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QURIOSITY

THE MONTHLY NEWSLETTER FROM QUANTINUUM

SEPTEMBER 2012

ISSUE 3 : VOLUME 5

MOVIE REVIEW



LIGHT SPEED TRADING

QUANTS GURU (HANS REICHENBACH)



RISK ANALYSIS

K.J Somaiya Institute of Management Studies & Research, Vidyavihar, Mumbai



Quriosity

SEPTEMBER 2012

VOLUME 3 : ISSUE 5

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Hi All,

I am pleased to inform you that you are seeing a revamped newsletter from Quantinum. The masthead is the same but there are changes in the layout of the front page as well as the inside pages. We have also given a name to the newsletter. The name 'Quriosity' represents an indomitable spirit like that of the Mars Rover. The usual stories and news items are there. We hope you will like it.

We would really like to receive your comments and feedback from the readers.

We welcome suggestions for further improvement.
Happy reading.

Regards
Prof N.S.Nilakantan
TEAM QUANTINUUM

EDITOR'S NOTE

Dear Friends,

It was only three years ago that Team Quantinuum's newsletter embarked on the journey to introduce young ignited minds at SIMSR to the fascinating and mesmerizing world of quants . Since then, we have strived constantly to bring you the latest from the world of quants, along with illustrating the far greater applications and consequentially the impact of these beautiful numbers in our lives at individual and societal levels.

Change is inevitable and a prerequisite for growth. Deriving from the thought, our team brings you a revamped version of our monthly newsletter –with a name now - QURIOSITY, elaborately the curiosity for quants (and mind you, it is much more than just numbers!).

The cover story provides an insight on the phenomenon of **Risk Analysis** and its application in the wake of global financial crises and economic shocks while Quant digest dwells on the challenges of quant and light speed trading. The movie review covers the much acclaimed film "**MONEYBALL**" and introduces us to the concept of SABERMETRICS.

Further, to work your gray matter, we give you our regular features- Quant trivia, Quantiz and Quant fun.

Happy reading!

Rationally Yours!

Editorial Team

MAIN STORY: RISK METRICS

“The 4.15 Report refers to the one-page market risk report that was delivered to the one-time chairman of J.P. Morgan, Sir Dennis Weatherstone, at the close of trading (4:15 p.m.) each business day, summarizing the daily earnings at risk for J.P. Morgan worldwide. The methodology used in the now-famous ‘4.15 Report’ to estimate potential losses has become known as value at risk (Var).”

Risk may be defined as the uncertainty of returns. On the basis of uncertainty risk may be classified as Credit Risk, Operational Risk, Liquidity Risk and Market Risk. Market risk arises due the fluctuations in the market prices resulting from the changes in interest rates, volatility and market. An Absolute market risk estimates the potential loss in currency terms. Trading managers try to estimate the losses which they might incur in a day which is also called the DEaR(Daily Earnings at Risk). J.P.Morgan referred to this as the Value at Risk (Var).

Value at Risk is an estimate, with a predefined confidence interval, of how much one can lose over a day on typical trading activities or a month for longer for portfolio management. RiskMetrics supports a series of VaR methodologies, from the "delta" valuation approach where changes in the value of a position are approximated by a linear function (VaR = value of position times price volatility of instrument) to a full simulation approach where all instruments are revalued under different scenarios.

RiskMetrics datasets is a comprehensive set of daily re-estimated volatilities and correlations across a large number of asset classes and instruments. The datasets are an important input to any risk management model as they contain forecasts of financial asset volatilities and their correlations.

The methodology for estimating the volatilities (defined using a 95% confidence interval) and correlations is fully transparent and consistent across asset classes. Three datasets are currently available: one applicable for estimating risk over a 24 hour horizon, one designed for market participants with a 1-month horizon and the last developed to meet the requirements contained in the latest proposals from the Bank for International Settlements on the use of internal models to estimate market risk. The RiskMetrics™ datasets cover foreign exchange, money markets, interest rate swaps, bonds, and equity indices in 23 countries, along with commodities.

