

# Development of Cost of Debt and Risk Formula for a Period of Financial Turbulence Focus: The Cost of Global Financial Crisis

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## Abstract

Financial institutions specifically banks and small businesses have encountered difficulty in sustaining their ability to remain stable during the financial crisis. During this period most scholars addressed the cause and risk of financial turbulence but very few studies identified the cost of debt and risk of financial turbulence. The objective of this study is to enhance the Mahalanobis model to include the measurements of cost of debt when measuring financial turbulence which essentially has an impact on the stock market. The data collected in respect of the South African Reserve Bank (SARB) and Statistics South Africa (SAS) identifies the correlation of financial turbulence in banks as well as small businesses and analyses and interprets the relationship between total liquidation of companies and total assets of banks. Although different countries had different industries contributing to the financial crisis, this study is not industry based.

## Keywords

Cost, Financial Turbulence, Financial Crisis, Volatile, Financial Risk, Capitalism, Liquidation, Investors, Small Businesses, Commercial Banks, Mortgage Bonds, Stock Markets, Return on Investment, Return on Equity

## 1. Introduction

This chapter introduces the focus of the research and prior work that has been done relating to the financial crisis discipline. The financial crisis affected industries differently but the result of this epidemic was the same (Sharples, 2011). The impact of financial crisis on different markets as well as on small businesses and commercial banks is identified and discussed from different angles. This

study engages on occurrences of losses encountered by small businesses as well as financial institutions such as banks. There are a number of studies conducted by different scholars which relate to the findings of the impact of this crisis (Chow et al., 1999), (Chari et al., 2008) and (Sharples, 2011). The cause of the financial crisis is not known but what may have caused the collapse of the stock exchange and/or open-ended investments on mortgage bonds sold nationally and internationally, promising to generate investment income. This promise was non-existent when the dream to generate investment income failed. One of the reasons for failure is that the mortgage industry has already reached a price ceiling (Truman & Dowson, 2007). The increase in interest rates did not make it easier for newcomers to enter the market, in fact, investors had less buying power during this time, and sellers could not make much profit. Some sellers were making a sale at a loss because they could not sell their properties for even the price it was bought. Investigating and identifying the losses encountered during the 2007-2008 financial crisis generated an interest in investigating the risk and cost encountered during a period of financial turbulence, and further established a methodology that could forecast the cost and risk of financial turbulence (Chari et al., 2008).

Financial turbulence is a period of financial strain and affects most if not all industries. During this period, industries suffered financial loss. A number of scholars studied this epidemic, however despite the impact generated; the cost and risk of the financial crisis have not been studied in depth, because their focus was on the cause and impact of the financial crisis (Chari et al., 2008).

The purpose of this research is to investigate and define a formula that can forecast the cost and risk of the recession. Looking at historic events and patterns of the recession, most studies conducted do not investigate the cost but rather the cause of the event. Using the Mahalanobis (1936) formula as the foundation of the formula that determines financial turbulence and (Firer, Ross, Westerfield, & Jorda, 2008) which measures risk gave a guideline on how to create a formula that can establish the calculation of the cost and risk of the financial crisis.

## 1.1. Background

This section discusses the impact of the financial crisis on different markets by investigating the effect of bond market on the stock exchange. It further analyses the influence and cost of financial turbulence on investors. Lastly, it focuses on the effect of the financial turbulence on small businesses and commercial banks that is the focal point of this study throughout the research.

### 1.1.1. Financial Crisis on Different Markets

The global financial crisis affected many developing countries in different ways. This affected risky portfolios adversely, forcing many investors to incur losses. During this time of financial turbulence, the stock market globally was volatile especially concerning international portfolios (Ramos et al., 2011). In the case of

the United States of America, the major impact was on the bond and stock market. In the United Kingdom and Europe, the major impact was in the banking industry (Schich, 2008).

The impact of the crisis affected the South African the stock market, bond market financial institutions and small businesses. Most industries resulted in financial strain during this period, according to Marshall (2009) the United States housing bubble was not accidental as it was pre-empted by financial decisions made by the bank industry. The financial innovation was established to reduce risk, which ensured that the crisis spread across the financial market and the economy.

