
FocusInvestor.com: The Focused Few Presents:

The Focus Investing Series Part 3: The Munger Network of Mental Models

Written by:

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Introduction

“You’ve got to have models in your head and you’ve got to array your experience – both vicarious and direct – onto this latticework of mental models.” Charlie Munger

Mr. Charles T. Munger, Vice Chairman of Berkshire Hathaway, is Warren Buffett’s partner at Berkshire Hathaway. He is famous for his cutting and insightful commentary on issues that concern him and he is a preeminent investor. He is a voracious reader and devotee of great thinkers such as Ben Franklin, whose wisdom he partially credits with developing his thought processes. Mr. Buffett has frequently given credit to Mr. Munger for providing him with key insights into the investment process.

Mr. Munger does not pretend that investing is easy. He advises that it takes sharp wits, strategy, and a lot of discipline to be successful in the investment field. Mr. Munger contends that more individuals could achieve better investment results than they actually do, if only they’d employ some of the basic "mental methods" he and Mr. Buffett have used throughout their careers.

"The number one idea," he said in a 2001 Harvard Law Bulletin interview¹, "is to view a stock as an ownership of the business [and] to judge the staying quality of the business in terms of its competitive advantage. Look for more value in terms of discounted future cash flow than you're paying for. Move only when you have an advantage. It's very basic. You have to understand the odds and have the discipline to bet only when the odds are in your favor."

Mr. Buffett is clearly a master of betting only when the odds are in his favor. This excerpt from the Berkshire Hathaway 1980 annual report shows how he uses this concept to his advantage:

“GEICO’s problems at that time [1976] put it in a position analogous to that of American Express in 1964 following the salad oil scandal. Both were one-of-a-kind companies, temporarily reeling from the effects of fiscal blow that did not destroy their exceptional underlying economics. The GEICO and American Express situations, extraordinary business franchises with a localized excisable cancer (needing, to be sure, a skilled surgeon), should be distinguished from the true “turnaround” situation in which the managers expect – and need – to pull off a corporate Pygmalion.”

This article will attempt to list a series of models that cover areas of knowledge that individuals have almost certainly amassed during their lifetimes. This article will also discuss how most individuals understand these concepts only as they relate to the task they are currently performing or pondering. For example, most engineers would never consider adapting their knowledge of breakpoint to the investing process.

It is my hope that, after reading this article in the focus investing series, the reader will understand how to develop and use his or her own system of mental models. I believe that developing the habit of examining problems using this multidisciplinary approach should not only help you become a better investor but, much more importantly, a better thinker.

¹ http://www.law.harvard.edu/alumni/bulletin/2001/summer/feature_1-fulltext.html

A Network of Mental Models

The idea of developing a network of mental models is based on the concept that everyone should approach problem-solving from many different perspectives. The traditional teaching method used in the typical American classroom revolves around the idea that topics should be learned in isolation from other topics. This inhibits students from learning that ideas from multiple disciplines can be used with great success when trying to solve problems. Focus investors should develop their own systems of mental models to help them make better investment decisions.

In the following section of this article the various individual areas of knowledge that Mr. Munger has discussed in several of his speeches will be covered on an individual basis. This information should help everyone develop and enhance his or her own system of mental models.

Mathematics

It is critical that investors have at least an understanding of high school level mathematics. Compound interest, the time value of money, and the basic ideas of probability theory, for example, are vital concepts that all investors should have a firm grasp on; they must be a part of their basic repertoire of skills. If investors fail to add these skills to their repertoire they will be at a severe disadvantage to others in the investing field who are equipped with these skills.

Let's examine more mathematical concepts that should be part of your investment toolkit. In this section we will cover probability theory, decision trees, and the law of large numbers. Compound interest and the time value of money were covered in Part 1 of the Focus Investing Series and as such will not be covered here.

Probability Theory

"Fear of harm ought to be proportional not merely to the gravity of the harm, but also to the probability of the event [occurring]" Blaise Pascal

"Take the probability of loss times the amount of possible loss from the probability of gain times the amount of possible gain. That is what we're trying to do. It's imperfect, but that's what it's all about." Warren Buffett²

In 1654, Blaise Pascal, a prominent French scientist, mathematician, and philosopher, and Pierre de Fermat, a government official and mathematician, exchanged a series of letters that discussed the odds involved in games of chance. They formed in those letters the basis of what today is known as probability theory.

Probability theory is the branch of mathematics that develops models to help explain random phenomena. Traditional questions that involve randomness include, 'will it rain today?' or 'will I be dealt a royal flush today?' These two questions have one common feature: the outcome (it rains today; being dealt a royal flush) cannot be accurately predicted on a consistent basis in advance, but we know that if enough days are observed, it will rain, and someone will eventually be dealt a royal flush.

The practical aspects of the theory were soon realized. For instance, the study of human mortality by life insurance companies resulted from applying this theory. Probability theory is now a major branch of mathematics with widespread applications in science and engineering.

² 1989 Berkshire Hathaway Annual Meeting

Probability theory also helps us manage risk. In his excellent book, *Against the Gods*, Peter Bernstein states that the “essence of risk management lies in maximizing the areas where we have some control over the outcome while minimizing the areas where we have absolutely no control over the outcome and the linkage between effect and cause is hidden from us.” This can certainly be applied to investing and is why investing only within your circle of competence is so critical to the success of the focus investor.