At all levels of the risk management process, be they individual position (micro), portfolio (macro) or

global business lines (strategic), the risk management process should meet the following attributes:-

1. Transparency of risk
2. Rigorous risk measurement techniques
3. Timely, quality information
4. Diversification of risks
5. Independent oversight
6. Use of disciplined judgment

There are two major requirements to setting up a risk management framework, such as RiskMetrics, to estimate market risks: -

1. Quality data must serve as the basis for estimating sound statistics of future market movements, i.e., volatilities and correlations. Within the RiskMetrics framework, procedures have been implemented to address a number of common data problems. One is the distinction between multiple outliers and influential observations.
2. A comprehensive mapping system must represent positions in a consistent manner. Although seemingly simple, most practitioners know that the logistical problems of collecting accurate position data within an institution may be overwhelming.

Traditional practice has been to estimate current volatility in the financial markets as the standard deviation of changes in price or yield over a set prior period, such as six months or a year. This approach explicitly allocates an identical weight to all of the observations and leads to volatility estimates that can decline abruptly once a large influential observation falls out of the measurement sample. The RiskMetrics approach uses exponential moving averages of historical rate and price returns to forecast future volatility in order to ensure responsiveness to market shocks and a subsequent gradual decline in the forecast of volatility.

The RiskMetrics methodology uses historical return data to forecast how the markets are likely to move in the future over a specified time. This is a methodological choice. There are various alternative approaches to forecast future volatility. One is the internal forecast method where market risk professionals are asked for their estimates. The problem with this method is that it is subjective and cannot be practically implemented for a large dataset. A second method is to use implied volatilities and correlations extracted from options prices. The problem with this approach is that quality data is difficult to obtain for a wide range of rates. Good data only exist for derivatives traded on established

exchanges. We, therefore, base RiskMetrics volatility and correlation forecasts on recently observed price and rate return histories.

The estimates of volatilities and correlations that comprise the RiskMetrics dataset assume that changes in prices and yields of financial instruments are normally distributed. Given this assumption, volatility is expressed in terms of standard deviation. The RiskMetrics approach has been to use 1.65 standard deviations as its measure of risk which encompasses 95% of occurrences. The assumption has two important implications:-

1. Occurrences outside the 95% confidence interval theoretically occur 1 day out of 20. Therefore, the estimates of volatility will underestimate risk one day a month by an unspecified amount. The simulation of worst case scenario impacts on the value of positions cannot be easily implemented using standard probability distributions.
2. Most return distributions have fat tails. RiskMetrics takes this into account by allowing volatilities to change daily and using exponential weighting.

Where to get the RiskMetrics datasets

The RiskMetrics dataset is available daily by 10:30 a.m. U.S. Eastern Standard Time (based on the previous day's market close) on a number of systems which include:

1. Internet: RiskMetrics publications and datasets are posted daily on a J.P. Morgan server accessible through the Internet. Users wishing to browse through the Web can use Mosaic or other equivalent browsers.
2. CompuServe: Users can access the J.P. Morgan forum on the CompuServe Information Service from around the globe, generally via a local phone call.

A methodology and the underlying market data are not sufficient to enable users to implement internal market risk management systems. Therefore, J.P. Morgan has encouraged third-party consultants and software developers who are committed to developing risk management estimation and reporting tools to utilize the RiskMetrics methodology and data. Third parties have strongly endorsed RiskMetrics by incorporating it into new or existing systems. Their products are geared to providing participants in the financial markets with the tools necessary to estimate the risks resulting from exposure to market movements.

VINAYAK NAIR
PGDM 2012-14

QUANTS NEWS DIGEST

Quant trading: How mathematicians rule the markets

Trading floors were once the preserve of adrenalin-fuelled dealers aggressively executing the orders of brokers who relied on research, experience and gut instinct to decide where best to invest. Long ago computers made dealers redundant, yet brokers and their ilk have remained the masters of the investment universe, free to buy and sell wherever they see fit. But the last bastion of the old order is now under threat. Investment decisions are no longer being made by financiers, but increasingly by PhD mathematicians and the immensely complex computer programs they devise. Fundamental research and intuition are being usurped by algorithmic formulae. Quant trading is taking over the world's financial capitals.

