor will the previous outcomes of a million spins you analyzed very carefully, affect which numbers will come up while you are at the table. Each spin of the wheel is a new event (or statistically referred to as a 'trial') which stands completely on itself: the amount of pockets available on each spin for a ball to end up in clearly NEVER diminishes. On each spin the same 37 or 38 pockets are staring you right in the face, and the pocket in which the ball will come to rest, is left to the following: 1/37 or 1/38.

We know for sure it will be one of them, but in all cases it always remains a guess which number it will be. At very best sequential and binomial probability theory allow you to make an estimate what is more or less likely when it comes to consecutive outcomes, but a roulette wheel couldn't care less about the math. The absolute probability on each spin will remain the same: one out of 37 or 38 numbers will show up for certain, unless the ball drops on the floor.

As such, any mathematician and statistician will agree roulette is to be considered an 'independent' event, when it comes to probability theory because the amount of pockets (possibilities) is NEVER diminishing after each spin.

Well then, which games are to be considered 'dependent' events?

Suppose we start out with a full deck of cards (52 cards = 52 possibilities) and after each hand out numerous cards are removed from the full deck. We know for sure the cards which were removed can not be drawn again from this very same deck unless all cards would be gathered and reshuffled. The amount of cards left in the deck is decreasing after each hand out. If the amount of cards is decreasing, this also directly affects which cards could be drawn from this very deck during the next hand out. We can clearly state, without a reasonable doubt: on the next hand out the cards which will be drawn will surely be not one of the cards which have been removed already. As such this is a 'dependent' event: the cards which will show up in the next hand outs are dependent on the cards which have been removed already. For instance, if all aces would have been removed in previous hand outs and there are only 20 cards left in the deck, we know for sure not one of the 20 cards that will be drawn will be an ace or any other of the cards which have been removed already. As such the probability figures for which cards could show in the next hand are constantly changing depending on the cards which were removed already.

If you wouldn't have guessed it already: Blackjack, Poker and any game in which the possibilities for future outcomes are affected with each hand out untill the deck is reshuffled are considered to be dependent events.

It's very easy to distinguish between dependent and independent events: just ask yourself, are the probabilities for future results really diminishing after each trial? In roulette, the 37 or 38 pockets are still there after each spin, so it should be clear roulette is an independent event.

Accepting this fact and the consequences is absolutely necessary to avoid the **gamblers fallacy**: it is to think previous outcomes in roulette would have any direct influence on future outcomes. Many roulette players are a victim of this belief: you should always, at any time, be fully aware you are dealing with an independent event. No matter which string of strange outcomes in the previous spins, on the next spin, there are and there will be until eternity 37 or 38 pockets with an equal chance of appearing, no more, no less.

2.4 Sequential probability theory, single numbers

If you are not reading this guide chronologically, it is advised to read the previous part 'independent vs dependent' event, before continuing.

We already defined roulette to be an 'independent' event. If we accept this fact, the consequence is the following calculations can only be an estimate and there is a thin line between using sequential probability theory, and becoming victim to the gamblers fallacy.

To make the distinction between 'gamblers fallacy' and 'sequential probability theory' mathematics are involved.

Suppose we enter the casino and we see number 1 has just turned up. The chance for this very number to turn up on that particular trial was 1/37 or 1/38. It's a small chance, one has to agree. Now, one might wonder, how large is the chance this very same number might turn up twice in a row? This is what 'sequential probability theory'[17] is all about: estimating what can happen in several consecutive NON interrupted trials, or commonly referred to as 'in a row'.

If we know the chance for a predetermined number to show up on one single spin is small, we have reason to believe the chance for the very same number to turn up twice in a row, should even be smaller. However, at the same time, the pocket with this very number is not removed from the game: clearly it is still there, so there is the possibility for a repeat and no matter how experienced you are in probability theory or statistics, it is simply impossible to predict when exactly a repeat might occur. **And, no matter how many times a single number might drop in a row, this very pocket with this very number will NEVER be removed from the game. The absolute probability for this number to turn up on the next spin will always remain 1/37 or 1/38 no matter how many times this very same number turned up in the previous spins.**

Sequential probability theory (which we will refer to as 'relative' from now on, as opposed to the 'absolute probability' which is 1/37 or 1/38 for each single number on any given trial) however allows us to develop mathematical estimates what is more or less likely to happen according to outcomes for numerous spins in a row. But, be warned, the very same mathematicians who figured this out warn us even the most unlikely is bound to happen eventually and this can be proven mathematically.

The relative probability for the same number to show twice in two consecutive spins is:

French roulette : 1/37 * 1/37 = 0.027 * 0.027 = 0,00073046
American roulette : 1/38 * 1/38 = 0.026 * 0.026 = 0,00069252

As you can see, one simply needs to multiply the probability for one single spin with the probability for the next spin. Because the number is not removed from the game, the absolute probability for a single number (1/37 or 1/38) is not diminished, but the relative probability figure for the same number to come up twice in two consecutive spins is diminishing.

[17] Sequential probability theory and the formula's we will be using are also known as 'the multiplication rule of probabilities', which are mathematically used in all cases where one needs to calculate the joint probability of two independent events, such as two spins or more spins in roulette.

As we have discussed earlier, if you want the figure to make more sense, you can multiply it by 100 to get a percentage value.

French roulette: 0.00073046 * 100 = 0.073046 % chance, a number will repeat itself on the very next spin.

American roulette: 0,00069252 * 100 = 0.069252 % chance, a number will repeat itself on the very next spin.

But, as we can clearly see, the chance you would have a repeat on the very next trial, can not be ruled out completely: the chance is there and we might add, **the chance will ALWAYS be there no matter how many times this particular number appeared in a row previously.**

At this point, we might warn the reader some pocket calculators or Excel spreadsheets might round up the figures so you would end up with 0 or 1 if there are many digits involved behind the comma.

The mathematical truth is, no matter how many digits behind the comma (for example 0.000000000001), no matter how remote the probability figures, we can NEVER obtain complete certainty, at best you might end up with a figure like 0.9999999999 with '9''s being added into infinity, which would represent extremely close to certainty, but without ever reaching it, or on the very opposite side 0.00000000001, which would represent: the probability is very remote, but it can also not be ruled out completely.

This is why it will always remain impossible to develop a 'certain win' mathematical system. At best, depending on the strategy used one could say the probability of loosing is small but without ever being able to disregard it.

Most 'holy grail' or 'certain win' systems will round up the figures to achieve '1' which would be complete certainty. For instance if one would be calculate that the odds for a certain combination would be less than one in several millions, one could say reasonably 'I bet against the occurrence of such a combination while I'm playing because the odds are so small I bet I would NOT see it appear.' One should however always be fully aware that complete certainty can NEVER be achieved mathematically simply because each pocket remains it the game at each trial.

And, it is no wonder people tend to disagree and end up in harsh debates: persons who are inclined to think purely abstract will state if there are only enough trials (think billions of trials) in an independent event (such as roulette), even the most remote probabilities will eventually appear (even without bias being present). For instance, the sequential probability the very same number might drop 6 times in a row is so small one could be inclined to think it's simply impossible, but because the very number is still there after each trial the absolute probability remains the same (1/37 or 1/38) on each consecutive spin. As such, theoretically the probability that it could happen –even if it wasn't seen in millions of spins- could never be excluded completely. For the layman, this phenomenon is probably more know as **'Murphy's Law'**: 'If it can happen, it will happen.'

Researchers with a more empirical (practical) approach will state that some remote probability figures could never happen because they are only a product of abstract thought: probabilities which are very remote refer to a theoretical, rather than the real physical world. This is also the view of the French mathematician **Emile Borel** (1871-1956).

Proving one school of thought right or wrong is essentially more a question of 'belief', as such it can be discussed until grass is growing out of your belly.
When someone would experience a string of bad events in his life, some people might believe its 'higher destiny', others will argue the person was simply extremely unlucky and there is no specific reason why something happened or didn't happen to this person, others will state there is bias (in relation to roulette it becomes a mechanical reason). And each category of 'believers' could illustrate there point with specific individual occurrences or non occurrences, while it would be easy to disprove a certain point on other occasions. That's why we will stop engaging in such discussions: it is pointless and impossible to prove one school of thought right or wrong; people will always be inclined to believe whatever they want to believe. In the chapter 'The Psychology and Chemicals of Gambling' you'll find why our perception of reality can become distorted.

Never the less, we can summarize, according to sequential probability, the further an awkward pattern goes, the lesser the chance it will continue, without us knowing for certain when it might actually stop.

This explains why a certain sequence like 5 times the same number in a row is only very rarely seen: the sequential probability figure for it to happen diminishes the further it goes:

French roulette:

= 1/37 * 1/37 * 1/37 * 1/37 * 1/37
= 0.027 * 0.027 * 0.027 * 0.027 * 0.027
= 0,000000014

American roulette:

= 1/38 * 1/38 * 1/38 * 1/38 * 1/38
= 0.026 * 0.026 * 0.026 * 0.026 * 0.026
= 0,000000012

But, as you can clearly see, the possibility can never be ruled out completely, no matter how many times a number drops in a row (unless you start dropping digits behind the comma). And, because there are worldwide so many roulette tables producing trillions of trials all together, without a doubt five in a row strings are regularly reported.

When will a five in a row string end exactly? Unfortunately, we don't have a clue, because this certain pocket is never removed from the game.

The same logic holds the opposite way: if we have determined the probability for a single number to appear, we can also calculate the probability a number would not appear during a predetermined amount of trials in a row. The only thing needed is to subtract the obtained probability figure from the number 1 (which represents certainty).

For instance if the probability something would happen is 0.02, the probability it will not happen is 1 – 0.02 = 0.98. Getting the hang of it? Now multiply with 100 and you obtain the probability percentage: in this case 0.98 * 100 = 98 % chance it will not happen.

And, what might be more interesting: we can also do this for groups of numbers.

2.5 Sequential probability, multiple chances

If you have read the previous, you might be under the impression one can only calculate chances for single numbers, but the good news is: with sequential probability theory, for any given combination of bets we can calculate what the probability is, any out of a set of numbers would appear or not appear within a restricted amount of trials.

Suppose you wonder how many times it could take before a dozen or column shows. The mathematical formula needed is as follows, but for those of you who might feel cold sweat, staring at those pesky little symbols, we'll take it step by step.

French roulette:

$$P` = \left(\frac{37 - m}{37} \right)^n$$

American roulette:

$$P` = \left(\frac{38 - m}{38} \right)^n$$

Step 1

Determine the amount of probabilities for the table (37 in French roulette, 38 in American roulette).

Step 2

Deduct the amount of numbers (represented by the symbol 'm') you are playing from the total amount of possibilities. In case you are playing a dozen, a column or any other combination which makes up 12 numbers, this would be:

French roulette : 37 – 12 = 25
American roulette : 38 – 12 = 26

Step 3

Divide the previous result, by the total amount of possibilities in the game on each trial.

French roulette : 25/37 = 0,675675676
American roulette : 26/38 = 0,684210526

Step 4

Multiply by the power of the amount of trials you are planning repeating your bet on the SAME numbers (you might want to check the explication of multiplying by powers in the chapter on the calculation of standard deviation).

For instance if we would be planning on playing any dozen bet for 10 times in a row, the calculation would be:

French roulette : 0,675675676 ^ 10 = 0,019832746
American roulette : 0,684210526 ^ 10 = 0,022485239

If you want the numbers to make more sense, multiply by 100 to get to the percentage values.

French roulette : 0,019832746 * 100 = 1,9832746 %
American roulette : 0,022485239 * 100 = 2,2485239 %

At this time, the larger risk in American (double zero) roulette should become more apparent: no matter which combination you choose to play, we have just proven beyond any reasonable doubt at any time your risk is always higher on American roulette.

On a French roulette table in 10 consecutive trials we have a 1.98 % chance a dozen bet would NOT be hit, while on American roulette this is already 2.24 %.

What if we wanted to calculate the probability for one out of multiple chances to appear within a predetermined amount of consecutive spins?

As you may notice, the only difference with the previous formula is the number 1 which is added in front of the calculation between the brackets. In probability theory the number 1 signifies absolute certainty. So, it is logical if you do not play all chances (all possibilities) in a given spin, no matter how long you play the same chances over and over, obviously the remote possibility remains you might not get the bet right no matter how many times you repeat the bet in a row.

The good news, the sequential probability you would not get your bet right diminishes the longer you play the same chances (without ever becoming certainty).

The bad news, we know in front even remote probabilities will show occasionally and you have absolutely no way of knowing for certain, when this will be the case. We might add: these remote probabilities will show eventually EVEN without any bias being present. Why? Simply because the mathematical probabilities are in there, no matter how small the probability: remember the wise **Murphy**: 'If it can happen, it will happen' and there is no proof what so ever against his statement. Simply because we never saw it happen, we can not exclude the possibility completely, given many trials it would happen on some rare occasion anyway. But, one could also reason correctly: the sequential odds are so remote, I'll bet against it happening on this very occasion.

French roulette:

$$P = 1 - \left(\frac{37 - m}{37} \right)^n$$

American roulette:

$$P = 1 - \left(\frac{38 - m}{38} \right)^n$$

Suppose, you want to determine how certain it is getting your bet right, if you would be planning to play any combination of 3 numbers during 20 consecutive trials?

We will not cover the calculation step by step because we have already done so previously. The only difference with the previous is, now you first have to work out the calculation between the brackets and then multiply it by the power of the amount of trials you are planning to play the same bet. Finally, subtract the obtained result from the number 1.

If you execute the exercise correctly, you should obtain the following figures (or closely to them, depending on the rounding up or down you use):

French Roulette : 0,815692139
American Roulette : 0,806941488

In percentages:

French Roulette : 81,5692139
American Roulette : 80,6941488

So, it seems like a pretty decent bet: if you play any 3 numbers for 20 spins, according to sequential probability theory you have a better than 80 % chances at least one of the numbers you will be playing will show before the 21st spin. But, as with all things in life there remains a downside, because you have not obtained 100 % certainty.

How large is your risk you might not get it right? I'm glad you asked:

French Roulette : 100 % - 81.5692139 % = 18,4307861 %
American Roulette : 100 % - 80,6941488 % = 19,3058512 %

And, we might add, no matter how high your probability percentage of a success, there will ALWAYS remain those annoying remote probability digits behind the comma which would represent 'the streak from hell', unless you would lure yourself into some kind of false sense of security by rounding up the figures. Otherwise, this isn't even a streak from hell, because mathematics warned you in front it might (and WILL) eventually happen, although the probability was small.

In fact, the more spins you play, the higher the probability becomes you will observe a streak of which the sequential probability figures for it to emerge are very low. The larger the sample size, the higher the probability you'll find one or more remote streaks in there. You simply didn't encounter such a streak before exactly because within a small sample size (for instance a couple of hundred spins) the

mathematical probability figures for it to happen were very low. However, if you are unlucky, you might even be confronted with such a streak the very first time you start out playing.

'Hit and run' sessions are no solution. Why not, you might ask? Well, even if you chose to play a certain system of which the probability figures for it to go wrong are very low, the larger your sample size becomes (= the more sessions you play), it's only a matter of time before a streak shows you will not be able to cope with, because it's beyond the reach of your bankroll or table limits. Imagine 18 reds dropping in a row: yes, this has happened on real tables. Imagine a dozen hitting 12 times in a row, yes this has happened on real tables. And, no matter how low the probability percentages your system is not covering for, the unfortunate streak could emerge from the very beginning of your session.

'Hit and run' sessions however do offer one advantage: if you are on the upside and you run out as quickly as you can with your winnings, never to return, you could state you have beaten the casino by taking from money from them and never giving it back to them (if you stop playing that is).

2.6 From probability to odds

Readers who went through the previous chapters might find it difficult to comprehend what a probability figure like 0.0241 represents in terms of odds.

We've already covered that multiplying a probability figure by 100 offers a percentage value, which might already make more sense.

For instance take 0.02141 * 100 = 2.141 %.

I have good news for you. There is a quick way to transform probability figures into odds and it is pretty easy to.

Simply take your probability figure you've obtained (not your percentage value), put the number 1 before it and divide for instance 1 / 0.02141 = 46,70714619

So, the odds are approximately 1 in 47.

As an example, let's determine what the odds would be if you play 6 numbers on an American wheel for 10 trials?

First step

Determine the probability: we refer to the step by step approach in a previous chapter, using the following formula.

American roulette:

$$P = 1 - \left(\frac{38 - m}{38} \right)^n$$

If you apply the calculation yourself correctly (as we have illustrated to you earlier) you should end up with the following, or something very close to it, depending if your pocket calculator or Excel spreadsheet rounds up figures:

0,820665512

Now divide the figure by 1

1/0,820665512 = 1,218523242

What does it mean?

One time out of approximately 1.2 times you will get the bet right. So in this case the odds look pretty sweet.

The downside: if you are planning on playing 6 numbers for 10 trials, you'll need a 60 chips bankroll and despite of the odds looking great, there will be occasions in which you will not be successful.

How many occasions?

100 % - 82.0665512 % = 17,93344879 %

In approximately 18 % of the ‘play 6 numbers for 10 trials’ kind of the occasions you will fail.

2.7 Controversial and paradoxical issues concerning sequential probability theory

We would like to point out from the very beginning that this is a controversial issue, so we wouldn't have to debate the issues below until kingdom comes. We'll simply try to deal with the pros and the con's while explaining it. The route you decide to follow is your own personal responsibility based on pros and cons as with any decision to be made in life. In any case, you'll never hear us saying when playing roulette there isn't AT ALL TIMES risk involved, so let's be clear on this.

Your question might be, as we have asked ourselves numerous times:

Does waiting for extreme streaks to happen BEFORE playing, increase your chances of winning on the occasions you will be playing?

If we stick to the previous discussed formula's we haven reason to believe the longer a streak continues (for instance numbers out of the same set keep reappearing, be it even chances, squares, streets, dozens or columns) the higher the mathematical combination probability figures rise AGAINST the continuation. But, at the same time, one can never rule out the possibility the streak you've picked might be the very one that would reach an extra-ordinary length. In fact, by waiting you might be closer to the very occasion on which this might happen. For instance if an even chance, let's say red, would have shown 10 times in a row, it's only 5 trials removed before turning into a 15 in a row streak. The overall sequential probability for 15 even chances from the same set to appear is very low, but you have absolutely no way of knowing for certain when such a streak might appear. In fact, when you would wait on any given occasion for 10 even chances to appear in a row, before playing the opposite even chance, increasing the stake after each miss trial, eventually you will run into a streak which will go beyond 15 or even 20 in a row. Why: because the mathematical probability, no matter how remote it was, was in there from the beginning on, and the more times you decide to play this scenario, the higher your amount of trials become, the higher the mathematical chance becomes such a streak may show (even without any bias being present) while you are at the table.

We have stated before there were many outcomes on this wheel, before you walked into the casino and started playing, so of all occasions this could be the very occasion on which a disastrous streak could present itself. In fact, you even deliberately picked out streaks which were already out of the ordinary, and there is no way of knowing for certain when the out of the ordinary might turn into the extra ordinary.

But here comes the paradox, however this time in favor of the 'waiting' betters. A mechanical roulette machine is NOT aware when or what the player is betting.

In electronic (software) roulette this is certainly NOT the case because the player has to type in his betting choices in to the same software which will generate a new outcome. It doesn't necessarily imply software roulette would be forged (outcomes are no longer random but depending on betting choices, so the game seizes to be an independent random event), but **every reader should be very aware fixing a software game could be done with much ease if the developer of the software would have provided this option to who ever is owning for instance an internet casino**. Already scandals have appeared on the internet in which tempering with the software was the case. Statistically proving the forge could not be done with the outcomes of the small samples the player collected in his playing sessions. This makes the internet player very vulnerable and at all times dependent on the fair play of the organizer. Of course,

when it comes to mechanical roulette there is also the 'dealer is in on it conspiracy' which we'll deal with in the chapter 'The dealer is NOT your friend' later on.