Senbet & Gande (2009) illustrate that excessive lending in the mortgage industry in an era of low interest rate caused the housing bubble. The credit rating boom and other derivative factors powered the easy access to money with complex securitization of mortgage-backed securities (MBS). The United States mortgage backed securities retained its value by selling mortgages around the world. This resulted in a global phenomenon because financial institutions and investors around the world had exposure to the mortgage market through MBS (Senbet & Gande, 2009). Therefore when the crash of the mortgage industry occurred, the stock market was impacted immensely, and this resulted in the collapse of the stock exchange.

### **1.1.2. The Influence of Financial Turbulence to Investors**

Despite investors who were able to retain their investment portfolios during the financial turbulence, most portfolio holders generally experienced excessive losses because most of their assets were not diversified (Boscaljon et al., 2011). The measurement of 'asset diversification benefits an average correlation' tends to be misleading. Investors tend to consider only average correlations, because they believe that portfolio were diversified during this period. This was one of the biggest mistakes investors made that led to catastrophic losses in the 2007-2008 financial crisis (Kritzman & Li, 2010). Investors should have measures that take into account the behaviour of an asset during financial turbulence as this will enable them to analyse the cost and risk of an asset before considering to invest in that asset (Kritzman & Li, 2010). Local debt markets in emerging economies led to financial crisis during the period of financial turbulence where the development of these markets had a major reliance on the bond market, which in turn was over indulged by its main role players (Schich, 2008). Major contributing factors of financial turbulence are mostly from big bondholders who have over indulged in the process of lending which had resulted in the client's negative balance sheet.

### **1.1.3. Cost of Financial Turbulence**

Neither the cost of financial turmoil nor the possibilities of preventing financial turmoil are discussed in detail. Within the small business, discipline over lending of commercial banks landed most of these businesses into unmanageable fi-

nancial state (Sharples, 2011). Structured finance however is a model that could be used as a mechanism for the prevention of financial turmoil as it allows borrowers to lend money at an agreed upon interest rate which is always lower than the standard interest rate. According to Bernanke (1981), the cost of credit intermediation (CCI) is the cost of channeling funds from the ultimate savers/lenders into the hands of good borrowers. The CCI includes screening, monitoring, and accounting costs, as well as the expected losses inflicted by bad borrowers, which makes this process similar to structured finance.

#### **1.1.4. Financial Impact on Small Businesses and Commercial Banks**

The Federal Reserve Bank serves as a guide and determinant of quotas for the commercial banks and also as a governance methodology in order to put control on the lending habits of commercial banks (Neely, 2011). Small businesses landed into trouble because this period resulted in limited support from customers causing a decrease in demand for products on some of the small businesses. This caused them to turn to commercial banks where continuous lending and below the market loan payback was practiced (Sharples, 2011). This practice drove the commercial banks to a negative balance sheet because small businesses could not keep up with repayments due to the decrease in business. This left small businesses with no choice but to cut costs: this meant there needed to be a cutback on their employees resulting in job losses, still leaving the small businesses with a big loan to cover (Sharples, 2011). Some small businesses could not bear the crunch of managing their small businesses and this forced them to close their doors (Itzhak et al., 2012).

Most businesses were left with bad debt even after the business was closed down. Some small businesses led to liquidation because they had no sustainability (Itzhak et al., 2012).

When small businesses failed sustainability, it led commercial banks into a tight situation of trying to manage loans that could not be repaid or that were being repaid at a decreased pace (Sharples, 2011). With this financial dilemma banks had to increase their interest rates in order to recover their losses. This made it difficult for clients to repay their loans because the interest was too high. This description of financial turmoil reduced the money supply hence the increase in interest rates, which led to unaffordability and eventually repossession of property by suppliers and ultimately bankruptcy (Itzhak et al., 2012).

## **2. Background to Capitalism on Financial Crisis**

The study of Shiller (2013) “Capitalism and Financial Innovation” and other financial studies which have been conducted with the objective of understanding the crisis which occurred in 2007-2009 have a common relationship. Most of these studies such as Truman & Dowson (2007), Itzhak et al. (2012), Shiller (2013) have been focusing on the United States as they were extremely affected by this predicament. There are numerous markets that have been impacted by the financial crisis on the global spectrum as a collective result of the economic

downturn (Shiller, 2013).

