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# Finding Alpha

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# EQUITY VALUATION: -\$30 OR \$150?

CAMERON COX

APRIL 7, 2019

Equity valuation is the analytical process of projecting the worth of a firm in order to estimate the intrinsic value that a security should trade at in the market. The most commonly used equity valuation models are:

- **Discounted Cash Flow (DCF):** Projects a company's future revenues and expenses, discounted at their weighted average cost of capital (WACC), to determine the present value of their outstanding equity.
- **Comparable Approach:** Assumes that an equity's value should bear some resemblance to other equities' in a similar industry, a firm's competitors, or industry leaders.

The benefits of being an equity analyst are lucrative and often attract highly skilled and quantitative minds [1]. These analysts are primarily categorized as working in one of two categories:

- **Sell-Side:** Primary job function is to provide research reports to a firm's clients that consist of financial estimates, price targets and a buy, sell, or hold recommendation.
- **Buy-Side:** Primary job function is to leverage the data provided by sell-side analysts, as well as conduct their own research, to generate high-alpha and risk-mitigating ideas.

An analyst's success, particularly in the case of sell-side analysts, is often dependent on the results (success) of their research, and in an environment where 85% of large-cap managers lagged their respective benchmarks, this can often lead to uncertainty in the effectiveness of these types of analysts [2]. Furthermore, in an environment where reputation and reliability are material factors to an analyst's success, publishing research indicating a security is trading at a significant discount or premium can often be a risky move. Luckily for these analysts, there are many ways to significantly manipulate DCF and comparable models that can be - in one way or another - justified. This will be demonstrated by attempting to apply both models to Tenet Healthcare (**NYSE:** THC).

THC is a US-based healthcare services provider focusing in hospital operations, ambulatory care and healthcare revenue cycle management solutions. As of April 1, 2019, the stock closed at US\$29.76 and is up 62.3% year-to-date.

[1] CFI. (2019). Equity Research Overview. Retrieved from Corporate Finance Institute: <https://corporatefinanceinstitute.com/resources/careers/jobs/equity-research-overview/>

[2] Perry, M. (2018, March 20). More evidence that it's very hard to 'beat the market' over time, 95% of finance professionals can't do it. Retrieved from AEI: <http://www.aei.org/publication/more-evidence-that-its-very-hard-to-beat-the-market-over-time-95-of-financial-professionals-cant-do-it/>

## Market Summary &gt; Tenet Healthcare Corp

NYSE: THC

[+ Follow](#)**29.76** USD **+0.92 (3.19%)** ↑

Closed: Apr. 1, 5:13 p.m. EDT · Disclaimer

After hours 29.28 **-0.48 (1.63%)**

1 day

5 days

1 month

6 months

**YTD**

1 year

5 years

Max

**Figure 1:** Tenet Healthcare Corp stock chart

Source: Google Finance

Over the past four years, THC has consistently generated between US\$16.6-19.6 billion in revenues. However, they have yielded a positive net income in only 1 of the last 4 years due to their high-margin business segments and ~5.6 leveraged market capitalization, which indicates that the present value of the debt on their balance sheet is valued at about 560% of their current market capitalization. With a Price-to-Sales ratio of approximately 0.157 (indicative of the value placed on each dollar of a company's revenues), THC is a strong candidate to demonstrate why a DCF model can be sensitive to changes in assumptions.

Despite a market cap of approximately US\$3.03 billion, THC currently holds US\$14.83 billion worth of long-term debt. DCF models are especially sensitive to WACC and by associativity the Debt Cost of Capital, which is often much less than a company's Equity Cost of Capital due to its riskiness and the tax advantages of debt interest payment [3]. Debt Cost of Capital represents the effective rate a company pays on its current debt and is a product of some assumed riskiness (commonly categorized as a credit rating) of their business while Equity Cost of Capital is the return theoretically required by equity investors based on a company's sensitivity to the market (the stock's Beta) and the market's risk-free rate. Given THC's actual WACC of 7.80% and assumed terminal growth rate to be the 10-year US T-Bill rate, one can construct a sensitivity analysis on the changes that these variables would have on the implied price-per-share.

[3] Kenton, W. (2018, May 1). Cost of Equity. Retrieved from Investopedia: <https://www.investopedia.com/terms/c/costofequity.asp>

		Terminal Revenue Growth Rate				
		1.75%	2.25%	2.65%	3.25%	3.75%
WACC	6.75%	\$ 108.10	\$ 133.08	\$ 153.59	\$ 199.37	\$ 249.09
	7.25%	\$ 85.30	\$ 105.53	\$ 121.48	\$ 156.77	\$ 193.37
	7.80%	\$ 64.62	\$ 81.01	\$ 93.41	\$ 120.79	\$ 148.05
	8.25%	\$ 50.23	\$ 64.22	\$ 74.46	\$ 97.13	\$ 119.08
	8.75%	\$ 36.46	\$ 48.33	\$ 56.73	\$ 75.45	\$ 93.07

Figure 2: Table Revenue Growth Rate

As you can see, without manipulating metrics relating to margins or other financial metrics, given the current risk-free rate, one can construct a price range of US\$57-155. This provides evidence that a DCF model may not be applicable to THC, or perhaps even the healthcare services industry in general. This motivate us to conclude that perhaps a comparable model might yield a better result.

In their annual 10-K filing, THC identified Community Health Systems (**NYSE:** CYH), HCA Healthcare (**NYSE:** HCA), and Universal Health Systems (**NYSE:** UHS) as companies they consider to be in their peer group [4]. The third-party market research platform Capital IQ also identified Acadia Healthcare (**NASDAQ:** ACHC) and Encompass Health Corporation (**NYSE:** EHC) as comparable companies to THC. In our comparable model, we will analyze each company's Enterprise Value-to-Sales (EV/S), Enterprise Value-to-EBITDA (EV/EBITDA), Enterprise Value-to-Long Term Debt (EV/LTD), and Enterprise Value-to-Goodwill (EV/G) in comparison to their actual Enterprise Value in an attempt to determine THC's implied share price based on their own financial ratios, i.e. solve:

	EV/S	EV/EBITDA	EV/LTD	EV/G		EV
Acadia Healthcare	3.51	12.39	1.76	2.41	X =	5,764.15
Community Health Systems	1.08	10.40	1.08	3.16		14,399.19
Encompass Health Corporation	2.17	9.49	3.89	4.17		8,753.84
HCA Healthcare	1.59	8.16	2.29	10.39		79,091.04
Universal Health Services	1.65	9.37	4.05	4.19		16,114.20

Figure 3: Share Price Solver

Using a least-squares approach to solve the above system of equations, applying THC's respective financial ratios, and after considering their long-term debt and cash, an implied share price of (\$US27.89) can be arrived at.