However, let's suppose (which is true in the far majority of the cases) we're dealing with a fair non biased roulette game:

When it comes to gambling, most authors will refer to sequential odds as starting out from the moment one starts laying down his bets. This is NOT logical if we agree a roulette table has no conscious what so ever when someone starts gambling on a certain streak 'in a row' (be it for the streak to continue or to discontinue). The mathematical sequential odds for certain combinations to appear are independent from the betting behavior, the probability mathematics are NEVER influenced by the betting behavior of the player.

But, the dilemma is, even if you would wait for a remote pattern appearing (without betting that is), only to start out betting after the unusual you have no way of knowing when the remote (for instance 10 dozens in a row) would turn into the extra-ordinary (15 dozens in a row). The last can only be seen in retrospect.

Let's introduce a table to make things clear:

	French	Odds	American	Odds
1	0,32432432	3,08333333	0,31578947	3,16666667
2	0,54346238	1,84005376	0,53185596	1,88020833
3	0,69152864	1,44607171	0,67969092	1,47125697
4	0,79157340	1,26330672	0,78084115	1,28067020
5	0,85917122	1,16391236	0,85004921	1,17640248
6	0,90484542	1,10516115	0,89740209	1,11432769
7	0,93570636	1,06871134	0,92980143	1,07549845
8	0,95655835	1,04541453	0,95196940	1,05045393
9	0,97064754	1,03024008	0,96713696	1,03397972
10	0,98016725	1,02023404	0,97751476	1,02300245
11	0,98659950	1,01358252	0,98461536	1,01562502
12	0,99094561	1,00913713	0,98947367	1,01063831
13	0,99388217	1,00615549	0,99279777	1,00725447
14	0,99586633	1,00415083	0,99507216	1,00495224
15	0,99720698	1,00280084	0,99662832	1,00338309
16	0,99811282	1,00189074	0,99769306	1,00231227
17	0,99872488	1,00127675	0,99842157	1,00158093
18	0,99913843	1,00086231	0,99892002	1,00108115
19	0,99941786	1,00058248	0,99926107	1,00073948
20	0,99960666	1,00039349	0,99949441	1,00050584
21	0,99973423	1,00026584	0,99965407	1,00034605
22	0,99982043	1,00017961	0,99976331	1,00023674
23	0,99987867	1,00012135	0,99983806	1,00016197
24	0,99991802	1,00008199	0,99988920	1,00011082
25	0,99994461	1,00005540	0,99992419	1,00007582

In the first column you'll find the amount of trials, the second and fourth column are the probability percentages for single zero and double zero tables any dozen bet would be hit within the amount of trials. Besides each column you'll find the sequential odds: for instance the odds are 1 in 1.04 a dozen will hit before the 9th spin. I've deliberately

chosen to display up to 8 digits behind the comma, to make it very clear the number 1 (which would signify absolute certainty) can never be reached, no matter how many trials, at best you could end up with for instance 0.99999999 … into infinity.

Suppose a player is observing the game without playing. He notices that any of the dozen bets did not hit in the past 15 trials. It would be illogical to state that the probability percentages for it to hit in the next 5 consecutive trials are 0.85 (look at the fifth row). The mathematical calculations for combinations are INDEPENDENT from a player betting, so at this time the sequential odds for it to hit in the next 5 trials are continuing from the 16th row on: the machine has NO recollection if a player would have been betting from the 1st trial or the 16th trial on.

The critics will argue that a machine has NO recollection what so ever of the past spins and this is also true. As we've seen before each spin of the wheel is a completely new event. An argument against it: neither have planets a recollection when circling in orbit where they were before. Let us explain: mathematics allows us for instance to figure out the gravity laws why planets spin in elliptical orbits amongst one another. The event itself (where a certain planet would be within a half an hour) wouldn't be changed either if someone is betting on it, rather than observing it. Nor do planets chose a certain orbit because man made mathematical laws insist they would do so.

When we are dealing with roulette, probability theory (in this case the multiplication rule of probabilities which is a mathematical valid tool to use when dealing with random independent events) allows us to make a prognosis what is more or less likely according to consecutive spins. A roulette machine will not behave mathematically differently, nor would the sequential odds change for certain combinations appearing or not appearing from the moment a player is betting or only observing. As such the odds for certain sequences emerging are completely independent from the moment the player starts betting.

Does this imply that a player would be better out waiting for until a dozen did not show in the past 15ths spins before betting that it would appear in the near future? As the graph clearly shows even if a player would play from the 16th spin on until the 25th spin, he has NO certainty either because the sequential probability percentages can never reach 1 (unless we would round up the figures). However it would be logical to state that if we would take millions of trials in roulette, there will be far less combinations in which the same number set (for instance a dozen) would not appear 30 times in a row, than there are combinations in which the same number would not appear 15 times in a row. The higher the conditions are set (for instance number set x should not appear within x amount of trials) the more unlikely it becomes you would witness such an event BUT one would never have complete certainty when it eventually might show, the last can only be seen in retrospect.

The benefit however waiting for the extreme to happen before playing is:

a) A player will play far less spins, most of the time he'll be observing so he'll be less exposed to the house edge. The more spins are played; the more one is exposed to the house-edge (see the chapter 'The House Edge').
b) If we consider the mathematical odds for 15 non appearances of a dozen (after which the player starts betting on the 16th spin), the mathematical odds for a 15 in a row turning in for instance a 30 in a row event, are very remote if we consider the whole sequence
c) On the downside: although the mathematical odds would be very low for a 15 non appearance of a dozen to turn into for instance a 30 non appearance sequence, it

would be wrong to state it could never happen, in fact it WILL happen occasionally and the player is deliberately betting on out of the ordinary streaks which are already closer to turning into an extra ordinary event.

So, at all times it should be very clear there is NEVER absolute certainty to be obtained, but it would not be an unreasonable bet to decide the following: I bet of all occasions I will not be the unlucky one who will actually witness for instance 15 non appearances of a dozen in a row turning into 30 non appearances in a row because the overall combination probability figures for this streak to happen are very low. The con is: this might work out well several times (the probability for the streak to continue is rapidly and exponentially decreasing the further it goes) but because you were patiently waiting for the extreme to occur before playing, on some blue Monday the out of the ordinary streak might turn into the 1 in a million odds kind of streak. Why: because the mathematical probability could never be discarded of, no matter how remote the possibility, no matter how many digits you used behind the comma.

On the pro side: mathematically we know there will be far less 30 non occurrences of a dozen in a row in the long term than for instance 12/37 = 0,324324. Transformed to odds = 1/0,324324 = 3,083. The last value would give you the average appearance of a dozen in the long term on a French roulette wheel. Remember however that any given session of only a couple of hundred spins should be considered short term, not long term.

Because we promised we would deal with pros and cons: **the reports about the most remote probability sequences appearing in roulette are undoubtedly psychologically distorted.**

Humans naturally have a better recollection of the extra ordinary, rather than the usual. So, without any doubt, on several occasions for instance combinations of 12 and more dozens in a row have shown on all the billions of trials on roulette tables worldwide, but these very small occasions will always draw far more attention, rather than the far majority of all the cases in which for instance dozen sequences alternated within more mathematically expected alternation figures.

When the extra ordinary happens there is rumor, when the ordinary happens it's left unnoticed.

The LARGE and beyond reasonable doubt benefit however of being patient is: the less you play, the less you are exposed to the house edge (which we will cover later on). If you are betting against a streak head on (for instance red showed up on the previous spin, now you play the opposite: black) on several occasions reds will keep coming up far beyond the reach of your bankroll and table limits. The sequential odds however for a 10 reds in a row streak to turn into a 20 reds in a row streak are far less than a one red turning into 10 reds in a row streak, but even then there is no guarantee what so ever. **That's why it is recommended if you chose this route to predetermine the maximum progression you would be willing to take on this bet and stick to it at all occasions.** As we've seen, there is no way what so ever to exclude the probability, no matter how infinitely small, the streak you've decided to play is all occasions the 'streak from hell.'

Before you rush out to the casino to stake out the tables, waiting for the extra ordinary to happen, before betting, please continue reading this guide.

2.8 Binomial probability theory

In the previous part, we've analyzed how high or low our chances were to get a bet right at least once in several consecutive trials.

We can also calculate how many times a single number or combination of bets could appear in several trials. For instance, if you would play an even chance for 10 spins you might not get the bet right at all, or you might have several winners.

What's the origin of this theory? The Swiss mathematician **James Bernoulli** (1654-1705) literally spent his lifetime flipping coins and trying to find out what would be the mathematical chances for getting heads or tails once or several times in consecutive trials.

You might be thinking, what has flipping coins to do with roulette? Well, the basic principle is very similar: when you flip a coin and you bet on tails or heads to show up, it's either going to be right or wrong: there is no in between unless the coin doesn't fall over. The analogy with roulette is if you pick a number or any combination of numbers in roulette and bet on them to hit, it's also going be to either right or wrong: your numbers will either hit or they won't. The only thing which is different is the probability for a win or a loss. A coin has a 50/50 absolute probability on each trail: it's either going to be heads or tails. In roulette, when it comes down to a single number you are either dealing with 1/37 (French roulette) or 1/38 (American roulette) probabilities for win or 36/37 or 37/37 loss odds on one trial. If you bet a dozen you have 12/37 or 12/38 odds to get your bet right on a single spin and vice versa for the loss.

In the previous part, we've already covered how to mathematically calculate the probabilities if you play for several spins in a row. The result of the calculation was the figure you would either get it right at least once, or not at all. Now, we're switching to second gear: we also want to know the 'in-betweens'. Suppose we pick a number and we play it for 10 spins. What would be the probability this very number drops for instance three times in a 10 spins trial?

The calculation is fairly complex and it is advised to use a spreadsheet such as Excel, because the calculations will drain your pocket calculator and fingertips in no time. Excel also offers a build in formula to determine binomial probabilities very quickly.

We remind you our statistician set up a spreadsheet you'll find in the download section of our website www.john-solitude.be which calculates binomial probabilities of roulette outcomes automatically (available for single and double zero roulette).

Below, you'll find the full calculation so at least you would know how a certain 'binomial' probability figure is obtained.

Step 1

Determine the probability for each spin you will be playing.

For this example we are planning to play 1 number during 10 spins on a French roulette wheel. We do not only want to determine the probability for getting it right or wrong once during those trials, we want to know what our chance would be to get for instance three hits on a single number in 10 spins.

First, apply the multiplication rule we've covered earlier: for this example we suppose our number would hit on the third, the seventh and the eight spin.

Using the multiplication rule (see previous) we get:

= 36/37 * 36/37 * 1/37 * 36/37 * 36/37 * 36/37 * 1/37 * 1/37 * 36/37 * 36/37

The logic is, on the third, the seventh and the eight spin our number dropped of which the absolute probability on a single zero wheel was 1/37 on a single spin. On the other trials one of the other probabilities appeared, so we use 36/37. Do not forget, if you would want to calculate the probabilities for an American wheel you'll have to replace the 1/37 by 1/38 and the 36/37 by 37/38 because of the extra added possibility of a double zero.

If we want to use less individual calculations you can group the similar probabilities, for instance

= ((36/37)^7) * ((1/37)^3)

= 0.000016

Step 2

You might be thinking: the first step is very similar to the multiplication rule we've covered earlier on, and you are right. However, to obtain the desired probability figure to obtain exactly three hits on a single number in 10 consecutive trials we'll have to proceed and introduce another mathematical formula called a 'combination'.

The combination formula is normally symbolized like this: "*C*" (now this makes sense if you compare it to other symbols mathematicians pestered us with during the past centuries.)

Combinations are the number of different ways in which objects can be arranged without regard to order. What does this mean? In this example we are not interested if your number would drop on the 1st, the 2nd and the 3 spin or on the 4th , the 6th and the 10th spin. Nor are we interested what the probability would be our number would not be hit at all or drop five times in 10 trials. We want to determine what the odds are for exactly three hits in 10 spins.

In this case the symbol for combination could be depicted like this: $C_{10,\,3}$

Number 10 represents the amount of trials; number 3 the amount of successes.

Now, before you faint out, let me tell you in Excel or most other spreadsheets you also have a very convenient way to calculate combinations.

If you however are still interested to know what the handiest way would be to calculate $C_{10,\,3}$ yourself with a pocket calculator, this is it:

= (10 * 9 * 8) / (3 * 2 * 1)

The first part between the brackets starts out with the number 10 (because in this case we have 10 trials), the second part between the brackets is the number of successes (in

this case we want to calculate the probability for three successes). We won't bother you will the fully fledged formula, because it would probably put you to sleep.

= 720 / 6

= 120

Now, do not fear, if you have a spreadsheet installed on your computer just look into the help file and look for the 'combination' formula. For instance in the English version of Excel it would be enough to type in the following formula in any cell you fancy:

=COMBIN (n,r)

In this case n would represent the (n)umber of trials, r would represent the number of successes. So, if you type in =COMBIN(10,3) in any cell of Excel you'll find 120, which means you now know, how Excel actually came up with this.

Step 3

Multiply the obtained combination figure (in our case 120) with the multiplication figure you've obtained in the first step.

= 120 * 0.000016

= 0.00192

The last figure gives you the exact probability any number would appear exactly three times, no more, no less in 10 spins on a French roulette wheel.

Let's determine the odds:

= 1/0.00192
= 1 in approximately 521

Or in percentages:

= 0.00192 * 100 = 0.192 %

Your head must be spinning and you're probably thinking: what's the point of all of this?

Well, it's a persistent myth if a number is 'hot' it is bound to appear even more.

Mathematically this doesn't make any sense, if anything it's rather the very opposite. The binomial probability for a number which has appeared several times in a small amount of trials to turn up even more in a restricted amount of trials actually diminishes the further it goes. But because we have 37 or 38 numbers, given enough trials several of these numbers might at some time or another turn up 3 times in 10 spins. Would it be bias? There is absolutely no way to tell in a small sample (see chapter standard deviation). Even on a very small sample (10 trials) without any bias being present, we have just calculated the probability for a number to hit three times in 10 spins is in there. The probability is exactly 0.192 %. When will this happen exactly? There is no way to tell: the only mathematical conclusion is the probabilities for a number to appear several times in a restricted amount of trials are diminishing the more appearances are added. When will

a number stop appearing, even if it appeared already a lot in a small sample amount? Again, there is no way of knowing this for sure, the only thing we can reasonably conclude is the more appearances of a specific number in a small amount of trials, the more remote the probability becomes that this would continue.

I've already pointed out in the previous part, because we have billions of recorded spins worldwide, even the most remote probabilities are bound to appear at one time or another and rumor will spread rapidly in internet forums some extra ordinary streak has presented itself. Even on a smaller scale, within the sessions a player has observed himself, a player will always take more notice of the extra ordinary, rather than the ordinary. The more spins are played; the higher your chances become to witness an extra ordinary combination of outcomes. Depending on luck or bad luck, an extra-ordinary streak might even present itself the first time you sit down at a table.

Let's use the binomial formula in Excel this time to determine the probabilities for a single number to show several times on an American roulette table in a restricted amount of trials.

To determine this yourself in Excel you'll need to type the following formula[18] in any cell you prefer:

= BINOMDIST(r,n,p,cumulative)[19]

r = amount of successes (for instance if you want to determine the chances for a single number to turn up 5 times you replace the r with 5)

n = the amount of trials (for instance if you want to determine the chances for a full cycle in American roulette, you replace the n with 38)

p = the probability of a success (for instance if you want to determine the probability for a single number you replace the p with 1/38)

cumulative = Excel offers two binomial probability figures, if you replace cumulative with FALSE, you'll get the exact probability for x amount of appearances in x amount of trials. If you choose TRUE, you'll get the probability for x amount of successes or fewer in x amount of trials. For instance a number could show up three times in 38 spins, but it could also be 0, 1 or 2 times.

Referring to our example: to determine what the binomial probabilities are for a single number to show exactly 5 times in 38 spins, in Excel you would type the following formula:

=BINOMDIST(5,38,1/38,FALSE)

Excel will happily tell you the probability is 0,002627446.

Of course you can do this for any combination you prefer. You could determine how large the probability is a number would appear 5 times or less within 38 spins in American roulette.

[18] Actual name for the formula may differ depending on the language version of Excel you use. Use the help file to find the appropriate name in your language.
[19] Please note that depending on the version and the way Excel was set up, the separation of the parameters could be ; (point comma) in stead of , (comma).

=BINOMDIST(5,38,1/38,TRUE)

=0,999555631

The binomial probability a number would appear 0, 1, 2, 3, 4 or 5 times on an American roulette wheel within 38 spins is 99.95 %. So, the number crunchers out there can use Excel for about any probability calculation you fancy, using any bet combination you would like to. The best part is: you will no longer have to be dependent on the expensive merchandise of sellers and scammers.

On the next page, to get you started, you'll find a table our statistician constructed in Excel with the binomial probabilities any 6 number combination would drop exactly once within a full cycle. In French roulette a full cycle is 37 spins because there are 37 possibilities, in American roulette a full cycle is considered to be 38 spins. Please don't have a heart failure when you turn the page, the interpretation of the table is right below it.

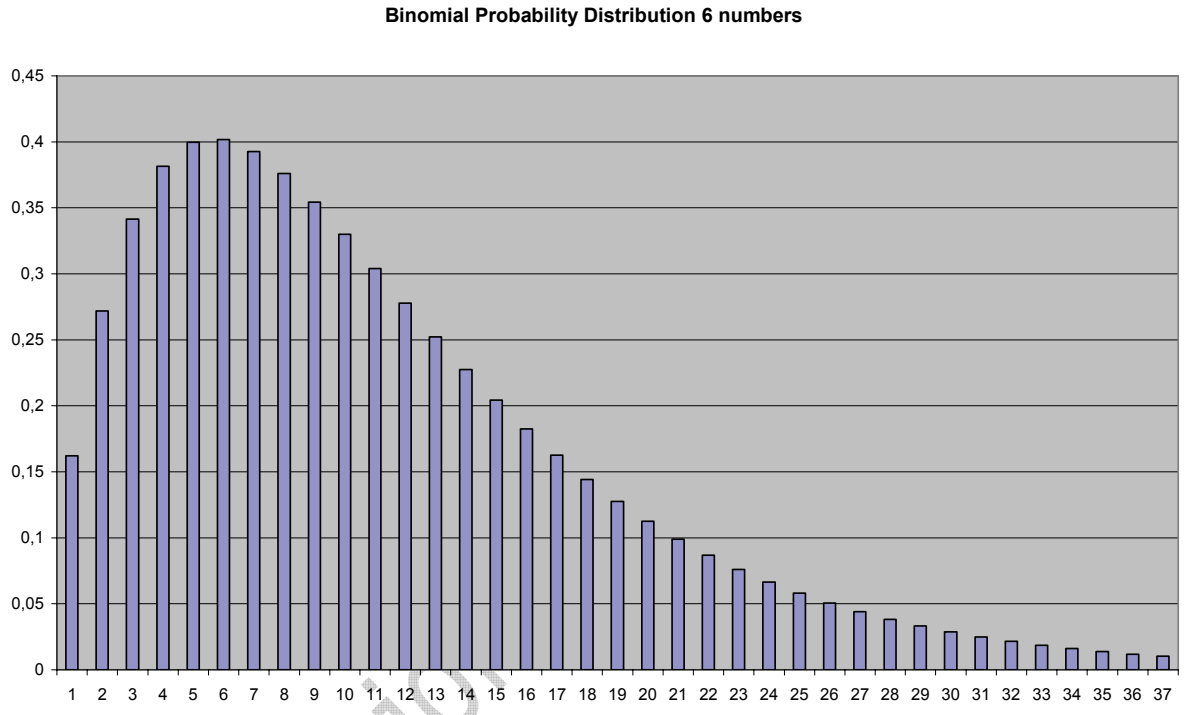
Table Binomial distribution 6 number combination
Exactly 1 appearance in 37 or 38 spins

	French	Odds	American	Odds
1	0,1621622	6,1666667	0,1578947	6,3333333
2	0,2717312	3,6801075	0,265928	3,7604167
3	0,3415	2,9282576	0,335909	2,9769965
4	0,3814955	2,6212629	0,377161	2,6513875
5	0,3995392	2,5028832	0,3970116	2,5188182
6	0,4016989	2,4894269	0,4011907	2,4925805
7	0,3926516	2,5467869	0,3941522	2,5370908
8	0,3759753	2,6597493	0,3793345	2,6361959
9	0,3543821	2,8218128	0,3593695	2,7826513
10	0,3299053	3,0311732	0,3362522	2,9739585
11	0,3040478	3,2889562	0,3114757	3,2105234
12	0,2779012	3,598401	0,2861403	3,4947885
13	0,2522392	3,9644914	0,2610403	3,8308259
14	0,2275921	4,3938258	0,2367329	4,2241696
15	0,2043056	4,8946274	0,2135936	4,681788
16	0,1825867	5,4768512	0,1918595	5,2121468
17	0,1625391	6,1523642	0,1716638	5,8253405
18	0,1441921	6,9351919	0,1530624	6,5332812
19	0,1275213	7,8418299	0,1360555	7,3499414
20	0,1124654	8,8916232	0,1206032	8,2916526
21	0,0989392	10,107222	0,1066386	9,3774643
22	0,0868424	11,515119	0,0940772	10,629569
23	0,0760671	13,146293	0,0828239	12,073804
24	0,0665028	15,036956	0,0727789	13,74024
25	0,0580402	17,229441	0,0638412	15,663874
26	0,0505734	19,773242	0,0559114	17,885433
27	0,044002	22,726235	0,0488942	20,452324
28	0,038232	26,156116	0,042699	23,419737
29	0,0331762	30,142087	0,0372413	26,85194
30	0,0287548	34,776838	0,0324425	30,823789
31	0,0248949	40,168877	0,0282306	35,422499
32	0,0215307	46,445264	0,0245401	40,749711
33	0,018603	53,754831	0,0213111	46,92391
34	0,0160586	62,271963	0,01849	54,083256
35	0,0138502	72,201041	0,0160285	62,388899
36	0,0119358	83,781674	0,0138833	72,028851
37	0,010278	97,294847	0,012016	83,222524
38			0,0103922	96,226043

How to interpret the table: you'll notice when you go down the rows of the table the probabilities are increasing with a peak on the 6th spin and decreasing from the 7th spin on. You may be dazzled at first because in the previous part (sequential probability theory) we determined the mathematical odds for an appearance increase the longer a certain combination has NOT shown. However, because this table deals with the binomial probabilities of exactly one appearance of any six bet combination in a full cycle you'll find there is no contradiction with our previous findings. Look at the 37th spin; the

probability any six number combinations would not have shown by now at least once is 0.01 which is pretty low (but not low enough to be certain). The highest probability you'll find on the 6th row and this is no coincidence either. If we have 37 numbers and you're quickly trying to determine the long term average appearance you simply divide 37/6 which gives you 6.16

So, it is no wonder the table tells us in the long run a six number combination bet will drop on an average of approximately 6.16 spins and the probability for it to appear more decreases the further you go.