### **2.1. The Influence of Capitalism on a Financial Crisis**

Capitalism always leads the financial industry into a disadvantage specifically where capitalists do not contribute to the money supply that will essentially reduce financial growth and will push the industry into loss of cash flow (Shiller, 2013). Investigating the impact of the financial crisis will give a predefined view of the cost of financial turbulence where capitalism had an influence on financial growth or loss.

According to Reinert & Daastol (2011), there is a relationship between financial capitalism and production capitalism, which has an impact on the global financial crisis. Most capitalists would withhold their finances and limit investments during difficult times that slow down the money supply; this in essence creates high market volatility (Meyer & Kirby, 2012). Guevara (2011) investigates the market volatility specifically where traders have given rise to a much stronger focus on risk management and further explains that volatility is related to periods of market downturn. Guevara (2011) enhances the concept introduced by Kritzman & Li (2010) of measuring financial turbulence index to measure periods of high volatility in one or between two different assets.

Meyer & Kirby (2012) illustrates that capitalism is an obsessive pursuit of return on equity (ROE) and a determination to preserve competition, to the point that it compromises sustainability. Where there were no returns on equity for continuous periods, mostly in cases where losses were encountered due to low cash flow, financial capitalism that has gone wrong may be illustrated, hence in times it is regarded as financial greed (Shiller, 2013).

### **2.2. Historic Costs Leading to a Financial Crisis**

On the global arena of financial expert, many have analysed that if most of the costs were established prior to the economic downturn, none of the industries would have anticipated financial loss (Senbet & Gande, 2009). These costs resulted as an increase in bad debts and this was not expected because some of the transactions that generated high costs were bad debts written off. Kissell (2011) established that market impact costs are related to liquidity and price volatility, where Engle et al. (2012) emphasise on equity market execution costs that estimate transaction costs, which are the main barrier of return on investments (ROI). Analysing the return on future portfolios may have the potential of saving or minimizing the potential of extensive financial losses that may lead to financial crisis if it is not regulated. Such financial costs, which at times are stipulated as transaction costs, are a contributing factor to capitalism that is an element of the financial crisis (Shiller, 2013).

### **2.3. Identifying Crisis in Commercial Banks and Small Businesses**

This study however investigates the impact of financial crisis on commercial

banks and small businesses within the South African environment. According to [Bernanke \(1981\)](#) there is a relationship between the financial crises that occurred in the 1930's and during 2008, as it both affected the banking industry. He further elaborates that the significance of banking difficulties are from their central role played in the financial system. Without the injection of the money supply by financial institutions, it is likely that interest rates will increase because of the high demand, which will generate the potential of financial distress. This financial distress may slowly be because of high volatility products within commercial banks which impact on volumes of portfolios that generate no returns ([Neely, 2011](#)).

During the global recession, most companies landed in a negative balance sheet that resulted in challenging circumstances and eventually having to close down businesses that were not generating any turnover. During this period, it was very difficult for businesses to acquire financing because of the decrease in money supply that increased interest rates beyond what businesses could afford. Most small business portfolios had suffered financial instability during the global financial crisis, where portfolios that had high volatility were seen as risky assets.

Most businesses took a knock during the financial crisis that created economic instability in the global arena. This created a decrease in money supply because debtors were unable to honour their debts. The next section discusses the effects of capitalism and financial innovation, which contributed and have an impact on costs and risk of the financial crisis.

Capitalism may be a contributing factor in the growth of the economy however during the financial turbulence it was a contributing factor to the loss of money supply. The decrease in money supply has a negative effect on small business, which caused a disruption in the market. The problem described addresses the cost and risk of financial turbulence during a volatile period.

### 3. Objective

The objective of this research is to establish a methodology that can forecast the cost and risk of financial turbulence for businesses. By investigating and understanding the [Mahalanobis \(1936\)](#) calculation of distance and further analysing and enhancing the formula developed to detect financial turbulence by [Chow et al. \(1999\)](#) will drive the study to achieve its goal. This study further investigates the impact of the global financial crisis that affected small businesses and commercial banks in the South African business environment.

