

# Applied Risk Management: Valuation of Derivatives under AI and Data Science Technologies

## Introduction to Risk Management and Derivatives

- *Risk*
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- *Risk Management: A Career Choice*



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## Part I: The Science of Risk Management

- ▶ Chapter 1: Introduction to Risk Management and Derivatives
- ▶ Chapter 2: Price, Returns, and Volatility Modeling
- ▶ Chapter 3: Financial Econometrics and Machine Learning

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## Introduction to Risk Management and Derivatives

**R**isk has a significant impact on the human experience. Some individuals take more risks than others, whether it comes to financial planning, daring sports activity, or dating. But, neuroeconomists have linked several socio-economic and demographic factors with the degree to which the individual can tolerate risk (Gaudecker et al., 2011). Every time you confront a decision with an uncertain outcome, you are essentially entering the equivalent of a scientific experiment. An experiment where the brain can change and adapt due to experience. Neuroscience refers to this ability as neuroplasticity (brain plasticity). The brain demonstrates its adaptability by creating new neural pathways to accommodate the evaluation of risky decisions. It is from this perspective that we introduce the principles of risk management applied to financial markets.

This introductory chapter of Applied Risk Management: Valuation of Derivatives under AI and Data Science Technologies, or ARMDAT, establishes the book's framework for studying risk mitigation using derivative securities. As we begin the journey, it is helpful to note that the ARMDAT presentation is intended for student learners interested in a ubiquitous and experiential learning experience in the global derivatives community.

### A Networked World

Have you ever said – “*what a small world we live in...*?” Today, no matter where you are in the world, it is not surprising to discover that you and another person know someone in common. The network of knowing others results from professional and social networking (i.e., LinkedIn, Facebook, etc.). This “network” effect creates a responsibility for world political and business leaders to create a decision-making environment that encourages the development of culture-neutral and palatably responsive risk-mitigating tools. But how do you develop tools that work in the United States of America and ensure they also work in the major markets of Europe? Financial innovation and “Big Data” provide clues to an appropriate answer. The evolving intersection of “Big Data,” structured digital information, intelligent software, and an upgrade to human preparedness continues to foster the growth of more uniform decision-making systems around the globe. Sovereign governments, large and small, are jumping on board. Institutions like the European Central Bank and the Bank for International Settlements work cooperatively and inter-culturally to promote system-wide efficiency.

Technologically savvy data aggregators (e.g., trading exchanges, Google, Facebook, Twitter, and more) have bought in and sustained a 24/7 network connectivity that has all but marked the end-

of-an-era for unique and proprietary paper-based non-networked information flow. But these same technological advances also raise new questions about how sovereigns can effectively support new growth while corralling growing risk sophistication in the form of a) uncertain high-frequency financial performance; b) digital-theft; c) algorithmic model validation; and d) terror-inspired organizations. More than ever in the past, all stakeholders must understand the process of planning, organizing, managing, and evaluating the activities associated with live “Big Data” decision-making.

## AI in a Networked World

Artificial Intelligence (AI) is no longer considered a new phenomenon. The technology of AI is already deeply engrained in the financial service sector. In fact, some argue that AI has already taken a toll on Wall Street jobs. According to Opimas (<http://www.Opimas.com>), by 2025, AI technologies will reduce employees in the capital markets worldwide by 230,000 people. A lower-IQ form of AI replaces process-oriented jobs – jobs where small software programs perform simple tasks like looking up a document or a piece of information. More analytical jobs in finance will continue to fall victim to machine learning (ML). These AI methods can quickly digest large volumes of real-time data and learn to find telling patterns with a speed the human brain cannot match. These trends have implications for jobs in the front office to risk management. But there is good news – AI will also create some new jobs, just not entry-level jobs. To put the discussion in a learner context, let’s present some relevant questions to consider.

- What do I need to know about AI?
- What are the ethical considerations in higher-ed and professional employment?
- How are students using AI tools, and how can I partner with fellow students?
- Do I need to rethink exams, papers, and projects I assign?
- How do I redesign my courses in the wake of AI disruption?
- What other AI tools or capabilities are coming, and how can I prepare for them?
- How will AI tools affect the courses in financial derivatives?

The ARMDAT presentation is specifically designed to consider the AI impact on risk and financial derivative management (see, [Amplification](#) of a derivative on Wikipedia). The approach is not restricted to a narrow space. To the contrary, the presentation incorporates the latest thinking from the Association to Advance Collegiate Schools of Business (AACSB). According to a recent AACSB report on “*Technologies with the Potential to Transform Business and Business Education: Artificial Intelligence*”, Artificial Intelligence can be utilized in four ways: (1) as automated intelligence, (2) as assisted intelligence, (3) as augmented intelligence, and (2) as autonomous intelligence. ARMDAT integrates AI and the study of financial derivatives in a manner that exploits some, if not all, of these AI-based contributions. However, implementing AI models without grasping the full power of AI can lead to unexpected or even disastrous results. To protect you from this trap, the ARMDAT presentation adds a detailed introduction to “explainable AI” (XAI). Why do you need to extend your understanding of AI applications to include XAI? For an expert opinion, see, [Why neural net pioneer Geoffrey Hinton is sounding the alarm on AI](#).

## ChatGPT (v3.5) in a Networked World

ChatGPT (<http://chat.openai.com>) is a new and powerful language model developed by OpenAI in 2022. It is based on the GPT (Generative Pre-trained Transformer) architecture. Versions of the GPT model are constantly updated. The ARMDAT discussion is based on GPT-3.5, last updated in September 2021. ChatGPT is designed to understand and generate human-like text. The model’s primary strength is engaging in interactive conversations with users, hence “ChatGPT.” It can understand user queries and provide relevant and coherent responses, making it suitable for chatbot applications and interactive dialogue scenarios. Because the field of NLP is constantly evolving, newer versions are likely to be available by the time you read this.

ChatGPT is a vital support tool to enhance critical thinking for derivative security professionals. Critical thinking is a necessary skill that employers look for within their teams and the candidates they seek to recruit. In the study and practical use of derivative securities, critical thinking will help you to analyze received information, draw conclusions from the information and make better decisions. Critical thinking is essential to the efficient management of risk, trading, and hedging in a complex and dynamic financial marketplace. Here is what ChatGPT had to say about the role of critical thinking for derivative security professionals (Figure 1).



ChatGPT 3.5: How critical thinking impacts derivative market participants (edited and revised)

1. Risk Assessment: Critical thinking helps participants assess and analyze the risks of different derivative products. Participants need to understand the complexities of these instruments, their potential for gains and losses, and their correlation to underlying assets. This enables them to make informed decisions and manage risk effectively.
2. Strategy Development: Derivative market participants, such as traders and investors, must develop effective strategies to achieve their financial goals. Critical thinking allows them to evaluate various strategies, consider the pros and cons, and adapt them to changing market conditions.
3. Analyzing Market Data: In derivative markets, a vast amount of data is available, including historical price movements, volatility, and market sentiment. Critical thinking helps participants process and interpret this data to identify trends, patterns, and potential opportunities.
4. Identifying Mispriced Derivatives: Derivative markets can sometimes exhibit mispricing due to market inefficiencies, informational gaps, or behavioral biases. Critical thinking lets participants spot these mispriced derivatives and potentially exploit them for profit.
5. Hedging Decisions: Many participants use derivatives for risk management and hedging purposes. Critical thinking allows them to assess their risk exposure accurately and determine the appropriate derivatives to hedge against adverse price movements.
6. Emotion Control: Emotions can often influence decision-making in the financial markets, leading to irrational choices. Critical thinking helps participants remain rational, objective, and disciplined, reducing the impact of emotional biases on their trading and investment decisions.
7. Evaluating Counterparty Risk: In derivative transactions, participants often deal with counterparties, and assessing their creditworthiness is crucial. Critical thinking aids in evaluating the financial stability and reliability of counterparties to minimize the risk of default.
8. Compliance and Regulation: Derivative markets are subject to various regulatory frameworks, and participants must adhere to compliance rules. Critical thinking helps participants understand and comply with these regulations to avoid legal and financial consequences.
9. Scenario Analysis: Derivative market participants must anticipate different market scenarios and their potential impact on their positions. Critical thinking allows them to perform scenario analysis and stress testing to assess their portfolio's resilience.

Against this backdrop, the chapter discussion begins with a formal introduction to risk. We then introduce the derivative trading markets and overlay of regulation that guides and controls the functioning of these markets. Next, we present the different instruments traded in these markets. We conclude the chapter by examining professional opportunities and a discussion of career choices for the student learner.