Obviously, this model is not performing nearly as well as one might hope. Consider the argument that EV/G may not be a good indicator of the typical valuation of a healthcare services firm, given the volatility of the metric especially as it relates to HCA and its EV. In this case, eliminating the EV/G column in our system of equations yields an implied share price of US\$35.78, which is much closer to the end-of-day closing price of approximately US\$30.

Lastly, consider the argument that EHC and ACHC are not considered by THC to be a part of their peer group, and their inclusion in the model might not be justifiable. In this case, eliminating those rows yields an implied share price of US\$147, which is much higher than its current market value.

One can see that both methods of valuing equity can be easily manipulated to yield vastly different share prices and therefore, severely different recommendations to a firm's clients. In conclusion, clients should be wary when making use of price targets formulated by novice analysts and always question whether the assumptions being made are valid, as they will often have material impacts on the resulting share price.

# CHINA'S P2P LENDING CRISIS

DARREN LI

APRIL 7, 2019

Peer-to-peer (P2P) lending is a type of financial exchange that occurs between individuals without a direct intermediation of a traditional financial institution [1]. Traditionally, P2P lending was simply the lending and borrowing between friends, families, and small communities. Today, P2P lending is a lucrative business that involves the matching of borrowers and investors through a web-based platform with the operator managing, as an agent for investors, the resulting repayment obligations of borrowers [1]. As a rapidly growing industry, P2P lending is introducing many opportunities and risks that could interest or alarm investors.

## The P2P Lending Scene

P2P lending has become an important alternative financing model in recent years following the lost of trust in the traditionally regulated banks after the 2008 financial crisis. The global P2P lending industry amounted to US\$26.16 billion in value in 2015 with prospects of growing up to US\$897.85 billion by 2024 [2]. However, while the P2P market in countries like the US and the UK are relatively regulated and matured, the emergence of the industry in China has faced many complications.

## The Problem in China

China has been liberal towards internet-based lending in its early years as the government promoted it as an innovative model to help reform the mainland's financial sector [3]. As a result, however, many P2P lending platforms mushroomed and many of which indulged in fraudulent schemes and activities. P2P firms promised investors tempting rates of return, much higher than the rates offered by traditional financial institutions, with reliable underlying assets to back up the promise. However many, if not most, of the investments never make it to the day of maturity. Investors often never see any real profits and may even end up losing all the principal invested. Today, P2P platforms comprise of one of the riskiest and least regulated sections of the shadow banking system in China.

By December 2017, outstanding P2P loans in China ballooned from almost nothing in 2012 to 1.22 trillion yuan (US\$176 billion) [4]. Amidst a surge in defaults, fraud, and investor anger in 2018, Chinese authorities responded by announcing, on November 29, 2018, a plan to dramatically reduce the P2P lending market in the country by winding down small- and mid-sized P2P lending platforms nationwide [5].

[1] Omarini, A. (2018, August) Peer-to-Peer Lending: Business Model Analysis and the Platform Dilemma, in International Journal of Finance, Economics and Trade (IJFET). Retrieved from Researchgate: [https://www.researchgate.net/publication/327836640\\_Peer-to-Peer\\_Lending\\_Business\\_Model\\_Analysis\\_and\\_the\\_Platform\\_Dilemma\\_in\\_International\\_Journal\\_of\\_Finance\\_Economics\\_and\\_Trade\\_IJFET\\_submitted\\_August\\_1st\\_2018\\_Accepted\\_Sept\\_24th](https://www.researchgate.net/publication/327836640_Peer-to-Peer_Lending_Business_Model_Analysis_and_the_Platform_Dilemma_in_International_Journal_of_Finance_Economics_and_Trade_IJFET_submitted_August_1st_2018_Accepted_Sept_24th)

[2] Bajpai, P. (2016). The Rise of Peer-To-Peer (P2P) Lending. Retrieved from NASDAQ: <https://www.nasdaq.com/article/the-rise-of-peertopeer-p2p-lending-cm685513>

[3] Ren, D. (2019, Jan 4). China's P2P lending crisis worsens as second firm runs into trouble in a week. Retrieved from South China Morning Post: <https://www.scmp.com/business/banking-finance/article/2180731/chinas-p2p-lending-crisis-worsens-second-firm-runs-trouble>

[4] Liu, A. (2019, January 1). China P2P Lending Crackdown May See 70% of Firms Close. Retrieved from Bloomberg: <https://www.bloomberg.com/news/articles/2019-01-02/china-s-online-lending-crackdown-may-see-70-of-businesses-close>

[5] Bloomberg News. (2018, November 29). China Planning Major Purge of \$176 Billion Loan Market. Retrieved from Bloomberg: <https://www.bloomberg.com/news/articles/2019-03-31/china-to-continue-with-tariff-suspension-on-u-s-autos-parts-jtwz46rw>





**Figure 1:** Summary of Failed Chinese P2P Lenders in 2018  
Source: Business Insider

By the end of 2018, more than 80% of China's 6,200 P2P platforms had either closed up shop or encountered serious difficulties [5]. By January 1, 2019, researchers forecast a 70% drop in the number of remaining Chinese P2P lenders over the year, led by the exit of Yidai, an online P2P lending intermediary with an outstanding principal balance of 4 billion yuan (US\$581 million) [4]. Although the company stated that the balance would be repaid within five years, their exit has only sparked public fear.

## Panic

Following the news of the P2P crackdown and the exit of Yidai, there was widespread fear in the investors of Chinese P2P companies. Many were outraged and demanded their money back. On January 3, as the second firm to collapse in the same week, Hangzhou-based Xinhui informed investors at a meeting that it will not be able to make repayments on a total of 2.26 billion yuan (US\$330 million) of products issued to them, affected by shrinking transaction values and triggered defaults as a result of the widespread panic [6].