Mr. Munger has compared betting on horse races to investing in common stocks on several occasions. He states that the way to win at horse racing is to carefully study the individual horses and only betting when the odds of a given horse winning a particular race are in your favor. So in essence the investor should only invest when the probability of the investment outperforming the market indexes is high. By following this rule the investor builds a margin of safety into their investment decisions.

This section of a fascinating article by Michael J. Mauboussin captures the vital points of long-term success using probability theory³:

- *Focus.* Professional gamblers do not play a multitude of games—they don’t stroll into a casino and play a little black jack, a little craps, a spend a little time on the slot machine. They focus on a specific game and learn the ins and outs. Similarly, most investors must define a circle of competence—areas of relative expertise. Seeking a competitive edge across a spectrum of industries and companies is a challenge, to say the least. Most great investors stick to their circle of competence.
- *Lots of situations.* Players of probabilistic games must examine lots of situations, because the “market” price is usually pretty accurate. Investors, too, must evaluate lots of situations and gather lots of information. For example, the very successful president and CEO of Geico’s capital operations, Lou Simpson, tries to read 5-8 hours a day, and trades very infrequently.
- *Limited opportunities.* As Thorp notes in *Beat the Dealer*, even when you know what you’re doing and play under ideal circumstances, the odds still favor you less than 10% of the time. And rarely does anyone play under ideal circumstances. The message for investors is even when you are competent, favorable situations—where you have a clear-cut variant perception vis-à-vis the market—don’t appear very often.
- *Ante.* In the casino, you must bet every time to play. Ideally, you can bet a small amount when the odds are poor and a large sum when the odds are favorable, but you must ante to play the game. In investing, on the other hand, you need not participate when you perceive the expected value as unattractive, and you can bet aggressively when a situation appears attractive (within the constraints of an investment policy, naturally). In this way, investing is much more favorable than other games of probability.

³ Page 3 of the January 29, 2002 edition of *The Consilient Observer*, entitled *The Babe Ruth Effect: Frequency versus Magnitude* by Michael J. Mauboussin. Reprinted with permission of the author.

Decision Trees

“One of the advantages of a fellow like Buffett is that he automatically thinks in terms of decision trees.” Charlie Munger⁴

Decision trees are excellent tools for helping their users choose between different courses of action. They provide a highly effective structure within which you can lay out possible courses of action and investigate the possible outcomes of choosing various actions. They also help develop a balanced picture of the risks and rewards associated with each possible course of action under examination.

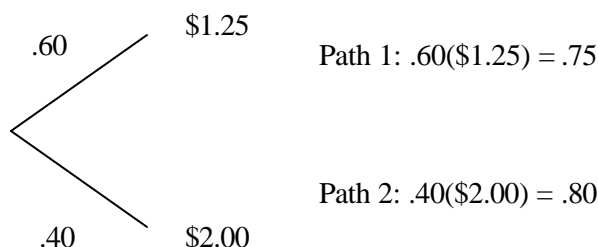
Now you are ready to evaluate the decision tree. This is where you can work out which option has the greatest worth to you. Start by assigning a cash value for each possible outcome – what would the expected value be if that particular outcome were to occur?

Next look at each break in the tree (which represents a point of uncertainty) and estimate the probability of each outcome occurring. If you use percentages, the total must come to 100% at each circle. If you use fractions, these must add up to 1.

Once the two aforementioned steps have been taken (i.e. the values of the outcomes have been entered and the probability has been estimated) it is time to start calculating the expected values of the various branches in the decision tree.

Once all expected values of the outcomes have been calculated, the investor should pick the break of the tree that represents the highest expected value. As you can see in the example below path 2 would provide the highest expected value of the two paths under consideration.

Example:



Decision trees assist the investor in making effective investment decisions because they:

- provide a nice picture of the problem in such a manner that all options can be observed
- allow investors to analyze all the possible outcomes of a decision
- provide a framework to quantify the values of various courses of action and the probabilities that they will occur
- aid investors in their quest to make the best decisions on the basis of available information.

As with all decision-making methods, decision tree analysis should be used in conjunction with common sense – decision trees are just one important part of the decision-making tool kit.

⁴ Page 50, May 5, 1995 edition of *Outstanding Investor Digest*

Law of Large Numbers

This “law” relates to the relative frequency of an event, and the probability of the event occurring. These two factors need to be equal only when an infinite number of repetitions are being observed. In other words, reality tends towards theoretical values when the number of observations is large.

Let’s examine this concept using a sample consisting of all the mutual funds in existence and grouping them into a bell curve by performance against a market index like the S&P 500. With a large number of mutual funds in the sample, some funds will dramatically underperform the market and some funds will dramatically outperform the market. These outliers are graphically represented by the tails of the bell curve.

The farther one gets from the average return, the flatter the tail gets, but, given a large enough sample of funds, there will always be a group of funds that really outperform their peers and end up at the far ends of both tails. In other words, these funds at the tail ends have performed far better than the average fund in the sample.