The graph clearly shows the binomial probabilities for only 1 appearance are rapidly decreasing from the 7th spin on HOWEVER they are never, no many how trials you add, completely going to reach 0 % probability, at best 0,0000000 … 1 with zero's being added on the dots in between into infinity. The only way to ever reach 0 would be to round down the most extreme figure to 0. This is often done by roulette strategy sellers who would like to prove there system is completely waterproof, but as you can see yourself by now, arithmetically this can NEVER be done: the probability for even the most remote outcomes remains in there, no matter how small it is.

What's the moral of this story: you are at risk; let no one tell you otherwise.

3. THE HOUSE EDGE

3.1 Introduction

It seems like a negative word and it is. In the previous part of the guide, we've already determined that even if you would be rewarded fairly for any bet you might take in roulette, some combinations could take an awful lot of time before they drop. However, if you would have an unlimited bankroll and no table limits, one could simply pick some numbers, add a mild progression, and simply keep playing the same chances over and over until the combination you've picked comes up. It would be the only way to play completely risk free.

This is the part where the house edge and the table limit come in. A casino never minds a player winning in the short not even medium time span; in fact this is even very good for business. Winners attract more players and if your friend has done well on his previous sessions, you'll be more inclined to take a gamble as well. What is of importance to the casino and the player is the long run. **Beyond any reasonable doubt the casino is mathematically in the advantage on EACH game they offer with an exception on Blackjack (but only in limited situations where the remaining cards in the deck are mathematically disadvantageous for the dealer, but pay-out odds remain the same for the player) or other 'dependent' card games with fixed odds.** Unlike roulette, when a card has been drawn from the deck and put aside, we know for certain that this specific card will not appear again unless the deck is reshuffled. Please refer to the chapter on 'What is probability theory?' to remind you of the difference between dependent and independent events.

Would a casino forge a game of roulette as sometimes suggested? Surely they could, for instance using electro magnets beneath the platter and a ball which appears plastic but has a metal core. But, a respectable casino could lose their license if government gambling investigators would find out the games have been tempered with and this would be bad for business in the long run (the loss of a license to exploit a gambling venue). Casino's need another way to make sure in the long run they are far more likely to be on the receiving rather than the giving end. We specifically state 'more likely' because as seen before in the chapters on standard deviation and probability theory, the player still has a chance he could place a large amount of bets and still be at the receiving end. But, it's reasonable to say: the longer one would play, the less likely the player will be winning.

To completely understand the implications of what follows, it is advised you have read the guide chronologically, so you have developed an understanding of standard deviation and probability theory by now.

3.2 How does the house-edge work to the advantage of the casino?

To avoid misunderstandings: when we refer to pay-off this is the net amount of credits you gain on a success for a hit on a single number or a combination of bets. The first confusion might already appear. **In fact many (internet) casino's or automated roulette tables are designed to psychologically fool the player into thinking they gave gained more than what is really the case.** Suppose you bet on a single number and you have a winner: much software will indicate your winning bet and multiply the amount of chips with 36. At first occasion you might think you have just gained 36 credits, which is NOT the case because you have to deduct the chips you've laid down on the table to make the bet. To find your real gain simply make the following calculation from left to right:

Invested capital (for instance 1), multiply with the received capital on a win (for instance 36 for a single number hit) - Invested capital (1).

So, if you play a single number on French or American roulette wheels for a hit on a single number you would receive 36 chips, but you have to subtract the invested capital (1) = 35 net gain for the player.

To mathematically determine the house-edge you'll need the following calculation:

Step 1

Deduct the correct payoff from the actual payoff.

French roulette : (35/1) – (36/1)
American roulette : (35/1) – (37/1)

What would be the correct payoff on a win? In French roulette when playing on a single number you have an absolute probability of 1 out of 37 possibilities to get your bet right. (Refer back to the chapter on probability theory to understand the difference between absolute and relative probability). So, if roulette would be a 'fair' game, the risk you took should be rewarded equally. Taking a risk of 1 out of 37 possibilities to get the bet right, you should be rewarded with a net gain of 36 chips if your number comes up. However, this is not the case: previously we have just analyzed that your net gain is only 35 chips.

In American roulette, matters are even worse: when playing a single number you have an absolute probability of 1 out of 38 possibilities to get your bet right. But, the higher risk is not rewarded with a higher payoff. In fact for taking a higher risk, you are only rewarded with the same payoff as in French roulette. On a straight up number hit you'll only receive 36 chips – the capital invested (1 chip) = 35 chips net gain.

So, in the above calculation you'll find that the first calculation between the brackets is similar for French and American roulette, but different for the second part between the brackets. The first part is the net gain pay-off (in both cases 35 – 1), the second part is the risk you took: in French roulette (36 -1), in American roulette (37 – 1).

Step 2

Multiply the outcome of the previous calculation with the risk you took on a single spin:

French roulette : (35/1) – (36/1) * 1/37
American roulette : (35/1) – (37/1) * 1/38

French roulette : (- 1) * 0,0270 = -0,027027027
American roulette : (- 2) * 0,0263 = -0,052631579

As we've seen earlier, to make more sense out of probability figures you can multiply with 100 to obtain the probability percentages.

French roulette : -0,027027027 * 100 = -2.70 %
American roulette : -0,052631579 * 100 = -5.26 %

Because the final number is a negative value, this figure is often referred to as **'negative expectancy'**. What does 'negative expectancy' mean: on each bet the player takes his risk of failure is always higher than the net gain if he is successful.

Many might think an added zero on American roulette is very insignificant for the long term expectancy of risk by the player, but we have just calculated this is far from the truth. **In American roulette, the negative expectancy is nearly double (!!!) compared to single zero roulette tables. Fact is the negative expectancy on American double zero roulette is AMONGST THE HIGHEST OF ALL THE GAMES the casino offers (together with Keno and some slots depending on the way they were set up).**

I am not kidding you: you should all simply STOP playing American roulette, and if single zero roulette tables are not available in you area, PLEASE do switch to another game with a smaller negative expectancy for instance Blackjack or Baccarat.

The lowest negative expectancy bets can be found on the banker bet in Baccarat (- 1.06 %), Blackjack (negative expectancy depends on rule variations and the ability of the player to count cards) and each 'dependent' card game in which real time applying of probability theory can influence the negative expectancy. Jackpots normally offer (long term) fixed returns, for instance 97 or 98 %, so in some cases playing slots could even be preferred to playing American roulette when it comes to the house-edge.

The French wheel (one single zero) should also for another reason be preferred to the American wheel, because if the 'partage' rule is used when the zero hits while the player is making a bet on the even chances, he would get half his money back making the house edge on even edges a more acceptable 1.35%.

3.3 Can a player reduce the negative expectancy in roulette?

No matter what a player does, no matter which combination he plays, he can not change the house payout rules that in roulette on each individual spin the absolute probability for a success (1/37 or 1/38) or risk will always be higher than the pay-off (35 to 1). The negative expectancy applies to each of the bets on any given spin. For instance if you would play a double street you would have an absolute risk of 6/37 for a winner, but only be rewarded with a net gain of 5 chips if you get the bet right.

Further investigation of this question is yet again a controversial issue:

A mathematician is by definition an abstract thinker. As such he will reason that even the most remote of outcomes are theoretically possible, so even if a player would have a large bankroll and a fairly large spread (difference between the minimum and maximum bet), the abstract thinker will reason at one time or another losses will evaporate the winnings. So, an academic will agree that in the long run (which takes at least a couple of hundred thousand spins) the experienced loss will converge with the average theoretically expected loss. This would be a negative -2.70 % or – 5.26 % loss for the player. The real actual loss will depend on how kind the standard deviation was towards you (see the chapter 'What is standard deviation').

Also, there is a paradox concerning the use of sequential probability theory (see previous). Mathematicians agree with the multiplication rule of probabilities, but most mathematicians will determine the odds for getting a bet right from the moment on a player starts betting. For instance, if a player would repeat 5 times a dozen bet the sequential probability for getting the bet right at least once is approximately 86 %. However and here is the paradox: as well as a roulette wheel has no conscious of previous outcomes, nor is it conscious if a player is only observing or playing. So, a player could reason it would be better to wait for 5 non-appearances of a dozen before he starts betting it. The sequential probability for a dozen appearing at least once in 10 trials is approximately 98 %. If the sequential odds for a certain streak to continue or discontinue are calculated from the moment on a player starts a bet, this is also a flaw against logic, because the statistical probability for combinations are completely independent from a player betting or only observing. However, even if a player would wait for the most of remote outcomes before playing, there is absolutely no guarantee that this might not be the streak which could still go way beyond the bankroll or table limits. One could only say: 'the probability is very remote' a dozen would for instance not show within 40 trials, but this does not equal to 'not possible'.

The downside, as we have seen earlier, is that the 'waiting' better deliberately is picking streaks to play which are already out of the ordinary, and there is absolutely nothing which would disallow the streak of becoming an extraordinary event. The last can only be seen in retrospect.

Another important factor is the size of the bankroll and the spread of the table. A patient player with a large bankroll is more able to battle with the fluctuation in outcomes, so it could take a long time before losses occur. Never the less, an unfortunate streak of which the probability odds are low (say less than 1/10.000) might also present itself right from the beginning on. **This is why it might seem that 'high rollers' are often successful at what they are doing:** they often have very large bankrolls so they are reasonably prepared for fighting with less likely sequences. But, even 'high rollers' will have to accept that sequences of which the probability is very low will as mathematically expected occasionally appear which could lead to massive loss if one is playing aggressive stake progressions.

The argument that a negative expectation game could not be beaten is doubted by some mathematicians. **Edward Packel**, Phd M.I.T. and author of the classic 'The mathematics of games and gambling'[20] (see review in the literature section on our website www.john-solitude.be) states 'Yet there are unquestionably people who have made negative expectation bets a large number of times and ended up with a profit.' However, in the same book Packel theoretically proves the chance for this to happen is very slim.

The difficulty to either prove or disprove that a negative expectancy game could not be beaten depends on many factors: how many bets were actually placed (this is not equal to the amount of observations) for how many trials, how large was the difference between the expected loss and the achieved gain, how large was the bankroll, what was the spread of the table, … As we have seen previously the standard deviation can fluctuate in favor or against the player. The final net gain or loss will be the total of all these fluctuations minus the negative expectancy.

When a mathematician is asked how many trials one should actually play on roulette before one could state with certainty one has an edge, the answers will differ or are vague ranging from a couple of hundred thousand to billions of actually played spins. The reason being: roulette is considered to be a random independent game. The very nature of the game allows for a very large amount of mathematical combinations. If one would only play a couple of ten thousand spins, this only represents a very small proportion of all the possible combinations. How can we prove this?

Each trial offers 37 or 38 possible outcomes. So after two trials the amount of possible combinations already adds up to 37 * 37 for French roulette or 38 * 38 for American roulette. After only one cycle of playing (37 or 38 spins) the possible amount of sequence combinations is already:

French roulette : 37 ^ 37 =

1055513495577780000000000000000000000000000000000000000000000

American roulette : 38 ^ 38 =

10759118019799900000000000000000000000000000000000000000000000

We can not even pronounce in billions or trillions how many possible outcomes the above figures represent.

Certain combinations which could prove disastrous to the bankroll could not show up at all, especially if the sequential or binomial probability for a certain sequence to happen is very low. If the sequence doesn't show within a couple of ten thousand trials this could make the player betting against it a winner.

The fact is: if the same player would use the same strategy on the next ten thousand trials, a disastrous sequence could show several times resulting in a huge loss if one would play aggressive progressions. At any time there is an element of luck involved.

Nor bias players, nor visual prediction players, nor probability players, nor dealers claiming they could aim for sectors or pockets could EVER statistically proof in the short

[20] Edward Packel, The Mathematics Of Games And Gambling, pg. 67, The mathematical association of America, 1981

run, not even medium run they have an edge or not. Why not? Because as we have just proven in a limited sample of only 10.000 or even 100.000 spins the amount of sequences generated will only represent an insignificant tiny small amount out of all the possible mathematical combinations. And, no matter how small the probability for certain combinations of outcomes are, one can simply not state they would not be possible, only the probability is (very) remote they would appear within a limited sample space like 100.000 spins.

Often roulette strategy sellers will take advantage of this fact to mislead the uninformed player: they will advertise a certain system, strategy or device has beaten x amount of spins, but they will not mention the trial space used was only infinitely small compared to all possible mathematical outcomes (which we have calculated above for only 37 or 38 trials and this was already above the trillion range) which could have occurred but did not show because the trial space was FAR too small.

You could compare this to the lottery: if you only play once the chance that you'll draw the right combination the very first time is very tiny; however, because the probability is still in there it is not impossible but rather improbable. Does this mean that someone who plays only once and manages to pick the right combination from the very first start has an edge: no, he was only very lucky because even the improbable can happen simply because we can NEVER disregard even the smallest probability.

4. THE DEALER IS NOT YOUR FRIEND

Have you ever wondered why in most casino's players are expected or even ordered to give a chip to the dealer on a straight hit?

Some players even like to buy themselves a false sense of security by over tipping the dealer; one of the most persistent myths around is dealers would be able to (with margin for error) target sectors, even pockets.

We'll explore this myth using common sense. First of all, it's clear for anyone to see the dealer is an employee of the casino. He or she is paid by the casino to operate the games and bring in the bacon for the casino: your chips. You might think the tips given to the dealers are divided fair and square amongst all dealers but using our inside source we know for a fact this is NOT the case in most European casino's –we do not know about other continents, so please don't ask.

What really happens is the 'tip' chips in the table boxes are gathered and then a complicated pyramid percentage structure is applied which involves dividing money between the casino itself –yes, you have read this correctly –, the pit bosses and the dealers. As a general rule of thumb: the lower you are on the food chain, the lower the percentage will be. The actual percentage of tips really going back to the dealers is only a fraction of the total amount and differs from venue to venue.

The tipping ritual is a first illusion created towards the player: if you tip a person you expect the tip to go to the person who served you right? Table dealers are forbidden by the management to keep personal tips: at all times they should be dropped in the box and a dealer who doesn't stick to this rule will be fired and you can be sure they eye in the sky (the dark bulb you see in the ceilings of casinos) is watching.

Now, suppose a dealer would be able to target sectors: do you think a dealer would be working for long in a casino if he would favor the players? The only way a dealer could gain a personal profit by influencing the game is by having an accomplice to lay out the bets, so afterwards the dealer and the accomplice could split the profits. This might work well for small amounts of money, IF it were possible, but even then it wouldn't be long before casino security finds out if dealer A is spinning the ball, player A is winning most of the time.

Notice we did put 'suppose' before the last paragraph. In fact, we personally know an ex-dealer who gave his co-operation to this project and who has worked for several years in a casino, and when we asked him if a dealer would be able to target sections, he stated: 'This is a myth deliberately kept alive because dealers know this will bring in the tips'. Also, he didn't know of one dealer who was able to deliberately influence the outcomes. Let's say you know for certain it wouldn't make any difference if a blind man spins the wheel or a regular dealer: would you still be as willing to give tips to the dealer when your numbers show up? But, if players are convinced a dealer can influence the outcomes, players will be more eager to give nice tips, hoping the dealer will be more willing to hit there numbers.

If you are a regular casino visitor and you often see the same dealers, it's only human you'll tend to look for similarities in outcomes. When you see a certain number coming up three times or more in several consecutive spins, you might think this particular dealer fancies this particular number or sector. But, the fact is, even if a blind man would spin the wheel several numbers or sections will come up more than expected in the short run.

To seriously investigate the myth we would need a dealer who:

a) states he or she is able to target sections
b) will state clearly which sections he or she will be targeting BEFORE the experiment

Now, here comes the interesting part: obviously you should NOT do this experiment 'in the short run'. Why not: because as we have seen earlier it would not be possible to make any distinction between deliberate targeting or only achieving the result by chance.

Suppose you are convinced dealer A is more likely to throw section A than B. Say this section is composed of 6 neighboring numbers.

The average frequency in which this section will turn (without applying any influence at all) up is 6/37 or 6/38. But, as we have seen earlier: standard deviation will cause this section to either turn up more or less than the expected average frequency in the long run. As a general rule of thumb, anything below 3 standard deviations would certainly not be good enough in the short run to state dealer A has any deliberate influence on the game because such a pattern could easily be created by chance as well. What does this mean: if dealer A would state he or she will be targeting a certain section, a hit on this section is not necessarily deliberate; the section might very well turn up more than once than expected in the short run by pure chance also.

Let's say you are convinced that dealer A is more likely to throw a particular 6 number section in any part of the game:

Using the multiplication rule of probability we have covered earlier, for an American wheel the probability any one of the numbers out of this 6 number section would turn up by chance in 10 consecutive throws is:

Attempt	Probability
1	15,78947368
2	29,08587258
3	40,28284006
4	49,71186532
5	57,65209711
6	64,33860809
7	69,96935418
8	74,7110351
9	78,70402956
10	82,06655121

Interesting to know is, after 4 attempts, the dealer would already have a 57 % probability chance he would hit any out of 6 numbers in 5 attempts WITHOUT deliberate intent what so ever. So, if you walk into a casino thinking dealer A is more likely to throw a particular section, just remember in any 5 consecutive throws the probability one of the numbers out of this particular section might show up is already better than 50 % (without any influence at all).