## Insights to Draw

China's aim to crack down on the industry is good, as it protects consumers against potentially fraudulent investments. However, the process with which it is happening is very concerning. On March 1, 2019, Dianrong, one of China's biggest P2P lenders, announced a shutdown of 60 of its 90 offline stores and layoff of an estimated 2,000 employees [7]. The fact that the market leader of the industry is struggling in this regulatory environment signifies that even established firms can be severely hindered under these regulations.

[6] Bloomberg News. (2019, January 3). China's Second Peer-to-Peer Lending Lapse in a Week Costs Investors \$330 Million. Retrieved from Bloomberg: <https://www.bloomberg.com/news/articles/2019-01-03/china-s-second-p2p-lapse-in-week-costs-investors-330-million>

[7] Nonninger, L. (2019, March 4). Dianrong has laid off as many as 2,000 employees amid a regulatory crackdown. Retrieved from Business Insider: <https://www.businessinsider.com/dianrong-scales-down-business-china-regulation-2019-3>



Although the most severe of the cases are in China, investors should remain vigilant as we will likely see other P2P lenders and related firms struggle in other markets soon. The UK has already announced changes to P2P lending, including a limit on how much retail investors are allowed to invest on a platform, and P2P lenders in the US have also been struggling with making revenue [7]. As such, it is likely that P2P lenders in various markets will have to diversify their products and seek out more institutional backers for their platforms. This could very well pose interesting opportunities for investors in the future as we follow how the story unfolds.

# AN INTRODUCTION TO FINTECH

DAWSON MACDONALD

APRIL 7, 2019

**F**intech describes new technology that seeks to improve and automate the delivery and use of financial services. At its core, fintech helps companies, business owners, and consumers better manage their financial operations, processes, and lives by utilizing specialized software and algorithms on computers and, increasingly, smartphones. Fintech, the word, is a combination of "financial technology" [1].

## A Brief Introduction

Financial technology is becoming one of the most important innovations in the financial industry. It is evolving at such a fast pace, driven in part by the sharing economy, regulations, and infotech [2]. The goals of these financial technologies include cutting costs, improving the quality of financial services, and creating a more diverse and stable landscape. The first instance where new technologies impacted financial markets was the 1990s internet revolution. One of the first technological advances was referred to as e-finance, denoting all forms of financial services that can be performed on the internet. These changes led to the downsizing and reduction in the number and size of physical financial institutions.

Fast forward a bit to a study conducted by PwC in 2016; it was found 83% of financial institutions believe that various aspects of their business are at risk to fintech start-ups and their developments [3]. Investments in this field have also grown significantly over the past decade. Furthermore, it is clear that fintech has surpassed the stage of hype and is a major player in the financial industry, and companies need to be prepared to stay ahead of their competitors.

## Types of Fintech

Since fintech is such an inclusive word, there are many subcategories that fall within it. The fintech umbrella includes insurance technology (insurtech), regulatory technology (regtech), financial data APIs, payments, banking, and mobile banking, among other types of technology. Each category represents a distinct type of finance-specific technology. Every part of the financial services industry has been affected by this revolution, from insurance and compliance to banking and payments. Here, we will briefly explore some areas of this industry.

[1] Kagan, J. (2019, March 13). Fintech Definition. Retrieved from <https://www.investopedia.com/terms/f/fintech.asp>

[2] Shin, Y. (2017, October 09). Fintech: Ecosystem, business models, investment decisions, and challenges. Retrieved from <https://www.sciencedirect.com/science/article/pii/S0007681317301246>

[3] PwC. (2016, March 10). Blurred lines: How Fin Tech is shaping financial services. Retrieved from <https://www.pwc.de/de/newsletter/finanzdienstleistung/assets/insurance-inside-ausgabe-4-maerz-2016.pdf>

**Insurtech:** Insurance technology has seen over US\$2 billion worth of investment in 2017. A previously un-innovative industry, insurance is now embracing insurtech. However, given this industry's strict regulations, implementation of new technologies is quite the task for various corporations.

**Regtech:** Regulatory technology helps financial institutions meet compliance regulations. This subcategory has also seen an immense surge in popularity within the past few years. Regulators have made it a point to shackle these new technologies, as they aim to ensure the prevention of data misuse by financial institutions. Regtech spending is expected to reach US\$76 billion by 2022 [4].

**Payments & Lending:** Payments, one of the largest subcategories, has greatly improved the ease with which people can do business. The goal of payment technologies is to reduce transaction costs and transaction time between financial institutions. Lending has also developed rapidly, offering businesses and consumers the opportunity to borrow and lend like never before.

**Blockchain:** Although blockchain is not unique to the financial services industry, it was the first industry in which it was used. Many people have heard the term 'blockchain' from the rise in cryptocurrencies, but it goes further than just digital coins. The main premise of blockchain is that every transaction is housed in a ledger that is publicly distributed, which ensures the accuracy of the data housed within it. While regulators are still working on making solid regulations, it looks like blockchain technology is here to stay.

