

Take a chance

Gambling and investment practices are not so far removed from one another

There is a fine line between the public's and the law's distinction between investing and legalized gambling. Stocks and bonds, bank accounts and real estate are traditional investments. Poker, blackjack, lotteries and horseracing are popular gambling games. Gold and silver, commodity and financial futures and stock and index options are somewhat in between but are generally thought to be on the investment side of the line. English spread betting is a good example where legal bets can be made without tax liability on sports events and financial investments such as stock index futures. The higher transaction costs are compensated by the absence of taxes. See Tables 1.1 and 1.3.

In all of these situations, one is making decisions whose outcome has some degree of uncertainty. The outcome may also depend upon the actions of others. For example, consider buying shares of Qualcomm. The stock is one of the few high flying US internet and high tech stocks did not completely crash in 2000. The stock was around 100 in December 2000 versus a high of 200 in January 2000. The company has signed deals with the Chinese government and others for their pioneering wireless technology. Despite its 90 plus price earnings ratio, its future prospects looked excellent. While its niche in digital wireless communication is fairly unique and future demand growth looks outstanding, others could possibly market successful and cheaper alternatives or the marketing deals could unravel. What looks good now has frequently turned into disaster in the current technology market place since enormous growth is needed in the future to justify today's high prices. Qualcomm has continued to grow but at a slower rate and its stock price fell to a third of its December 2000 value in mid 2002. Such is typical price experience of high PE stocks.

Economic effects that manifest themselves into general market trends are important also in a stock's price. Most stocks are going up in a rising market and vice versa. Indeed in the most popular stock market pricing theory – the so-called capital asset market equilibrium beta model – securities are compared via their relative price movement up or down and at what rate when the general market average (e.g. S&P500 index) rises or falls. Over time, stocks have greatly outperformed bonds, T-bills, inflation and gold. For example, \$ 1 invested in 1802 in gold was only worth \$ 14.38 in 1997, similar to the CPI inflation at \$ 14.67. T-bills made, \$ 4455, bonds \$ 13 975 and stocks were a whopping \$ 8.8 million and

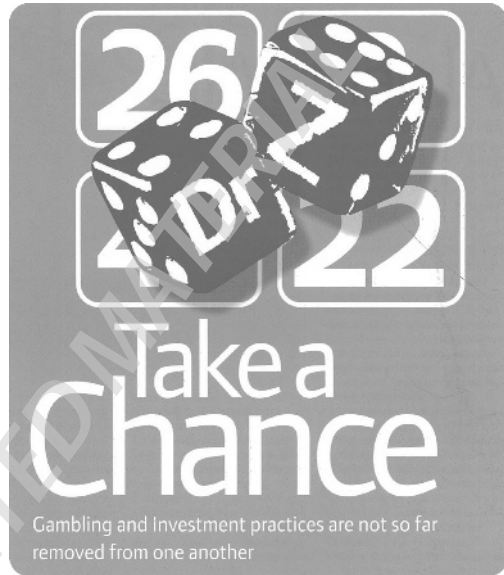


Table 1.1 Essentials of Investment and Gambling

INVESTING	LEVERAGED INVESTING	GAMBLING
Bank accounts and term deposits	Commodity and financial futures	Blackjack
Gold and silver	Options	Dice games
Mutual funds	Spread betting	Horsereading
Real estate	Hedge funds	Jai Alai
Stocks and bonds		Lotteries
		Roulette
		Sports Betting
<ul style="list-style-type: none"> • Positive sum game usually • SLOW – ‘buy and hold’ • To preserve your capital • Gains usually exceed transaction costs for the average person • Path dependence is not extremely crucial 	<ul style="list-style-type: none"> • ZERO SUM game • Many winners and many losers • Low transactions costs • Risk control is important • Path dependence is crucial 	<ul style="list-style-type: none"> • Negative sum game, average person LOSES • FAST play • Entertainment • High transactions costs • Winners share net pool: house cannot lose if payoffs are parimutuel, percent of play • Edge on each play: each play is either won or lost; house cannot lose except in fixed odds cases where they do not diversify

Table 1.2 Average continuously compounded yearly rates of return, 1802–2001. *Source:* Siegel (2002)

Average edge, percent	
Gold	1.4
CPI	1.4
T-bills	4.3
Bonds	4.9
Stocks	8.3

the gains are pretty steady over time; see Table 1.2. In purchasing power \$ 1 in 1802 is about \$ 15 in 2002, see Siegel (2002).