So, this is hardly proof at all: if any dealer would tell you in the course of 100 spins he'll have an average hit rate of 1 out 5 for hitting a six number section, you can tell him plainly he's a con artist because he has a better than 1 in 2 chance for pulling this one of anyway.

That's what might explain why we didn't find one dealer prepared to take our experiment, not even when at one time we offered a 1000 euro for a potential challenger who would only have to concentrate on aiming balls all day. Let's face it: it would have been easy money if you would have the skill. The downside being: if the challenger didn't pull it of, he wouldn't get paid for wasting our time and money to rent a full size low profile scalloped wheel.

Now, we mentioned the word 'wheel'. We surely do not underestimate the power of human will to practice a skill no matter how difficult, nor do the casinos. This might explain why wheel manufacturers started developing **'low profile'** wheels which are now most common to be found in respectable casinos. Low profile wheels increase the scatter of the ball on impact. In some venues the balls themselves are even regularly switched: to the ordinary player they might look the same but the diameter or weight is slightly different which will produce more or less scatter on impact. So, even when a dealer would have the tremendous skill to aim approximately towards a certain section, the velocity, the weight, the diameter, the position and the angle of the ball on impact, will determine the amount of scatter: the ball could come to a nearly dead halt or happily scatter around several sections further before loosing enough momentum to finally drop dead.

The skill itself would not only involve roughly aiming towards a section, but even the need to control the position of impact on a particular pocket, because this would determine the amount of scatter that will be produced. A drop from striking a diamond on the downward spiral, straight on the edge of a particular pocket would produce a totally different amount of scatter as opposed to the ball skimming the edge of a pocket on impact without hitting a diamond. To make matters even worse when it comes to influencing the game, major wheel manufacturers also have introduced **'scalloped' pockets**. A scalloped pocket is constructed like a deep spoon: even when the ball drops straight in, due to the velocity and the shallow angle of the pocket the ball will wobble and might bounce out.

Below you can see an image of the John Huxley Starburst wheel. Notice the pocket edges are rounded, as opposed to old style wheels which had deep pockets with straight edges. More information can be found on http://www.tcsjohnhuxley.com Also other major manufacturers like Cammegh http://www.cammegh.com have introduced low profile wheels.

If you are not convinced yet: summarized we believe at very best on old style wheels (deep, not scalloped pockets) a very skilled dealer might have influenced the course of the game deliberately - however, NOT one statistically tested recorded document of a successful attempt exists. On today's modern style wheels we believe deliberate aiming and consistently succeeding to influence the outcomes is out of the question.

We would have preferred to test a dealer on this particular subject, but as mentioned earlier, an ex-dealer we personally knew, already denied the possibility, nor did he know of a dealer who was able to do this. After insisting we only found one candidate dealer for our challenge but this one backed of very quickly when we introduced him to our statistician. Probably the contender found it easier to convince the layman of his skills (which brings in the tip chips), but even if you only know the basics of stats and probability you know that a hit rate of 1 in 5 for a 6 sector pocket simply isn't prove of anything in the short run: such a pattern could appear easily by chance as well.

As we haven chosen the route of common sense: suppose such an extra ordinary skilled dealer would exist. Wouldn't you find it strange in this world of numerous tv game shows, documentaries and literature to be found on any human skill, there is to our knowledge **NOT ONE officially recorded and successful attempt of a dealer hitting a certain section in a significantly higher rate than expected over a long amount of trials?** A (retired) dealer who would have this skill would surely have turned up by now in the presence of a statistician to prove himself, if only for historical sake. Does this evidence exists: no, and internationally there must have been over 1.000.000 dealers by now (amateurs or professionally, retired or still active).

Even for the casinos it is good business if the public thinks a dealer can influence the game. As a player you will be more likely to tip and as such a casino doesn't have to pay decent basic wages. This is the ethical side to the question: casinos are undoubtedly a multi million dollar revenue business, so we could expect even the employees on the base of the food chain to get a fair share of the profit in wages. But, in reality many dealers are depending on tips to secure their modest wages (if you compare it to what the management is making). So you can be certain if a player believes the dealer might hit a certain section the dealer will be the last to state otherwise: even if the dealer only receives a fraction of the chips in the tips box, it's the butter on his bread.

Besides casinos wouldn't have to pay decent wages to dealers which are more consistent with the large profits of the casino, there is also a mathematical reason why players are expected to tip the dealer on a straight hit. In the chapter on the house-edge we've analyzed that a player is not rewarded fairly for the risk he or she is taking. If you have a chance of 1 out of 37 or 38, you should receive a net reward of 36 or 37 chips, but in both occasions your net gain is only 35 chips. On top of this, on a straight hit most casinos have installed a 'good conduct' or 'player etiquette' policy you should give one chip to the dealer on a straight hit.

If the player agrees with this, the mathematical house-edge is even increased:

French Roulette : (34/1) – (36/1) * 1/37 = -0,054054054 * 100 = - 5.40 %
American Roulette : (34/1) – (37/1) * 1/38 = -0,078947368 * 100 = - 7.89 %

Notice the first part of the bracket would be your actual gain on a hit: you receive a 35 chips payout of 35 chips for a straight hit, but if you are expected to give one chip to the dealer for each straight hit the house edge increases dramatically from 2.70 % to 5.40 % in French roulette; on American roulette the house edge has now become a staggering 7.89 % in stead of 5.26 %. Both are devastating for the bankroll of the player in the long

run. You might have wondered where all your chips went in the last year: well, the expected dealer tips are a major contributor.

Not only does the tipping policy provide the casino a good excuse why they shouldn't pay decent basic wages to the dealers, the expected tipping also increases the house-edge even further. For the casino this is a win-win situation: it reduces the cost of tax on basic staff wages, and in the long run the chances for the player are even worse. This is the real story from the inside, which is why our dealer finally quit his job and decided to co-operate in this project.

This situation can only continue as long as players are not informed of what is really going on: a first protest of players would be to simply switch to automated mechanical roulette so the player isn't longer expected to help the casino pay for the dealer (which the player already does simply by gambling on negative expectancy games), or simply refusing to tip unless the casino executives show you a document in writing. In the last case you might start a scene to find out if the dealer is really getting the chips he or she is obliged to drop in the tip box or only a very small fraction. Inform other players about the knowledge you have just gained. After all, if you tip a person you do this for providing good service and you expect this particular person to receive the tip in full: **this is not the case in the large majority of all the (European) casinos.**

In Belgium, recently dealers went on strike in a certain venue because there wages had dropped to below minimum wage while the casino itself was producing wealthy profit. It the kind of industry you are dealing with.

5. THE PSYCHOLOGY AND CHEMICALS OF GAMBLING

5.1 Introduction

There is an obvious question remaining: why do people like to gamble? Look around you: we have state lotteries, casinos, sports betting, the stock market, charity bingo …

One of the contributors to the John Solitude project has a higher degree in social science and worked with young adults who had developed a gambling addiction, so let's investigate what is known.

Psychologists as well as the casinos themselves have done vast research on the topic. The first group because they have to deal with gambling addiction, the casinos because they want to create as much profit as they can regardless of the ethical question involved: should people be subconsciously encouraged into more gambling?

Opinions differ and of course casinos will not publish the 'deliberately create a gambling addiction' strategy they use. Most psychologists claim gambling is so successful because it appeals to a primitive biologic craving for excitement and dealing with risk. The caveman used to hunt and face the elements of nature on a daily basis. When he returned home from his exciting journey, he had a sense of accomplishment: he faced risk and if he managed to evaluate the situation successfully the reward was survival for himself and his community.

Biologically there are two major chemicals involved: **adrenaline** (which is produced when you find yourself dealing with an exciting situation) and **serotonin** (which is released after facing a challenging situation successfully). If there is balance between both, a human has a sense of well being. Humans are sensitive creative beings: playing games and wondering about the best approach, directly appeals to our biology. But we deal in different ways with the primitive urge to get our literally mind altering chemicals flowing: some will literally risk there lives in extreme behaviour (driving over the speed limit, extreme sports), others do so in a more accepted social way (competing in a business), while gambling introduces an entertainment fashion of dealing with risk. Of course human genes differ: one person may find satisfaction in occasionally putting the pedal to the metal while driving, others seek accomplishment in destroying a competitor in a business situation, while a majority will find a small thrill in playing for a dollar on a state lottery.

In general modern man's life offers a lot of routine behaviour: if you are financially dependent chances are high your daily job doesn't quite offer you the satisfaction you seek. Most occupations demand routine behaviour and in most occasions you are only a small part of the chain gang. The biological essential connection between effort and result is increasingly lost in modern society. For instance, if you would work in a fast food chain: everything comes in prepared and the cook has no personal accomplishment putting the same exact ingredients together all day. Wealth is very unevenly spread: while some may gain enormous fortunes by appearing in a Hollywood movie while flashing a toothpaste smile, others literally have to work long hours for small wages which will be just enough to survive and pay the bills. The difference in income can not longer be conceived to be reasonable. While a nurse working long shifts in a hospital would only receive a very moderate income for doing often unpleasant and psychologically demanding work (being faced with misery all day), a manager on top of a company which produces not as essential services (like the nurse) to the community may make the tenfold.

This is the second major component to our urge to gamble: to escape from daily life and reality in which things often can become bleak. No working class man could ever gain such fortune, not even in a hard working lifetime as picking the right combination in the state lottery. The reward for a good gamble offers money and excitement in the process. Depending on the stake, if a player is on a winning streak one could gain the equivalent of several days pay checks in only a couple of minutes or hours. And, in contrary to ordinary jobs one doesn't have to wait a month to get paid: all casino games offer immediate payout.

But, there is a dark side to the pleasure gambling offers: adrenaline narrows the mindset to focus on the present situation. While gambling, you probably won't be thinking about ordinary life: the only thing which matters is drawing the right card, picking the right numbers, determining the stake, hoping for the best. While gambling, you are in the core of a biochemical rush. In the process of lengthy sessions most players will loose the connection between the plastic chips and the money they represent. If you gamble, you are relatively confident you have a chance to win: you'll determine the strategy, the stake, the risk, all the while hoping you can pull it off. If there is success, serotonin will be released: you went thru an exciting situation and now your brain counteracts with chemicals which make you feel good. You feel a sense of accomplishment: after all it was you who determined the strategy, placed the bets and your guess turned out right. You felt a buzz of adrenaline (excitement) along the way. By the way, increasing the production of serotonin in the brain which is vital for the well being of humans is also the goal of most anti-depressive pills.

When playing long sessions, the constant interaction between adrenaline and serotonin can make a player feel numb. One will become less aware of the risk, and the human mind goes into a cocoon: the only thing that matters is the outcome. The financial risk for the player increases: one is less inclined to think about the consequences if the gamble turns out wrong. You might spend more time and money gambling than you planned to. A similar thing happens to the workaholic in daily life: at first he'll feel good because working restricts him of thinking about things he might be missing in his spare time, but after a while a feeling of numbness 'burnout' sets in. Suddenly what seemed most important in his life 'working' is stripped of meaning. It is no different for the addicted or compulsive gambler. After all, let's face it: watching a ball spin around, pushing a jackpot button, or seeing cards flipped then reshuffled for hours on end can hardly be called a creative way to spend one's time: the very act is hypnotising because it is repetitive and finally a feeling of numbness and loss of reality will set in.

Especially, if your daily life does not give you satisfaction, finding pleasure in gambling can present a major financial hazard. All commercial gambling games offer the organizer a better mathematical chance to win in the long run. A player, who experienced a good run, may forget that the odds were against him for achieving such a positive result, and when one starts loosing there will be temptation to raise the stakes, chasing losses. Losses are mathematically inevitable; unless you would play a game in which betting all possible outcomes would give better odds to the player in the long run.

The chemical rush in itself is addictive: when you find pleasure in escaping reality while gambling, you will be more likely to play long sessions and return frequently. The losses which might occur, making you feel bad (no serotonin release) might increase the craving for the excitement and sense of well being you felt before after a successful session. You might take larger risk, playing with higher stakes (more adrenalin) to gain back your losses or win even more (more serotonin). When the vicious circle isn't stopped in time you might find yourself in serious debt. The nature itself of these

chemicals is addictive: after all, when you felt good after experiencing a successful gamble you will feel the urge to repeat the situation. If you loose, this only increases the urge to feel good again.

It might seam very confronting but the regular gambler is no different than a junkie craving for a mind-altering drug. For instance, a smoker knows cigarettes are bad for his health, but if he lights up a cigarette in the short run the reward is release of the longing for a cigarette. Of course smoking the cigarette itself will only extend the addiction. 'Kicking of' a gambling addiction can result in a serious test for the nerves (lack of chemicals being released), sleep deprivation,

If you are in a situation in which your financial losses are seriously increasing you should stop gambling and seek professional help. You have just become one of the many victims of the increasingly vicious gambling industry.

Gambling addiction is no different than being addicted to cigarettes, alcohol, tranquilizers and drugs in general: the essence is a biochemical addiction and the root is most often you simply don't feel at ease with daily life in general. We do understand this reflex fully and have no prejudice why many humans do not feel at ease with life and turn to gambling for financial or social reasons or a combination of both.

Some humans are even genetically predetermined to be more sensitive to addiction than others. Others, depending on there life situation will feel a greater urge to escape reality. If you want to find out if you are a compulsive gambler go to http://www.gamblersanonymous.org/20questions.html and take the test. Please, seek help for your own benefit and those who surround you: there are many humans just like yourself around.

In any case, the casino industry is a major contributor to gambling addiction because a casino will do everything in its legal power to ensure players would play more, longer and will deliberately psychologically challenge them into making larger bets. You should be at all times very aware of the psychology casinos will use against the player to make a profit.

5.2 The psychology the casino uses against the player

These are facts which you'll find in any psychological scientific research concerning gambling.

- The shorter the time between the bet and the outcome, the more addictive the nature of the game. This is why casinos like to offer fast paced games: besides the pace generating more income for the casino, the pace also reduces the time for rational thought from the player. The player will find himself in the middle of a chemical rush and chances increase severely the player will loose track of time and the risk involved.

- Casino's offer an environment in which there is a high stimulus for the senses: jackpots are blinking and buzzing for attention, the interior often has vibrant colours (red for instance is the colour which has the highest frequency of stimulating the senses –this is why Ferrari's are mostly red, or bull fighters use red cloth to excite the bull) and there is lots of sound distraction.

- The bombardment of the senses undermines rational thought because your brain is trying to deal with all the sensory overload input which is going on. Over stimulation will first introduce a sense of excitement, but eventually will lead to a sense of numbness: again the strategy of the casino is without any doubt to deliberately undermine the rational thought of the player.

- Many venues offer alcohol at the tables, some venues will even offer alcoholic drinks for free. Alcohol is a substance which undermines rational thought. As well as it reduces your ability to drive; it also reduces your 'social' borders. You might feel overconfident, less restricted and what is very important to the casino: you will be less aware of the risk. To be very clear: you should NEVER drink alcohol before or while you are gambling. In fact, there should be strict government regulations prohibiting serving alcoholic beverages in game rooms to protect the player against him – or herself. This is the case in some European venues and a result of (wise) government legislation.

- The casino taps directly into human desire: for instance you will find huge publicity announcing the very few jackpot winners, but you'll never find advertisement in casinos how much money was lost by the general public. The objective mathematical odds for the player are in a majority of the cases hard or not be found at all in a gaming venue. Government should step in and make it obligatory for each casino to display the mathematical odds besides each game they offer. Information on gambling addiction should be freely and easily available in a gambling venue itself, and the casino should pay for these expenses because after all they offer the drug which is at hand.

- All casino games are designed as a ritual event. The ball spinning, the final call on the bets, the fluent movement of the dealer, the shuffling of cards, the stacking of chips … Rituals bring to humans a sense of well being and security. The outcome of this ritual is however insecure, that's the part where the casino cashes in. Although rituals can be very healthy for human beings, the casino has used the potency of rituals to bring you in a state of mind in which you will be entranced in playing long sessions, will be less thinking about the risk your taking in each and every bet and finally will surrender to the casino by playing without self-control or rational thought.

5.3 How the player can counteract the psychology used against him

- Any time you go out playing keep detailed record of the net invested capital, the wins and losses for each session. Do not fool yourself: at the end of the month and year you will obtain an objective financial indication how good or bad you did. Keeping detailed track of the money you spend on gambling at any given opportunity is the only way to keep track of reality. Scientific research (depending on the source) has shown that 1 out of 3 gamblers have a distorted view on the real amount of money they have spent (and in a far majority of the cases lost) on gambling. The moment you decide to not keep record of your exact wins and losses, is the moment you will start fooling yourself (sub) consciously.

- Determine your strategy and money management before you step in a casino. Never bring more money than you can afford to loose. Use only cash money and never bring bank- or credit cards with you. Stick to your predetermined strategy and money management at all times. For each bet you make, analyse the probability figures of the particular game and the bet you'll be taking before ever placing down a bet. If you loose, accept the fact the risk turned out to be negative on this occasion. No matter what you do there is no possibility what so ever to ever achieve absolute certainty. No matter how many roulette strategy sellers will try and convince you they have developed a mathematical system, a computer device, bias or visual prediction techniques of which they state they simply can not fail: the very fact sellers are depending on sales rather than generating personal wealth by playing is the best prove they could not support in there income from gambling. Read the chapter 'Scammers, conmen and roulette strategy' to avoid becoming seduced in the roulette strategy sales psychology and what legal action you can take against scammers.

- Do not play sessions for longer than an hour: even an hour is very long for keeping your concentration up to the level needed to be aware of the risk that you are taking. The longer you play, the higher the risk of becoming trapped in the biochemical rush. Long sessions will lead to a feeling of numbness: you'll make more mistakes in sticking to your predetermined strategy, you'll increase the financial risk and eventually the house edge will take over. You may not be aware of the biochemical rush if you are a regular player but be ensured your brain is under the influence: in fact it's the same as the driver believing that having two beers makes no difference what so ever to his driving skills. Scientific research has proved WITHOUT A DOUBT this not to correct. You may have wondered why college classes mostly are not exceeding one hour straight of teaching: this is because the human attention span severely drops the longer you need to concentrate.

- Be very aware why casino's can offer such a luxurious environment: together with millions of other players worldwide you have paid for this environment by gambling and loosing. Sure, there are players who have managed to play negative expectancy games and still managed to achieve a positive result in the long run. However, these players represent less than a half percent of the total gambling population. The elements involved in winning are always a combination of luck, strategy and sheer discipline.

6. SCAMMERS, CONMEN AND ROULETTE STRATEGY SELLERS

6.1 If you only read one part of the guide, please read this

Please do read this chapter with utter most attention: the knowledge contained in this chapter will help you to save a whole lot of money and in the very best case you will be able to successfully prosecute scammers and claim financial losses as a direct result of misleading advertisement applied by the seller. **We URGE players who were the victim of scams to follow the advice at the end of this chapter very carefully and press charges to authority instead of going for the 'money back guarantee' statement which can be found on numerous sellers websites.**

Sellers are most vulnerable when it comes to operating without a **seller's license** (which is obligatory whenever someone markets and sells a product of which it is the only aim to make a personal profit, no matter if this is a roulette system, advice or device –which is undoubtedly the case with roulette strategy sellers as they openly or covertly advertise there products and / or services, this is a business as any other) and as such tax evasion on sales is the case.

Governments do not take these matters light heartedly and the financial damages to the seller could be very serious when it comes to a court case. As an alternative, when a purchased system or device fails you could also try to come to an agreement with the seller: NOT only do you ask your money back, you should also claim the financial losses occurred by applying the system or device. After all, if an architect is paid to build your house, and the house tumbles in no time, the architect will not only have to pay back the fee he charged but will also be held legally responsible for the damages which directly occurred or could have occurred because of his dodgy work. If you pay for ANY roulette system, advice or device what so ever, you expect your bankroll to increase and the seller will give the impression or suggestion purchasing his 'expertise' will make this possible. In all cases a business license is obligatory. Whenever you have bought a roulette system, - strategy or –device and the seller did not inform you of the risk involved per definition you have been scammed.