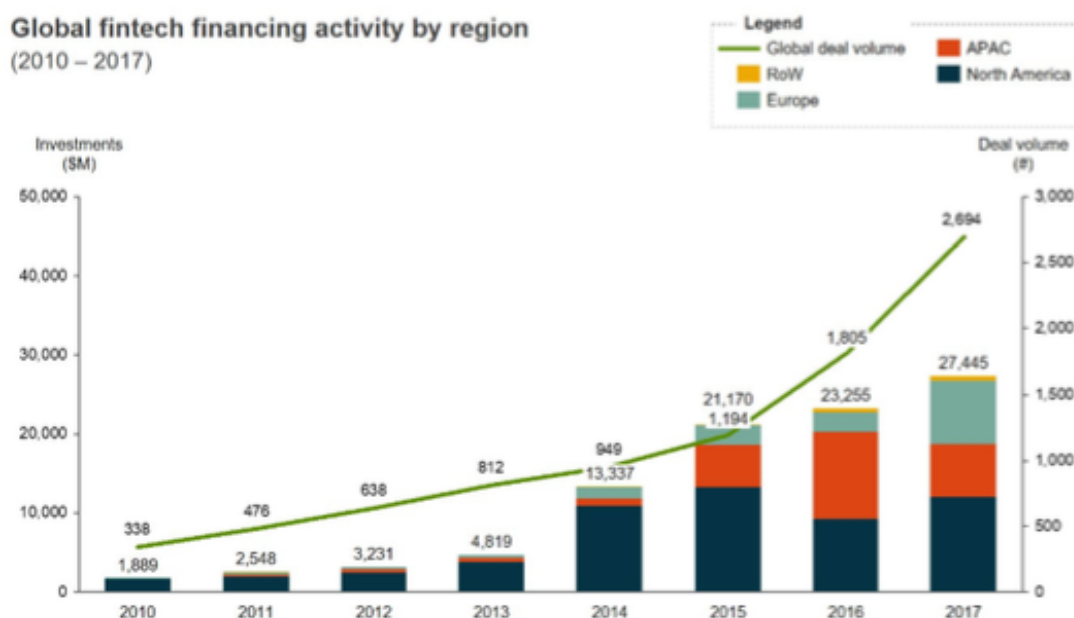
## **Investment in Fintech**

Over the last decade, investment in new financial technologies has grown exponentially, and is projected to keep growing into the foreseeable future. According to Accenture, global investment in fintech ventures in the first quarter of 2016 reached US\$5.3 billion, which is a 67% increase YoY [5]. Much of this increase has been contributed by traditional financial institutions. The main reason for this is that they seek to keep developing technologies that enable stay ahead of their competitors and gain a competitive advantage. More recently, it was found that, in 2017 alone, there had been more than US\$27 billion invested into this industry globally [6]. The increase is expected to continue, with Asian and African markets driving a significant portion of the growth. The graph below illustrates this growth.

[4] Smith, S. (2017, October 24). Regtech Spending to Exceed \$76Bn By 2022, As Compliance Costs Soar. Retrieved from [https://www.juniperresearch.com/press/press-releases/regtech-spending-to-exceed-\\$76bn-by-2022](https://www.juniperresearch.com/press/press-releases/regtech-spending-to-exceed-$76bn-by-2022)

[5] Accenture. (2016, November 30). Global FinTech investment growth continues in 2016. Retrieved from <https://newsroom.accenture.com/news/global-FinTech-investment-growth-continues-in-2016-driven-by-europe-and-asia-accenture-study-finds.htm>

[6] Barreto, E. (2018, February 28). Global Venture Capital Investment in Fintech Industry Set Record in 2017. Retrieved from <https://newsroom.accenture.com/news/global-venture-capital-investment-in-fintech-industry-set-record-in-2017-driven-by-surge-in-india-us-and-uk-accenture-analysis-finds.htm>



**Figure 1:** Global fintech investments by region  
Source: Accenture

## Benefits of Fintech

It has already been stated that fintech help institutions cut costs; here's how: one is automation of processes, through which businesses can save on labour cost. It is also beneficial to consumers because they are saving on transaction costs and other fees. Next is AI: businesses can now rely on AI technology to shape their strategies and decisions. They can now make better informed decisions with this new data. An application of AI technology is detecting fraud: computers can help identify fraudulent activity faster than humans ever could.

## The Future

The future looks to be rather bright for the fintech industry. Advances in technologies such as AI will drive even more innovation in the coming years. As previously mentioned, multiple studies have shown that there will be an increase in spending in this sector. If you are looking to capitalize on this movement, you can either create your own start-up (this one takes a bit of extra work), be employed at a fintech firm, or find companies to invest in. Some companies involved in fintech right now are Square (**NASDAQ: SQ**) and PayPal (**NASDAQ: PYPL**).

# THE FUNDAMENTAL REVIEW OF THE TRADING BOOK

FRANK SHI

APRIL 7, 2019

The Fundamental Review of the Trading Book (FRTB) initiative is something that I came across during my co-op search. RBC describes it as the “one of biggest projects that [they] have ever undertaken”, and McKinsey describes it as “nothing less than a fundamental overhaul” for the big banks [1]. Being closely related to risk management in capital markets and with some very recent updates, it is a topic that I thought might be fun to include in Finding Alpha. A remark: it's perfectly safe to skip any equations in this article. The main goal of this article is to give the reader an idea of some “behind-the-scenes” workings of the financial industry. Additionally, any reader with a keen interest in mathematics should find this particularly exciting.

## Basel III

After the financial crisis of 2008, the Bank of International Settlements (BIS), located in Basel, Switzerland, published a set of regulatory rules known as “Basel III”. These rules were agreed upon by the major banks across the world, and the goal was to create a more stable financial system so that a similar crisis in the future can be avoided.

The earliest version of Basel III was published in December 2010 by the Basel Committee of Banking Supervision (BCBS) [2]. Perhaps not surprisingly, one of the “pillars” of the publication was stricter capital requirements for all banks. For example, a bank needs to hold a minimum common equity worth 4.5% of its assets, plus an additional 2.5% reservation buffer, which means that all banks’ common equity standard is raised to 7.0%, compared to the 2.0% before Basel III [3]. The goal of increasing capital holdings is to ensure that banks can absorb losses during a financial crisis. Interested readers may look up “Common Equity Tier 1” to find out more about this topic.

### Basel Committee on Banking Supervision reforms – Basel III

Strengthens microprudential regulation and supervision, and adds a macroprudential overlay that includes capital buffers

Capital				
	Pillar 1		Pillar 2	Pillar 3
Capital	Risk coverage	Containing leverage	Risk management and supervision	Market discipline

**Figure 1:** Summary of Basel III

Source: Bank of International Settlements

[1] Azoulay, M., Haertl, D., Mushkin, Y., Raufuss, A. (2018, May). FRTB Reloaded: Overhauling the trading-risk infrastructure. Retrieved from <https://www.mckinsey.com/business-functions/risk/our-insights/frtb-reloaded-the-need-for-a-fundamental-revamp-of-trading-risk-infrastructure>  
 [2] Basel Committee on Banking Supervision. (2013, October). Basel III: Finalising post-crisis reforms. Retrieved from <https://www.bis.org/bcbs/publ/d424.pdf>  
 [3] Basel Committee on Banking Supervision. (2017). Basel III Summary Table. Retrieved from [https://www.bis.org/bcbs/basel3/b3\\_bank\\_sup\\_reforms.pdf](https://www.bis.org/bcbs/basel3/b3_bank_sup_reforms.pdf)

## Basel III Pillar 1: Risk Coverage and Capital Requirement

The FRTB initiative is more concerned about how a financial institution approaches calculating risk. When it comes to trading, the primary risk factors are:

- Market risk
- Credit risk
- Credit Valuation Adjustment (CVA) risk
- Operational risk

Market risk originates from the uncertain price movements in the financial markets. Credit risk is relevant in fixed-income products trading and refers to the possibility of counterparty defaults. CVA risk is perhaps less heard of, but it is closely related to credit risk. It refers to a change in the value of a derivative whose underlying asset is exposed to credit default risk.