So for success in stocks, one has two crucial elements: general uncertainty about the economy and the product’s acceptance and the effect of competition.

An analogous situation is found in a gambling context such as sports betting on the Super Bowl. The general uncertainty affects the outcome of the game whereas the competition from other players shows up in higher or lower odds.

What then is the difference between investing and gambling? In investing one buys some item, be it a stock, a bar of platinum or a waterfront house, pays the commission to the

Table 1.3 Aspects of Several Gambling/Investment Situations with Winning Systems

	Average Edge	Probability of Winning	Wagers	Does the Wager Affect the Odds?
Blackjack	1.5 %	45–55 %	Large	No
Financial Futures	10 %+	2–98 %	Extremely Large	Yes
Horseracing	10 %+	2–98 %	Medium to Large	Yes
Lotteries	25 %+	Less than 1 %	Very Small	Yes

seller and goes, off possibly for a long time. Nothing prevents all participants from gaining. In fact they usually do. The essence of an investment is this: it is possible for *every* person buying the item to gain and it is generally expected that most people will in fact reap profits.

More interesting and profitable is the construction of hedges involving combinations of long and short risky situations where one makes a moderate profit most of the time with little risk. This is the basis of some successful hedge fund and bank trading department strategies, as we will discuss in later chapters.

The situation is different with a gambling game. There is usually a house or some type of negative or zero sum game, be it a casino, racetrack management or provincial lottery that takes predetermined (minimum or average) commission. On the surface, it seems that the house cannot lose except in rare instances and certainly not in the aggregate. Surprisingly, lottery organizations around the world make many conceptual mistakes in game design that lead to situations in which winning player strategies exist and we will discuss some of these in a later column. How about the players? On average, they must lose since the house always makes its commission. So all players *cannot* win. Some may win but many or most will lose. In fact estimates show that very few persons (about one in a hundred) actually make profits in gambling over extended periods of time. Most people talk about their wins and are much more quiet about their losses. As my colleague Mr B says, they want ‘bragging rights’. For most people, gambling is a form of entertainment and although they would like to win, their losses seem to be adequately compensated by the enjoyment of the play. The game also does not take very long. When it is played, the management takes its commission and distributes the prizes or winnings in a quick and orderly fashion. Then the game is repeated.

A gambling situation can be of two types. In fixed payment games the players wager against the house. In any particular play, the house and the player either win or lose. What one wins the other loses so both parties have risk. However, by having an edge and by diversifying over many players, the house remains profitable. But the players cannot do this. In pari-mutuel games, the house is passive and takes a fixed piece of the action. The rest is then split among the winners. In this way the house cannot lose and takes no risk.

In these games, the players are really wagering against each other. In both types of gambling the average player loses. Some players may win, but the players as a group have a net loss. The vigorish (transactions costs) is essentially the payment for the pleasure of playing. It is an important result in the mathematics of gambling that, faced with a sequence of unfavorable games, no gambling system can be devised that will yield a profit on average after one, two, three or any number of plays. You simply cannot change an unfavorable (negative expected value) game into a favorable game with a clever mathematical betting scheme.

THE COLOCATION OF MONEY AND MATH

Be especially wary of advice of the doubling up strategies: Martingales, pyramids, etc. While such systems may allow you to make small profits most of the time, the gigantic losses you suffer once in a while yield losses in the long run.

The most useful result that we have for unfavorable games is that if you want to maximize your chances of achieving a goal before falling to some lower wealth level, you should use **bold play**. With bold play you do not let the casino defeat you by grinding out small profits from you along the way. Rather, you bet amounts that get you to your goal as soon as possible.