If the seller isn't willing to do BOTH (refund you the purchase + pay a damage fee) **press charges to authority and keep all correspondence of the previous transaction as evidence**. Disclaimers on seller's websites often do not have any legal ground what so ever, they are merely there to pull up a smokescreen and discourage customers in taking legal actions. By taking action you will not only have a chance to at least redeem your money spend on the system or device, you will discourage sellers to continue their scam business and on a broader level you will also help other players to avoid becoming victim to these scammers. Please consider this not only for your own but public interest.

You should not feel any remorse what so ever by taking legal actions which could represent serious financial hazard and even imprisonment for the scammer: in all cases you can be very sure the scammer wasn't thinking what the financial hazard could be for his customers when he or she deliberately lured you into purchasing his product or service.

The often stated 'money back guarantee' is a scam in itself, because the nature of the game of roulette makes it mathematically IMPOSSIBLE for the regular player (unless you would have advanced mathematical, statistical and programming skills in which case

you wouldn't buy ANY system) to seriously evaluate if a system or device is living up to the expectation created by the seller in order to sell you the system or device in the first place. The time needed to really play the system or use the device on a large sample basis in a real environment would exceed the 'money back' time span.

Find out on the next page how you can distinguish between fact and fiction: how to test roulette strategies?

6.2 How to test roulette strategies?

Many experienced roulette players use the affordable software **Roulette Xtreme** to test roulette strategies. Roulette Xtreme is not a system: it was designed to develop and test roulette systems using large amounts of spins. You should always do this before heading out to the casino, BEFORE being convinced you have bought or developed a 'certain win' system. Many roulette strategies, often sold (expensively) and advertised as 'certain win' or 'win millions' roulette systems have been exposed on Roulette Xtreme as loosing systems.

Roulette Xtreme is probably the only roulette tool which can save you money, because why would you play a roulette system for real cash if you KNOW it's going to loose anyway and it's only a matter of time before the bankroll tumbles down?

Roulette Xtreme is **the best and most convenient roulette analysis software which is currently available on the internet and represents the greatest fear of roulette strategy sellers.** It has a large user base, giving you access to hundreds if not thousands of systems by now. Roulette Xtreme will relentlessly test roulette strategies, showing you what could happen if you deploy a certain strategy in a real casino environment or online internet sessions.

And, we're proud to say our statistician contributed to beta testing and statistically enhancing the new version, giving it two thumbs up. It was however not developed by the John Solitude project, so sadly we can not give it away for free but you'll find the price very reasonable if you know it could literally save you tons of money if only you would test before using any roulette systems.

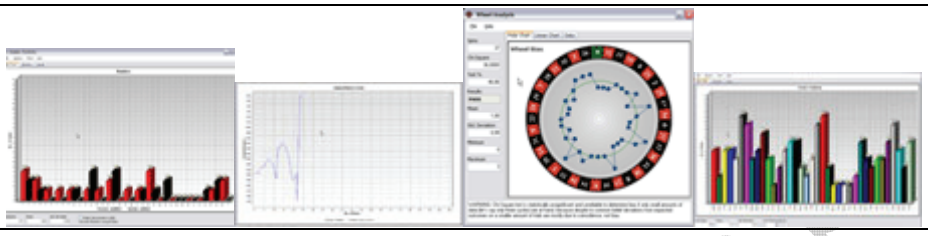
Features: (screenshots on the next page)

- suited as well **for French (single zero) and American (double zero) roulette**
- use the vast amount of **pre-programmed roulette systems** or **design your own**
- analyze your **win-loss chances** before you head out to the casino
- **share your systems** with others or **test your fellow man's** system
- use **easy statistical analysis** to keep track of the amount of times any combination appeared, in graph or datasheet
- **calculate Standard Deviation** automatically
- **generate random numbers** with the excellent build in random number generator or **analyze roulette outcomes you collected yourself**
- **analyze millions of real casino outcomes** from Hamburg and Wiesbaden or introduce your own records of roulette sessions
- play a quick free game against the computer or use Roulette Xtreme to analyze the stats of **online roulette playing**

- **You'll never find a better deal than this to prevent you would ever loose large amounts of money in the casino again: if you can not beat Roulette Xtreme, you won't be able to cut it in real play as well. The prize is only 29,95 $ and it can be purchased online immediately, with any major credit card and secured server transaction clicking on the logo on the next page.**

Screenshots Roulette Xtreme

(have been reduced in size for lay-out reasons, can be used for single and double zero roulette)



Click on the logo below to purchase Roulette Xtreme now or go to www.john-solitude.be in the links section

Roulette Xtreme 2.0
System Designer

Why should you test roulette systems using very large amounts of spins:

Having success in the short and medium time span (arbitrarily let's say between 10.000 or 100.000 spins for respectively the short and medium time span, the long time span could take literally millions of placed bets) could all be a matter of having (very) good luck, which could have been achieved without any system, device or skill what so ever.

If you deploy a roulette strategy for real cash, without testing it first in Roulette Xtreme, by the time you'll find out the strategy isn't living up to the misleading advertisement claims from the scammer, chances are the scammer will already be gone, changed nicknames or websites, or the scammer will simply claim your 'money back guarantee' has expired.

Some sellers even claimed analysis using a large amount of spins was not 'proof' their product 'didn't work', because they designed their system, strategy or device for a 'real environment'. Nonsense, because Roulette Xtreme can use as well 'real' outcomes from tables in casino's or randomly generates new outcomes just like online casinos software.

Of course, if you would test a certain strategy you bought or developed yourself in the casino, using real cash, it would take up a lot of time (and risk) before one could distinguish between luck and having an edge, by then the 'money back guarantee' which some scammers offer would be expired.

Parallel with the phenomenal rise in the presence of the gambling industry, unfortunately there is an even more devastating rise in all kinds of scammers and conmen who will advertise and sell gambling information, often for hefty prices.

Even asking hefty prices, besides the personal gain for the seller is a psychological sales seduction weapon: **as a customer you will be more inclined to think a product will be of better value because of the higher price tag. This is often the case when it comes to purchasing regular products, but when it comes to roulette systems, devices or literature this is certainly NOT the case.**

On http://www.roulettesystemreviews.com the 10.000 $ price tag system from Don Young was announced to be a loser after only 50.000 spins (using data from real wheels). Surely if only a few players would have paid this price tag the seller must be laughing his pants of by now. Many other (expensive) systems and devices go down the hatch on http://www.roulettesystemreviews.com but even the owner of the website itself does not go free of charge. For those who read the small print (what you should ALWAYS do) on this day 2005-11-19 you can read in the disclaimer on the bottom of the page '*The author has products that are in direct competition with those reviewed here.'*

Which simply means: the author is a seller of gambling or roulette related strategies as well. As the author remains anonymous, of course setting up a website like this, could only be a very cleaver way to slay of the competition in favor of his own products. Never the less, we examined the provided reviews and as far we were able to research http://www.roulettesystemreviews.com offers reasonable reviews on the major existing scams, although the reviews on computer devices do not mention certain facts.
When a system or product isn't reviewed this wouldn't mean you wouldn't be dealing with a scammer: you could be dealing with a product of the owner of the website (of which of course a negative review wouldn't make it to the website).

It makes no difference what so ever if a seller only asks 25 $ or 10.000 $ for any gambling related information: the moment the impression or suggestion is given the purchase of a system, device, whatever would lead to a completely risk free road to riches, the seller becomes a scammer. Refer to the mathematical analysis in the previous chapter, why this is undeniably the case.

Please at all times use your common sense or use Roulette Xtreme to evaluate all kinds of claims by roulette strategy sellers. Never forget that the seller is out there to achieve personal financial gain: as such he will use any legal (and more often) illegal ways of advertising his product, making claims which would often need complicated computer-, statistical- and probability analysis to seriously evaluate the claims after one has purchased the system. Of course most regular players are not up to this, so if the price tag isn't to high, out of curiosity or being desperate to gain back losses one will buy and apply such a system, finally finding out the sellers claims do not hold to be true in the long run. In some cases sellers will offer a money back guarantee (often with a limited time span) but of course this is the whole deal: it is IMPOSSIBLE in the short or medium run to seriously analyze certain claims. Unless you own a computer, have statistical and programming skills you will simply NOT be able to do so.

When it comes to **visual prediction or computer ballistics** the ONLY way to research claims is to observe a very large demonstration in the presence of the seller in a real casino environment. Even when numerous sessions would turn out to be positive, one would still not be able to fully statistically claim the system offers an edge because the sample space (which we have discussed earlier) would be too small to distinguish between having very good luck or really having an edge. At very best one could say the results are more or less probable, which is not the same as stating the results were obtained as a direct result of the system, advice or device being used. This could only be determined if one has a very large sample size (depending on the amount of numbers being played, flatbet or progression style, initial bankroll, amount of actually played spins, …). Most sellers are aware of this, and as such deliberately are speculating that the player wouldn't find out in the short run the system or device isn't working or at least not when the 'money back guarantee' is still valid. Other sellers have installed 'disclaimer' pages, mentioning in small print that the advertisements should not be considered 'factional' or some variation in this. This simply means the advertisement is nothing but a lot of bullshit –excuse the language- to dazzle you into buying something that won't live up to it's expectation, otherwise why would one place such a disclaimer? We'll tell you why: because they hope you will not read the small print, or they'll mention the small print after you've lost your money.

Suppose someone found a sure strategy of winning each time he or she approached the tables. Well, what would you do: become a regular player visiting international casino's merrily playing your road to riches while on route staying in expensive hotels, or would you spend lots of time in your room, hanging around in forums, setting up websites, advertising your sure win knowledge, hoping to make a few extra bucks on the side by selling your invention, spending large amounts of time convincing and luring people into purchasing your system or device? Let's face it: you would probably hope no one would find out, at best you would share your sure win knowledge with only a few selected close friends and relatives, hoping to make as much as you can before the casinos catch up or take countermeasures.

Someone who is very successful at gambling wouldn't need the money from sales, nor would he or she spend energy to advertise their goods. Why should they if they could make far more by playing themselves?

6.3 The scam report: the ugly, the ugly and the ugly

These are the common scam tricks which can be found all over the internet, but even in common gambling literature for sale in respectable bookshops. We would like to thank all players who contributed to this chapter by sending in their complaints. What else could we say than the classic line we have repeated so many times before: 'You have been scammed.'

6.2.1 The classic all time favorite scam

- A classic scam is stating all kinds of variations on 'This system has won … amount of money'. Sure, but where are the details: how many bets were actually placed, how large was the bankroll, what was the mathematical probability of winning or loosing the bet on the total amount of all the placed bets? Even if the probability of winning was low, this still isn't prove what so ever the positive result was achieved due to the purchased system or device, because in the short and medium time span it is statistically impossible to distinguish between having (very) good luck or achieving a good result by applying the purchased product. Of course a seller will advertise using the most seducing gain figures, but the player has NO means what so ever to investigate if the claim is genuine before purchasing the product. Serious research in any case involves using your own spin files or the ones obtained via an independent internet database. See the previous pages how to test systems. If a system is completely risk free it shouldn't make any difference what so ever if you place a 1000 or 10.000.000 bets. Obviously there would be fluctuations in returns because you are dealing with a random independent game, but if the system is a winner obviously even trillions of spins shouldn't lead to bankruptcy.

6.2.2 The video demonstration scam

- If you are interested in buying a strategy which deals with visual prediction or computer ballistics: ask the seller to observe several live sessions in which the seller will play with his own money demonstrating his skills. During the course of our research two 'visual prediction' players stepped up –often using knowledge they expensively paid for- taking our statistical challenge and both failed miserably to achieve a better hit result than mathematically could be expected in slightly less than 1.000 spins. In fact, one could even have done better by only using plain probability theory in his betting choice. Demanding a 'live' demonstration in a real casino environment instead of ordering an easily forged DVD or internet video demonstration should not be a problem: if the seller claims you can win consistently by applying his device (computer ballistics) or strategy (visual prediction) in a real casino environment, using common sense, for the seller it should be a win-win situation. The seller would be making good money for himself while doing the demonstration, and if he's successful over a longer amount of time he may even add a customer to his database. This proposal would be no different than a merchant demonstrating what his product or idea can do in a 'live' situation. If a seller would really be convinced of the consistent winnings a live demonstration in a casino should not be a problem at all. If the seller claims to be interested in helping other people to win in the long run, even traveling expenses should not be a problem for the seller: after all, if the seller claims his product is a winner, he should be able in a very short period to become a millionaire more than willing to travel around international casino's to help others

around, if only to prove the product is genuine or for self esteem. Of course the opposite is the case: sellers are not millionaires due to gambling but they aspire to become a bit closer to millionaires by being very successful as a scammer. If they were successful in gambling, they wouldn't have become sellers in the first place. If a seller does not agree to do a 'live' demonstration in a casino environment using his own money, we have just shown beyond any reasonable doubt it is a scammer. Some will argue they have been 'barred'. Our answer is: well, with all the millions you made why do you not travel or play on cruise ships? Any further investigation to acquire a live demonstration in the presence of a statistician on a modern (not biased) wheel will mostly lead to dead silence.

6.2.3 Reverse engineering scams

- One of the most dangerous scams is the 'reverse-engineering' of systems. In this case a system or devices developer will deliberately choose roulette sessions on which his system performed well, as such trying to convince the public the system 'works' in general. We have already mathematically proven each session is a highly unique event; as such a small sample space is only a very tiny representation of all the possible outcomes which could happen in the long run. The fraud is very deliberate and could lead to serious financial losses by the purchaser, because the supplied disinformation results in a false sense of security for the consumer who will be likely to think he can simply not fail if he only uses the product correctly in any session he decided to do so. Never believe a system works based on a supplied sample spin file or a video demonstration by the seller, nor use a supplied 'random' number generator which comes with the system itself

  To obtain real spin files go to:

  http://www.spielbank-hamburg.de/spielsaal/permanenzen.php4

  where you can download literally millions of spins of French roulette or go to:

  www.random.org

  which has an excellent random number generator in which you can generate random numbers for free for French or American roulette. For a more practical solution purchase the excellent software 'Roulette Xtreme' (see the previous pages) and ask a member of the VIP-forum to program a system you purchased or learn to program Roulette Xtreme yourself. It is not illegal to do research for educational reasons: if the results were negative post the name of the scammer, the website you obtained it from in the same forum, stating the amount of spins before things turned sour. Expose the scammers in any which way you can.

6.2.4 Bias scams

- As stated before: bias techniques are old hat. Of course roulette wheels are human made devices so they can never be absolutely perfect. The fact is: today in modern professional wheels space age technology is being used. Large statistical tests were applied before a wheel ended up in a casino and while it's in the casino statistical monitoring continues in real time or on a sample basis. It would be ridiculous to believe bias is very common, if you know that today's engineers are able to construct a vehicle and drop in on the right spot on a planet millions of

miles away, wheel manufacturers who often have decennia of experience in wheel developing would not be able to build a wheel which is very near perfectly random for the time it will be used in the casino, before it is replaced. Some scammers will provide in a DVD or home environment demonstration, but they'll fail to mention they are working with a wheel which is out of date and could only very scarcely be found in real casino's or even worse: they bought a second hand wheel after it was thrown out of the casino before it became unreliable. This would be the same research as purchasing a dodgy car, to state to your customers: 'you see, I told you it was dodgy'. Providing in a demonstration on DVD or in home environment doesn't prove anything what so ever: the real test is real wheels in today's casino environment.

If there would be genuine bias introduced over time the casino will be the first to notice, not the player. That's why there are professional second hand wheels to be obtained in the first place: they do not longer match the high standard the casino sets for their equipment, or they regularly chance wheels to prevent security breaches.

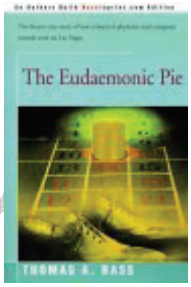
Imagine yourself in the position of the casino executive: would you risk loosing large amounts of money to high rollers because you didn't regularly check, maintain and replace your gambling equipment? Would a casino executive simply be not aware of the danger of negligence or all the roulette literature around how to determine bias? Any casino manager who would be so negligent would be fired immediately. Other sellers will argue they could spot a bias in the short run: nonsense. There is no way what so ever to statistically accurate determine bias in the short run (only wild guesses) and not one qualified mathematician nor statistician would disagree with this statement. We already have proven this beyond any reasonable doubt in the chapters on standard deviation and probability theory. If there are visible flaws (for instance the ball leaving the upper track at the same spot, or the same diamond being hit on each spin, a defect cylinder …) these flaws would also quickly be spotted by the casino security – especially when a player seems to be winning more than expected- and the wheel would simply be shut down.

Determining bias the right way is a very time consuming occupation which you couldn't do alone unless you would have enormous amounts of time to waste. You would not only need to spend countless days tracking outcomes before making any bet what so ever (see the story of Joseph Jaggers who needed six clerks full time for several weeks to determine bias in the chapter on 'What is standard deviation?). In the far majority of the cases you would find there is no bias or the bias isn't severe enough to exploit. We also would like to point out that the far majority of bias victories (for instance documented in 'Beat The Wheel' of Russell T. Barnhart –see the review on our website www.john-solitude.be - refer to old types of wheels (but of course someone selling manuals on bias will not mention this …).

Another problem few times mentioned: in the process, only observing for numerous days recording outcomes and never playing, it wouldn't be long before the eye in the sky notices what you are up to. Even if you wouldn't draw attention from security: today's high tech casinos have more data than the bias spotter at all times. More data means the statistical analysis is more accurate. Sure, there is still a very small chance a bias might occur but in the far majority of the cases the bias will not be sufficient enough to be profitable compared to the house edge or the time you would need to invest to find a profitable biased wheel could take an

eternity. **And, remember at all times: there is no way what so ever a bias spotter, a visual prediction player, a computer seller or a dealer pretending he can deliberately hit pockets or sectors could EVER prove in the short run they have an edge because it would simply not be possible to distinguish between having a good lucky run or actually having an edge.**

6.2.5 Computer devices scams



- Inspired by the book 'The Eudaenomic Pie' by author Thomas A. Bass, still a couple of computer device sellers are openly advertising and selling thru the internet. They set up sales websites and are regularly present in gambling forums to hustle for customers. In several occasions one seller was exposed in gambling forums (see the records in the Gamblers Glen forum) for having posted positive feedback about his own computer under different nicknames to increase sales. Dissatisfied customers who came forward in the Gamblers Glen forum were barked at by the developer. It is rather amusing (and bad for business) that computer device sellers do not get along with each other, because obviously they are competitors in the same small market (the customers who would fork out to buy such an expensive device). The very fact that developers would spend time in forums debating their computers is probably the best proof it isn't likely to work in a real casino environment, otherwise why would one bother going into endless discussions instead of traveling international casinos to use the device to one's own benefit. One developer also refused to have his computer seriously tested by researchers for a tv-show because he didn't want to expose himself. Kind of rare for a person who even sets up a website to promote it's very existence.

  It is however a fact that in previous decennia working computer devices have been reported to successfully predict outcomes with a larger probability than expected, but unfortunately too few, missing or opposing details are know (amount of played spins, initial bankroll, hit-miss ratio, mathematical probability of winning-loosing on the time played) to do any serious research. Successful attempts are few and only scarcely documented when it comes to real environment appliance. Of course the public doesn't get noticed of the attempts which failed due to security detection or failure of the device. However, what is for sure, with the introduction of the new low profile wheels and scalloped pockets, the amount and variation of scatter which can be expected has increased significantly. Depending on the velocity and the angle of the ball on impact, a ball can scatter, wobble out of the pocket (scalloped pockets) or drop dead. A common scam is to provide in a live or a DVD demonstration on a very specifically chosen or deep pocket wheel in a home environment. The wheel used for the demonstration could be severely biased or tilted which could only be determined by serious statistical testing by the purchaser before the seller demonstrates the use of his machine on this particular wheel. The very reason why developers refuse to subject their machine to serious statistical testing by independent researchers is of course it is far easier to impress an uninformed player, than a qualified statistician. If the wheel is biased (some numbers will naturally appear more than others due to wear of the wheel) or tilted (resulting in the ball leaving the upper track at the same spot, as such making the prediction less hard than on a properly balanced set up wheel which you can expect to find in casinos) and the seller is aware of this, the false and deliberate impression is given to the

purchaser the machine is predicting the outcomes, while it's actually the principal of bias which is at work. One developer is also known to offer (of course paid) betting advice based on a 300 spin file supplied by the customers. This is a scam because a 300 spin file is FAR too short to analyze or advice anything statistically credible what so ever.