This leads to the motivation behind the FRTB initiative: it is part of the Basel III Reforms that outlines how market risk and credit risk should be calculated and modelled such that banks have sufficient capital reserves to withstand losses in times of crises. I picked out two things that stood out in the FRTB papers, summarised in the following two sections.

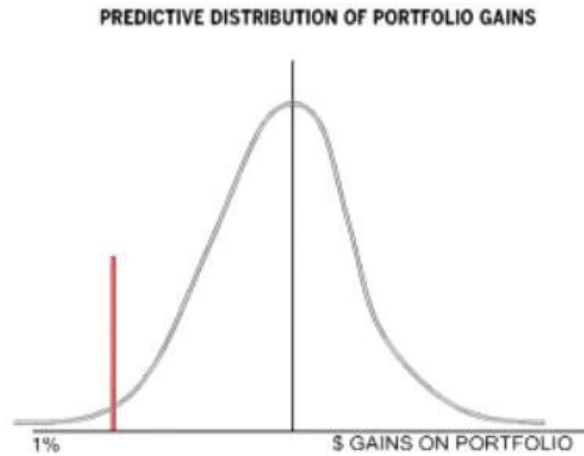
### VaR & Expected Shortfall (ES)

VaR stands for “Value at Risk”. It is a statistic that represents the potential losses that can be incurred from a portfolio or financial firm over a specific time frame. It also includes the probability that such losses can occur. Banks use VaR values to calculate how much capital they should hold in the case of unexpected events that can lead to losses. However, the Basel paper that outlined the FRTB initiative concluded that VaR values failed to “capture ‘tail risk’” [4]. To that end, the May 2012 paper proposed a new metric called “Expected Shortfall” to replace VaR [4].

It is necessary to give a high-level review of why VaR values failed in 2008. One of the problems was that each financial firm had their own way of calculating their VaR values. The lack of standardization meant that, during some calculations, the data selected from historical periods was understating the volatility that was possible in the market, leading to falsely benign VaR values, and thus overly leveraged subprime portfolios.

Another problem is the so-called “failure to capture tail risk”. We illustrate this with a grossly simplified example. Say we have a VaR value of 95% with 20% asset risk. This implies that, 1 time out of 20, the portfolio may incur a loss of at least 20%. The catch is that, given the VaR calculation, a loss of 50% is also valid, and this 50% loss is an example of “tail behaviour”. In fact, any losses greater than 20% can be thought of as “tail behaviour”.

A diagram might help with the illustration of this concept. Consider the symmetric distribution in Figure 2 below. It is meant to resemble something close to a normal distribution or a t-distribution. Say the Profit & Loss of a portfolio is modelled with such distribution. We remark that the losses at the left of the vertical line is theoretically unlimited. The construction of such a statistical distribution tells us that, although the losses at the left tail of the distribution are extremely unlikely, they are still possible.



**Figure 2:** Missing tail risk

With the new metric, Expected Shortfall, the FRTB papers attempt to solve both issues. In order to ensure that banks are selecting the most conservative data in determining the appropriate level of capital requirements, the BCBS is proposing that all banks must use an observational horizon dating back to 2005 [5]. This means that all banks must gather a whopping 14 years worth of risk factors and determine which period offers the best historical data for stress testing.

The formula being proposed by the FRTB paper is as follows:

$$ES = ES_{R,S} \times \frac{ES_{F,C}}{ES_{R,C}}$$

where  $ES$  is the expected shortfall for capital purposes,  $ES_{\{R,S\}}$  is the expected shortfall during the stressed period in the observational horizon (i.e. 2005 to present) based on a reduced set of risk factors,  $ES_{\{F,S\}}$  is the expected shortfall of the current 12-month observation based a full set of risk factors, and  $ES_{\{R,C\}}$  is the expected shortfall of the current 12-month observation based on a reduced set of risk factors [5].

Furthermore, the BCBS is proposing a 97.5% confidence interval for the metric, and they believe that this will capture similar levels of risk as the 99% percentile VaR method illustrated in Figure 2, with the added benefit of capturing tail risks and better historical data selection [5].



## Profit & Loss (P&L) Attribution

The FRTB is also proposing new metrics for Profit & Loss Attribution (might also be known as P&L Decomposition or P&L Explained). While I do not intend to elaborate on the details of these new metrics, it is still interesting to define what P&L Attribution means under certain contexts.

The motivation behind P&L Attribution is to explain the driver behind trading Profit & Loss. Under the context of derivatives, this means a decomposition of changes in Mark-to-Market (MTM) values of a derivative. The factors that might influence the value of a derivative include the following:

- price movement of the underlying asset
- passage of time
- change in the underlying asset's implied volatility
- change in interest rates

For a trading desk, its P&L might also be impacted by booking new trades, trade cancellations, etc.

Explaining the P&L of derivatives involves sophisticated mathematics. A pricing model has to exist before any P&L breakdown can make sense. In financial institutions, the quantitative analysts (quants) develop the models that calculate the P&L breakdown. Here is an example. Suppose that we have a call option of a stock. In their language, we have

$$\Delta = \frac{\partial c}{\partial S}$$

where Delta (the triangle) is the "delta",  $c$  is the price of the underlying stock,  $S$  is the price of the call option. In other words, the delta of an option is the portion of the movement of an option's MTM that is caused by the price movement of the underlying asset.

Delta is known as an "option Greek". Other names include "position Greek" or simply "a Greek letter". Other option Greeks include theta, rho, and vega. There are also second-order Greeks such as gamma.