## Risk

To the business decision-maker, risk is a numerical estimate of uncertainty. What is of interest is understanding how decision-makers measure (quantify) a perceived risk. History argues that the vital component to ethical decision-making is the underlying process by which managers convert uncertainties to quantifiable possibilities. At this point, a statement of the perceived uncertainty is reduced to a measurable form that is ready for subsequent action. As the study progresses, the ARMDAT presentation identifies and uses financial modeling, intelligent and traditional, to produce clear and unambiguous statement(s) concerning the path to follow to achieve a successful outcome in the face of uncertainty.

Uncertainty → Risk

Traditionally, in the world of business decision-making, two types of risks were featured: **business risk** (systematic) and **financial risk** (unsystematic). The consequences of indecision, or incorrect quantification of possible outcomes, often

*A global view of risk: the Chinese characters to express the dual nature of risk.*

*The first symbol expresses "risk or danger" in the context of business venture or the risk you might take when investing in the stock market. The second holds the meanings of "dangerous and rugged." It is an expression of gambling, or the taking of extreme risks.*

lead to paralyzing effects for the firm. How is this so? For example, consider the scenario where a global competitor faces today's volatile foreign exchange market (forex). The forex volatility can be attributed to varied sources: Brexit (Britain's exit from the European market), the unexpected victory by Donald Trump in the 2016 presidential election, the attempted 2016 Turkish coup d' état, or other market affecting events. By employing a management team that understands how to predict, hedge, and otherwise manage international orders in the face of unexpected exchange rate volatility, the firm has its best chance at minimizing the devaluation effect on the dollar revenues occurring from an adverse

change in the rate of exchange.

Lastly, we might point to a portfolio manager for a relevant example of why risk management is essential. Consider the manager of an equity-based portfolio who faces the risk of a meaningful decline in stock prices. He needs to know how to cope with the expected decline in value. The most astute portfolio managers learn to hedge their views by creating hedge fund portfolios. Although we have not defined or explained the concept of a hedged portfolio, it is sufficient to state that it is a portfolio where the manager has introduced financial instruments designed to offset any negative trend in the held equity securities. By advancing to the use of a hedge portfolio, the fund manager faces a new opportunity and a new risk.

On one hand, it is good to know that financial risk can be offset. On the other, there is a need to understand an additional source of variability belonging to the hedging instrument. And, it is this latter topic that commands our attention in this textbook.

Our discussion brings us to the interesting question: how does the ARMDAT book define and use the word risk? As we progress with the presentation, it will become



evident that a simple definition for the word ‘risk’ will not support the totality of our learning objectives. A simple definition would undoubtedly facilitate our task. Still, it is impossible to reduce the study of risk to a static or straightforward concept across the dynamic finance systems in the global markets. Instead, we will benefit by treating the definition of risk as an ongoing and evolving process driven by any number of complex interactions in the global economy. With this thought in mind, we begin the study of risk by setting a foundation for an appropriate description and definition.

## Risk and ARMDAT

In financial decision-making, it is not uncommon for the decision-maker to link the probability of an event occurring with the consequences of the event itself. At this introductory stage of the learning process, let us put energy into ‘containment of the risk management process. ARMDAT defines and elaborates on the following key concepts: risk, risk management, risk assessment, mitigation, and contamination.

- Risk is the assignment of a probability to a threat vulnerability that has escalated to a hazard. It is a dangerous level capable of producing meaningful adverse outcomes.
- Risk assessment represents the process of deciding what the hazard is to the desired outcome(s) associated with a decision-making choice.
- Risk management is a contemplated set of actions that result in a sustainable business and operating environment.
- Risk mitigation represents the collection of actions that, when taken together, help to reduce the vulnerabilities to disastrous outcomes. In practice one defines a *risk mitigation period* during which the collection of actions is valid.
- Risk contamination is a process whereby a failing or depreciating asset depletes the value of an otherwise healthy asset. In finance theory, this is better known as financial contagion.

The rewards for learning how to identify, measure, and mitigate risk usually result in positive outcomes – outcomes that can be significant when compared to the naïve or do-nothing approach. We can argue that competency in risk management skills is often associated with managers who are better positioned to experience innovation and accept sophisticated decision-making alternatives.

## Risk and Artificial Intelligence Models

Artificial Intelligence (AI) methodologies have been widely adopted across both academia and the business community. The pursuit and deployment of AI is growing from trading companies to retail organizations. Today, AI modeling systems are used to predict stock and commodity prices, make credit decisions, and ‘explain’ outcomes. In subsequent chapters, the ARMDAT presentation makes substantial use of ANNs to understand risk in asset price forecasting better, devising optimal hedging strategies, and computing AI stock betas. In the study of derivatives, emergent technologies utilizing ANNs, machine learning, and other novel techniques are becoming the new standard prediction risk management and optimal equity portfolio management (Gu, Kelly, and Xiu, 2019; Kelly and Pedersen 2020). Here we mention how the widespread use of AI has also resulted in several new fields of study to explain these AI models.

### Neuroinformatics

One goal of using AI more extensively is to exploit biases in massively large data structures. While the models and discussion presented in ARMDAT lends itself to large data sets it is not the objective of this course to work with these large data sets. Instead, we briefly mention that this type of deployment is part of the growing field of neuroinformatics. Neuroinformatics deploys novel and emergent technologies on large-scale data collection and analysis to understand biases in data that can be replicated and perpetuated.

### Neuroeconomics

With an emphasis on brain science, AI is interconnected with the interdisciplinary field of neuroeconomics. Neuroeconomics relies upon neuroscience studies to explain human decision-making. Economists, biologists, psychologists, and social scientists employ neuroeconomic studies to understand how individuals approach the decision-making process. Inside ARMDAT, the study of neuroeconomics is engaged to help risk managers tackle risk in complex decision-making problems.

### Explainable AI

Explainable AI are a set of tools and frameworks that are used understand and interpret the predictions made by the AI models. The goal is to increase transparency of the AI models and build trust in the AI model's prediction. In ARMDAT the student will be exposed to one of the widely used explainable AI model – The Shapley Value. The Shapley value is so named after the Nobel Prize winning mathematician [Lloyd Stowell Shapley](#).

## Risk in a Sustainable World

Apart from identifying and discussing sustainable finance, the ARMDAT presentation explores alternative approaches to managing and reducing various sources of risk associated with sustainable activities. You may ask, “*Why sustainability in a risk management book?*” Sustainability in finance offers hope that the study of financial risk-and-return concepts can facilitate meeting an economy's needs without compromising the ability of future generations to meet their needs. Financial crises have a way of revealing weaknesses and, subsequently, causing the industry-wide reflection to take place. After the financial crisis of 2008, a focal point emerged. The financial community realized there are definite limitations to maximizing profit without a plan to assure long-term stability and sustainability.

### ESG Risk

**ESG** is the acronym used to describe the effects on firm performance from adaptations to *environmental*, *social*, and *governmental* policy factors. Table 1 provides a categorization of some of the more recognizable impact dimensions.

Table 1:

ESG

Sustainable

Impact

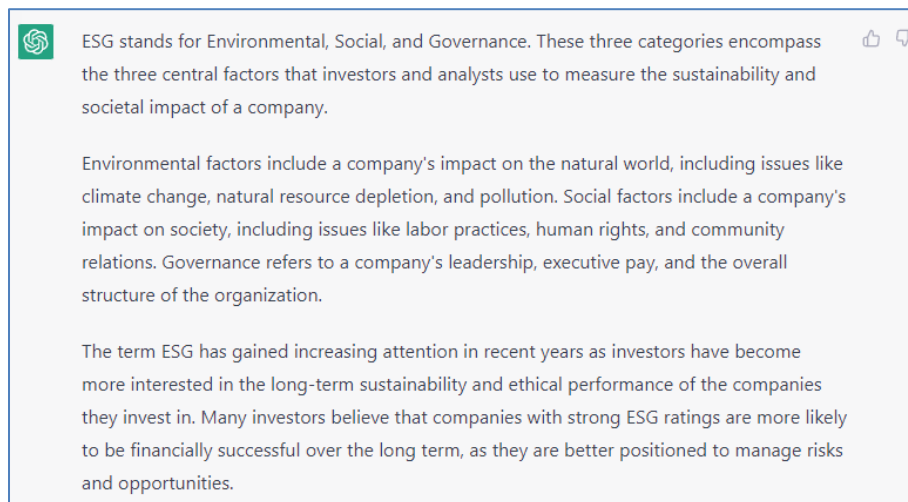
Dimensions

<b>Environmental</b>	<b>Social</b>	<b>Governance</b>
Environment Policy	Human Rights	Corporate Governance
Environment Performance	Labor Standards	Code of Ethics
Climate Change	Health and Safety	Bribery and Corruption
Nuclear Energy	Employee Development	Death Penalty
Biodiversity	Supply Chain Standards	Military Expenses

Source: Invesco, Vigeo Eiris, <https://www.invesco.com/corporate/about-us/esg>

Is this the only recognized definition of the ESG domain? As the world settles on a need to generalize a formal definition as your authors, we asked ChatGPT (<http://chat.openai.com>) to provide “a definition of the term ESG.” Figure 2 displays the response from the open AI resource.