Of course, if the seller is convinced of the merits of this machine you as a customer should always demand a demonstration by the seller in a real casino environment. If the seller agrees, pick the wheel yourself when entering the casino. And here comes the first hurdle: the use of such devices is explicitly illegal in the far majority of the venues; as a result detection will lead to confiscation and possible law suite. The correct use of computer devices needs a player who is standing relatively stable and close to the wheel itself, not noticeably tracking the wheel and accurately introducing the data in the hidden device. Bets can only be laid down after the dealer has launched the ball in the very last seconds before the 'no more bets' call, because the device needs time to measure the velocity speed of each individual spin. Remember, at all times you are in a heavily security scanned area while pulling this one off. Casino security is aware of the existence of such devices and as such a player who is constantly standing in the same spot, with an earpiece or nervously reaching into his pockets, each time laying down the bets on the very last moment will draw attention of security in no time. If the time is too short between the launch of the ball and the 'no more bets' announcement, the prognosis will not be accurate enough. And, when you are dealing with a low profile wheel with scalloped pockets a computer can NEVER predict exactly where the ball might hit a certain pocket, resulting in more or less scatter on impact which will downsize the hit-miss ratio. This is the second reason why computer device developers rather like to make money by selling the device, in stead of using it themselves: of course the risk is far less if you make money by selling such a device rather than using it yourself in a real casino environment.

When you would still feel inclined to research this possibility, before cashing out (expensively) ALWAYS demand a demonstration in a real live environment on a wheel you pick yourself, and do never forget it would be impossible in the short run to determine if the seller really has an edge or not. Never pay cash in hand. Always compare the amount of 'predicted' hits with the sequential and binomial probability figures. For instance in the short, nor in the medium term achieving a 'predicted' hit of one out of 23 doesn't prove anything what so ever. If you play a certain section or numbers again and again you may well achieve such a result also by chance. In the short run one could only state the obtained result is more or less probable, but even less likely outcomes can occur randomly in the short run. Remember, even when you would not use such a machine, if you lay down your bets on several numbers at each spin, mathematically you'll get it right sooner or later: a machine is only 'working' if it would allow to significantly and consistently achieving a better prediction in outcomes in the long run than only using plain probability theory.

Some customers who light heartedly bought such a machine only find out the hard way it was near impossible to use in a real environment or got caught in the process. Of course sellers will try and seduce you by suggesting consistent profit in the future, or will refer to the successful use in a real environment in a few cases of which important details are unknown (initial bankroll amount, amount of bets placed, probability vs 'predicted' results, …).

Again, the most reasonable question is: if the machine was working why would a seller invest a large amount of energy setting up a website and spend time seeking customers instead of using it himself and playing himself to riches so he wouldn't be financially dependent on selling. The fact is: computer device roulette sellers know very well casino security is very strict so it's far less risky to make money selling such a device rather than using it.

We can warn until eternity for scammers, conmen and roulette strategy sellers: the basic issue is the wide presence of these people is an alarming fact that there are a lot of readers out there who feel tempted to put there money in scammers hands. If you have lost large amounts of money while gambling, how difficult it might seam: try to come to terms with this, do not chase your losses because the chance for complete financial ruin is very real if you would continue. If you put your money in scammer's hands: on top of your gambling losses you'll also add the money you've spend on the scammer.

This is the main reason why some players become sellers anyway: to support there (previous) gambling addiction. The smart sellers only wish to take financial advantage of not informed players. **The fact is: if you gamble, by definition you have chosen to take risk, if there is no risk it is not a gamble. And, if there would be a certain win system each time you play, you wouldn't have a large crowd of sellers: these people would be happily playing away, not caring for sales, nor spending energy in setting up websites to hustle you as a customer.**

The fact is: most sellers know there systems will fail in the long run. The smart sellers know this by running computer simulations, the amateur sellers had to find out the hard way and now try to make up gambling depths by selling there system. There is serious tax free money to be made by selling systems and / or devices: most sellers do not have a sales license which is obligatory whenever someone runs a business or they do not comply with sales regulations. Most countries have severe penalties when it comes to tax evasion and / or making false or misleading claims in advertising. If you have purchased a system or device which doesn't live up to the claims made by the seller, please refer to the following page: 'Putting the scammer out of business'.

6.3 Putting the scammer out of business

There are several steps you can take, depending on your own temperament to put an end to the scamming business.

- Instead of informing the seller of your losses, folding or begging for at least your 'money back guarantee' (see previously the 'money back guarantee'), **immediately inform your credit card company, Paypal or any other intermediary channel you have used to make the purchase**. Each intermediary channel the seller uses to accept money makes him vulnerable. That's why you should NEVER use cash money. State the date, name, website, email address, credit card or other account of the seller, handing over e-mails or any other correspondence between you and the seller to the intermediary, claiming you have been the victim of a scam. Feel free to use any information in this guide to prove the scam. Also, demand an investigation to **find out if the seller has a seller's license for running a business**: if he has not we'll add deliberate **tax evasion** to our complaint which makes it a federal offence. An investigation is most likely to be followed which could result in freezing the account of the seller blocking down his assets until further investigation by government or a private organization filing complaint. The seller could be subjected to law suit, and if the offences are severe enough even paying caused financial damages and imprisonment for fraud can be the case.

  Remember: the seller was after your money and was willing to scam you for personal gain; it's now time for the payback. You should not feel any remorse pursuing a scammer, because after all the seller wasn't worried also when he sold you a system or device which could lead to severe financial losses for yourself being given the impression or even assurance 'the product' works. If **misleading advertisement** was used or a seller doesn't have any license to conduct business, successful law suite is a real possibility. Of course when it comes to a law suite you will not only claim your money back for the purchase, but also ask financial compensation for the losses which might have occurred, while you are at it.

- **Inform the internet provider of the scammer.** Go to http://www.whois.net and type in the web address which is being used. After a bit of browsing you should find as well the internet provider of the scammer and if it's a registered domain name even the name and address of the scammer. In some countries internet providers can be held legally responsible for supplying content which is in breach with government sales regulations. If you find out the internet provider write a registered letter to the internet provider you have been victim of a scam, include all the transactions which have taken place, use any information in this guide to prove your case and inquire if the sales going on at this particular page are in regulation with government rules. Some providers fear prosecution if they will not close down the account of the scammer. If you have written a registered letter you have an official proof you have filed complaint.

- It would be practically impossible to include all the proper channels for each country to take legal action or start an official inquiry towards the scammer, but just go to http://www.google.com , **type in search variations in your language on 'consumer protection', 'reporting tax evasion', 'reporting illegal sales' or 'reporting unethical sales conduct' with or without the word 'government' in your language** and after a bit of browsing you should find the proper channel. The following website

http://www.ripoffreport.com/editorial.asp can help you to find your way around and has a network of volunteers to assist you in making an official complaint, start an inquiry or a law suite. Even if you do NOT live in the country of residence of the seller do file complaint: in this case international sales laws still apply. If your complaint is viable and the seller obviously has made false or misleading claims concerning the product you've purchased, or the seller is operating illegally without sellers' license, it's possible to start a lawsuit by you or combined with others. In fact, if you would stumble on other unhappy customers (which you can find plenty in gambling forums like http://gambling.projectsydney.com , take the initiative to bundle the complaints and send the credit card company and / or authorities all the complaints at once. **Start a new thread in a gambling forum, claiming you were the victim of a scam to find out if there are any others. Group your complaints and send them of in a bundle to any internet provider, government agency, or private organization you see fit to handle the case.** Do not let the scammer get away with it.

- In some countries (especially in the U.S.A. this is very common) lawyers will even work for free if they receive a percentage of a successful claim. You could also **make a deliberate group purchase, only to claim a group refund afterwards**: this is from a legal standpoint a very good approach because this way you can directly show the seller is running a business without a license which is a federal offence in itself due to tax evasion.

- If you are member of a consumer protection organization **call the hot line to report fraud**. Becoming a member of a consumer protection organization is advisable in all occasions. A consumer protection organization will start an inquiry at your behalf when you are ever in a dispute with a seller. When the case is viable for prosecution they will do so.

- If you would happen to be member of a **gambling addiction organization inform** them of the scam you have been lured into and find out what is the best approach to take legal actions against the seller. Gambling addiction organizations are mostly in close communication with government officials and as such they can help you prepare your case.

The above may seem harsh words, but you can be sure this is nothing compared to the money has been lost to scammers and the financial losses that may have occurred while playing 'certain win' systems, applying certain strategy's or devices.

Do not prostitute yourself or others by having a scammer as a pimp.

7. THE EXPERIMENT

7.1 Introduction

When you've taken the time to read this guide chronologically, you might decide to stop playing roulette all together. In fact that would be a wise decision because the odds to win in the long run are AGAINST you from the very first spin you start out.

Of course you may think: 'Whatever, I'll take my chances' and this is fine also, as long as your gambling behavior does not get out of control (see the chapter 'The psychology and chemicals of gambling').

So you may wonder, if I decide to take a risk, which strategy could I follow **WITHOUT EVER BEING CERTAIN OF A SUCCESS**.

The answer will vary wildly on many factors so there is not one 'right' answer. The answer depends on: the amount of risk and time you are willing to take and feel comfortable with, the bankroll at hand, the amount of bets placed, the spread of the table, …

Let's investigate:

American Roulette is one of the worst games to play in the casino, except for Keno and some jackpots. Most historically recorded serious wins were done on French roulette, but even here the house-edge is worse than for instance playing Blackjack or becoming a good poker player. The highest ever return in gambling was done on Blackjack by M.I.T.-students and they used mathematics (probability theory and the 'law of averages' or sometimes called 'the law of large numbers'), statistics (keeping track of the deck) and very self disciplined money management in order to gain literally millions of dollars. At not one time the M.I.T.-students could be accused of cheating: they only applied probability theory and statistics in real time. However, what is often forgotten: they had a very large bankroll at there disposal (far more than any regular player could ever afford to risk) exceeding 100.000 $ and they had sessions in which they lost tons of money. Where did they get the money for such larges bankrolls: from 'investors'. They were not playing with there own money and nor should you ever consider gambling with money you can not afford to lose in the first place.

A professional player or a good gambler will always go for the game with the lowest house-edge: why would you choose a game in which your risk to loose is objectively higher than another game in the same venue? That's why we are fairly certain there are no professional roulette players, and those who pretend to be we consider to be scammers or they simply have a very large bankroll at there disposal in which case they are only able to financially deal better with serious drawbacks occurring over time. Because they have enough money to start out in the first place, they are less concerned with loosing it and betting aggressively can indeed make it appear they have won millions by gambling. The downside is: they also risked a fortune to achieve such a positive result. As usual, in the gambling literature you only hear about the very few cases in which fortunes where made by gambling: this psychologically distorts reality which is in a far majority of the cases fortunes were lost by gambling. **The casino industry is –despite to what you may be thinking- very glad with 'I have won**

serious money by gambling' statements, and such stories appearing in gambling literature, because casino executives know very well players will also be eager to pursue such an accomplishment. In fact, most casinos will even openly advertise large wins to seduce you in taking higher risk as well. Casino executives are even very pleased with all the gambling literature around promising large wins if you only do this or that: it keeps the games popular.

Many stories about bias tracking are still around, but as we have discussed earlier: due to far better wheel technology, regular maintenance and statistical analysis on a real time or sample basis the only bias promoters out there are sellers as well. They have become sellers because they found out they were having a very hard time to find a sufficiently biased wheel and all the time needed wasn't in proportion to the returns or the risk involved when the statistical analysis was hasty.

Another problem: suppose you would still be able to find a biased wheel after countless days, weeks, months of searching: you will be more likely to use high stakes to justify all the time spend. If the statistical analysis of outcomes however was hasty, crummy, maintenance has occurred in the mean time or the sample used was far too small to reach the needed statistical significance, this could also lead to considerable loss. If there is no bias present, but you are betting some numbers would appear more than expected, you will be playing against probability theory and 'the law of large numbers' (both are accepted mathematical laws) which could lead to higher loss in even a shorter time.

Typically when you would use a large bankroll the fluctuations in wins and losses will alternate, as such betting aggressively with large stakes could gain 100.000 of dollars, but a bad streak could literally cost millions. **Even without having any skill, any device, any system what so ever, a player can still achieve a positive result even after 100.000 placed bets depending on the betting strategy and luck**.

The mathematical nature of roulette is set up in such a way the more spins you play; the more the house-edge will nibble and erode your bankroll. But at the same time the fluctuation in standard deviation in your behalf may might it seam you are consistently winning in only a small sample space. Chasing losses and increasing the bankroll in the process might due to fluctuation in outcomes lead to gaining back the loss, but the chance you'll even lose more or experience serious financial problems is very real.

7.2 Here are the basic premises we used to conduct out experiment:

1. We only played French roulette due to a significantly lower house edge (nearly half) than on American roulette. We would not even consider EVER playing American roulette. This makes sense: since this experiment is dealing specifically with roulette, we'll choose the variation in which the house-edge for the player is the lowest. If we were to pick any game in the casino we would choose for Blackjack and learn basic strategy and card counting, or if you do not wish to put up with this simply walk over to the Baccarat table and play on banker. Learning how to become an excellent poker player is also a good choice.

2. We did not play dealer operated roulette, but chose automated mechanical (not video roulette) instead. We only played 'French Roulette' distributed by Eurautomat http://www.eurautomat.com in different venues. This is a low profile, slingshot type of wheel. The wheel speeds up and central centrifuging gravity force takes over combined with air pressure. The applied air pressure and wheel speed on each spin is variable and random which ensures a high degree of randomness. Each player had his own betting terminal: minimum bet is 0.25 cent, maximum bet is 150 euro, which ensures us the large spread we need. However, due to government restrictions the maximum pay-out could only be 2.000 euro on any given spin so putting 150 euro on a single number was out of the question. But, very importantly, on these machines we could bypass the max spread if so desired by playing on two terminals in stead of one as such spreading the bet. The player can also automatically repeat or raise stakes, which lowers the chance for mistakes in laying down the bets. An important factor in choosing this machine was the time between the spins: due to government restrictions on the amount of spins per hour we had enough time to reason what we were doing between each spin, the risk we were taking and if necessary back out of the game when things became hairy. Remember, as we have discussed earlier: the shorter the time between the outcomes, the higher the biochemical rush and addiction factor and the higher the chance you'll get sucked into the game making irrational decisions. This is why in some countries government restrictions are in place which we fully support to protect the players. Again this makes sense: choose for an environment and playing conditions which allow you to observe the game very carefully while at the same time trying to avoid you get sucked in the game by the enormous pace. We know as a matter of fact from our ex-croupier that in casinos dealers are instructed to increase the pace when a player is making a decent profit You may deny it, but the moment you sit down at the table and start gambling the biochemical rush has just started (see the chapter 'The Psychology and Chemicals of gambling).

3. We chose fully automated mechanical roulette because the expected tips for the dealer are a covert way to deliberately increase the house edge (see the chapter 'The dealer is not your friend'). As with the house edge itself, the player may not notice the increase in the house-edge in the short or even medium term, but the tips for the dealer mathematically increase the edge of the casino. Casinos are multi million dollar businesses so we can expect they give a fair share to there employees. Demanding the player to tip while playing a game which has over 5 % house-edge (like in American roulette) is simply outrageous: in a far majority of the cases the player will be paying the salary of the dealer anyway simply by playing. Inform other players of this fact.

4. We used a large bankroll: for each session we had at very least 2000 credits to our disposal in 0.25 cent stakes (a bankroll of 500 euros for one session). If we managed to generate some return we even increased the gained capital to 3000 credits and more in some occasions (which proved to be a bad idea). What's the idea behind this: we know having more trials to obtain at least one hit makes sense according to sequential probability theory, HOWEVER without ever being able to achieve complete certainty. So, instead of playing hours on end letting the house-edge slowly erode our capital, and turning your brain into a state of biochemical numbness, once we decided to engage a certain streak we tried to beat it putting the whole bankroll at risk. The thought of doing this may send shivers down your spine because your playing time could literally be over after only one loosing streak, but mathematically the LESS spins you play, the less you are subjected to the house-edge. Most players will come in and decide they want to spend their full afternoon or evening gambling away, but playing large amounts of spins as a pass time is exactly what the casino wants you to do. The more spins you play, the better the chances for the casino to win because of the house-edge. If this idea seams unappealing: try and introduce 'observe' time without playing. Rather play few spins but bet aggressively on the streaks you will be engaging in, than play regularly for hours on end each day. The last thing is mathematically the worst you can do for your bankroll.

5. If you have a relative or a friend who you can trust: join the bankroll to split the risk (and the profit). For instance when we were with three players we each donated 1.000 credits to have a 3.000 credits bankroll, or more if there were more players. Agree on the strategy BEFORE you do this: use this guide to determine the probability for a success for whatever combination you might prefer. Because all the systems we deployed will need you to observe rather than play, it's ideal to be with more players each tracking a wheel, notifying the others when the opportunity arises to get into action. We chose venues with several identical wheels, each player of the team tracking a different wheel.

6. There are ALWAYS two sides to a coin: if you choose betting combinations which have a large return (for instance only playing a single number) the probability to get the bet right lowers severely and in most occasions you'll need far more trials to get the bet right. If you choose a betting combination with a higher probability of a hit (for instance playing two dozens) the profit will be lower and you will have to increase the stake more dramatically after each miss, increasing the amount of capital that is exposed to the house edge. There is no 'right' or 'wrong' answer to this choice: if you seek high profit but low probability go for only a few inside bets, if you seek lower profit but more probability go for the outside bets. For our experiment we chose a combination of both extremes: single or only a few numbers and double dozens.

7. Do NEVER, under not any circumstance bet more than you can afford to loose. Think in front what the money represents to you if you might loose it. Rather walk into the casino thinking how much you are prepared to risk, than thinking on how much you want to win. Remember: even having a large bankroll is not a guarantee you will win, you could even loose a very large bankroll the very first time you sit down at the table. Using a large bankroll however undeniably gives you a better chance to deal with the variance of outcomes: that's why we joined our individual bankrolls into a large bankroll. If you do not have friends or relatives, rather choose to only play once a month than once a week. However

be aware of this: no matter how large the size of the bankroll you are at risk and let no scammer ever tell you otherwise.

8. Whenever we felt tired, bored, whatever we simply stopped playing. Gambling in a responsible way needs you to be alert. Always keep track of time, that's why in most casinos you will not find (very) visible clocks: the casino wants you to play as long as possible and loose track of time. Do not play sessions for over an hour (less is far better). If you want to remain in the casino, rather track a wheel without playing or observe the atmosphere than play. Observations will teach you one thing: there are far more people who will walk out broke, than those who win on a specific occasion. And, when you come to know the 'in crowd' and regular players, you know that high rollers, being incredibly successful on some days, will loose a fortune on other days.

9. Each of the bets we made were predetermined: we knew exactly when and for how long we would bet and how much we would be willing to risk on each spin. Determine your money management BEFORE you walk into the casino, NOT while you are in there. Even for us it was highly challenging to not get sucked into the game and to avoid starting making bets we did not prepare for. If you wonder how comes one can afterwards be angry one didn't manage to stick to a plan: please read the chapter 'The Psychology and Chemicals of Gambling'. The casino will do everything to make you loose control: you should be very aware of this.