The law of large numbers also has another meaning to investors. It's a matter of simple math. A \$30 billion company will have a much more difficult time maintaining a 40% per year growth rate than a \$30 million company growing at the same rate.

Accounting

Accounting is the language in which business results are reported. The ability to understand this language should be an integral part of every investor’s toolkit. Focus investors can either take a formal class on accounting or purchase a book on the subject to educate themselves on the subject.

Understanding GAAP (Generally Accepted Accounting Principles), which is the common language that accountants use to prepare financial statements, is not enough for focus investing practitioners. This is so because GAAP is a flexible system and, as such, allows company management a certain amount of leeway in how they report their financial results. This leeway is dangerous in that management can take advantage of the accounting system to show better results than are actually occurring.

To learn more on what accounting red flags to watch out for I would recommend reading the interesting books, [Guide to Financial Reporting and Analysis](#) by Eugene E. Comiskey, Charles W. Mulford and [Financial Shenanigans](#) by Howard Schilit, or reading the FocusInvestor.com article entitled “Accounting: Focus on the Red Flags”.

Legal System

The legal system of the country that the investor lives in must strongly protect copyright and trademark information in order for a capitalist system to function properly. Entrepreneurs and businessmen need a proper legal system to be in place in order for them to be willing to spend the time, energy and commit necessary capital to build businesses. Why expend the necessary time and effort to develop a well-known brand name, for instance, if there is no system in place to protect the trademarks of the business?

The Decision-Making Process

Asking the Who, What, When, Where, and Why Questions

Focus investors should always attempt to solve problems and examine issues by answering the who, what, when, where, and why questions. Using this method to examine issues or problems can provide the investor with key insights into the subject matter being examined.

Invert

Mr. Munger also advocates thinking through problems backwards. This is similar to what Carl Jacobi, an eminent algebraist, was fond of saying: “Invert, always Invert”.

In one of Mr. Munger’s speeches he gave an example of how a situation could be examined using the process of thinking backward. He discussed the development process of Coca-Cola as if a businessman wanted to create a soda company from scratch and examined the key issues that would need to be solved. Below are several examples of the types of questions they would have asked themselves:

- What kind of properties should the new drink have? One property the drink should not have is an aftertaste. Consumers should be able to consume large quantities of the drink at every opportunity and not be deterred by an unpleasant aftertaste.
- The soda should be developed in such a manner that it can be shipped in large quantities at minimal costs. This makes it easier to develop an efficient, large-scale distribution system.
- The soda should be produced in such a manner that others will find it hard to replicate. To accomplish this goal, certain hard-to-find ingredients should be included in the formation of the soda, or the list of ingredients in the soda should be kept secret. If the ingredients of the product are a closely held secret it could add a certain mystique to the soda, as well as making it much harder for a competitor to duplicate the soda.
- Keeping the formula a secret will also deter the competition that will surely be forthcoming if the product launches successfully. The company can also deter competition by expanding the business as quickly as possible. For example, the distribution system could be expanded until it reaches a critical mass that competitors would find hard to duplicate without massive capital expenditures.

The focus investor should always examine problems from several different perspectives. Try to discover what could destroy the competitive advantages of the companies under examination. The investor should also try to determine how these threats to the company’s competitive advantage could be avoided or negated. The focus investor should also try to disprove any conclusions they may have reached instead. This should improve their knowledge of all facets of the equation and help them avoid any potential mistakes made due to confirmation bias.

Statistics

Statistics are used to examine the characteristics of a sample group. Statistics are very common. For example, polls are always being conducted and their results examined from a statistical viewpoint. The results of the polls can affect government decisions, product designs, and many other decisions. The DNA matching programs frequently used by the justice system to convict or

acquit people are based on statistical analysis. In short, statistics is a science dedicated to trying to draw answers out of numbers.

Mean

The mean is one of the most common statistical concepts that investors will come across in their readings. To calculate the mean of a series of numbers, simply add up the values in the data set and then divide that sum by the number of values in the dataset.

For example, let's calculate the mean salary at a company with the following personal and salary structure:

- The CEO of the company has a salary of \$100,000 a year
- Two managers make \$200,000 a year
- The firm employs two accountants who each make \$45,000 each a year
- The firm's two secretaries earn \$30,000 a year

The mean is calculated by adding everyone's salary together. This would equal \$650,000. The next step would be to divide this number by the number of values, which in this case is 7. So the mean salary of this company is \$650,000 divided by 7, or \$92,857.

The main drawback to this concept is that any number that is unusually higher or lower than the rest of the series can negate the usefulness of this measurement. When the dataset is analyzed closely the investor will observe that only three out of the seven people earn a salary that approximates the mean salary. This is examined in the next statistical concept, the median.

Standard Deviation and Normal Distribution

Standard deviation is a concept which tells statisticians how wide apart the values in a data set are from one another. A large standard deviation means that the values in the data set being observed are fairly diverse, while a small standard deviation means the values in the data set are fairly tightly bunched together. This concept is a very important concept for all focus investors to understand.

Standard deviation is often called the "mean of the mean" and it can often help the investor find the true story behind a series of numbers. To fully understand this concept it is necessary to explain a concept that statisticians call normal distribution.