Figure 2:  
ChatGPT  
response to  
“ESG  
Definition”



As indicated in the last para of the ChatGPT response, investors and firm managers alike are known to ponder the question of what impact, if any, ESG organizational goals have on a firm's value. Cho et al. (2019) examined the relationship between corporate social responsibility (CSR) performance and corporate financial performance. The authors find support for the hypothesis that CSR performance exerts positive effects on financial performance. Additionally, CSR activities are investments that can enhance both corporate performance and value. Earlier to this contribution, the relationship between firm size and sustainability is also reported in the literature by Tarmuji et al. (2016). The research said that investors preferred firms that improved their ESG practices. The investors in the study also believed the ESG-oriented firms perform best at asset deployment and generating risk-adjusted market returns.

Increasingly, modernized portfolio managers seek to reconcile behavioral biases during the asset diversification process. With financial analysts swarming to consider ESG dimensions in the portfolio diversification process, ESG goals now represent a type of behavioral bias – *affinity bias*. Given the myriad of public and proprietary firm-level ESG scores, deciding how to incorporate ESG dimensions in behavioral portfolio management (BPM) is not so straightforward. New ESG factors derived by Dash and Kajiji (2020) demonstrate how to use financial networks and traditional portfolio optimization models with layered goals to manage BPM problem. Managing ESG-related risk, whether through efficient diversification or the use of financial derivatives, is a growth dimension with the longevity of practice.

## Climate Risk

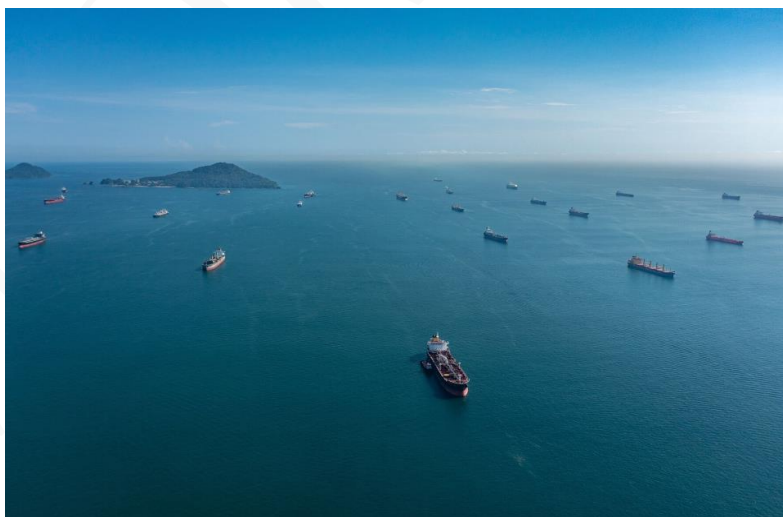


Does climate change pose a risk to firm performance? At the 2019 G7 meeting, responding to a question, U.S. President Donald Trump said, “...*American wealth is based on energy and he will not jeopardize that for dreams and windmills.*” Accordingly, the U.S. exited the 2015 Paris Climate Accord and declared global warming as a “hoax.” But, the financial markets expressed a degree of nervousness about future firm performance. That is, financial market expresses a degree of uncertainty about the unknown impact of warming oceans, higher sea levels, increased greenhouse gasses, more frequent and severe weather, higher wildlife extinction rates, and other manifestations of climate change. With a fast-forward move

of the timeline to the beginning of 2024, the nervousness expressed by financial markets proved to be well-founded. On 05-Jan-2024, the Bloomberg Green Daily newsletter reported the following:

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*There’s no better way to see how climate change can choke global trade than a visit to the Panama Canal...The drought-stricken waterway, which handles \$270 billion a year in global trade, is in trouble. With water levels languishing at six feet (1.8 meters) below normal, the canal authority capped the number of vessels that can cross to just 24 — from the usual 38...Its travails are just part of a wider story about how global warming is altering the flow of goods around the world.*



Source: [www.bloomberg.com](http://www.bloomberg.com)

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At specific points in the ARMDAT presentation, we explore some of the latest ways to mitigate climate risk. For example, Engle et al. (2019) use third-party ESG scores of firms to model (hedge) climate risk exposure using a novel approach.

A more detailed examination of climate risk would explore the following: carbon, energy, waste, and water risk. ARMDAT introduces sustainable investing, but time considerations limit the further development of each type of risk and associated management issues.

### Reputational Risk

Upwards of 63% of a firm's market capitalization is attributable to the firm's reputation. When the firm's reputation is at risk due to the behaviors of aggrieved, dissatisfied, and viscerally charged stakeholders, it is pretty possible reputation attacks can threaten firm value. Derivative security analysts develop risk mitigating derivative-based securities to offset value depreciation due to reputational damage. Unlike the use of pre-crisis signaling, acts of corporate social responsibility, and directed marketing communications, the use of derivative securities is a pure market-instrument mitigation strategy.

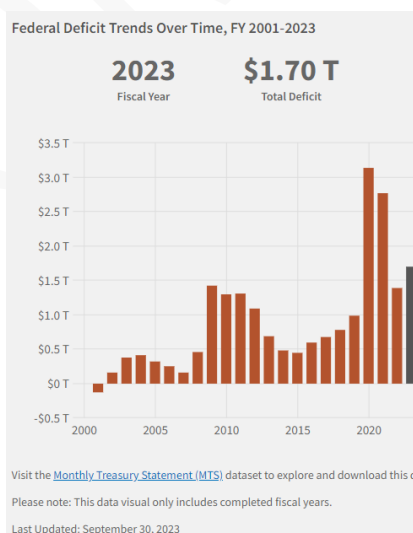
## Macroeconomic Risk

Macroeconomic risk describes the impact of macro variables such as political events, taxation, climate refugees, etc. on the financial markets. The shift in the national and international economic status can affect not only the individual financial status of states, districts, and regions, but also the valuation of company assets such as stocks and bonds. Let's look at two of the most recent macroeconomic risks.

### Government Deficit Spending

Even before the pandemic, the federal deficit was large by historical standards and projected to rise. The sharp recession and spending increases that Congress and the president approved in response to the pandemic have increased the deficit (figure 3).

Figure 3:  
USA  
Budget  
deficit



Source: <https://fiscaldata.treasury.gov/americas-finance-guide/national-deficit/#us-deficit-by-year>

Post-COVID-19, interest rates were extraordinarily low until March 2022. The low-interest rate environment allowed the U.S. to increase the debt burden as the cost of doing so was low. As the second half of 2022 evolved, the Fed began a series of rate hikes that immediately raised the cost of public and private borrowing. Continued government borrowing at higher interest rate levels will eventually lead to a

dampening of economic activity and possibly lower stock prices as consumers and businesses adjust to higher financing costs.

### Climate Refugees

Climate refugee is a person who has been forced to leave their home as a result of climate change on their environment. We have already established that climate change is of growing concern in the previous section. More importantly, it is estimated that by 2050 there could be 1.2 billion climate refugees. While most of the climate refugee syndrome occurs within a country often this is not so. For example, two category 4 hurricanes hit Honduras, Guatemala and El Salvador in November 2020, people poured across the border into Mexico and headed towards the U.S. as torrential rains and landslides meant they lost their homes, livelihoods and access to clean water (<https://www.zurich.com/en/media/magazine/2022/there-could-be-1-2-billion-climate-refugees-by-2050-here-s-what-you-need-to-know>).

## A Historical Taxonomy of Risk

In this section, we set the stage for the study of “risk” by taking a look back in time. We are reminded by the great U.S. General George S. Patton that we should “*prepare for the unknown by studying how others in the past have coped with the unforeseeable and the unpredictable.*” However, “*To history, human nature must be a stubborn and tiring student. No matter how many times history tries to show it the error of its ways, it never learns from its mistakes.*” ([Kelseyleigh Reber](#), *If I Resist*.)

Derivatives matter because they can reduce uncertainty for those investors that find it undesirable. Derivatives provide businesses and investors with a mechanism to increase or decrease exposure to four common types of risk: commodity, stock market, interest rate, and credit. For example:

- A farmer whose crops and profits depend on the cooperation of the weather.
- A pension fund manager who is concerned with maintaining portfolio value during bearish times.
- A Coindesk bitcoin trader subject to presidential tweets (Casey, 2019).

Derivatives cannot change the weather or predict a presidential tweet, but they can change the financial implications of a drought; or politically initiated market-changing sentiment.