#### 3.1. Historical and Future Impact of a Financial Crisis

The historical and future forecasted impact of the financial crisis by looking at the models previously developed to analyse financial turbulence. Models such as [Mahalanobis \(1927\)](#) formula to calculate distance [Wolfel & Ekenel \(2005\)](#) is used as the originating point to measure financial turbulence [Mahalanobis \(1936\)](#) formula. Most studies from different scholars such as [Bernanke \(1981\)](#), [Chow et](#)

al. (1999), Kritzman & Li (2010) and Sharples (2011) have investigated and discussed the impact of the global financial crisis especially in leading economies, however these studies did not investigate the costs and risk of financial crisis. Notably cost and risk of financial crisis are in relation to the quantitative ability of the study that has to follow a technical process in order to generate an understanding of the discipline (Schich, 2008). The literature also investigates the history of the existence of the formula that forms the basis of where this study derives an enhanced formula to calculate the cost and risk of financial turbulence. This chapter first identifies and analyses the journals related to the impact of financial crisis throughout the industry and further identify journals to investigate the cost and risk of financial turbulence. This study is narrowed to the cost and risk of financial crisis on commercial banks and small businesses during this period of financial turbulence that were affected to a point where some encountered a heavy financial loss which led to bankruptcy (Sharples, 2011).

### **3.2. The Impact of a Financial Crisis to Industry**

The first recession was identified in the 1930's Bernanke (1981), which had an interesting aspect of the general financial crisis relating mostly to bank failures. This was an event that was a coincidence in timing with antagonistic development in macroeconomic structure Bernanke (1981), however the impact differs from industry to industry. During this period, the status of the crisis was beyond critical hence, it was known as the period of the great depression (Harrison, 2012). After the 1930, financial crisis there was another financial strain that occurred in the 1990's which also affected different industries, specifically banks that were faced with high insolvency risk, but this crisis did not have the same level of effect compared to the 1930's crisis Soedarmono, Machrouh & Tarazi, (2012). Major emerging economies were affected by the global financial crisis, most industries could not handle the financial crisis, and had to make decisions to reduce costs in order to sustain their businesses, some of this cost reduction meant resource crunching. The financial turmoil that pushed commercial and investment banks to a compromising position led to heightened interest on the part of both the general public and policy makers in key aspects of the financial safety net (Schich, 2008). During the period of the financial crisis, the financial market reflected global financial nervousness on the markets and created a volatile environment where investors were skeptical to invest in risky portfolios (Bacidore et al., 2012).

### **4. Financial Turbulence Cost and Risk**

The cost of financial turbulence is not always clearly outlined or discussed during the financial turbulence. Possible cost implications over this period can be analysed through correlation between two or more assets and measurement of their returns by investigating historic dividends of a portfolio and forecasting future returns on the portfolios in study. The relationship between different as-

sets during a financial turbulence period is measured by the riskiness of a portfolio that could be diversified or undiversified (Kritzman & Li, 2010). Turbulence indices provide a range of applications that is used to analyse global markets, such as stress test portfolios that uses return, risk and correlation measures relating to period of turbulence state street global markets (2009). Such risk measures provide a more realistic characteristic of a portfolio risk during the financial crisis. Construct portfolios are risk parameters estimated from quiet times versus those that are in stressful financial times, and such portfolios are resilient to market turbulence (Bacidore et al., 2012). Another application that is used is to improve portfolio performance by scaling risk exposure up and down to analyse the lifecycle of risk in different portfolios. By understanding the reaction of market segments during a period of financial stress, one can improve returns by adjusting risk exposure when turbulence first strikes (Kritzman & Li, 2010). Risk parameters used to identify the potential of risk are methods of measure such as standard deviation and correlation that are not always accurate and can determine the volatility of portfolios over a short period of time (Kritzman & Li, 2010). There are a number of methods used to measure/forecast risk but for the purposes of this study the focus will only be on the Capital Asset Pricing Model(CAPM), which was established in 1964 by William Sharpe and it is being used ever since (Fama & French, 2004). The following is the standard formula used to calculate risk of portfolio, and to analyse the cost of risk CAPM will be completing the Mahalanobis (1936) formula to calculate the risk of financial turbulence during a period of volatility.