Consider roulette, which is an unfavorable game with an edge of minus $2/28$ or minus 5.26. Assuming that you are not able to predict the numbers that will occur any better than random, then you should bet on only one number with a wager that if you win you will either reach your goal or a wealth level from which you can reach it on one or more subsequent plays. If your fortune is \$10 and your goal is \$1000, then it is optimal to bet the entire \$10 on only one number. If you lose you are out. If you win you have \$360 (with the 35-1 payoff) and then you bet \$19, which takes you to \$1006 if you win and \$341 if you lose. Upon losing you would bet the smallest amount – \$19 again – so that if you win you reach your goal of \$1000, etc. This bold play strategy always gives you the highest chance of achieving your goal.

On the other hand, as in the case of roulette, the casino has the edge and your goal is to reach some higher level of wealth before falling to a lower level with as high a probability as possible, then ‘timid play’ is optimal. With timid play, you wager small amounts to make sure some small sample random result does not hurt you. Then, after a moderate number of plays you are virtually sure of winning. This is precisely what casinos do. With even a small edge, all they need to do to be practically guaranteed of large and steady profits is to diversify the wagers so that the percentage wagered by each gambler is small. With crowded casinos, this is usually easy to accomplish. A simple example of this idea, non-diversification, shows up in many if not most or all financial disasters as we will discuss in later chapters.

CHANGING A GAMBLE INTO AN INVESTMENT

The point of all this is that if you are to have any chance at all of winning, you must develop a playing strategy so that at least some of the time, and preferably most or all the time, when you are betting you are getting on average more than a dollar for each dollar wagered. We call this changing a gamble into an investment. This is possible in roulette, see Tom Bass’ *The Eudomonic Pie*. Also, for the simpler game of the wheel of fortune, see Ed Thorp’s article in the March 1982 issue of *Gambling Times*.

This section of the book discusses topics in the mathematics of gambling and investment. The basic goal is to turn gambles into investments with the development of good playing strategies so that one can wager intelligently. The strategy development follows general principles but is somewhat different for each situation. The wagering or money management concepts apply to all games. The difference in application depends upon the edge and the probability of winning. The size of the wager depends on the edge but much more so on the probability of winning if one takes a long run rate of growth of profit approach, as discussed in Chapter 2. We will look at situations where the player has an edge and

develop playing strategies to exploit that edge. These are situations where, on average, the player can win using a workable system. The analyses will utilize concepts from modern financial economics investment theory and related mathematical optimization, psychological, statistical and computer techniques and apply them to the gambling situations to yield profitable systems. This frequently involves the identification of a security market imperfection, anomaly or partially predictable prices. Naturally in gambling situations all players cannot win so the potential gain will depend upon how good the system is, how well it is played and how many are using it or other profitable systems. Also, most crucially, on the risk control system in use. Nor will every game have a useful favorable system where one can make profits on average. Baccarat or Chemin de Fer is one such example. However, virtually every financial market will have strategies that lead to winning investment situations. Chapter 3 discusses lottery betting on unpopular numbers. Chapter 4 discusses the good and bad properties of the Kelly criterion. Chapter 5 discusses how to modify the Kelly fraction to stay above a wealth path with high probability.

There are two aspects of the analysis of each situation: when should one bet and how much should be bet? These may be referred to as strategy development and money management. They are equally important. While the strategy development aspect is fairly well understood by many, the money management (risk control) element is more subtle and it is such errors that lead to financial disasters. Chapter 2 discusses the basic theory of gambling/investing over time using the capital growth/Kelly and fractional Kelly betting systems and apply this to futures trading. Chapters 11–13 discuss hedge funds and focus on strategy development and risk control failures such as Niederhoffer in 1997, Long Term Capital Management in 1998 and Amaranth in 2006 and models of lottery, horse race and other betting situations, pension, insurance company and individual investment planning over time.

I have been fortunate to have worked and consulted with seven individuals who have used these ideas in three separate areas: ‘market neutral’ hedge funds, private futures trading hedge funds and racetrack betting to turn essentially zero into more than \$300 million plus. One, Jim Simons of the Renaissance Hedge Fund made \$1.4 billion in 2005 and \$1.6 billion in 2006. All seven, while different in many ways, began with a gambling focus and retain this in their trading. They are true investors with heavy emphasis on computerized mathematical investing and risk control. They understand downside risk well. They are even more focused on not losing their capital than on having more winnings. They have their losses but rarely do they overbet or not diversify enough to have a major blow out like the three hedge fund disasters discussed in Chapters 11–13.