Firms are now employing gifted academic statisticians to track patterns or trends in trading behavior and create formulae to predict future market movements. These formulae are then fed into powerful computers that buy and sell automatically according to triggers generated by the algorithms. These are known as high-frequency trading (HFT) - in which stocks can be held for just a matter of seconds.

Note: - For more details, please refer <http://www.bbc.co.uk/news/business-14631547>

How Wall Street Got Addicted to Light-Speed Trading

Wired reporter Jerry Adler wrote a very well researched article on Wall Street high speed trading. It was originally scheduled for Wired's September issue but published in advance due to the 440M trading loss at Knight Capital Group. The author provides very interesting takes on the quants, their world and their obsession with more speed. Many people mentioned in this article are not stranger to our community so it's good read.

The scientists had claimed to observe subatomic particles called neutrinos traveling faster than the speed of light. But they were wrong; about six months later, they retracted their findings. And while "Special Relativity Upheld" is the world's most predictable headline, the news that neutrinos actually obey the laws of physics as currently understood marked the end of a brief and tantalizing dream for quant's—the physicists, engineers, and mathematicians-turned-financiers who generate as much as 55 percent of all US stock trading. In the pursuit of market-beating returns, sending a signal at faster than light speed could provide the ultimate edge: a way to make trades in the past, the financial equivalent of betting on a horse race after it has been run.

Note: - For more details, please refer <http://www.bbc.co.uk/news/business-14631547>

ANUJA SAKHARE
PGDM-IMC 2012-14

MOVIE REVIEW: MONEYBALL

Moneyball is a 2011 biographical sports drama film directed by Bennett Miller and distributed by Columbia Pictures. The film is based on Michael Lewis's 2003 book of the same name, an account of the Oakland Athletics baseball team's 2002 season and their general manager Billy Beane's attempts to assemble a competitive team. In the film, Beane (Brad Pitt) and assistant GM Peter Brand (Jonah Hill), faced with the franchise's unfavorable financial situation, take a sophisticated **sabermetric*** approach towards scouting and analyzing players, acquiring "submarine" pitcher Chad Bradford (Casey Bond) and former catcher Scott Hatteberg (Chris Pratt), and winning 20 consecutive games, an American League record.

Oakland Athletics general (Brad Pitt) is upset by his New York Yankees in the With the impending players Johnny Damon, Jason Isringhausen to free attempts to devise a assembling a competitive struggles to overcome player payroll. During a Indians, Beane meets Hill), a young Yale with radical ideas about



manager Billy Beane team's loss to the 2001 postseason. departure of star Jason Giambi, and agency, Beane strategy for team for 2002 but Oakland's limited visit to the Cleveland Peter Brand (Jonah economics graduate how to assess

players' value. Beane tests Brand's theory by asking whether he would have drafted him (out of high school), Beane having been a Major League player before becoming general manager. Though scouts considered Beane a phenomenal player, his career in the Major Leagues was disappointing. After some prodding, Brand admits that he would not have drafted him until the ninth round and that Beane should probably have accepted a scholarship to Stanford instead. Sensing opportunity, Beane hires Brand as the Athletics' assistant general manager.

The team's scouts are first dismissive of and then hostile towards Brand's non-traditional sabermetric approach to scouting players. Rather than relying on the scouts' experience and intuition, Brand selects players based almost exclusively on their **On base percentage (OBP)**. By finding players with a

high OBP but with characteristics that lead scouts to dismiss them, Brand assembles a team of undervalued players with far more potential than the A's hamstrung finances would otherwise allow. Despite vehement objections from the scouts, Beane supports Brand's theory and hires the players he selected, such as unorthodox submarine pitcher Chad Bradford (Casey Bond). Following the free agent signings, Beane finds that he also faces opposition from Art Howe (Philip Seymour Hoffman), the Athletics' manager. Beane eventually trades away the lone traditional first baseman, Carlos Peña, to force Howe to use the new recruits.