$$K_e = R_f + \beta(K_m - R_f)$$

## 5. Mahalanobis Approach

The Mahalanobis practice introduced in 1927 used to calculate distance and to analyse human skulls Wolfel & Ekenel (2005), and was later applied to turbulence in financial markets, to measure, manage risk and improve investment performance (Kritzman & Li, 2010). The mathematical measure of financial turbulence was established by Mahalanobis (1927) and further enhanced the research in 1936 with the purpose of analysing the human skull. With this development of measuring, the human skull Chow et al. (1999) developed a model using this theory to calculate financial turbulence by testing portfolios especially in volatile periods. The Mahalanobis human skull analysis was first identified as the Mahalanobis distance which measures the distance, a feature of critical importance for all classification methods. This shows good performance for clean features but loses performance very fast in the case of noisy features. To improve the noise robustness of the Mahalanobis distance we propose to weight the features according to their distances after the variance normalization (Wolfel & Ekenel, 2005).

Similar to the US financial market which had collapsed due to high borrowings of the bond market South Africa went through a comparable effect of the



recession, but the impact was much more emphasized on small businesses. During the period of 2007-2008, small businesses went through a financial crisis that forced most of the businesses to close their doors or lay-off a considerable number of employees in order to sustain the survival of their businesses. This exercise has contributed to the increase in unemployment and resulted in the decrease of gross domestic income (Harrison, 2012). Businesses that opened during this period suffered the most and limited financing forced them to close down.

The measurement of financial turbulence used the method developed by Mahalanobis (1936) where distance standard deviation and correlation of individual dimensions are taken into account. According to Kritzman & Li (2010), the calculation of financial turbulence is illustrated in the following manner: An  $n$  characteristic for measurements, each skull can be represented as an  $n$ -dimensional vector. The Mahalanobis distance of an individual vector  $y$  from a sample of vectors with average  $\mu$  and covariance matrix  $\Sigma$  is defined as:

$$d = \sqrt{(y - \mu)\Sigma^{-1}(y - \mu)^t}$$

where  $d$  = Mahalanobis distance from sample average (scalar)

$y$  = vector of multivariate measurements ( $1 \times n$  vector)

$\mu$  = sample average vector of historical returns ( $1 \times n$  vector)

$\Sigma$  = sample covariance matrix of historical returns ( $n \times n$  matrix)

Chow et al. (1999) independently derived a nearly identical formula to detect turbulence in financial markets, by substituting assets returns for skull characteristics

Chow et al. (1999) determined the statistical unusualness of a cross section of returns on the basis of their historical asset distributions. The statistical measure of financial turbulence, which we term the “turbulence index”, is formally defined as:

$$d_t = (y_t - \mu)\Sigma^{-1}(y_t - \mu)^t$$

where  $d_t$  = turbulence for a particular time period  $t$  (scalar)

$y_t$  = vector of asset returns for period  $t$  ( $1 \times n$  vector)

$\mu$  = sample average vector of historical returns ( $1 \times n$  vector)

$\Sigma$  = sample covariance matrix of historical returns ( $n \times n$  matrix)

The analysis of this formula has two advantages for statistical measurement of turbulence; it implies volatility and the estimates are determined for any type of asset rather than only liquid asset (Kritzman & Li, 2010). Liquid assets are in the interest of the investor as it is easily accessible for the investment however; they are volatile due to their rapid loss. This measure determines the volatility of individual assets as well as their correlation. The major correlation of assets studied is stock and bonds that had a major impact of the financial crisis in the period of 2007-2008 (Kritzman & Li, 2010). The turbulence-based approach, in contrast, anticipated the exposure to loss of these portfolios much more accurately. To clarify this phenomenon it is described by (Kritzman & Li, 2010) that

the turbulence-based approach does not offer reliable estimate of when an extreme event will occur; rather, it gives consistent estimate of the consequences of such an event that makes turbulence a relative measure. There are many contributing factors to financial turbulence, but economic instability in today's financial markets is the main contributing factor of the financial turmoil. Financial turbulence is a condition where asset prices continue to have mixed in volatility (Warren, 2012). Low savings and investments pushed high borrowings and the decrease in balance, which may lead to a deficit (Sharples, 2011) that is likely to cause financial crisis. The historical patterns of behaviour, behave in an uncharacteristic fashion which can be measured by the methodology of the skull financial turbulence. There are different techniques on measuring the exposure to risk. For the purposes of this analysis, value at risk (VaR) is used to measure a portfolio's exposure to loss (Kritzman & Li, 2010). The conventional approach for measuring VaR uses the full-sample covariance matrix to compute the portfolio's standard deviation and considers the probability distribution only at the end of the investment horizon. We can measure exposure to loss more reliably by estimating covariance's financial turbulence (Kritzman & Li, 2010). Variance swaps and forward variance swaps create the ability for investors to gain direct exposure to volatility. When losses are more likely to occur, and by accounting for interim losses as well as losses that occur from investments, this may result in financial turmoil (Warren, 2012).