From a regulatory point of view, having a P&L breakdown can help regulators limit the exposure to a certain risk factor. From a trading point of view, having a P&L breakdown is critical for hedging complex derivative instruments, since in most cases, there are no immediate "opposites" of a customized over-the-counter instrument that can offer a perfect hedge. From the delta of an option, traders can perform something called a "delta hedge". As we know that delta concerns the price movement of the underlying asset, can you take a guess at what delta hedge might mean?

## What does this mean for the banks and... for us as students?

In the FRTB paper published in 2012, the Basel Committee proposed that banks must submit the first reports of their implementation of FRTB by December 2019 [6]. However, in March 2018, that deadline was extended to January 2022. The primary reason was that institutions are struggling to complete the implementations on time [7].

Somewhat conveniently, major post-crisis overhauls such as Basel III (FRTB is part of Basel III) often create many new jobs. The effort required to re-shape institutional risk models is enormous. It might be of interest for those who are working in financial institutions to ask around about their respective FRTB initiatives. For many, rebuilding risk models poses an infrastructure-building challenge. Successful collaboration between front office and risk management is paramount, and this is not possible without well-developed infrastructure such as well-synchronized trading databases. Furthermore, as the FRTB is requiring an observational period dating all the way back to 2005, contributing to the FRTB project will involve working with enormous datasets. This is where data analysis skills using statistical software such as R and Python becomes an asset.

Of course, if things go according to plan, institutions will finish implementing the FRTB by the beginning of 2022, but initiatives such as the FRTB demonstrate a trend in the banking industry that perhaps no longer comes across as a surprise: the industry's transformation to a data- and technology-driven space. The analytical and problem-solving skills gained through mathematical and statistical education will prove to be critical.

Many risk management-related topics are illustrated in the latest financial literature. The tenth edition of John Hull's *Options, Futures and Other Derivatives* is also a great source for such information.

[6] Ernst & Young. (2016, February). Fundamental review of the trading book (FRTB): The revised market risk capital framework and its implications. Retrieved from <https://www.ey.com/Publication/vwLUAssets/ey-fundamental-review-of-the-trading-book/%24FILE/ey-fundamental-review-of-the-trading-book.pdf>

[7] Ernst & Young. (2018). Fundamental Review of the Trading Book (FRTB): EY regulatory alert on the March 2018 Consultative Document and FAQ. Retrieved from [https://www.ey.com/Publication/vwLUAssets/ey-fundamental-review-of-the-trading-book-frtb-march-2018/\\$File/ey-fundamental-review-of-the-trading-book-frtb-march-2018.pdf](https://www.ey.com/Publication/vwLUAssets/ey-fundamental-review-of-the-trading-book-frtb-march-2018/$File/ey-fundamental-review-of-the-trading-book-frtb-march-2018.pdf)

# INTEREST RATES ON MARKETS

DAVID ZHANG

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Interest rates are a prime indicator of the market's position; it is typical to infer that whenever interest rates increase, the stock market or the current issued bonds in the fixed income markets will fall in value, while a decrease in interest rates will cause the inverse. However, that is not the case in all circumstances, and interest rates may actually signify a movement in the opposite direction.

## Current Feds Fund Rate

Since 2015, the Fed Funds Rate held by the United States Federal Reserve, or the interest rate at which depository institutions lend to other depository institutions, has been consistently increasing [1]. The following chart shows the historical Fed fund benchmark rates, as well as the S&P 500 response for the last 40 years.

Note that not all increases in the Fed funds rate is matched with a drop in the stock market.

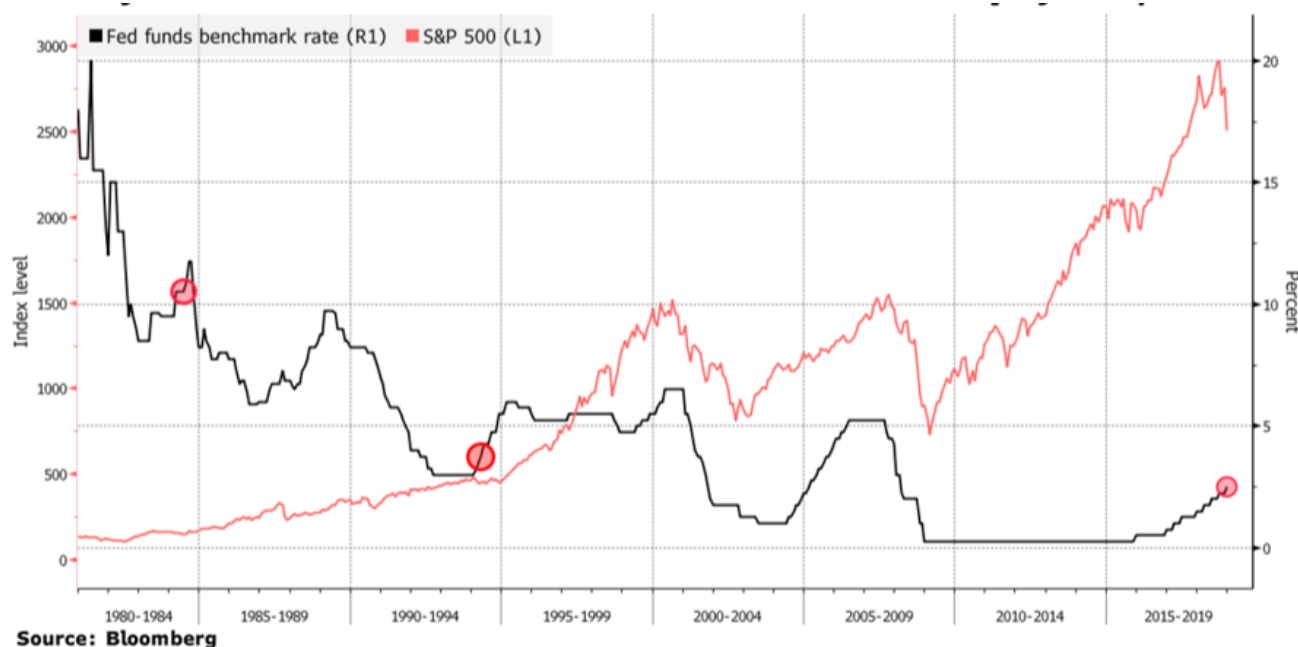


Figure 1: Historical fed fund rate targets and S&P500 performance  
Source: Bloomberg

## What is the Federal Funds Rate?

The federal funds rate is the core basis for other interest rates in the United States. The Federal Open Market Committee (FOMC) sets the targets for the Fed funds rates. Based on the GDP Deflator, the Consumer Price Index (CPI), and the Producer Price Index (PPI) adjustments made, and percentage targets established, the Fed is able keep the economy stable. This is to achieve maximum employment while keeping consumer prices balanced.