When statisticians say that the data they are examining shows a normal distribution, they are saying that most of the values in a set of data being examined are close to the average of the data series and only a small set of the data are far beyond the average.

For example, let's imagine that a statistician was conducting research on the sleeping habits of adult males. They would need to examine the normal sleeping habits of a large group of adult males to represent the data set. Like most data, the average time adult males spend sleeping per night will probably turn out to be normally distributed. That is, for most adult males, their nightly sleeping habits are closely aligned to the median sleeping habits of adult males in general, with only a small amount of adult males sleeping longer or shorter than the average of the overall group.

The results of the data seem to confirm what most people would understand implicitly. Most people would assume the general population of adult males would have similar sleeping patterns, with only a minority of people sleeping a great deal longer or shorter than the average.

This 1889 quote by Francis Galton, a famous pioneer of statistical correlation and regression, describes the macro view of standard distribution: “Whenever a large sample of chaotic elements are taken in hand and marshaled in the order of their magnitude, an unsuspected and most beautiful form of regularity proves to have been latent all along.”

If a set of normally distributed data were shown in a graphical format, it would resemble a standard bell-curve shape. When the standard deviations in a data set being examined are tightly bunched together, the bell shape will have steep curves and, conversely, the bell shape will be relatively flat if the standard deviations are not tightly bunched together.

Many investors have heard the expression “six sigma”. Six Sigma is a “highly disciplined process that helps us focus on developing and delivering near-perfect products and services. Why ‘Sigma’? The word is a statistical term that measures how far a given process deviates from perfection. The central idea behind Six Sigma is that if one can measure how many “defects” there are in a process, one can systematically figure out how to eliminate them and get as close to “zero defects” as possible.”⁵

Focus investors strive to be Six Sigma investors.

Regression to the Mean

Regression to the mean is a statistical phenomenon in which high or low results tend to be followed by more average results. In the 1800s Sir Francis Galton observed this phenomenon when he planted sweet pea seeds and calculated the average diameter of 100 seeds produced by each plant. He discovered that the seed diameters tended to “regress toward the mean,” meaning that the smaller pea seeds had somewhat larger offspring, and larger seeds had somewhat smaller offspring.

One word of caution is in order for focus investors. They should remember that the regression to the mean concept, when applied to the selection of common stocks, is a statistical explanation and not an economic one.

Engineering

Backup Systems

In engineering, for critical systems which absolutely have to work, a backup system is put in place every time. This redundancy helps to ensure that the system continues to operate even if part of it fails. The same thought process implies to focus investing as well.

Investors must make a series of decisions when examining companies, with an eye towards possibly making an investment. They have to determine the economics of the business and what the company will produce in future cash flows, for instance. The margin of safety principle is the focus investor’s backup system. The margin of safety principle basically states that an investment should be made when the price of the stock in question reflects a worst-case scenario,

⁵ <http://www.ge.com/sixsigma/makingcustomers.html>

so that even if the investor's projections are wrong he or she won't experience a dramatic loss in capital.

Breakpoints

All focus investors should possess an in-depth understanding of the company they have invested in, but they should also be wary of the dangers of over-analyzing information. In the investment process, it is important to remember that the number of decisions to be made should be kept as small as possible.

This is one reason that traders in stock never seem to earn an acceptable long-term return on their investments. They simply have to make too many decisions correctly on a consistent basis to have the effort prove worthwhile.

Does this seem to be an odd statement? Think of it this way: the more decisions that have to be made when conducting the investment process, the higher the possibility that an error will be made. Avoiding undue complexity whenever possible should be the motto of all focus investors. Remember the old maxim: KISS (Keep it Simple Stupid).

Physics

Physics is the realm of science that investigates how the universe functions. In a classic example of combined mental models, Sir Isaac Newton, one of the most famous physicists in history, explained the properties of gravity using two earlier discoveries. In order to produce his thoughts on the properties of gravity, he combined the laws of planetary motion with the observation that a falling mass accelerates at a uniform pace.

The Theory of Equilibrium

Economics uses the equilibrium theory; for example, when demand equals supply the market is in balance. Economists use this theory as a base explanation for how the markets are supposed to work. The efficient market theory is an example of thinking, since it states that stock prices and their intrinsic values always trade in equilibrium in the market. While that theory is incorrect, it is fair to say that stocks prices do tend, for the most part, to trade around their respective intrinsic values.

The market is really a complex adaptive system in which many intertwining parts continually change behavior patterns in response to changing environmental stimuli. The stock market is continually processing new information (i.e. new environmental stimuli) and, as such, can never be in a state of equilibrium. For focus investors this means that at times the market as a whole can present investors with valuations that are higher or lower than a company's intrinsic value.

Critical Mass

In nuclear physics, critical mass is the minimum amount of fissile material necessary to achieve a self-sustaining fission chain reaction (i.e. explosion). Great changes in the thinking of the masses generally do not occur at a single moment in time, but rather develop over time as a progression of events and developments which influence people's thinking. As time goes on these ideas seem to develop more and more momentum, until a critical mass is reached and the new change is adapted.

In business this idea can be observed when a business undergoes a fundamental change in regard to operations that leads to a reduction in cost per unit resulting from increased production, often realized through operational efficiencies.