There is a correlation between the measurement of the skull and financial turbulence hence the methodology developed is able to equally address issues related to these two concepts (Chow et al., 1999). The main principle is to establish the determinants of financial turmoil and define future solutions that can prolong or prevent the problem.

The impact of financial turbulence was worldwide and affected different developing countries in different ways, but they had similarities which resulted in the increase in debt which created a deficit and decrease in gross domestic income which had made it difficult to create a better financial market (Neely, 2011). The differential performance of risky strategies during turbulent and no turbulent periods, together with the persistence of turbulence, raises the alluring viewpoint that portfolio managers might be able to improve performance by conditioning exposure to risk on the degree of turbulence (Kritzman & Li, 2010). Indeed, we show here that a simple scaling rule applied to the carry strategy does significantly improve performance of the financial markets.

## 6. Conclusion

Chow et al. (1999) enhanced the formula to calculate financial turbulence in volatile periods; the literature describes events of financial turmoil of which could have been prevented. On the contrary, (Senbet & Gande, 2009) view the pre-crisis and post-crisis in risk adjusted terms that caused loss to real estate, however this crisis may have been planned to not only impact the financial institutions and

the stock market but have an impact on the global economy. The global stock markets crashed which led small businesses to liquidate and close the businesses. Financial turbulence measurements estimate the value of total assets which, when used, enables the businesses to forecast their total assets. The following chapter discusses the research method.

The purpose of this study is to develop a conceptual framework that will establish the process of calculating the cost and risk of the financial crisis by investigating the historic measures of this event and forecasting the possibilities of avoiding future financial turbulence. The crisis affected markets differently but they all had the same results of low cash movement that result in a decrease of money supply that resulted in financial turmoil. The next chapter discusses the impact of financial crisis on the industry as well as on banks and small businesses because they are the focal point of this study.

### Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

### References

- Bacidore, J., Bekow, K., & Wong, J. (2012). Inside the Opening Auction. *Journal of Trading*, 7, 7-14. <https://doi.org/10.3905/jot.2012.7.1.007>
- Bernanke, B. S. (1981). Nonmonetary Effects of Financial Crisis in the Propagation of the Great Depression. *The American Economic Review*, 73, 257-276.
- Boscaljon, B., Filbeck, G., & Zhao, X. (2011). Why Track Inefficiency. *Journal of Index Investing*, 2, 28-36. <https://doi.org/10.3905/jii.2011.2.3.028>
- Chari, V. V., Christiano, L., & Kehoe, P. J. (2008). *Facts and Myths about the Financial Crisis of 2008*. Federal Reserve Bank of Minneapolis Working Paper 666. <https://doi.org/10.21034/wp.666>
- Chow, G., Jacquier, E., Lowrey, K., & Kritzman, M. (1999). Optimal Portfolios in Good Times and Bad. *Financial Analysts Journal*, 55, 65-73. <https://doi.org/10.2469/faj.v55.n3.2273>
- Engle, R., Ferstenberg, R., & Russell, J. (2012). Measuring and Modeling Execution Cost and Risk. *Journal of Portfolio Management*, 38, 14-28. <https://doi.org/10.3905/jpm.2012.38.2.014>
- Fama, E. F., & French, K. R. (2004). The Capital Asset Pricing Model: Theory and Evidence. *Journal of Economic Perspectives*, 18, 25-46. <https://doi.org/10.1257/0895330042162430>
- Fire, C., Ross, S. A., Westerfield, R. W., & Jordan, B. D. (2008). *Fundamentals of Corporate Finance* (4th South African ed., pp. 386-457). McGraw Hill.
- Guevara, A. (2011). *Identifying Periods of Financial Turbulence*. Quantitative Analyst, Trade Station Labs Analysis Concepts TSLabs@TradeStation.com.
- Harrison, M. A. (2012). Economist. *CFA Digest*, 42, 36-38. <https://www.economist.com/node/21548255> <https://doi.org/10.2469/dig.v42.n2.16>
- Itzhak, B. D., Franzoni, F., & Moussawi, R. (2012). Hedge Fund Stock Trading in the Financial Crisis of 2007-2009. *Review of Financial Studies*, 25, 1-54. <https://doi.org/10.1093/rfs/hhr114>