Table 2 presents a brief annotation of major risk-related events from the mid-1930s. The table recounts at least one significant risk event per decade that resulted in market-wide price volatility across commodities, stocks, interest-denominated contracts, and institutional credit. For more details, see Appendix A.

Table 2:  
Some  
Major  
Risk  
Events

Year	Event
1933	The U.S. Congress passes the Glass-Steagall Act. The Act prohibited common ownership of banks, investment banks, and insurance companies. Revoked in 1999 the Act slowed the development of financial institutions and fragmented the risk management process
1952	The <a href="#">Journal of Finance</a> publishes “ <i>Portfolio Selection</i> ” by Harry Markowitz. The first unification of return and variance in the management of investment portfolios.
1973	Myron Scholes and Fischer Black publish their seminal paper on option valuation in the <a href="#">Journal of Political Economy</a> .
1987	“Black Monday.” October 19, 1987. The shock waves of the U.S. stock market collapse reverberated globally.
2001	The terrorism of September 11 and the collapse of Enron remind the world that nothing is too big for a failure.
2008	<a href="#">Fannie Mae</a> & <a href="#">Freddie Mac</a> agencies go bankrupt and are absorbed by the federal government. Lehman Brothers filed for bankruptcy after investing in bad mortgages. The bankruptcy was the largest casualty of the credit crisis. AIG receives \$85 million in loan guarantees after insuring bad loans and projects.
2008	Investment bank Bear Stearns fails due to excessive leveraging and overweight exposure to junk mortgage-backed securities.

Table 2  
(Cont.):  
Some  
Major  
Risk  
Events

Year	Event
2009	<p>U.S. inflation hits zero, with U.S. unemployment reaching 15% in April. Fannie Mae bailout disbursements reach \$59.9B. Freddie Mac bailout disbursements reach \$63.1B</p> <p>Quantitative Easing (QE 1) is the process where the US Federal Reserve expands its control over monetary policy by directly intervening in the short-term bond markets to purchase securities. By March, the FED held \$1.75 trillion in bank debt, mortgage-backed securities, and Treasury notes. QE is designed to reduce systemic risk and improve market confidence.</p>
2009-10	U.S. Bank failures skyrocket to 140 and 157 in 2009 and 2010, respectively, and the “Flash Crash” of 06-May (DJIA falls 900+ pts).
2011	MF Global, a futures and derivatives brokerage, fails after the execution of ultra risky and proprietary trades. The firm was led by former N.J. Governor Jon Corzine.
2012	In May, JP Morgan Chase admits it had a loss of at least \$2B on lousy credit derivative transactions. CEO Jamie Dimon said JPMorgan’s trading losses were due to “egregious and self-inflicted mistakes,” from trades that were “poorly executed and poorly monitored.”
2013	The self-regulatory organization Financial Industry Regulatory Authority (FINRA) reported significant losses nearing \$90 million for the second straight year. FINRA is an association of securities dealers – not a government regulator.
2015	The market capitalization for Volkswagen dropped \$18.6B in just one day after the company was caught falsifying emissions on certain cars sold in the U.S. The Clean Air Act allows the EPA to charge up to \$37,500 per vehicle for the 482,000 affected cars; or, \$18B.
2016	<ul style="list-style-type: none"> <li>• Taketa Airbag flaw and vehicle recalls in the millions</li> <li>• The growth and spread of organized terrorism</li> </ul>
2017	<ul style="list-style-type: none"> <li>• Cyber risk and data breaches</li> <li>• Geopolitical risk (e.g., hard Brexit).</li> <li>• Conduct risk; wrongdoing by high-profile senior personalities.</li> </ul>
2018	Exploding risk events: IT disruption, data compromise, financial modeling risk, theft, and fraud.
2019-20	<ul style="list-style-type: none"> <li>• Data compromise (unlawful encryption and ransom)</li> <li>• Election tampering risk</li> <li>• Talent risk (ability to attract, train, and retain the best)</li> <li>• Model risk</li> <li>• Personal identity risk</li> <li>• Identification and global spread of the Novel Coronavirus</li> </ul>
2020-21	<ul style="list-style-type: none"> <li>• The demise of LIBOR; transition to alternative risk-free rates</li> <li>• On 31-Jan-2020, Britain formally exited the European Union.</li> <li>• Global pandemic: Coronavirus / COVID-19</li> </ul>
2021-22	<ul style="list-style-type: none"> <li>• Post-COVID management of public-private collaboration</li> </ul>
2022-23	<ul style="list-style-type: none"> <li>• The global rise of inflation and enterprise risk management</li> <li>• Cyber attacks, automated malware, and AI privacy risks</li> </ul>



## Derivative Markets

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There are two different markets discussed throughout the book. One is the **cash market**, and the other is the **derivatives market**. The cash (i.e., spot) market is immediate. The spot market is utilized whenever a sale is made, payment is remitted (or credit arrangements have been secured), and the good is delivered. The performance of derivative security does not take place in a disassociated space. All derivatives are linked to an **underlying instrument** (e.g., stock, bond, credit portfolio, etc.). The value of a derivative derives directly from the value of the underlying. It is common to hear – “...a derivative is written against an underlying.”

## Exchange Markets

Derivatives that trade on organized exchanges are said to be “*exchange traded*.” Option exchanges provide a location and framework for the trading of standardized options contracts. Exchange-traded derivatives are written against the broadest of topics – from news on climate change to heating-degree days to cryptocurrencies. Two crucial exchanges influence the ARMDAT presentation on options contracts – the CME Group and the CBOE.

### CME Group



The history of the CME Group dates back to the founding of the Chicago Board of Trade (CBOT) in April 1848. In July 2007, the CBOT merged with the Chicago Mercantile Exchange to form the CME group. It is the world’s largest financial derivatives exchange trading asset classes that include stock indexes, currencies, interest rates, energy, agricultural products, and metals.

### CBOE



The Chicago Board Options Exchange was established by the CBOT in April 1973 as the first exchange to list standardized stock options. The CBOE is the largest U.S. options exchange with a trading volume of over 1 billion contracts for options on over 2000 companies. The exchange also offers options written against exchange traded funds (ETFs), stock indices such as the S&P 500 (SPX), Dow Jones Industrial (DJX), Nasdaq Composite (ONEQ), and more. Additionally, the CBOE produces broad market volatility indices. Two of the most frequently used volatility indices are VIX and VXN. The VIX tracks the volatility in the S&P 500, whereas the VXN tracks the volatility of the Nasdaq 100. The CBOE is regulated by the Securities and Exchange Commission (SEC).

### International Exchanges

The following option exchanges are some of the more popular places to provide a location and framework for trading standardized contracts. Although it is no listed in table 3 below, the CBOE is considered an international exchange.

Table 3:  
Some  
International  
Exchanges

International Options Exchanges	Description
<a href="#">Boston Options Exchange</a>	This automated exchange is also known as BOX Options Exchange. The exchange is operated by TMX Group, a public financial services company (Canada).
<a href="#">Montreal Stock Exchange</a>	A derivatives exchange based in Montreal, Canada. Trades in futures contracts and options on equity instruments.
<a href="#">Eurex Exchange</a>	An international exchange that features the trading of European-based derivatives. It is the largest European options and futures market.
<a href="#">NYSE Arca</a>	A popular international exchange from trading stocks and options owned by the International Exchange (Chicago). The trading platform blends open outcry with a trading floor with electronic trading technology.
<a href="#">International Securities Exchange (ISE)</a>	A wholly-owned subsidiary of NASDAQ, the exchange was launched as a fully electronic U.S.-based options exchange for equity, index, proprietary index, and FX options.

## The Over-the-Counter Market (OTC)

Unlike an exchange, which is a physical location, the OTC is a decentralized market where participants trade directly by using an electronic network rather than a physical trading floor. By the 1980s, a new derivatives era arrived – the age of credit derivatives. This era marked the growth of swaps and other types of complex OTC derivatives (e.g., non-standard option contracts).

## The Role of the Derivative Markets

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Technological advances in finance and computer science are driving forces behind the evolution of financially engineered derivative instruments. As the global technological revolution unleashed profound transformations in the financial sector, derivatives became a crucial tool to help facilitate the growth in private capital flows. Derivatives mitigate changes in the risk profiles associated with these flows. Today, derivatives provide three economic functions: a) risk management, b) price discovery and c) operational efficiency and liquidity.

### Risk Management

At its core, risk is the possibility of loss, injury, disadvantage, or destruction. Risk management is a required and fundamental part of managing the revenue stream from a producing asset. For there to be an environment where it is possible to manage risk, we need a better understanding of the following:

1. Often, the risk results from managers pushing the envelope of their experience (e.g., seeking higher returns from an untested investment strategy).
2. Risk measurement requires the application of standardized and well-known statistical methods.
3. The engineering of an enterprise-wide risk management system is central to achieving consistent institutional risk-adjusted performance.