These economies of scale can be observed in full force at Coca-Cola. No company could replicate their distribution system and thus be able to match their pricing, unless they were to spend billions of dollars. The achievement of critical mass usually means that the company achieving it has some type of competitive advantage over its competitors.

Know Yourself & Understand Motivation Factors

When examining a decision or when trying to determine what course of action people may take, it is vitally important to understand what motivates the interested parties. For instance, the stock brokerage profession has many built-in negative motivational factors. Most brokers only get paid on a per trade basis, which, in turn increases their motivation to have their clients trade on a frequent basis. Of course the vast majority of brokers avoid this behavior, but their motivation structure is set up in such a manner that it has inherent conflicts built into it.

Focus investors should also understand their circle of competence and stay within it. They should be honest with themselves concerning which business models they understand and which ones they don't.

Economics

Economics is a field of study that examines how society manages its scarce resources. Economists therefore try to determine how people make decisions, based on their salary, their buying and saving habits, and how they allocate their savings. Economists also study how buyers and sellers of particular goods determine the price that a good will sell at and what quantities of the goods will sell at the agreed-upon price. Finally economists analyze issues that affect the economy as a whole.

In the textbook *Principles of Macroeconomics*, by N. Gregory Mankiw lists ten principles of economics. The first six principles are relevant to this article.

1. *People Face Tradeoffs.* In order to possess the objects that we desire we choose to possess those objects over other, less desirable objects.
2. *The Cost of Something is What You Give Up to Get It.* Since people must make tradeoffs to possess what they desire, they must make decisions by comparing the costs and benefits of various courses of action. The opportunity cost of possessing an object is what was given up to obtain another object.
3. *Rational People Think at the Margin.* Often in life individuals must make small changes to their existing plans. Economists call these small changes marginal changes.
4. *People Respond to Incentives.* Individuals make their decisions after examining the costs and benefits of various courses of action. People's behavior can change dramatically in response to incentives.
5. *Trade Can Make Everyone Better Off.* Trade between multiple parties can result in all parties being better off.

6. *Markets are Usually a Good Way to Organize Economic Activity.* In a market economy, resources are allocated via the decentralized decisions of all the members of the economy.

The following is a list of key economic concepts:

Law of Supply and Demand

The law of demand states that there is an inverse relationship between the price of a good and the quantity of the good demanded. The income level of the buyer, the price of the good and the availability of substitutes are all factors that influence the level of demand.

The law of supply states that there is a positive relationship between the price of a good and the quantity supplied. The price levels of the good, the costs of inputs to produce the good, and the technological costs to produce a good are all factors that influence the level of the goods supplied.

Income and Substitution Effects

Substitutes are goods that experience an increase in demand when another similar product increases in price.

A fall in the price of a commodity, or good, generally has two effects on a consumer's income:

Substitution Effect:

- The consumer enjoys an increase in real purchasing power since they he or she can now buy the same amount of the product as before with less money and thus have money left over for additional expenditures or savings.

Income Effect:

- The consumer could conceivably use more of a good that has become less expensive and not use as much of the goods that are now relatively more expensive.

Although these effects occur simultaneously, a distinction can be made between the two. The first statement is what is called the substitution effect. The substitution effect measures the change in the purchase of a good resulting only from the change in the price of the good. In this case the utility (i.e. satisfaction) that the consumer receives from the good remains constant even though the price has changed.

The income effect is the change in the consumption patterns of a good that results from the change in purchasing power that occurs as a result of the price change. In the preceding case the price of the relatively more expensive product has reduced its utility.

Scarcity

Scarcity is a key concept in economics. The concept relates to the fact that there is only a limited supply of goods available for purchase.

Utility & Rationality

Economists assume that people will always try to maximize their happiness; in other words, that people will always try to obtain goods that maximize their utility. Economists assume that people behave in a rational manner and make rational choices.

Elasticity

Elasticity is the measurement of how sensitive a variable is in relation to another variable. These measurements are used to test the effect on demand and supply when there are changes in prices and incomes.

The concept of price elasticity of demand measures the responsiveness of changes in quantity demanded to price changes of a given product. Goods that have a price elasticity of less than 1 are said to be inelastic. Goods that have a price elasticity greater than 1 are said to be elastic. Necessities such as water are said to be inelastic since the demand remains much the same, even if the price of the product increases dramatically.

Income elasticity of demand is the same concept as price elasticity of demand, except that income changes and not price changes are measured.

Monopolies

A monopoly is a market structure in which only one producer, or seller, exists for a product. This domination of a market for a particular product or service by a single company tends to lead to restricted levels of competition and artificially high prices on a sustained basis.

Generally the product being sold has no close substitutes for consumers to switch to. Monopolies are typically characterized by the following: one firm supplies the market with many buyers and sellers; the product being sold is unique; the firm has strong pricing power; and entry into the market is restricted in some manner.

Oligopoly

Oligopolies consist of several firms that are in the same market and generally compete on features other than price. Price wars, where all the market players slash prices, tend simply to lead to lower profits for all the firms, leaving the overall market shares of the companies little changed.

Instead, oligopolistic firms tend to compete, for instance, through advertising, product or service quality. Companies that form the oligopoly are generally safe from new companies entering the market because the barriers to entry to the market are high.