7.3 Here is the strategy we used to conduct our experiment:

Because we wouldn't be in there long or regularly enough on the same tables we didn't bother searching for bias. In three occasions we split up in shifts and gathered a large amount of uninterrupted sample spins (7221, 8542 and 6878 to be exact) only to find there was no significant statistical indication of bias in each of the cases. One table came close, but more observations would have been needed to confirm the bias and even if it had been there it would hardly have been profitable.

This is what bias promoters or 'advantage players' will never tell you: collecting the large amount of data you need to seriously study bias takes up an enormous amount of time, and by the time you have gathered it the casino will have spotted it as well. We know that in respectable casino's maintenance occurs at least once a week, so as a fact all statistical data that would have been gathered BEFORE the maintenance occurred becomes invalid because the conditions have changed.

In any case, the probability you are playing a random wheel is FAR HIGHER than you would be playing a biased wheel. If the wheel is random probability theory is your best shot to mathematically and objectively evaluate your chances. If you think you would be playing a biased wheel, please do remember you should always seriously analyze outcomes on a large sample basis before you could obtain such relative certainty. If the outcomes you used are samples from different interrupted sessions you should find out if there was maintenance in the mean time, otherwise the data is NOT valid. Any difference to the conditions of the wheel between outcomes of different sessions (be it leveling, calibrating, cleaning, turning or switching the pocket separators, or even the complete switching of wheels without you noticing) makes any data from previous sessions statistically invalid. That might explain why we didn't bother watching for bias, neither should you unless you would have all the time of the world to do such research (and accept the fact that in more than 99 % of the cases you will only find there is no bias, or not sufficient enough bias to be exploitable).

We used a controversial starting point:

The hypothesis that sequential and binomial probability for combinations of outcomes is INDEPENDENT from the moment the player starts betting. Our argument is: as well as roulette machine has no recollection of previous spins, it has no recollection of the moment a player starts betting. What does this mean: many mathematicians will argue if a player starts betting, the probability figures are such and such a hit might occur within the amount of trials a player is betting. We argue this to be a wrong approach because the statistical probability for combinations occurring is independent from the betting behavior: betting or not betting does not influence the probability for certain combinations to appear or not to appear. Again, this is a hypothesis, but we figured out it would be as good as any and the best part was we would only make a fraction of the bets of someone who would play for hours on end. This strategy is undoubtedly better, because one is less exposed to the house-edge if one only places 100 bets in stead of a 1.000. Although the house-edge remains the same for each spin you play, the more spins you play the more this will erode your capital in the long term because on each trial you slightly take a higher risk (36-1 or 37-1) than the reward (1-35). Read the chapter on 'The House-Edge' why this is a mathematical fact.

A general mathematician will (typically) think in the short run (the amount of bets placed and the probability for each bet to have a success or a loss), a statistician will have a tendency to think in the long run: how many times would a certain combination appear on a large sample basis and what is the probability such patterns would appear while the

player is betting. Most successful betters are statisticians: they have a tendency to think long term.

However, neither approach can EVER obtain complete certainty in roulette: because not one number is ever removed from the game on any given trial it is impossible to predict exactly when a certain streak might or not might happen. We can only determine what is more or less likely and accept the fact that even the highly unlikely will happen occasionally. And, what is more important: we simply do not know which combinations occurred while we were not at the table; any statistical analysis is always restricted to the outcomes we observed.

In any case, being patient for a given pattern to occur reduces severely the amounts of spins we were going to play, and as such you would on a yearly basis play far less spins, be less exposed to the house-edge, than someone who will be betting from the moment he comes in till the moment he walks out for several hours on end. However, when we decided to engage we will go for an all or nothing shot: we'll put the whole bankroll at risk and as such we will bet gradually more aggressively within the spread to beat the streak.

Is there certainty we'll beat the streak: NO. We even expect in front on several occasions we'll loose the bankroll that why you should never bet with money you can not afford to loose.

Combining as well as our knowledge on standard deviation, sequential and binomial probability we chose for the following systems. **It should be made very clear that NONE of these systems represent a 'sure win' at any time –that's why you should NEVER bet more than you can afford to loose-** however each one is designed to make the probability of a win as high as possible within our bankroll and the table limits we were playing.

7.4 Here are the systems we deployed

7.4.1 The John Solitude Wheel Frequency Analysis

As this system has been discussed in much detail before as well as in our guide as in gambler's forums, we refer to the previous guide: The John Solitude Wheel Frequency Analysis v3_1 for detailed information on this system. The full guide can still be downloaded for free on several webpage's:

- http://myaz.fateback.com/jswfa.html (complete with feedback of several players)
- http://www.freewebs.com/turbogenius/clercxjsolitudedoc.htm (complete with the link to the heated and lengthy discussions which occurred at a gamblers forum in which the author mainly faced sellers who were obviously not to pleased with the content)
- http://www.uxsoftware.com/pages/article.html
- http://www.gambletowin.bravepages.com

We are working on an updated version at this time, but since we do not know when you will be reading this, check on www.john-solitude.be to find out.

If we have been correctly informed, there should also be two forums out there which have translated the previous guide or portions out of it in Spanish and Russian. As we do speak neither, we have no way of knowing if these translations were accurate or not, nor do we know how the distribution occurs. For original versions, always refer to www.john-solitude.be .

For our experiment, as a rule of thumb, we never settled for less than 90 % sequential probability for the TOTAL combination to appear or not (which means not simply the bets we were actually placing). Remember, for our experiments we did chose the controversial hypothesis the probability for the patterns that will be generated are INDEPENDENT from the betting behavior of the player. The bankroll being used for our experiment was always approximately 2000 credits for any given streak we decided to engage in –slightly less or higher depending on the amount of numbers which qualified for the John Solitude Wheel Frequency and previous gain or loss in the session.

The statistical base for this system is that it is unlikely (however not certainty) that a large deviation on one of the sectors, would be followed by another large deviation. You can compare this to the flipping of coins: it would be unlikely in 10 successive trials you would manage to flip all heads or all tails. As such it would even be more unlikely that a pattern of all heads or all tails in a row would be followed by another 10 tails or heads in a row: the sequential probability (multiplication rule of probabilities we have discussed before) for the pattern to continue (all heads or all tails in a row) diminishes the further it goes. The difference with 'gamblers fallacy' is that we statistically calculate in front what the probability is for each of the given combinations to appear or not appear in successive trials. As a result we also have to accept that 100 % probability could only be achieved by rounding up the figures, or otherwise 'certainty' of winning the bet is not possible (resulting in a loss depending on the probability figures one has chosen for the bet).

Of course the machine itself has no knowledge of patterns, but neither has the earth a 'conscious' while making an orbit in space. However, mathematically it is possible to

predict with margin for error where the earth will be orbiting within 100 years. Mathematics is only a tool to study reality but mathematics does not define how reality should be: in this case probability theory is used to analyze the outcomes of roulette and the nature of chance. We can analyze what is more or less likely what will happen within x amount of trials: if all chances are equal on any given amount of trials it is always more likely that you will have alternations in the appearing of chances (different numbers appearing), rather than the some chances would continue to appear more than others (after a large deviation, the same numbers or sectors keep on appearing in a higher rate than expected).

If one is stating that it is unlikely after observing 10 heads or tails in a row, we would observe another 10 heads or tails in a row; one isn't committing gamblers fallacy but one is stating a statistical fact. If we would examine millions flips of coins you would fine there are far less patterns in which the chances did not alternate within 20 consecutive trials, than patterns of for instance 20 times the same chance reappearing consecutively. The bias spotter who didn't take the time to do serious statistical analysis before making a statement about bias being present, is in fact making the 'gamblers fallacy': the belief that if a chance appears more than others on a small sample base, it would continue to do so, is 'gamblers fallacy'.[21] and in contradiction with probability theory.

7.4.2 Even chances

Let me point out that the name 'even chances' is another illusion the casino has created. When you are playing red, black, odd, even, high or low you have a probability of 18/37 in French roulette or 18/38 in American roulette for a success on a single trial.
An 'even chance' would mean you have a probability of 18.5/37 (French roulette) or 19/38 (American roulette) to win on any given spin. This is a very important distinction: in fact the correct term for 'even chances' would be 'slightly less than even chances', but of course the first one seams more appealing to the player.

There is no difference what so ever if you play red, black, odd, even, high or low. The probability figures are the same for each: each set does contain 18 numbers.

Remember, to make our chances as high as possible to beat the table, we have deliberately searched for a table with a high spread, in our case the spread was between 0.25 c up to 150 € on any of the even chances for a single trial. We could however bypass the maximum spread because on the automated roulette tables we were playing the spread applied for the bet on one terminal. When the maximum spread was reached for one terminal, we used two terminals to spread the bet on the same chance. This is another advantage of playing in a team. Once we decided to engage in a streak, again we set out to play the same chance as long as possible within the spread, putting the complete bankroll at risk.

Were we sure we were going to win each time we did this: NO. In fact even one failure to beat the streak could have evaporated the bankroll for the given occasion and recovery for this system alone would be very hard. But, we figured out the sequential and binomial probability figures for this bet were acceptable for the limited amount of trials we were going to play during the experiment, so we accepted a calculated risk. We had eleven trials to ensure the even chance we were playing would drop at least once within our betting trials. And, we followed the controversial hypothesis we would only

[21] If you would want more information on this, please refer to statistical study on the 'central limit theorem', 'standard deviation' and the 'Z-score'.

play an even change if it did not appear in the previous eight trials before making the bet. As such, let there be no mistake, the real bet is: would we observe a combination of 20 equal even chances in a row while we were at the table? The sequential probability that in 20 consecutive trials on a French Roulette table at least one red would appear within a streak of blacks or vice versa for any of the even chances is 0,99999837.

If black did not appear in the previous eight trials, we played red. If odd didn't not appear in the previous eight trials, we played odd. Whatever even chance did not appear in the previous eight trials we would have a go at it, swinging the total bankroll gradually into action. You'll notice however we did not completely abandon the even chance which had been dropping before: this was only a matter of buying more trials within the bankroll and the spread to get the bet right.

We would settle for very low profit, but a very high probability of getting the bet right. If zero dropped in the mean time we would keep the progression going, slightly increasing the below figures so we would still end up with a profit of only one.

Red	Black	Minus	Money	Profit
2	1	3	0,75	1
3	1	7	1,75	1
5	1	13	3,25	1
9	1	23	5,75	1
17	1	41	10,25	1
33	1	75	18,75	1
65	1	141	35,25	1
129	1	271	67,75	1
257	1	529	132,25	1
513	1	1043	260,75	1
1025	1	2069	517,25	1

This is a very aggressive bet, but the downside is: most dealer operated tables will not allow you to place this bet due to table limits. However, on some automated roulette like in our case the spread was large enough or we could even increase the spread by betting the same chance on two terminals of the same table. Check the spread on the table before you play it and remember at all times **this is NOT a risk free bet**, but it does offer a very high probability figure of pulling it of. In fact, in over 40.000 observations the bets we placed when the qualification was met were winners. BUT, and there is a large BUT to this one: we can never predict when a combination like 20 in a row will happen, if you are very unlucky, it could even appear the very first time you are at the table. Is it a risk: yes once again.

7.4.3 The Triple Double

This one is very similar to the previous: we would observe and wait until we had 3 double streets (6 numbers a piece = 18 numbers) which did NOT appear in the previous consecutive 10 spins before engaging. The progression on this one is very simple: just double up on each of the three streets you will be playing. On a hit on any one of your streets before your bankroll runs out, you'll have a profit of 3 units.

Double Street 1	Double Street 2	Double Street 3	Total Bet	Minus	Money	Profit
1	1	1	3	3	0,75	3
2	2	2	6	9	2,25	3
4	4	4	12	21	5,25	3
8	8	8	24	45	11,25	3
16	16	16	48	93	23,25	3
32	32	32	96	189	47,25	3
64	64	64	192	381	95,25	3
128	128	128	384	765	191,25	3
256	256	256	768	1533	383,25	3

In the first three columns you see the stake in credits on each of the double streets, in the fourth column the total amount of stakes placed per spin, in the fifth and sixth column how much credits or money there will be lost if there was no success on not one of the trials, in the last column the profit if a success occurred on any of the given spins. The real bet is: we bet against the probability that in 19 trials (10 observed + 9 bets) not one out of 3 double streets will appear. The sequential probability that this would not happen is 0,99999683. Again we have a large probability of a success, and only seek very modest profit to buy as much trials as possible within our bankroll.
The downside: in a case of failure we would risk a total loss 383.25 euro's.

7.4.4 James Bond with a twist

Anyone who saw 'Casino Royale' may have noticed James Bond played the double dozens, tripling on each occasion. We consider this to be a financial suicide system, so we only employed it in extreme occasions after we've observed 5 hits in a row on a particular dozen. This system should never be played if you only have a small bankroll you can put at risk because the progression is very aggressive and profit only very small. However, the probability for a hit becomes very high if you have a large bankroll and can buy a sufficient amount of trials. To still obtain a profit of one you need to triple the stake on each of the two dozens or columns you are playing after each mistrial.

D1/C1	D2/C2	Total Bet	Minus	Money	Profit
1	1	2	2	0,5	1
3	3	6	8	2	1
9	9	18	26	6,5	1
27	27	54	80	20	1
81	81	162	242	60,5	1
243	243	486	728	182	1
729	729	1458	2186	546,5	1

As you can see in the first two columns, we started out with a stake of 1 on each of the two dozens or columns which did not appear in the previous 5 spins. After each mistrial we tripled the stake. But, because we only started out playing 24 numbers which did not appear in the previous 5 spins, the real bet was: will we observe a combination in which not one out of 24 numbers will appear within 12 successive trials (5 observed + 7 bets). The probability that in 12 trials one out of 24 numbers will appear is 0,99999646.

Again we have very low profit, but very high probability of a success. The downside: in our case a loosing streak will set us back 546 euro's in total, this is the risk we were prepared to take with a joined bankroll.

7.4.5 The binomial tale

We will play any number or numbers that did not appear in the previous 222 spins. At each successive trial we'll flat bet these numbers and only start increasing the bet when profit on a success drops below a profit of 1. (Please be advised this was the calculation for French roulette with a bankroll of 2000 credits, for American roulette you should at very least increase the amount of non appearances up to 266 spins: because the amount of probabilities on each spin is higher this is also of influence to the figure you obtain when applying the multiplication rule of probabilities and the binomial probability).

For instance if there would be one number that qualifies after 222 non appearances, your first 35 bets on this number will be flat bets, afterwards you only increase the stake if your profit drops below one in case of a success. So starting from the 36th trial we'll bet two units on this number until the 54th trial when we switch to three, and so on, until either there is a success or our bankroll ran out.

It would take a large amount of pages to include all the progressions for playing only one or very few numbers, so we will not include them, but please refer to Excel to work out the money management before you try this one.

As with each system there is a positive and a downside. We could buy a large amount of trials because the investment on each trial was very acceptable (one credit per trial for the first 35 trials), but because you only play one number the sequential probability to get it right only increases only very slowly.

7.4.6 The binomial twelve

This is a variation on the previous but this time we focused on the dozens and columns. We would play any dozen or column which did not appear in the previous 15 trials (French roulette), starting out slowly and steadily increasing the bet using the complete spread of the table we were playing. In this case the real bet was: will we observe a combination in which 12 numbers will not appear in 31 trials (15 observed + 16 bets).

Trial	Bet	Total	Money	Payout	Profit
1	1	1	0,25	3	2
2	1	2	0,5	3	1
3	2	4	1	6	2
4	3	7	1,75	9	2
5	4	11	2,75	12	1
6	6	17	4,25	18	1
7	9	26	6,5	27	1
8	13	39	9,75	39	0
9	20	59	14,75	60	1
10	30	89	22,25	90	1
11	45	134	33,5	135	1
12	67	201	50,25	201	0
13	101	302	75,5	303	1

14	151	453	113,25	453	0
15	227	680	170	681	1
16	341	1021	255,25	1023	2

Once again we want to strongly stress that each of these systems represents an element of risk: we tried to achieve a high amount of probability to get the bet right within the specific spread of the tables we were playing and the bankroll that was at hand. High probability however NEVER equals certainty.

You may be wondering how to 'clock' (note down outcomes of tables correctly) wheels? Please refer to our website www.john-solitude.be . We use templates we have custom designed in Word for this process and which we print out before entering the premises.

7.5 The results

We had set out to play 150 sessions. A session is any occasion on which we entered a gambling venue, played only a couple (on some occasions only 5 bets) or numerous bets (over 100) depending on the betting qualifications we had set in front, the amount of 'tracking players' and the time we had at hand for a given session.

You'll notice that there is a high variety in the amounts of wins and losses. This is easily explained because on some sessions we were up to four players in the same venue, each tracking a table on the look out for betting opportunities. Make no mistake: to follow the strategy we needed patience, accurate 'clocking' and self disciplined money management before laying down our bets. In several occasions several hours of observations were needed on several tables before even placing down one bet.

But, as described before when we found a betting opportunity we would swing the total bankroll into action in order to beat whatever pattern that was at hand. When we were with at least three players we increased our bankroll up to 3.000 credits (1000 credits / player inlay) or 4.000 credits (four players) as such splitting the risk, the wins and losses afterwards. The reason why several players joined in this experiment was because it would be highly time consuming for only one player to play 150 sessions in a real environment. The downside was: once other players who were not part of the team noticed what we were up to were interested in joining in. This is a bad idea if you did not have a previous meeting in which the basic strategy is laid out

Typically each player was on the look out tracking one table, each with a tracking sheet, informing the others when a betting opportunity presented itself. Playing in team offered the benefit that we 'socially' controlled the experiment: as each player had invested in the bankroll, one would be less inclined to change the strategy we agreed up on before we entered the casino.

Our playing strategy for roulette can be easily summarized as:

- play as less spins as possible
- use a large (gathered) bankroll and once you engage bet the same chances until a hit or loss of the bankroll
- make optimal use of standard deviation, sequential and binomial probability
- be accurate in tracking and keep your patience
- rather go for low profit but high probability
- start out at minimum stakes to make optimal use of the spread
- do not divert from the predetermined strategy at any time

In total 42.563 observations were done by all the players and only 1.142 bets were placed in total for all the previous described systems, producing a total profit of 2.863 euros (which had to be split depending on the amount of players who joined in). We ALWAYS started out with a minimum stake of 0.25 cent, increasing the stake as we had predetermined depending on the pattern that we were playing. Whenever we felt tired or bored we simply walked out, no matter how much win or loss at a given moment.

We had our dark days as well (see session 46 and 47) in which the 'Triple street double' and 'James Bond with a twist' failed consecutively due to an occurrence of patterns of which the probability was very low (12 dozens in a row). In these two days 1.400 euro's were lost due to being seduced in increasing the bet to beat the negative streak.
It once again was a fierce reminder it is far wiser to accept loss of the initial bankroll on some days, rather than to prolong the progression (in which case only a couple of extra

trials could be bought against very high stakes) to chase the loss. It also shows that even players who are very aware of the psychology and chemicals of gambling, can still be sucked into the game: we even argue it is biologically very difficult to keep your self discipline the longer you are in the venue at any given session (see the chapter 'The Psychology and Chemicals of Gambling'). One should always be aware that even patterns of which the probability is very low will show occasionally simply because you can never exclude the mathematical probability that they wouldn't appear all together. Remember Murphy: 'What can happen, will happen.'

The JSWFA, only starting out at 90 % probability never failed, although at numerous occasions we even lowered the probability when we found that the wheel distribution had produced large adjoining gaps (minimum 9 adjoining numbers) of which only one or two numbers had dropped in several consecutive trials (See explication in detail in the previous guide). When we finally got a hit within our bankroll, and still there were eight numbers of the nine adjoining ones which did not drop we kept on playing the same nine numbers until another hit occurred. According to binomial probability and standard deviation this made sense: it would be unlikely (however, not certainty) that a large deviation would be followed by another large deviation in which the same number set would not appear.