- Kissell, R. (2011). Creating Dynamic Pretrade Models: Beyond the Black Box. *The Journal of Trading Fall*, 6, 8-15. <https://doi.org/10.3905/jot.2011.6.4.008>
- Kritzman, M., & Li, Y. (2010). Skulls, Financial Turbulence, and Risk Management. *Financial Analysts Journal*, 66, 30-41. <https://doi.org/10.2469/faj.v66.n5.3>
- Mahalanobis, P. C. (1927). Analysis of Race-Mixture in Bengal. *Journal of the Asiatic Society of Bengal*, 23, 301-333.
- Mahalanobis, P. C. (1936). On the Generalised Distance in Statistics. *Proceedings of the National Institute of Science of India*, 2, 49-55.
- Marshall, J. (2009). *The Financial Crisis in the US: Key Events, Causes and Responses*. Research Paper 09/34 House of Common Library.
- Meyer, C., & Kirby, J. (2012). Runaway Capitalism. *Harvard Business Review*, 90, 66-75.
- Neely, C. J. (2011). A Survey of Announcement Effects on Foreign Exchange Volatility and Jumps. *Federal Reserve Bank of St. Louis Review*, 93, 361-407. <https://doi.org/10.20955/r.93.361-385>
- Ramos, S. B., Vermunt, J. K., & Dias, J. G. (2011). When Markets Fall Down: Are Emerging Markets All the Same? *International Journal of Finance and Economics*, 16, 324-338. <https://doi.org/10.1002/ijfe.431>
- Reinert, E. S., & Daastol, A. M. (2011). *Production Capitalism vs Financial Capitalism-Symbiosis and Parasitism. Evolutionary Perspective and Bibliography*. Working Papers in Technology Governance and Economic Dynamics No. 36.
- Schich, S. (2008) *Financial Turbulence: Some Lessons Regarding Deposit Insurance*. Financial Marketing Trends. <https://www.oecd.org/finance/insurance/41420525.pdf>
- Senbet, L. W., & Gande, A. (2009). Financial Crisis and Stock Markets: Issues, Impacts and Policies. In *Annual Conference of the Dubai Economic Council Financial Crisis, Its Causes, Implications, and Policy Responses*.
- Sharples, A. (2011). *The Great Recession and Its Effect on Small Businesses and Unemployment Rates*. Coastal Carolina University.
- Shiller, R. J. (2013). Capitalism and Financial Innovation. *Financial Analysts Journal*, 69, 2-53. <https://doi.org/10.2469/faj.v69.n1.1>
- Soedarmono, W., Machrouh, F., & Tarazi, A. (2012). Bank Competition, Crisis and Risk-Taking: Evidence from Emerging Markets in Asia. *Journal of International Financial Markets, Institutions and Money*, 23, 196-221. <https://doi.org/10.1016/j.intfin.2012.09.009>
- Truman, E. M., & Dowson, D. (2007). *Financial-Market Turbulence: Greed versus Fear Does It Matter* (pp. 1-6)? Institute of International Economics.
- Warren, G. J. (2012). Can Investing in Volatility Help Meet Your Portfolio Objectives? *Journal of Portfolio Management*, 38, 82-98. <https://doi.org/10.3905/jpm.2012.38.2.082>
- Wolfel, M., & Ekenel, H. K. (2005). *Feature Weighted Mahalanobis Distance: Improved Robustness for Gaussian Classifiers*. Institut fuer Theoretische Informatik, Universitat Karlsruhe (TH) Am Fasanengarten.

## Appendix

CAPM	Capital Asset Pricing Model
CCI	Cost of Credit Intermediation
MBS	Mortgage Backed Securities
ROE	Return on Equity
ROI	Return on Investment
SARB	South African Reserve Bank
SSA	Statistics South Africa
VaR	Value at Risk
SA	South Africa