Economies of Scale

The advantages that economies of scale bring to businesses are terribly important to most companies. One has to look no further than Gillette or Coca-Cola to see what benefits having a large, dependable manufacturing division, coupled with an efficient distribution system, can bring to a company.

Think of Gillette. The company has an approximately 70% share of the global wet shaving market. It would not have been able to do this without an efficient manufacturing process and the

ability to ship its products globally on an affordable basis. Any company trying to match them would have to spend billions of dollars to match these economies of scale.

Pavlovian Conditioning

Almost everyone, on hearing the term “Pavlovian”, thinks of the famous canine experiment. In the experiment a dog was conditioned to expect food when a light was turned on. Eventually the dog would start salivating as soon as the light was turned on, even if no food was present.

From birth, all animals, and humans are equipped with a limited set of reflexes, i.e. genetically hard-wired responses to specific environmental stimuli. A reflex is a relationship between a specific environmental event (i.e. stimulus) and a fixed behavioral action (i.e. response) that it evokes. These reflexes are often a key factor in survival.

Pavlovian association is generally broken down into several classifications: Classic, Operant and Instrumental Conditioning. These are discussed in detail below

Classic Conditioning

Classic conditioning is when a stimulus is experienced that elicits an emotional response time after time. For example, imagine past visits to a grandparent’s home, where it always seemed to smell of mothballs. Now if every time you smell mothballs you recall visiting your grandparent’s home, that is an example of classic conditioning.

This concept ties into the concept of association. Think of Coca-Cola commercials. Do you ever see the actors in the commercials not having a good time? Of course not. Coca-Cola is deliberately associating drinking Coca-Cola with good times and feelings. The company tries to connect happiness with drinking Coca-Cola in its ad campaigns.

Instrumental Conditioning

Instrumental conditioning occurs when the subject chooses to continue, or discontinue, a behavior based upon the positive or negative reinforcement the subject has received. Trademarks that have developed a positive image tend to generate positive thoughts to their current and prospective consumers, which help in future sales opportunities.

A great example of Pavlovian association would be when the sales of a product increase when the price of the product is raised higher than comparable products. One reason that the increase in sales occurs is that most people associate higher prices with higher quality.

Operant Conditioning

Operant conditioning involves associative learning, in which there is a contingency between the response and the presentation of the reinforcer. For example, this concept can be seen in the classic experiments by Frederick Skinner, where he trained rats and pigeons to press a lever in order to obtain a food reward. His experiments prove that behavior can be modified with the use of rewards.

Mr. Munger gave a powerful example of how a reward system can influence behavior when he discussed Xerox. He stated, “Early in the history of Xerox, Joe Wilson, who was then in the government, had to go back to Xerox because he couldn’t understand how their better, new

machine was selling so poorly in relation to their older and inferior machine. Of course when he got there he found out that the commission arrangement with the salesmen gave a tremendous incentive to the inferior machine.”⁶

Competitive Destruction

The best industry for investment is an industry in which the participants act in a rational manner. Oligopolies work best for an investor when this is the case. When the companies in a particular industry choose not to act in a rational manner, competitive destruction can be observed. An example of this type of behavior can be observed by examining the airline industry. When one airline went into bankruptcy protection it was allowed to keep operating at a loss, thereby hurting the performance of the rest of the companies in the industry.

Another example of this destructive behavior in the airline industry was observed when it became standard practice in the industry to offer free airline miles to frequent fliers. These programs worked well initially for the creator of the programs but they became an industry problem when the other airlines initiated their own programs. These new programs often provided better options in order to induce people to switch programs which in turn forced the other airlines to upgrade their programs.

The first airline to initiate a frequent flyer program likely experienced a temporary increase in sales and profits but at the end of the day the programs resulted in decreased profits for all airlines that developed their own programs.

Surfing

Individuals tend to become caught up in the latest crazes. For an example of this look at the Beanie Baby craze. People were waiting in line for hours to purchase the toys when they arrived in stores and were selling them for many times their retail value on the Internet, even though they knew that they had no true value in the long run.

The Internet stock craze was another example of this behavior. People started buying up the stocks because they had been spectacularly outperforming the market. The mass migration into these stocks then pushed the price even higher, and more and more people saw the incredible rise in market valuations and decided to jump into the act as well. Eventually the bubble was sure to burst.

Investors must form and act on their own conclusion and not blindly follow the behavior of the crowd.

The Stock Pari-Mutuel System

Mr. Munger has compared investing to betting on the horse races on several occasions. The similarity between investing and gambling is that in both instances the person is estimating the probabilities of possible outcomes occurring and only investing or wagering when the probabilities are judged to be positive.

⁶ <http://www.tilsonfunds.com/mungerpsych.html>

The gambler studies the past behavior of the horses in a given race and only places a bet when he believes the odds of a given horse winning have been mispriced and he can take advantage of his situation. He is also taking into account the potential payoff should the horse he picks win.

The focus investor is performing the same activities. They are studying the economics of various businesses and assessing at what price would investing in that business provide the highest possibility of above average, long-term gains. Focus investors should only make investments when the odds are strongly in their favor, since they are maintaining concentrated portfolios.