Early in the season, the Athletics fare poorly, leading critics within and outside the team to dismiss the new method as a dismal failure. Beane convinces the owner to stay the course, and eventually the team's record begins to improve. Ultimately, the Athletics win 20 consecutive games, setting the American League record. Their streak is capped with a victory over the Kansas City Royals. Like many baseball players, Beane is superstitious and avoids attending or sometimes even following games as they are in progress. His young daughter implores him to go to the A's final game against the Royals, where Oakland is already leading 11–0 after third inning and appears set to advance their winning streak to a record-breaking 20. Beane arrives in the fourth inning, only to watch the team go to pieces and eventually allow the Royals to even the score 11–11. Finally, the A's do win, on a walk-off home run by one of Brand's picks, Scott Hatteberg. Beane is disappointed, but satisfied at having demonstrated the value of his and Brand's methods. Beane is later approached by the owner of the Boston Red Sox, who realizes that the sabermetric model is the future of baseball, and offers to hire Beane as the general manager of the Red Sox.

In closing, the film notes that Beane passed up the opportunity to become the general manager of the Boston Red Sox, despite an offer of a \$12.5 million salary, which would have made him the highest-paid general manager in sports history. He returns to Oakland to continue managing the Athletics. Meanwhile, two years after adopting the sabermetric model, the Boston Red Sox win their first World Series since 1918.

***Sabermetrics** is the specialized analysis of baseball through objective evidence, especially baseball statistics that measure in-game activity.

BHAWNA JAIN
PGDM-FS 2012-14

QUANT GURU of the MONTH

Hans Reichenbach - A German Philosopher of Science was born on 26, September 1891.



**September 26, 1891 –
April 9, 1953**

He entered the University of Stuttgart with the intention of becoming an engineer. However his interests moved towards more theoretical aspects of science and he left Stuttgart in 1911 after one year of study and took mathematics, physics and philosophy courses at Berlin, Munich and Göttingen. Being at three different universities over the course of four years was certainly not unusual, for at this time most German students took courses at several different universities. The theoretical physicists Planck, Born, Einstein and Somerfield, the mathematician Hilbert, were among his teachers. Reichenbach was also active in the universities outside his immediate academic studies. He had strong views on society and was outspoken on social topics, taking advantage of student politics to air his views. In 1915 he received his doctorate from the University of Erlangen for his thesis on philosophical aspects of the theory of

probability "Der Begriff der Wahrscheinlichkeit für die mathematische Darstellung der Wirklichkeit". The thesis had a mathematical part and a philosophy part. In 1916 his thesis was published.

In 1917 he was one of only five people who attended Einstein's first course on relativity. The topic intrigued Reichenbach and he launched himself into undertaking research on its philosophical aspects. He remained in Berlin until 1920 when he was appointed professor at the Polytechnic at Stuttgart. There he taught a wide variety of topics showing both the breadth of his interests and his background: relativity, philosophy of science, history of philosophy, surveying, and radio techniques. In the year he took up this position he published his first major text on relativity "The theory of relativity and a priori knowledge" which attacked Kant's synthetic a priori theory of space and time, and of physics. His second major book "Axiomatisation of the theory of relativity" published in 1924. This work again examined the philosophical meaning of the theory of relativity.

He was later appointed to the chair in the philosophy of physics at the University of Berlin in 1926. Reichenbach took a very different approach to teaching than that used throughout the German system at that time. He encouraged discussion and made himself available to students who could debate

QUANT TRIVIA



“95 is the number of planar partitions of 10.”

topics in the courses with him. He founded the "Society for empirical philosophy" in Berlin in 1928, known as the Berlin Circle. Carl Gustav Hempel, Richard von Mises, David Hilbert and Kurt Grelling all became members of the Berlin Circle and During these years in Berlin, Reichenbach published further important works on the problems of space and time associated with the new physics. "The philosophy of space and time" was an important text published in 1928, followed two years later by another major book "Atom and cosmos: the world of modern physics". In 1931 he published a further paper "Aims and methods of modern philosophy of nature".

Reichenbach attempted to define probability as the limit of a frequency but many criticised this approach. He argues that if n trials have been carried out, the only evidence one might use to predict the next trial is the frequency observed in the n trials. This, he writes is: "the most that can be expected of a theory".

Later, when he moved to the United States he also wrote major works on the philosophical foundations of quantum mechanics and on time. On the first of these topics he published the book Philosophic foundations of quantum mechanics (1944), he defines order of time by: "event A occurs before event B if event A can produce a physical effect on event B". As to the direction of time, he writes that the: "direction of time is definable only by means of irreversible processes ", in other word by means of increasing entropy.