### Price Discovery

How would you like a 'free' forecast of a market price that is expected to materialize at a defined point in the future (20-minutes, day, week, etc.)? Forward and futures markets provide valuable information about cash or spot market prices. Both markets collect information that is relevant to the formation of expected spot market prices.

You may be surprised to hear that futures prices and spot prices contain the same rudimentary prediction information. The information set (of factors) that explain how these prices vary are not always universally understood and may be subject to different interpretations by alternative market professionals. Still, the fact remains that understanding one type of price volatility will assist in explaining the price volatility of other similar market instruments. In short, it is often argued that forward and futures markets provide price discovery.

### Operational Efficiency and Liquidity

Previously we stated that derivatives are inextricably linked to the underlying. It is this linkage that helps investors to achieve greater operational efficiency in day-to-day derivative trading practices. For many years, derivatives presented a lower transaction cost than the costs associated with the underlying. This differential is primarily erased today because of recent trends in electronic markets. To exemplify this point, consider a recent posting of transaction costs by [Interactive Brokers](#). In figure 4, the cost of trading options contracts is presented. In the first box, we can see that trading one contract costs \$0.70, with a minimum value per order of \$1.00. However, as we will learn in a subsequent chapter, one traditional option contract trades 100 individual options. Hence the cost per option is 1/100 of the listed

amount – this is a minimum of \$0.01. As shown in figure 5, the cost of trading *US stocks, ETFs, and Warrants*, is now \$0.0035 per share, which is significantly lower. Today, both the derivatives market and the markets in which the underlying trades indicate increasing operational efficiency.

Figure 4:  
Cost of Trading  
- Options

United States			
Tier	Commissions	Minimum per Order	Example
<b>Smart Routed: &lt;=10,000 Monthly Contracts</b>			
Premium >= USD 0.10	USD 0.70 per contract	USD 1.00	1 Contract @ USD 2 Premium = USD 1.00 2 Contracts @ USD 5 Premium = USD 1.40
USD 0.05 <= Premium < USD 0.10	USD 0.50 per contract	USD 1.00	3 Contracts @ USD 0.075 Premium = USD 1.50
Premium < USD 0.05	USD 0.25 per contract	USD 1.00	5 Contracts @ USD 0.03 Premium = USD 1.25

Source: <http://www.interactivebrokers.com/en/accounts/fees/commission.php>

Figure 5:  
Cost of Trading  
– Stocks, ETFs,  
and Warrants

Volume (per month) <sup>(1)</sup> :	IB Commission per Share
US Stocks, ETFs, and Warrants <sup>(2)</sup>	
<=300,000 Shares	USD 0.0035
300,001-3,000,000 Shares	USD 0.002
3,000,001-20,000,000 Shares	USD 0.0015
>20,000,000 Shares	USD 0.001

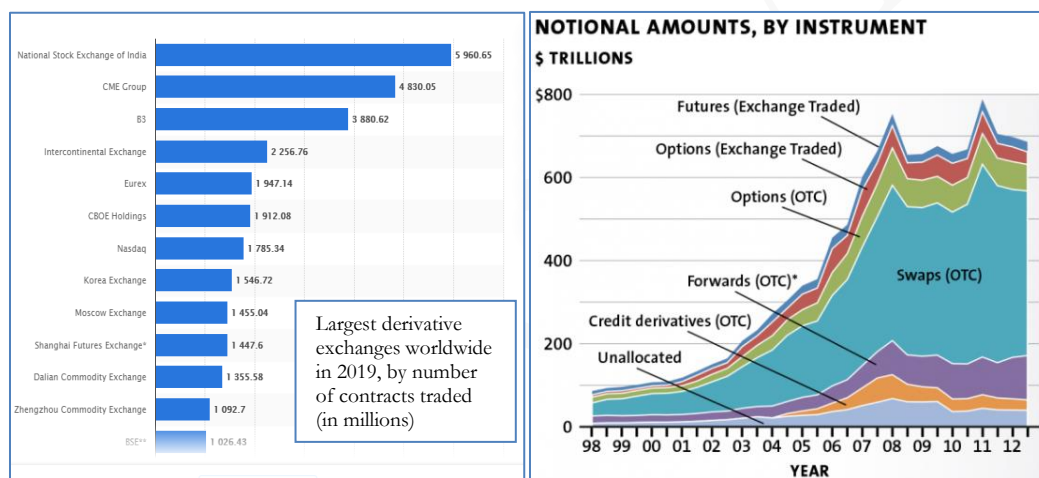
Source: <http://www.interactivebrokers.com/en/accounts/fees/commission.php>

Derivative markets also have potentially superior liquidity than the spot markets. Liquidity risk arises whenever a party interested in a trade cannot execute that trade as no counterparty exists that wants to trade the same asset. In the equity markets, for example, the liquidity is relatively high for the securities of major companies. But, even for the securities of large companies, sometimes it is impossible to trade as the markets might need to cope with a growing imbalance between large and small investor transactions.

## Derivative Market Size

The news stories of 2008 indeed prove the surging popularity of derivative contracts as a fundamental hedging tool. Worldwide derivative exchanges are some of the most active (Figure 6, left). From bankers, insurance companies, investors, and corporate treasurers, the participation has grown along with the sophistication of the instruments in use. EconomyWatch reports the derivative markets reached a size of just under \$370 trillion by the first half of 2007. EconomyWatch noted that over the decade beginning in 2000, the derivative market size almost quadrupled. In the over-the-counter markets alone, the increase was just under 25% in the face value of all derivative contracts for 2007, with equity derivatives reaching about \$114.1 trillion. In fall 2008, the credit derivative markets took center stage as they became the primary focal point of a severe meltdown for several financial service firms. In 2001, the credit derivatives market stood at approximately \$0.7 trillion. By 2008 the credit derivatives market was trading at roughly \$52 trillion. Much of this [increase](#) was attributed to new synthetic collateral debt obligations that traded alongside more traditional markets using the efficiency of electronic trading systems.

Figure 6:  
Left: Volume  
by Markets;  
Right: Which  
derivatives  
are most  
active in the  
US?



Source: Statista, 2020;

Source: BIS, June 2013

To help visualize the relative importance of various derivative contracts, consider how these contracts are used by insured U.S. commercial banks and savings associations from 2001 through quarter 3, 2012. Reference is made to figure 6 (right), showing that swap contracts are three times more active than futures and forwards. Within these depository institutions, option contracts are the next most popular, followed by a fast and continually growing area of credit derivatives.

The growth in the derivatives market did slow down between 2008 and 2019. But, as of 2020, the derivatives market is estimated at over \$1 quadrillion. But this seems to be grossly over-exaggerated, say some experts. The [Bank of International Settlements](#) (BIS) estimated that in the first half of 2019, the notional value of the outstanding contracts was about \$640 trillion, a significant jump from the 2007 figure of \$370 trillion. They also estimate that the total gross market value of all contracts is approximately \$12 trillion – a more realistic picture. When narrowing down to the OTC market, the notional value in 2019 was estimated to be its highest since 2014. The notional value of all interest rate contracts traded on the OTC was estimated at \$200 trillion.

But, as the derivative markets have grown, so have the leverage debacles. History

now documents several notable and unfortunate cases where derivative contracts were misused. Because of the significant losses incurred by the investors behind the misuse, it is common to hear questions about whether the large-scale use of derivatives is speculation versus a well-calculated approach to risk management. The interested reader is referred to Appendix B for a list of some well-known historical leverage debacles.

## Derivative Instruments

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### Option Contracts

An option is a contract between two parties. One party is the buyer, and the other is the seller. An options contract gives the buyer the right, but not the obligation, to purchase or sell something at a later date at a price that is agreed upon today. The option buyer pays the seller of the option contract, a price referred to as a **premium**. When the option confers the right to buy something, it is called a **call** option.

Conversely, when the option contract confers the right to sell something, it is called a **put** contract. Stated differently, a call option holder has the right to purchase the underlying (stock, grain, etc.) at an agreed (strike) price. The put states the same, except it is the right to sell.

Exchange-traded option contracts dominate the ARMDAT presentation. These options are tightly defined by the use of standardized terms. But options traded on the OTC are not ignored! Often, OTC options are tailor-made derivatives. That is, the defining characteristics of these options are not standardized. Is there a market for uniquely specified options? You bet! Tracked by the Bank for International Settlements, look at the growth (and volatility) of the OTC derivatives notional amount. There is a substantial market for derivative instruments that trade privately between two parties.