Psychology of Investing

This section was covered at length in the second part of the focus investing series. Several subjects that weren't discussed will be covered here. One of those subjects that weren't covered was the concept of social proof.

Social Proof

Social proof occurs when individuals attempt to confirm their previously developed assumptions on any given subject. This is a natural product of how we tend to learn through imitation of others' actions and behaviors. This learning style, however, can cause problems for investors because the behavior of the crowd can be dead wrong.

Denial

Denial is another area that wasn't explicitly covered. This can happen when someone learns of an occurrence that is too terrible for him or her to comprehend easily, so they refuse to believe that the occurrence really happened. This behavior is often observed when a family member is accused of a heinous crime. Often the initial reaction of other family members is to state firmly that the accused family member would never be capable of committing such a crime.

Consistency

Humans are often trapped into certain behavior patterns because they have already committed to believing that those behavior patterns are correct, and they feel that if they change their behavior they will be judged to be inconsistent and indecisive. Psychologists have long recognized a desire in most people to be and look consistent in their words, beliefs, attitudes, and deeds.

Reciprocation Tendency

Reciprocation is the tendency to want to pay back someone who has done something for you. This is a very strong psychological phenomenon. Individuals are often far more willing to provide information or assistance to someone who has helped them or provided advice to them in the past.

Another aspect of this tendency can be seen when people initially ask for a big favor and then, if that is not granted, they ask for a smaller favor (often what they really wanted). This other party will often agree to the smaller favor, since they feel bad for refusing the big favor and also wish to appear to be reasonable.

Authority

From birth, our society trains everyone to respect people of perceived authority, whether that authority is real or not. People are much more willing to believe a statement when it comes from someone they believe is an authority on the matter. People are also much more willing to go along with actions taken by an authority figure, even if know that the action is inappropriate.

Scarcity

Quite simply, people desire objects that are hard to obtain. Robert Cialdini advises, “the rule of scarcity tells us that people are especially persuaded and motivated, not so much by what they stand to gain but by what they stand to lose if they don’t do something (e.g., act now, attend a function). That loss is more powerful psychologically.”

Focus investors need to learn to think for themselves and not be lulled into practicing mindless and reflective behavior just because that is what “everyone” is doing. Focus investors also need to understand the natural bias to be highly accepting of information that confirms their thoughts or beliefs. They should instead think of looking for information that doesn’t jive with the theories that are developing on a subject matter.

Chemistry

Autocatalysis

In chemistry, when certain processes (or reactions) start to occur, they can speed up of their own accord when they are combined with a catalyst. The catalyst tends to stabilize the reaction and makes it easier for the process to jump to another level. The catalyst itself usually is not affected by the process and can go and influence many other reactions. For example, when a couple wants to get married they have an official legalize the marriage, but the official otherwise does not participate in the marriage.

In the autocatalysis process, properties, events or products serve as their own catalysts and are "self-breeding". For example, the invention of the air conditioner created the need for air conditioning, hence the self-stimulated increase in the demand for air conditioners.

Biology

“The slightest advantage in one being ... over those with which it comes into competition, or better adaptation in however slight a degree to the surrounding physical conditions, will turn the balance.” *On the Origin of Species by Means of Natural Selection* by Charles Darwin.

Natural Selection

The theory of evolution is the key biological concept that focus investors need to understand. Charles Darwin developed his theory of natural selection by carefully observing wildlife during his trip aboard the HMS Beagle.

While visiting the Galapagos Islands, he observed that each of the islands supported its own form of tortoise, mockingbird, and finch. He further observed that the various individual species were closely related but differed in structure and eating habits from one island to the next. These

observations caused Darwin to question if there weren't in fact possible links between the distinct but similar species.

After much discussion with other scientists on why, and how, the species on the island were so similar, he developed a theory that natural selection could produce variations that had some benefit to a species and its survival. These variations, and their subsequent benefits to the species, would be passed on to succeeding generations.

How does this relate to the investment process? I think Robert Hagstrom, in his book *Latticework: The New Investing*, explained it well when he wrote, "Whereas in nature the process of evolution is one of natural selection, seeing the market with an evolutionary framework allows us to observe the law of economic selection."

This law of economic selection is easily observed in the business world. For example, one firm may develop a unique way of producing a product in a less expensive manner, which allows it to generate higher profits than other firms that are in the same line of business but are not using this new procedure. Hence, conceivably, the firm using the less expensive procedure should sell for a higher multiple than its competitors.

Survival by Differentiation

In the 1930s the Soviet scientist G.F. Gause conducted an experiment in which he placed two protozoans of different species into a glass jar with a limited amount of food. He also placed two protozoans of the same species into the same situation. He discovered that the protozoans of different species survived by sharing their food source, while the protozoans of the same species were unable to cooperate and did not survive.

In the business world the companies that have sustainable competitive advantages have somehow differentiated themselves from their competition. They may have a lower cost structure, superior customer service, superior quality, or a more efficient distribution system, for example.

Lollapalooza Effect

The idea of developing and using your own network of mental models reaches its logical and powerful apex when they are combined to form lollapalooza effects. A lollapalooza effect occurs when several models in the network are combined and are heading in the same direction to produce a given result. The results of this combined effect can be quite dramatic. For instance, in order to suppress and combat the HIV virus, a drug "cocktail" was developed. While the individual drugs weren't effective, the combination of several medications was extremely effective.