VARUN S.
PGDM-IB 2012-14

QUANTIZ of the MONTH

Q 1) There are 8 marbles that weigh 1 ounce each, and 1 marble that weighs 1.1 ounces. The marbles are all uniform in size, appearance, and shape. You have a balance that contains 2 trays. You are only able to use the scale 2 times. How do you determine which marble is the heaviest using only the scale and marbles in 2 weightings'.

Q 2) Some months have 31 days, Some months have 30 days.
How many have 28 days?

Q 3) I went to bed at 8 o 'Clock in the evening and wound up my clock and set the alarm to sound at 9 o 'Clock in the morning. How many hours of sleep would I get before being awakened by the alarm?

Q 4) How long did the Hundred years war last?

Q 5) The one who makes it sells it.
The one who buys it doesn't use it.
The one who's using it doesn't know he's using it.
What is it?

Keeping the Grey
matter Alive!

Please send us the answers at simsr.quantinum@gmail.com. Answers and Name of the winner (first all correct /most correct entry) will be published in the next issue.

We didn't receive any correct entry to last issue's Quiz!!

Solutions to last issue's Quiz of the month

1. 11 pieces of the nickel candy, 19 of the 2 cent, and 70 of the 10/penny.
2. Pick from the one labeled "Apples & Oranges". This box must contain either only apples or only oranges. E.g. if you find an Orange, label the box Orange, then change the Oranges box to Apples, and the Apples box to "Apples & Oranges"

3. 10 lockers are left open:

Lockers # 1, 4, 9, 16, 25, 36, 49, 64, 81, and 100.

Each of these numbers is perfect squares. This problem is based on the factors of the locker number.

Each locker is toggled by each factor; for example, locker #40 is toggled on pass number 1, 2, 4, 5, 8, 10, 20, and 40. That's eight toggles: open-closed-open-closed-open-closed-open-closed. The only way a locker could be left open is if it is toggled an odd number of times. The only numbers with an odd number of factors are the perfect squares. Thus, the perfect squares are left open.

For example, locker #25 is toggled on pass number 1, 5, and 25 (three toggles): open-closed-open.

4. Possible solutions are:-

$$888 + 88 + 8 + 8 + 8$$

$$(8(8(8+8)-(8+8)/8))-8$$

$$8888/8.888$$

5. $8/(3-(8/3))$

$$= 8/(1/3)$$

$$= 24$$

QUANTIZ TEAM

QUANT FUN

Sudoku of the Month

					3		8	
9				2	1			
					9	6	1	3
4			2				5	
		7				4		
	1				4			7
5	7	8	1					
			7	6				5
	3		9					

Please send us the answers at simsr.quantinum@gmail.com.
Answers and Name of the winner (first allcorrect /most correct entry) will be published in the next issue.

Solution to last month's Sudoku of the month

1	3	2	5	4	9	8	7	6
7	9	8	2	3	6	5	4	1
5	4	6	1	7	8	3	9	2
9	2	7	8	1	3	6	5	4
8	1	5	9	6	4	2	3	7
3	6	4	7	5	2	1	8	9
2	8	3	6	9	7	4	1	5
4	7	1	3	2	5	9	6	8
6	5	9	4	8	1	7	2	3

The correct answer to Sudoku was given by Gaurav Bhargava, PGDM-Finance 2009-11 batch. Congratulations!
We invite anyone interested to come forward and solve the Sudoku through Solver.

QUANT TRIVIA



“Arithmetic is where numbers fly like pigeons in and out of your head. ~Carl Sandburg.”

QuantConnect

Quantinum, the Quant's forum of KJ Somaiya Institute of Management Studies and Research is formed with two objectives. Firstly to remove the common myth from the students mind that mathematics is difficult. Secondly to give students an exposure on how to make decisions in real life business problems using quantitative techniques. This helps to bridge the gap between theory and the practical application.

For any further queries and feedback, please contact the following address

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Rush your articles, concepts, trivia, facts and news about the

Wonderful World of Numbers to us by email to