*Notional is the dollar value of the underlying instrument*

#### Case Study – McDonald's Chicken McNuggets

Before the introduction of Chicken McNuggets, McDonald's found it necessary to hedge against the cost of chicken. McDonald's research uncovered two primary items that determined the cost of raising chickens – grain and water. Hence, an uncontrollable risk in chicken prices could jeopardize introducing the new food item. McDonald's risk management objective was to obtain chicken at a fixed cost. The risk management strategy led to the company purchasing an option on grain. The strategy gave McDonald's the right, but not an obligation, to purchase grain at a known price – the strike or exercise price. The approach ensures that McDonald's is protected against the risk that grain prices may rise. But, risk management is not free. The cost of the grain option resulted in a more considerable cost for the chicken served as nuggets. A hedging strategy always adds expense, but it does reduce risk.



### Forward Contracts

As we introduce the forward contract, you will find that the instrument sounds a lot like an options contract. But, there is one essential difference. As previously stated, an option contract carries the right, but not the obligation, to exercise the contract terms. The requirement is different for a forward contract. The terms of the forward contract must be carried out.

A **forward contract** is a contract between a buyer and a seller to purchase or sell a good (commodity) at a later date at an agreed-upon price. This definition does not confer any decision-making authority to the buyer. The description of the forward contract clearly states that the holder (buyer) of the agreement must be prepared to buy the goods, and the seller must be prepared to sell the commodity on some

specified date at the agreed-upon price on the day the contract was established.

Forward markets lack an identifiable physical facility where trades take place. All trades of forward instruments take place on the over-the-counter market. Hence, it is a market where direct communication among the primary participants is required to execute a contractual relationship. One of the more visible examples of the forward market is that for trading foreign exchange.

## Futures Contracts

A **futures contract** is a financial instrument that trades on an organized exchange. Like a forward contract, it is a contract between two parties to buy or sell an underlying commodity at a future date for a price agreed upon today. By trading on an organized exchange, a futures contract is subject to a daily settlement process. The settlement requires those investors who have incurred losses to pay them to those investors who have experienced gains in the futures market. The process is an essential process for maintaining an orderly futures market.

Relatively new to the futures market are Bitcoin futures. The underlying is the cryptocurrency Bitcoin. Cryptocurrency is a secure digital currency that relies on blockchain technology. Spread across many computers, a Blockchain is always decentralized. The underlying technology manages and records transactions. Bitcoin futures enable investors to gain exposure to Bitcoin without taking a stake in the underlying Bitcoin. As a derivative contract, Bitcoin futures allow investors to speculate on the underlying cryptocurrency's future price.

## Options on Futures

An essential synthesis between the two derivative security types occurs when an option contract is written against a futures contract. The integration is commonly referred to as a **futures option**. In essence, an option on a futures contract gives the buyer the right to buy (call option) or sell (put option) a futures contract at the exercise (strike) price anytime on or before the expiration of the option. Because futures options differ by the context of the underlying security (a futures contract), it is not surprising to learn that they bear a striking resemblance to traded commodity options—for example, the futures option trades on an organized (futures) exchange like a commodity option. The options on futures contract is not as popular as plain options or futures contracts. Still, the futures option offers an additional degree of risk control. We shall explore this in more detail in a later chapter.

## The Exchange-Traded Note (ETN)

An **exchange-traded note** (ETN) is a senior, unsubordinated debt security issued by an underwriting bank (e.g., [Credit Suisse](#)). ETNs are listed on exchanges such as the NYSE ARCA, trade like a stock and provide investor returns by tracking a market benchmark or strategy index. This is achieved by the underwriting bank promising to pay the amount reflected in the index (less the fees on maturity). Although the ETN is not an equity instrument, it shares characteristics of equity as it is traded on an exchange and can be sold short. But, as a debt security, the instrument does not have an ownership share in the underlying. Like equities, ETN values may fall (to zero) if the issuing underwriting bank goes bankrupt. Major issuers of ETNs include iPath (Barclays Bank PLC), BNP Paribas, Deutsche Bank, Morgan Stanley, and Credit Suisse.



## Swaps and Other Derivatives

A swap instrument differs in both legal and financial structures when compared to an option or futures contract. According to some prearranged formula, a **swap contract** involves a private agreement between two parties to exchange one stream of cash flows against another over a future period. The streams of cash flows are often referred to as “legs” of the swap. Most swaps trade in the OTC market, where they are “tailor-made” for the counterparties. Innovations have produced swaps that also trade on futures markets. Swap contracts have become an essential instrument in risk management and control. With swap contracts in interest rates, currency, credit, commodity, and equities, the notional size of swap instruments now measures in the trillions of dollars.

The first swap contracts were entered into in 1981. In 1985 several prominent participants in the privately negotiated derivatives industry chartered ISDA, the International Swaps and Derivatives Association, Inc. Today, ISDA has over 800 member institutions from 56 countries on six continents. The main objective of [ISDA](#) remains to identify and reduce risk in the derivatives and risk management business.

So, how does a basic swap contract work? Here is a short example. First, we note that the cash flows may be in any traded currency. Second, there must be a formula for determining the size and magnitude of the cash flows – this is usually an interest rate such as the 6-month LIBOR (**L**ondon **I**nter-**B**ank **O**ffered **R**ate). But with the phasing out of LIBOR, it is recommended to use the [SOFR](#) (**S**ecured **O**vernight **F**inancing **R**ate). A hypothetical basic swap arrangement proceeds as follows:

- *One party, let's say you through your bank (let's call you party X), agree to pay the other party, your vendor in London (let's call this party Y), cash flows equal to interest at a floating rate on a pre-determined notional principal for a given period of time.*
- *At the same time, party Y agrees to pay party X cash flows equal to interest at a fixed rate on the same notional principal over the exact same period.*
- *The swap term generally ranges from 2 to over 15 years. On each interest anniversary date, the swap agreement requires one party to send a payment for the difference between the two respective interest payments to the other party.*

## Interest Rate Options: Caps and Floors

Interest rate standard options are *caps* and *floors*. *Caps* and *floors* are options. The *cap* guarantees a maximum rate to the buyer. The *floor* guarantees a minimum rate to the buyer. Borrowers seek caps because it sets a maximum paid interest cost. This option has value only when the current rate is above the guaranteed rate. Investors seek *floors* because they offer protection against declining interest revenues. The floor option has value only when the current rate is below the guaranteed rate. Whenever either of these two options does not have value, it is considered worthless.

## Contemporary Regulatory Issues Affecting Derivatives

The first few years of the 21<sup>st</sup> Century have brought surprises to global markets. In the United States, the election of Donald Trump was not certain until election night. With the U.S. Presidency in hand, on election night, the nation's expectation was for his administration to seek changes in regulation, enforcement strategies, U.S. trade policy, changes to the Affordable Care Act, augmentation of immigration laws, and moves to reduce cyber risk and related attacks. How did these expectations interact with the U.S. derivatives market? Let's highlight some expected changes to derivatives market regulations to answer these questions. We start with a review of the Dodd-Frank Act – an Act passed in response to the economic crisis of 2008. Additional details on the financial regulations up to 2009 are in Appendix A.

### Dodd-Frank Financial Reform Act

President Barack Obama addressed the recession of 2007-2010, the worst recession since the Great Depression years (1929-1939), by signing into law the Dodd-Frank Wall Street Reform and Consumer Protection Act (Pub L. 111-203, H.R. 4173). The Act has three primary goals:

- Minimize systematic risk of derivatives trading
- Create transparency in derivative markets
- Prohibit entities holding customer deposits from engaging in speculative derivatives activity

Proposed in December 2009, the final Act presents a significant paradigm shift in how the U.S. deploys its financial regulatory system. This act impacts all Federal financial regulatory agencies and just about every aspect of the financial services industry. Surprised? You should not be. The American public demanded a bold response to the devastating recession and got one. Table 4 highlights the Act.