Another example of a lollapalooza effect can be seen in open outcry auctions. Mr. Munger summed up these effects in this statement: "the open-outcry auction is just made to turn the brain into mush: you've got social proof, the other guy is bidding, you get reciprocation tendency, you get deprivation super-reaction syndrome, the thing is going away... I mean it just absolutely is designed to manipulate people into idiotic behavior."⁷

⁷ <http://www.tilsonfunds.com/mungerpsych.html>

The key to understanding and creating lollapalooza effects is being able to understand how sets of models relate to one another. Once this relation is understood, the next step is to build an understanding of what effect the combination will have on a given situation.

Focus investors should avoid compartmentalizing all incoming information into separate, distinct mental compartments. Investors will prove to be much more successful in life and investing if they explore how separate pieces of information interact and use this newly gleaned information to solve future issues. Keep in mind that just because a piece of incoming information is connected to one process, it doesn't mean that the concept behind it can't be applied to other processes.

In his speech on Coca-Cola to a Stanford Law School class, Mr. Munger gave a fascinating example of how using various mental models in combination can produce incredible lollapalooza effects. I will attempt to capture the key concepts of the speech as they relate to the lollapalooza effect in the creation of the classic soda beverage, Coca-Cola.

Mr. Munger initiated the discussion on the creation of Coca-Cola by asking if the drink should be a hot or a cold beverage. The first mental model used to answer this question was the physics model, because the creator of the beverage would have had to foresee that refrigeration of the product would be widely available in the future.

The second mental model involved was physiology, since the maker of the drink needed to understand that individuals preferred to drink a cold beverage after engaging in strenuous activity. In addition, an individual residing in a hot climate would naturally prefer drinking a cold beverage when looking for relief from the heat.

After the decision had been made to produce a cold drink, the next issue involved creating a strong and well-known brand so the beverage could distinguish itself from its competition. In developing the brand, the creators needed to be confident that the legal system in place would protect them against competition infringing on their brand name.

Any company should endeavor to make the brand so familiar to its customers that they automatically order the drink by its trademark name. This is a desired conditioned reflex. In its marketing campaign the company should always associate their product with people experiencing happy times, thereby taking advantage of Pavlovian association effects.

It was decided that the drink itself should use ingredients that reinforce the desire to drink more of the soda. The stimulant caffeine and sugar should be used to flavor. The properties of these ingredients would combine and help the users of the product develop a favorable taste for the drink. An additional important factor was that the overall flavor profile of the beverage should not include an aftertaste. This would negatively affect the drinking experience and could cut down the quantities that users would be willing to consume.

In addition to the flavor properties, the visual properties of the drink were enhanced. The first step in this process was to give the drink a dark color to make it more appealing than the plainness of water. Carbonation was also added to provide a better taste and make the product seem more visually appealing.

The product should be in a form that can be easily shipped. This was a problem for Coca-Cola as the weight and dimensions of the soda and bottles combined made it expensive to transport. Their solution was to only sell syrup. They sold sales territories and developed a system of bottlers and

shipped only the syrup for the soda to the bottlers. The bottlers were then responsible for transporting the final product to customers in their respective territories. This allowed Coca-Cola to save on shipping costs and maintain control of the ingredients in their products.

Once the above steps in the development process had been completed, the company needed to develop an effective marketing strategy. The company gave many marketing products to establishments that used their beverages so they could display them in their establishments. The clients of those establishments would then know Coca-Cola was available. The company even gave away free sample coupons so new users would sample their product. Social proof was one reason for doing this. When one person observes another consuming the product, they are unconsciously showing other people that they like and enjoy the product.

I hope you observed all the different aspects of the mental models at work in the above example. As the history of the Coca-Cola Company has shown, building a business and products with a strong lollapalooza effect can produce incredible investment returns. The focus investor with a firm grasp of the mental models concept is a gigantic step ahead of the majority of investors.

Conclusion

To wrap up the discussion on mental models, here is a list of five “ultra-simple general notions” that Mr. Munger provided in a 1996 speech. These notions, listed below, tie into the mental models concept discussed in this article. The notions are:

1. Solve the big no-brainer questions first.
2. Use math to support your reasoning.
3. Think through a problem backward, not just forward.
4. Use a multidisciplinary approach.
5. Properly consider results from a combination of factors, or lollapalooza effects.

Focus investors should develop their own network of models that work best for them. They should always seek to increase their network of knowledge with information from a wide spectrum of disciplines. The most successful focus investors will, more than likely, be enthusiastic readers of widely varying subject matters, but only choose to retain ideas that prove to be useful in building their network of mental models.

I hope this article provides you with a strong foundation for starting your own model development process. I also hope that the material presented in the focus investing series has helped you understand the focus investing process, and the advantages it has for investors who are able to think rationally and make decisions free from the influences of herd behavior.

Please feel free to contact me via email at focusinvestor@yahoo.com or engage in further discussion on the subject of focus investing on the FocusInvestor.com message board at <http://www.focusinvestor.com/cgi-bin/ib3/ikonboard.cgi>.

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