[1] Condon, C., Craig T.. "Fed Minutes Show Officials Unsure on Need for Rate Hikes in 2019." Bloomberg.com, Bloomberg, 20 Feb. 2019. Retrieved from [www.bloomberg.com/news/articles/2019-02-20/fed-minutes-show-officials-unsure-on-need-for-rate-hikes-in-2019](http://www.bloomberg.com/news/articles/2019-02-20/fed-minutes-show-officials-unsure-on-need-for-rate-hikes-in-2019).

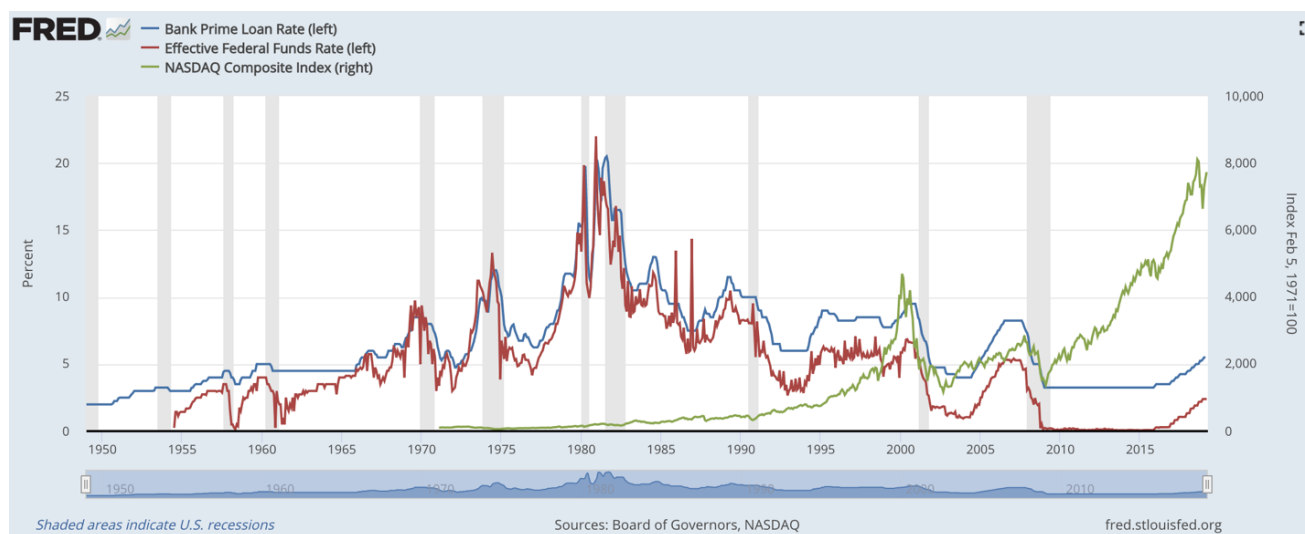
The rate of inflation, which also serves as a key indicator of economic health, is also a factor that the FOMC must analyze to determine adjustments to the Fed funds rates. A higher than expected rate of inflation must be reduced by increasing interest rates, while a lower inflationary measure may spur a decrease in interest rates to encourage economic activity.

With no plans to further increase the Fed funds rate in 2019, the economy appears to be slowing down. Strong U.S labour reports and declining inflationary measures leaves the benchmark interest rate between a range of 2.25% and 2.5% [2]. This is after a series of increases since 2015, where the U.S kept rates low to encourage recovery from the financial crisis. Rates are now being kept level to stabilize economic growth rather than forcefully stimulating it.

### How Does This Translate to the Markets?

One of the most important rates that shares a correlation to the Fed funds rate is the prime interest rate. The prime interest rate is the rate at which commercial banks charge their customers. Currently set at 5.50% [3], it determines the amount of circulating money and funds available for business expansion.

With higher prime rates, borrowing becomes more expensive, which results in less disposable income for individuals and less funds for business operational expansions. This inhibits company earnings, as well as the availability of funds contributed to the stock markets. A parallel effect is that there is less revenue for companies, and as a result, less expected growth. This, in turn, leads to a lower share price because of lower expectations and less investor hopes for the stock market.



**Figure 2:** Historical Prime Loan Rates, Fed Funds Rate and NASDAQ performance  
Source: Economic Research – Federal Reserve Bank of St.Louis

As shown in the graph above, the NASDAQ index experienced drops of more than 20% when increasing interest rates reached a point where they were too high for optimal economic growth. When prime rates at their peaks, the stock market reaches a bottleneck due to concerns of limited future growth.