Table 4:  
Dodd-Frank  
Highlights

Content	Summary of the Dodd-Frank Financial Reform Act
<b>Derivatives</b>	<p>Major new regulations for OTC derivative contracts that were previously unregulated. Regulations target asset-backed securities, hedge funds, mortgage brokers, and payday lenders. New transparency rules address:</p> <ul style="list-style-type: none"> <li>• Closure of regulatory gaps by providing the SEC and CFTC with new authority to regulate OTC derivatives</li> <li>• Requires central clearing and exchange trading for derivatives that are pre-approved by the SEC and CFTC.</li> <li>• Requires new margin limits for un-cleared trades to offset the significant risk such contracts impose on the financial system. Swap dealers and major participants are now subject to capital requirements.</li> <li>• Requires stronger market transparency. Clearinghouses and swap repositories must provide improved clarity to assist regulators in monitoring risks.</li> </ul>
<b>Consumer Protections</b>	<p>Title X of the Act created a new independent watchdog agency: The Consumer Financial Protection Bureau. The Bureau was given the authority to ensure American consumers receive clear, accurate information about mortgages, credit cards, and other financial products. The Act also protects consumers from hidden fees, abusive terms, and deceptive practices. Administratively, the new agency is under the auspices of the Federal Reserve.</p>

Table 4  
(cont):  
Dodd-Frank  
Highlights

Content	Summary of the Dodd-Frank Financial Reform Bill
<b>Too Big to Fail</b>	Halts the practice of holding taxpayers liable to bail out financial firms that threaten the economy. Provides provisions for an orderly liquidation of failed financial firms. This is achieved by installing new and significant capital and leverage requirements that effectively retard the goal of expanding size beyond certain limits.
<b>Volcker Rule</b>	Named after former Fed chair Paul Volcker, the rule is published in section 619 of the Act. The Volcker Rule prohibits banks from using customer deposits for their own profit. Additionally, banks cannot own, invest in, or sponsor hedge funds and private equity funds. The rule specifically targeted former large investment banks (i.e., Goldman Sachs and Morgan Stanley) that became commercial banks to take advantage of taxpayer-funded bailouts.
<b>Advanced Warning System</b>	This section of the bill creates a council to formalize the application of systemic risk principles applied to large, diverse firms that could threaten the American economy.
<b>Existing Regulation</b>	The oversight powers of regulators are strengthened. Encourages the aggressive pursuit of financial fraud, conflicts of interest and overall manipulation that may or does adversely affect the public.
<b>Federal Bank Supervision</b>	Additional support for community banks. Existing regulation is streamlined.
<b>Investor Protection</b>	Increased accountability and rules to achieve greater transparency for credit rating agencies.
<b>Executive Compensation and Corporate Governance</b>	Given a non-binding vote, shareholders now have input on compensation and corporate affairs.

## Dodd-Frank Reform

In March 2018, the Trump administration started a process that “rolls back the crippling Dodd-Frank regulations crushing community banks and credit unions nationwide...those rules just don’t work.” Working with a predominantly Republican Congress in March, the U.S. Senate passed the most significant loosening of financial regulations since the economic crisis of 2008. It only took until mid-May for the U.S. House of Representatives to approve the Senate’s March rollback. Although the bill stops short of unwinding Dodd-Frank oversight that prevents the nation’s biggest banks from engaging in risky behavior, the Congressional approval represents a substantial watering down of rules governing a large part of the banking system.

Interestingly, in this overhaul of Dodd-Frank, left untouched are regulations directed at governing the nation’s derivatives markets. Two significant changes include:

- They are making fewer banks subject to the strictest federal oversight. Currently, fewer than ten banks are subject to the most stringent regulations.
- Some loan companies are now exempt from specific requirements for disclosure established by the Home Mortgage Disclosure Act.

Deregulation of the Act continues. In August 2019, the FDIC and four other independent agencies dropped their proposal to tie the Volcker Rule to a strict accounting standard. Instead, regulators will give banks the benefit of the doubt on a much more extensive range of trades. As amended, the Volcker rule no longer imposes a meaningful constraint on speculative and proprietary trading by banks and bank-holding companies that benefit from insured deposits.

## Jumpstart Our Business Startups Act of 2012

Signed by President Barak Obama in April and affectionately referred to as the “The Jobs Act,” amended various federal securities laws provisions (Table 5). It simplifies the sale of securities and increases the threshold number of record holders required by reporting requirements of the Securities Exchange Act of 1934, as amended. Although the Jobs Act does not explicitly target derivative securities, the risk management panorama will change with the establishment of a new corporate entity: Emerging Growth Company (EGC). Experts identify three key risks: a) frauds and investor scams are more likely to increase risk (less regulatory oversight); b) the low business failure rate may increase (lower capital requirements); and c) The Act may have little effect (reduced capital formation?)

Table 5:  
Jobs Act  
of 2012

Key Major Provisions	Description
<b>Shareholders</b>	Increases the number of shareholders a company may have before being required to register its common stock with the SEC, thereby becoming a publicly reporting company.
<b>Solicitation</b>	Lifts the ban on “general solicitation” and advertising in specific kinds of private placements of securities.
<b>Emerging Growth Company (EGC)</b>	A company is defined as an EGC if it's initial public offering of common equity securities (IPO) was after 08-Dec-2011 and the company had less than \$1 billion of total annual gross revenues during its last completed fiscal year.
<b>Facilitation of Capital Formation by EGC</b>	Title I is designed to facilitate capital raising by companies designated as EGC
<b>Simpler Disclosure Requirements</b>	A registration statement filed by EGC with the SEC will differ from a registration statement filed by other companies in the following respects: <ul style="list-style-type: none"> <li>• Audited financial statements will be mandated for only two fiscal years in IPO filing.</li> <li>• Selected financial data will be required for only the audited fiscal years.</li> <li>• Management’s Discussion and Analysis of the Financial Condition and Results of Operations will be required for only the audited years.</li> <li>• Executive compensation information will be presented in the limited format required for smaller reporting companies (a company with a public float of less than \$75 million on the last day of its most recently completed second fiscal quarter).</li> </ul>
<b>Exemption from future PCAOB Rules</b>	EGC’s independent registered public accounting firm is exempt from any rules adopted by the Public Company Accounting Oversight Board (PCAOB).

Table 5  
(Cont):  
Jobs Act  
of 2012

Key Major Provisions	Description
<b>Testing the Waters</b>	The Act permits EGC to communicate with potential investors (qualified institutional buyers) to determine interest in contemplated securities offerings.
<b>Research Reports</b>	The Act permits research reports by a broker or dealer about the EGC regardless of whether the research report provides the information “reasonably sufficient” for making an investment decision and irrespective of whether such broker or dealer is participating or will participate in the offering.
<b>Crowdfunding</b>	Title III, Capital Raising Online While Deterring Fraud and Unethical Non-Disclosure Act of 2012 (CROWDFUND Act), exempts from registration offers and sales of securities to the public that complies with new rules to be adopted by the SEC.

## Tax Cuts and Jobs Act of 2017

The *Tax Cuts and Jobs Act of 2017* (TCJA), Public Law 115-97, is an Act advocated by congressional Republicans and the Trump administration. In addition to the provisions that impact individuals, the TCJA is expected to change every aspect of the hedge fund industry.

### Provisions Impacting Individuals

Presented to the American people to simplify the Internal Revenue Code, the Act increased the standard deduction and family credits. Still, it reduced the number of popular deductions and made itemizing deductions less beneficial. Eight key takeaways are:

1. Most significant tax overhaul in 30 years.
2. After considering its economic impact, it adds about \$1 trillion to the nation’s debt over the next decade.
3. Corporations own the majority of the long-term benefits.
4. Most Americans receive an immediate tax cut, while the wealthy receive a substantial one.
5. Over the long run, most Americans will not see a tax cut or a tax hike.
6. Blue states (those that voted for Democratic candidates) benefit less than red states (those that voted overwhelmingly Republican).
7. Some industries are favored within the Act.
8. The law reduces the impact of the Affordable Care Act.

### Provisions Impacting Funds

1. Funds that invest in cryptocurrency (e.g., Bitcoin) cannot take advantage of the like-kind exchange rules (section 1031) to defer income on exchanges of one currency for another. The legislation only allows like-kind exchanges for real estate.
2. Guaranteed income from Master Limited Partnerships (MLPs) and REIT dividends are eligible for the 20 percent pass-through income deduction.
3. Fund managers are forced to review their choice of an organizational entity given changes to the carried interest rules, the reduction of corporate tax rates, and the general unavailability of favorable pass-through treatment.

## Risk Management: A Career Choice

Risk management is a “hot” employment destination. Whether it is the management of an equity portfolio, international transactions involving multiple currencies, or controlling unexpected performance in a credit portfolio, you will eventually need one or more derivative instruments to offset (hedge) the risk appropriately. One of the essential questions you may have is what types of jobs are available.

[CLICK HERE](#) to read about your future opportunities!

Figure 7:  
Risk  
Management  
Word Cloud



## Summary and Conclusions

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The study of risk and risk management is an exciting activity. The dynamic nature of society transmits directly into the behavior of the financial markets. This introductory chapter provides an overview of how the derivatives markets are introduced in subsequent chapters. While several important topics are introduced to help explain the importance of derivative markets, the ARMDAT presentation is firmly committed to identifying the institutional structure and best use of domestic derivatives markets. This introductory chapter demonstrated how notable risk events helped to evolve the derivative markets and the instruments used to trade in

*What is a Vook?*

*A Vook blends the written book with high quality video and an on-demand Internet connection into a seamless complete topic presentation.*

*The typical Vook is optimized for reading on both stationary and mobile digital devices.*

these markets. Important new factors in the study of derivatives include examining sustainability issues and the role of climate change. In every phase of derivative usage, ARMDAT makes you aware of academic and professional opportunities that may interest you.