The 'binomial tale' proved to be the most risky bet (just like we expected) which failed whenever numbers didn't not appear during 300 trials. This is no surprise because of all the systems we deployed this one had the lowest probability of a success, but the highest profit on return. Again these are the two sides of the coin: if you want high profit (for instance 35-1) you'll have to pay with low probability of a success. The maximum amount a number did not show was 387 trials which can still be considered random not bias, unless this pattern of low appearance below the expected average would continue for a prolonged amount of time.

The even chance bet proved a winner all of the time, simply because in over 40.000 observations not one 20 combination of 20 equal even chances in a row pattern did appear.

Following are the details per session:

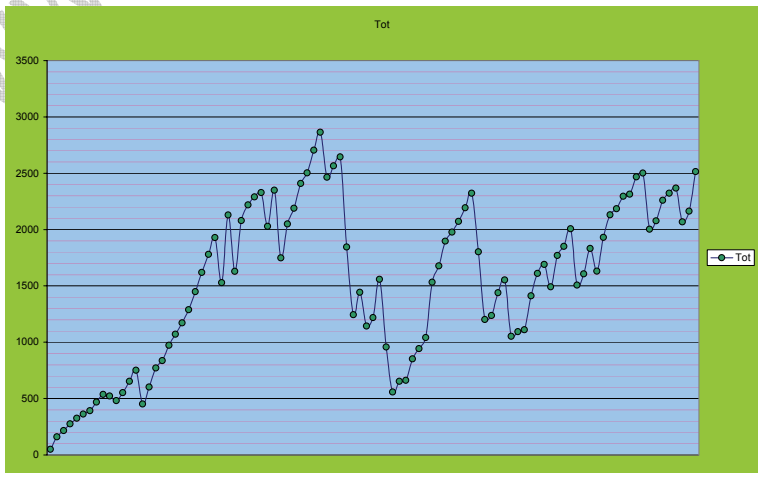
S = Number of session
W = Win (in euro)
L = Loss (in euro)
Tot = Total balance (in euro)

S	W	L	Tot
1	50		50
2	110		160
3	55		215
4	60		275
5	50		325
6	38		363
7	30		393
8	75		468
9	70		538
10		-15	523
11		-41	482
12	70		552

13	100		652
14	100		752
15		-300	452
16	150		602
17	170		772
18	65		837
19	135		972
20	100		1072
21	100		1172
22	117		1289
23	160		1449
24	170		1619
25	160		1779
26	150		1929
27		-400	1529
28	600		2129
29		-500	1629
30	450		2079
31	140		2219
32	70		2289
33	40		2329
34		-300	2029
35	320		2349
36		-600	1749
37	300		2049
38	140		2189
39	220		2409
40	95		2504
41	200		2704
42	160		2864
43		-400	2464
44	100		2564
45	80		2644
46		-800	1844
47		-600	1244
48	200		1444
49		-300	1144
50	74		1218
51	340		1558
52		-600	958
53		-400	558
54	94		652
55	10		662
56	190		852
57	90		942
58	100		1042
59	490		1532
60	145		1677
61	220		1897
62	80		1977
63	95		2072
64	120		2192

65	130		2322
66		-520	1802
67		-600	1202
68	35		1237
69	203		1440
70	113		1553
71		-500	1053
72	41		1094
73	17		1111
74	300		1411
75	200		1611
76	80		1691
77		-200	1491
78	280		1771
79	80		1851
80	155		2006
81		-500	1506
82	100		1606
83	225		1831
84		-200	1631
85	300		1931
86	200		2131
87	54		2185
88	110		2295
89	18		2313
90	154		2467
91	35		2502
92		-500	2002
93	75		2077
94	182		2259
95	64		2323
96	45		2368
97		-300	2068
98	95		2163
99	352		2515
100	87		2602
101	12		2614
102	60		2674
103	78		2752
104	110		2862
105	140		3002
106		-600	2402
107	23		2425
108	180		2605
109	75		2680
110	45		2725
111	110		2835
112		-200	2635
113	45		2680
114	25		2705
115	5		2710
116	145		2855

117		-500	2355
118	218		2573
119	95		2668
120	87		2755
121	63		2818
122	45		2863
123	145		3008
124	55		3063
125	75		3138
126	96		3234
127	45		3279
128		-600	2679
129		-100	2579
130	32		2611
131	89		2700
132	5		2705
133	115		2820
134	145		2965
135	96		3061
136	54		3115
137	89		3204
138	0		3204
139	63		3267
140	93		3360
141	121		3481
142		-500	2981
143	89		3070
144	41		3111
145	10		3121
146	0		3121
147		-300	2821
148	55		2876
149	92		2968
150	5		2973



8. QUESTIONS AND ANSWERS

During the time the previous guide appeared and the new one you're reading now, we've received literally hundreds of questions on roulette. Below you'll find the most common ones, so we wouldn't have to answer each question on an individual base.

If however you would still have questions you didn't find an answer to in this guide, you can send an e-mail to john.solitude@telenet.be Please accept we do not have the time to individually answer questions on a daily nor weekly basis, due to the sheer amount of questions which are send in. Donators will always receive first service: check on www.john-solitude.be how you can support our project. Do not ask us which commercial roulette strategy to buy, because we do not sell any, nor do we recommend buying one. For analysis of a specific system vs large amounts of spins please read the chapter 'Scammers, conmen and roulette strategy sellers' and buy a copy of Roulette Xtreme. This tool was not developed by us, so we can not offer it for free. Always remember that each roulette session is a highly unique mathematical event as such good results in only a limited sample (even 40.000 observations like in our experiment) could prove disastrous on any other occasion.

If your question is already answered in this guide or the previous one, you'll receive no response. Interesting questions or observations will be individually answered and can make it to the website.

Is flat betting better or worse than progressions?

This is a question which has more to do with the betting temperament of the player, than one or the other would be 'better'. If you flat bet, you typically increase the amount of trials you can buy with your bankroll: increasing the amount of trials mathematically increases the probability at one trial or another you might get the bet right. However, at some occasions getting the bet 'right' would still mean you are loosing money because the stake wasn't increased to regain the capital you have invested on the previous trials.

A progression is mostly used to make sure on a success you gain capital. In the case of our experiment our objective was to bet aggressive once a qualified opportunity did arise, which is why we used progressions. We wanted to make sure if we had a success we gained capital. If you want less risk of loosing large sums of money (but also decrease the volatility of winning money) you can chose to flat bet.

Flat betting is however a WRONG choice if you decide to use it only to make your playing time as long as possible: remember in the chapter 'The house-edge' we have seen the more spins you play, the longer you will be exposed to the house edge. This is the downside to flat betting: you'll have to play more spins because on some occasions a winning bet would still mean you have lost capital on the total of all the bets you placed.

Why did you choose to play automated mechanical roulette instead of dealer operated roulette?

The mathematical house edge is lower (see the chapter 'The dealer is NOT your friend'), in our case the spread was better and the minimum stake was lower so we could buy more trials within our bankroll. And, we could even bypass the spread by splitting up the

stake on different betting terminals of the same wheel. Playing on a 2 € minimum bet / chip would severely increase the finances needed to play our strategy (for 2.000 credits you are already talking 4.000 dollars or euro's for one session). Because we knew in front we could loose the bankroll at any given occasion we decided against it to take such a high financial risk.

Can I use this guide for internet operated casinos or video game roulette?

We do not trust internet casino's for several reasons:

- Most servers of internet casino's are located in offshore countries where there are little insufficient government regulations and inspections on gambling when compared to European countries or the U.S.A. It is very easy to 'rig' a random number generator depending on the bets that are placed. The player is completely dependent on the fair play of the organizer, but at the same time it would be very easy for the organizer to manipulate the games they offer. If the game is manipulated, all probability calculations are invalid.

  As a matter of fact some organizers even offer 'free play' roulette sessions with manipulated probability odds, only to seduce the player in playing for cash. If it is possible to manipulate the game in 'free play' mode it's surely possible to rig the game when playing for cash. Proving the game was fixed would be very hard because one would need to collect a large amount of trials to distinguish between having bad luck or being scammed. Even if one could prove the 'fix', the gambling regulations of the country in which the server is placed could be insufficient to take successful legal action.

- Video feed roulette is mostly interrupted to switch between a shot of the dealer launching the ball and a camera shot to show the final outcome. It wouldn't be very hard to play a prerecorded video feed of the second camera angle on some occasions. When playing video feed roulette it is not possible to only observe without playing: one is expected to play regularly or one gets thrown out of the room.

Were you sure you would end up with a profit after all the sessions?

No, but we figured out the calculated risk was worth the bet. We knew we would not loose nor win a fortune. You should never forget that 'winning' a fortune in gambling, especially when it comes to roulette can NEVER be done unless you are prepared to risk a fortune. If one tells you he 'won' a fortune, your first question should be 'how much did you risk' and be very aware one could have lost that fortune as well. **Do not believe wild stories deliberately spread by internet scammers unless you were present at such a 'win a fortune' event in person.** If the scammer insists, invite him to 'win a fortune' while you are present, gambling with his own money of course. And remember the knowledge you gained in the previous chapters: in the short and medium run it is impossible to distinguish sufficiently between luck and having an edge.

Can I expect similar results as yours?

No, as we have previously discussed each session is a completely unique event. Simply because a certain combination never appeared in a given amount of trials, we could not

state it could not happen if you had a larger sample space. Your success or loss will depend on the amount of betting opportunities, the amount of times a combination appears of which the probability is low (but never low enough to state it could never happen within the amount of trials you will be playing) and how kind the standard deviation is towards you. The player has no influence over standard deviation; he can only calculate it to estimate what is more or less likely. Remember the wise Murphy: 'If it can happen, it will happen'. In roulette not one number is ever removed out of the game, even the most remote combinations can happen occasionally. We can state the probability for observing certain combinations is very low, but we can not state they would never happen in the trials you would be playing.

Is luck a factor when playing roulette?

Yes. Although with probability theory and statistics we can mathematically estimate how low or high your risk is when you play a certain bet for x amount of trials, we can mathematically never exclude the probability that a combination of which the probability is very low could not happen altogether. Even the most successful gambling M.I.T.-students who used advanced money management coupled with complicated probability and statistical analysis had to cope with loosing sessions in which they lost serious amounts of money. They even had the benefit they played a random dependent event (Blackjack) while roulette is a random independent event, which makes it much harder to eliminate the probability of all possible outcomes.

It is luck that determines if you would encounter such a low probability event or not when you are at the table. Many scammers will only state otherwise because if they would state luck is a factor, you would not be inclined to buy whatever product it is they are offering. If it however possible to push your 'luck' as far as possible by using self disciplined predetermined money management and figuring out the probability odds for each of the bets you'll be taken. Study the spread of the table, the probability percentages, determine the risk you want to take and stick to it. Be self disciplined at all times; in most occasions it's better to accept reasonable loss rather than to chase loss using financial resources you could not afford to miss if things turn sour.

What about dealers' signature?

Its nonsense: in a far majority of the venues dealer shifts are far not long enough to seriously research such a statement. Even the slightest millisecond in velocity applied to the launch or the slightest difference in wheel rotation will result in a totally different outcome. Refer back to the chapter 'The dealer is NOT your friend' to check our findings.

Why are you giving out this information for free?

During the years we have seen many players, friends and relatives lose large amounts of money on gambling. We despise the tactics that casino's and internet scammers use against players. The only way to reduce the vulnerability of the player is to provide in information about the risk that is always at hand when gambling. When it comes to gambling information it is either biased (an author or seller wants to make money, so information is left out to seduce you into a purchase) or the information is too complicated for the general player who doesn't have an understanding of stats or probability theory.

We do not charge for this extensive guide because it is our goal to ensure the distribution amongst players would be as high as possible.

However, it took a lot of time and in some cases money to put this guide together and we do have to pay the additional cost of reserving a domain name and server space.

We hope if you found this information useful you would give us a small donation in return.

Even a donation as small as 1 $ is proof for us you appreciated our huge effort to avoid you would become victim to scammers.

For a 7 $ donation we'll even throw in the spreadsheets our statistician (which we paid for) came up with, and the tracking sheets we use ourselves. These are not systems but tools for advanced statistical analysis.

For a 10 $ donation we'll mention your name (or nickname) as an honorable donator on our hall of fame page, soon to be added to our website (or maybe it is already depending on the moment you read this).

Refer to our website http://www.john-solitude.be how you can make a donation.

Alternatively, if you buy a book on gambling, use the Amazon links on our website. Visit our literature section with independent reviews of gambling books. We will not make a fortune if you do so, but receive a 10 $ gift cheque from time to time which we can use to reward the people who contributed to this guide without any compensation.

You would be supporting a good cause: the further free development and distribution of this guide to the benefit of players worldwide instead of spending your money on some scammer. The donations gathered will only be used to pay for the statistician we've consulted, literature we bought along the way, the cost of purchasing a domain name, server space and the guy who put the website together and frankly the huge amount of time we've spend to bring you this free guide.

Please be informed that we have no control over the content of the Google ads, these are automatically generated based on content. We advise you at all times to be very cautious before you purchase systems, - strategy's or – devices over the internet, but feel free to explore the rubbish. The only product we support is **Roulette Xtreme**, because this tool allows you to analyze your risk using certain systems, before you risk your money. Refer to the chapter 'Scammers, conmen and roulette strategy sellers' for the features and how to purchase it. As we are not the developers of this tool, we can not give it away for free as we do not own the copyright, but consider it the best money you can spend on roulette tools.

Are you millionaires?

No, far from it, all players who volunteered to participate in this guide are all working class people. Many of us didn't have a clue about probability theory and stats when we started out years ago, which resulted in serious financial loss for some of our players. This guide is written to avoid you would end up in such a case.

Our device will always be: **gamble if you must, but at least try to inform yourself, know and accept fully the risk you'll be taking, do not have a scammer as a pimp, remain financially cautious and self disciplined at all times. For any winner there are far more people who lost enormous amounts of money. Do remember this well meant advice when you are out there.**

It takes a millionaire to win (or loose) millions in roulette. Because we fully know each time we go out to play we ARE at risk of loosing, we would never think of betting large amounts of money we could not support to loose. If you want to play with a larger bankroll like we did, we advise you to find some interested fellow players (with a lot of self-discipline), discuss and agree the strategy before you engage to spread the risk.

Do you have any commercial systems you can recommend or sell yourself?

No, we do not recommend any commercial systems, nor do we sell them. We only recommend you buy a copy of Roulette Xtreme to do your own analysis (refer to the chapter 'Scammers, conmen and roulette strategy sellers'. Please do not spend your hard earned bucks on some scammer whose only goal it is to rip you out of your money.

You saved me a whole lot of money, how can I thank you?

If you want to support our effort and the expenses that were made to bring you this free guide, please consider a small donation on our website www.john-solitude.be . This will ensure the further free development and hosting of this guide to the benefit of all players.

I do have more questions, can I contact you?

Yes, but please read the guide thoroughly before doing so.

You can write an e-mail to john.solitude@telenet.be Donators will be first served.

Will there be future updates and where can I find them?

Check the website http://www.john-solitude.be regularly or send in an e-mail to john.solitude@telenet.be you wished to be notified of any future developements. Your e-mail will be kept private for the sole purpose of informing you of any new additions to our website or this guide and not be used for spamming.

9. RECOMMENDED SOFTWARE, LITERATURE, WEBSITES AND FORUMS

To ensure the information in this chapter remains up to date, we decided to put the available information on our website http://www.john-solitude.be

Check out our section 'links' and 'literature.' Our reviews are independent and based on the joined opinion of a statistician, an ex-dealer and a couple of experienced players.

10. FEEDBACK RECEIVED ON JOHN SOLITUDE'S WHEEL FREQUENCY ANALYSIS GUIDE

You can find an original copy of the John Solitude Wheel Frequency Analysis on our website http://www.john-solitude.be This guide may be temporarily unavailable at this time for update, depending on the time you read this.

- Unedited feedback, the views do not necessarily reflect the views of the John Solitude Project. Initials are used to protect the privacy of the respondents unless people post publicly with their full name -

"I can honestly say that your manual is the best I have ever read in terms of patience, MM, bankroll, theory, evidence, mathematics, statistics and the system itself. You show the aspects that everyone must portray in order to become a winner in the realm of roulette gaming. You pick apart the anatomy of a professional roulette player, and show what you need to make it in the casino. And the cover is very sweet too! You could have sold this easily for 300-500 dollars if not more. I am very proud of you for not selling out, and being one of the VERY few that have released FREE manuals that are better than any system a scammer like Izak, or Mike Perkel could EVER come up with. Your system makes sense not only in theory, but also in reality. It is playable, even with a smaller bankroll, and you can adapt to fit your comfort zones while playing in a casino. Your goals are very realistic, and your tips are essential for anyone playing roulette, form the beginners to the professionals. Quite simply, one of the best reads I have ever experienced! Once again, great job." **Theo Rulte**

"I've been playing using Hamburg spins and the method does work. The probability behind the method is sound. I'm not sure if you've tried it using the Hamburg spins yet, but you should, since that's a really good way to test it out. I think I've played about 50-60 practice sessions using JS Method with Roulette Extreme. So far I've had all but 5 winning sessions of 150 or more units, using a starting bankroll of 500 units. That's pretty good, far above random expectation that's for sure." **S**

"I want to thank you for this method and all those who contributed. I've had 3 sessions in 2 days for a total of 409 units!" **H**

"You wrote a good piece. It must have took you a lot of effort. Great statistical explanations and also nice practical explanations (rain). I have begun to test it and so far it is looking good. I wil keep you informed." **L**

"I read through your document and have tested it with ~12 Hamburg sessions and have won all of them using your method. Your theory is pretty much right on in terms of the probability of the events to take place in the game of roulette. Specifically to what your method is aimed at, it is excellent and the only real way to beat roulete consistently..... The probability numbers and risk analysis is sound and is backed up by the Hamburg spins. The calculation that you have in your PDF is a really good layman's calculation of the probability of a group of numbers to skip or hit spins." **S**

"Your time put into this project is very much appreciated." **M**

"Personally, I'd pick John Solitude's method every day of the week. Not because it's a guaranteed winner, but because it's less likely to wipe me out." **SDF**

"Thank you very much for the guide John Solitude.
Will be looking forward to all future discussions and updates regarding this method.
Thanks for sharing." **G**

"John Solitude offered his apparently successful solution to Roulette without restriction. Those who are interested in it can study, test, alter or ignore it." **MM**

"I have to commend you for your great efforts, you really are a very a kind person and will be well rewarded for it. I will certainly be joining you in the discussion on your website." **WB**

"I would like to say thank you from the bottom of my heart for your kindness. Not many people like you out there. Thank you once again for the system. Would try and practice as much as possible before playing. All the best and congratulations a very well presented system." **MN**

"Thank you very much for sending me the superbe and well made strategy. I thank you that you share with me the strategy, in which you surely have invested a lot of time to develop, test and bring the strategy in such a superbe book-form. I wish you and your friends a lot of success." **K**

"First off I wanted to thank you for sending me the copy of your work. But just as fervently, I wanted to curse you for what you are about to put me through. Yes, I have been collecting and trying a multitude of systems, methods, ideas, etc. over the years (almost 35 to be exact) and I have become quite adept at putting to rest most within either a brief period of testing or through logic, without the need for testing at all. I must admit, what you have come up with certainly seems to hold merit, therefore I too will have to research its merit, relentlessly." **A**

"Firstly, thank you for the excellent guide. It should steer many people in the right direction. Thanks also for the mention :)" **P**

"Only opened my Yahoo emails today ....which is a bit of time since you sent out your pdf guide. I've downloaded it and look forward to studying it when i get some peace and quiet ! It is apparent you have put in a lot of work to this roulette project and i am humbly indebted to you !" **M**

"I've read over Solitude's PDF and it's pretty much the best thing I've ever read on Roulette strategy. I've been playing it for the past week, 1-2 sessions a day using Hamburg spins and I've won every one of them. I have given some thought to actually playing the system for real, but not yet. I'll keep practising so I can get quicker at making my bets. I'm kinda slow right now for real life spins I think.....Thanks for the excellent manual" **X**