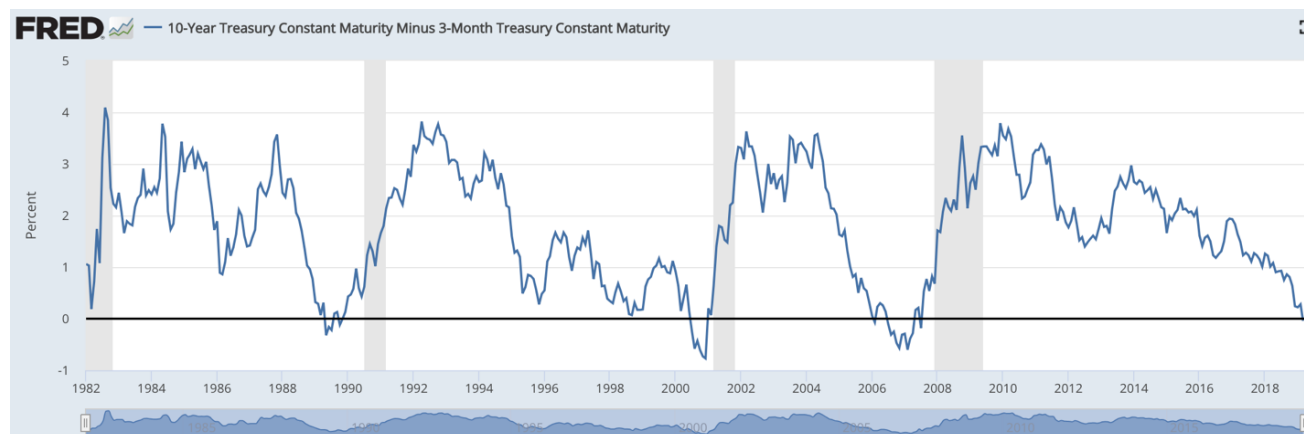
[2] Foster, S. "Federal Reserve Leaves Interest Rates Unchanged, Sees No More Hikes In 2019." Bankrate, Bankrate.com, 20 Mar. 2019. Retrieved from [www.bankrate.com/banking/federal-reserve/fomc-recap](http://www.bankrate.com/banking/federal-reserve/fomc-recap)

[3] "United States Prime Rate." United States Prime Rate, Retrieved from [www.fedprimerate.com](http://www.fedprimerate.com)

## Fixed Income and Interest Rates

On the other hand, bonds also share an inverse relationship with interest rates. When interest rates rise, prices of existing bonds fall as their demand drops and bonds with higher rates of return are more appealing. However, when interest rates fall, prices of already-issued bonds rise.

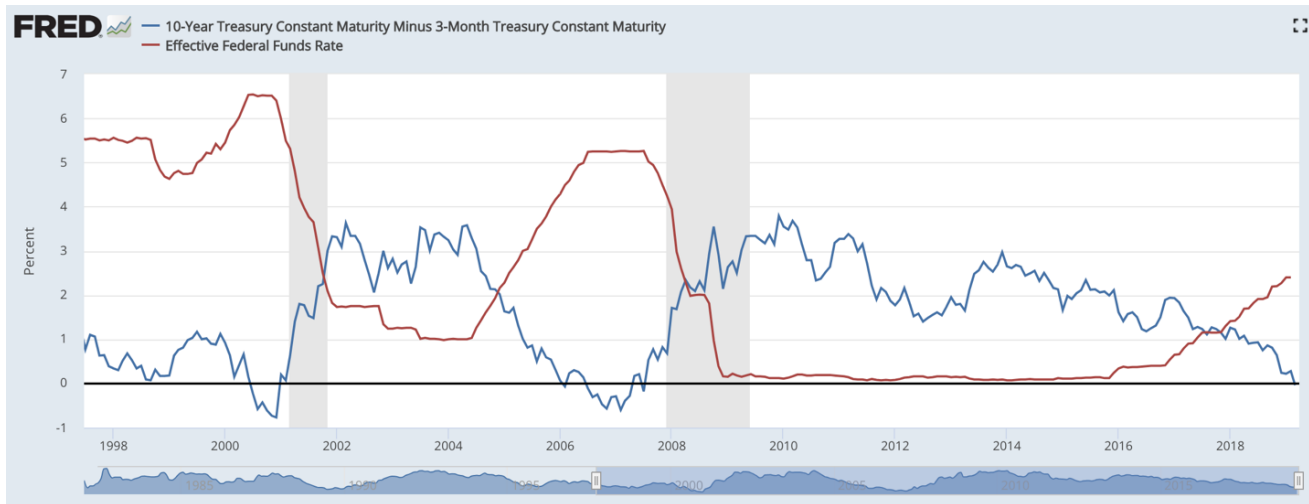
Applying this principle to US Treasury bills, it can be concluded that the Fed funds rate has a strong impact on the US yield curve. Short-term bonds are influenced the most, while long-term bonds are mainly governed by market expectations of future interest rates and inflation. Afterwards, it is demand and supply and the current economic state that ultimately determine the yields of these treasury bills.



**Figure 3:** Historical 10 Year – 2 Year Treasury Bill Spread  
Source: Economic Research – Federal Reserve Bank of St. Louis

The chart above shows a history of the spreads between 10-year US Treasury Bill Yields and the 3-month US Treasury Bill Yields for the past 40 years. Recently, an inverted yield curve formed on Friday, March 22, 2019, meaning the shorter-term treasury bill (3-month) yields more than the long-term treasury bill (10 Year). Currently, the 10-year yield is 2.407%, which is almost equal to the Fed funds rate [1]. This is significant as this signifies borrowing costs in the short term are higher than in the long term, possibly resulting in reduced consumer spending, business expansion, and ultimately a slowdown in the economy.

Due to this, there may be cuts made to the Fed funds rate to prolong economic growth. Historically, as shown in the chart below, an inverted yield curve is followed by a cut to the Fed funds rate, with typically a recession (area shaded in grey) following in the coming year.



**Figure 4:** 2 Year Treasury Bill Spread with Effective Federal Funds Rate  
Source: Economic Research – Federal Reserve Bank of St. Louis

## The Current Situation

With an inversion of yield curves, there exists more demand for short-term bonds than long-term bonds. This signifies less incentive for investors to lock in current long-term rates due to less-than-appealing economic data and inflationary measures. Following historic trends, this inversion may result in a cut in interest rates in the future to keep the economy afloat.

In terms of the market, this may create a wave of caution. However, one can now conclude that, if interest rates increase in the near future, it is because the economy is expanding at an appealing pace, resulting in a need to stabilize the growth. On the flip side, one can also assume that if interest rates drop rapidly, it may be the result of the economy slowing down to an eventual recession, requiring the inflow of cash to keep it alive.

# THANK YOU FOR READING!

**APRIL 7TH, 2019**

We were a little bit mischievous with this issue. In particular, some of us ignored the news in mainstream media and gave ourselves freedom with whichever topics we fancied writing about. We really enjoyed this, and there are probably less productive ways to spend time when one doesn't feel like studying.

As the Winter 2019 term draws to a close, the Market Research team would like to thank you for your interest in reading our articles. Best of luck with all of your future endeavours, and FARMSA will be back as soon as May 2019!

The Editor