Where this ARMDAT differs from the excellent alternative books available in the market is its ubiquitous learning platform and its aggressive incorporation of AI methods, including ChatGPT technology. This text was written to meet the specifications and demands of an Internet-driven and wireless society that depends on unfettered access to digital display devices. That does not mean that this exposition abandons the traditional paper-based format. However, with the advent of digital reading

tools such as the Apple iPad, Amazon Kindle, the Sony Reader, and high-definition large-display cell phones, it has become increasingly clear that an expanded view of pedagogy is needed to address the digitally aware students of today and tomorrow. The result is a new type of digital book that some refer to as a **Vook**.

In the Vook format, the reader expects to encounter rich multimedia-based videos, computational support for complex problems, and tight integration with the vast library known as the Internet. Also, the Vook format attempts to abridge the material to focus on the most relevant content while using videos and supporting computational methods to sustain a complete learning environment. The result is a book that is shorter in published pages but one that uses multimedia video and computational examples to fill any perceived void.

This first chapter offers a view into the two-sided responsibility that evolves from ubiquitous learning using a vook. It is our sincere hope you will gain an appreciation for what should be an exhilarating learning experience.

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## Appendix A: A Brief Taxonomy of Risk and Regulation: 1978-2016

Date	Act	Objective
1978	Marquette vs. First of Omaha	Supreme Court allows banks to export the usury laws of their home state nationwide and sets off a competitive wave of deregulation, resulting in the complete elimination of usury rate ceilings in South Dakota and Delaware, among others.
1980	Depository Institutions Deregulation and Monetary Control Act	The legislation increases deposit insurance from \$40,000 to \$100,000; authorizes new authority to the thrift institutions; and calls for the complete phase-out of interest rate ceilings on deposit accounts.
1982	Garn-St. Germain Depository Institutions Act	Bill deregulates thrifts almost entirely, allowing commercial lending and providing for a new account to compete with money market mutual funds. This was a Reagan administration initiative that passed with strong bipartisan support.
1987	FSLIC Insolvency	GAO declares the deposit insurance fund of the savings and loan industry to be insolvent as a result of mounting institutional failures.
1989	Financial Institutions Reform and Recovery Act	Act abolishes the Federal Home Loan Bank Board and FSLIC, transferring them to OTS and the FDIC, respectively. The plan also creates the Resolution Trust Corporation to resolve failed thrifts.
1994	Riegle-Neal Interstate Banking and Branching Efficiency Act	This bill eliminated previous restrictions on interstate banking and branching. It passed with broad bipartisan support.
1996	Fed Reinterprets Glass-Steagall	Federal Reserve reinterprets the Glass-Steagall Act several times, eventually allowing bank holding companies to earn up to 25 percent of their revenues in investment banking.
1998	Citicorp-Travelers Merger	Citigroup, Inc. merges a commercial bank with an insurance company that owns an investment bank to form the world's largest financial services company.
1999	Gramm-Leach-Bliley Act	With support from Fed Chairman Greenspan, Treasury Secretary Rubin and his successor Lawrence Summers, the bill repeals the Glass Steagall Act completely.

<b>Date</b>	<b>Act</b>	<b>Objective</b>
<b>2000</b>	Commodity Futures Modernization Act	Passed with support from the Clinton Administration, including Treasury Secretary Lawrence Summers, and bipartisan support in Congress. The bill prevented the Commodity Futures Trading Commission from regulating most over-the-counter derivative contracts, including credit default swaps.
<b>2004</b>	Voluntary Regulation	The SEC proposes a system of voluntary regulation under the Consolidated Supervised Entities program, allowing investment banks to hold less capital in reserve and increase leverage.
<b>2007</b>	Subprime Mortgage Crisis	Defaults on subprime loans send shockwaves throughout the secondary mortgage market and the entire financial system.
<b>December 2007</b>	Term Auction Facility	Special liquidity facility of the Federal Reserve lends to depository institutions. Unlike lending through the discount window, there is no public disclosure on loans made through this facility.
<b>March 2008</b>	Bear Stearns Collapse	The investment bank is sold to JP Morgan Chase with assistance from the Federal Reserve.
<b>March 2008</b>	Primary Dealer Facilities	Special lending facilities open the discount window to investment banks, accepting a broad range of asset-backed securities as collateral.
<b>July 2008</b>	Housing and Economic Recovery Act	Provides guarantees on new mortgages to subprime borrowers and authorizes a new federal agency, the FHFA, which eventually places Fannie Mae and Freddie Mac into conservatorship.
<b>September 2008</b>	Lehman Brothers Collapse	Investment bank files for Chapter 11 bankruptcy.
<b>October 2008</b>	Emergency Economic Stabilization Act	Bill authorizes the Treasury to establish the Troubled Asset Relief Program to purchase distressed mortgage backed securities and inject capital into the nation's banking system. Also increases deposit insurance from \$100,000 to \$250,000.
<b>Late 2008</b>	Money Market Liquidity Facilities	Federal Reserve facilities created to facilitate the purchase of various money market instruments.
<b>March 2009</b>	Public-Private Investment Program	Treasury Secretary Timothy Geithner introduces his plan to subsidize the purchase of toxic assets with government guarantees.

Date	Act	Objective
<b>2010</b>	Dodd-Frank Wall Street Reform and Consumer Protection Act	This Act was passed in response to the Great Recession (2008). The Act made changes in the regulatory environment that affect all federal financial regulatory agencies and almost every part of the U.S. financial services industry.
<b>2012</b>	Jumpstart Our Business Startups Act	A law intended to encourage funding of the U.S. small business industry by easing various securities regulations.
<b>2013</b>	Jumpstart Our Business Startups Act	Title II went into effect on 23-September.
<b>2015</b>	Jumpstart Our Business Startups Act	On October 30 the SEC adopted final rules allowing Title III Equity Crowdfunding. The final rules and forms became effective 16-May-2016
<b>2016</b>	\$20,000 Fine and Controls	Uber agrees to pay \$20k fine and impose controls on how it handles sensitive user data (New York).
<b>2016</b>	Baxter International Product-quality issues	Firm issued at least five recalls on products from IV Solutions t vascular patches.

## Appendix B: Derivative and Leverage Debacles

Consider the abbreviated list of a few notable derivative debacles (Table 4). In each case, the errors in derivatives deployment resulted in billions of dollars in losses. In some cases, the losses were due to wrong bets on the markets, and in other instances, some very knowledgeable users simply miscalculated the overall impact of large scale deployment.

<b>Type of Derivative</b>	<b>Event</b>
<b>Interest Rate Derivatives / 1994</b>	Orange County, CA. – a municipal bond fund transitioned into a hedge fund using leverage and interest rate derivatives. Losses of \$1.65 billion were realized on an investment portfolio of \$7.5 billion by inexperienced municipal fund managers.
<b>Interest Rate Swaps / 1994</b>	Procter and Gamble – Over \$152 million in losses due to improper use of interest rate swaps.
<b>Futures / 1995</b>	The House of Baring – rogue trading of Nikkei futures.
<b>Hedge Fund / 1998</b>	Long-Term Capital Management – a hedge fund that was improperly capitalized was forced to absorb leverage induced losses that ultimately required the FED and private creditors to provide a bailout package of \$3.6B.
<b>Rogue Trading / 2008</b>	Société Générale (SoGen) – fraudulent trading amounting to \$7.2 billion in losses.
<b>Futures / 2011</b>	MF Global was a leading financial futures and derivatives brokerage firm that filed for bankruptcy on 31-Oct-2011. MF Global was the eighth largest corporation to fail in U.S. history. The failure is attributed to overly aggressive proprietary trading strategies led by chairman and CEO Jon Corzine.
<b>Credit Derivatives / 2012</b>	A trusted trader implemented credit derivative transactions that cost JPMorgan more than \$2B in losses.
<b>Multiple Derivative Contracts / 2012</b>	In July 2012, the National Futures Association initiated an emergency enforcement action to put funds “on hold” and warned the public that the Peregrine Financial Group may not have funds sufficient to meet obligations to clients. Problems arose from accounting irregularities.

As you might imagine, when losses are measured in the billions of dollars, this becomes a signal to regulatory authorities to examine what went wrong. There seems to be a global response to recognize both the complexity and specific nuances of a risk mitigation policy that involves the use of large-scale complex derivative contracts. Hence, the passing of several regulations as discussed in the Chapter.

*End of Chapter 1*