THE IMPACT ON FINANCIAL MARKETS

Course: Impact of COVID-19 to financial markets

Professor Nabijon Holov

The rapid spread of coronavirus (COVID-19) has dramatic impacts on financial markets all over the world. It has created an unprecedented level of risk, causing investors to suffer significant loses in a very short period of time. This paper aims to map the general patterns of country-specific risks and systemic risks in the global financial markets. It also analyses the potential consequence of policy interventions, such as the US' decision to implement a zero-percent interest rate and unlimited quantitative easing (QE), and to what extent these policies may introduce further uncertainties into global financial markets.

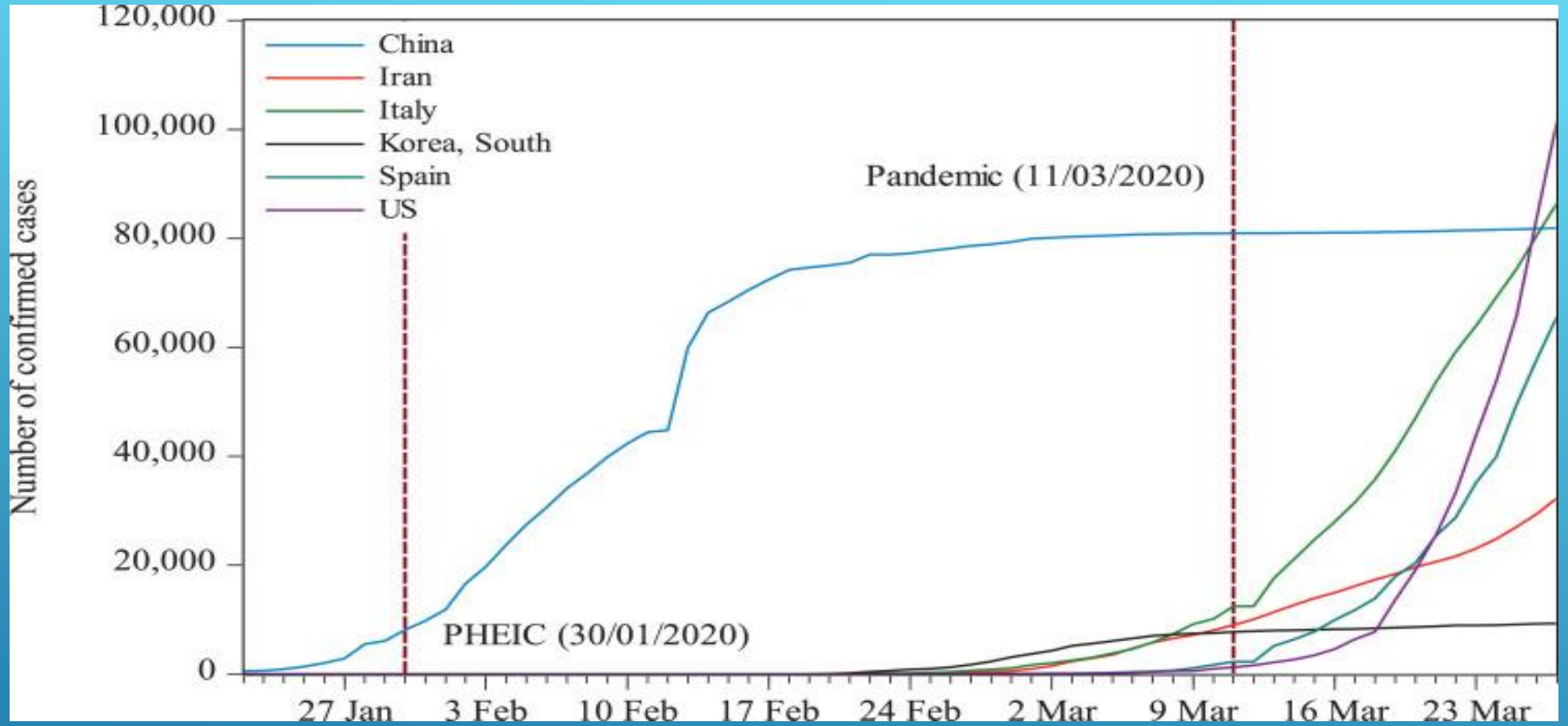
On 11 March, 2020, the World Health Organization (WHO) officially declared the coronavirus (COVID-19) outbreak to be a global pandemic[1] . As of 27 March, 2020, the number of confirmed cases surpassed 500,000, and it continues to rise (WHO, 2020). Over 170 countries are affected, with the US has the most confirmed cases. The outbreak has had clear significant economic impacts. In the short-term, as many countries adopt strict quarantine policies, their economic activities are significantly limited. The longer-term consequences of this pandemic may arise from mass unemployment and business failures. Some industries, such as tourism and aviation, will certainly face hardships.

While the exact global economic impacts are not yet clear, financial markets have already responded with dramatic movements. In March 2020, the US stock market hit the circuit breaker mechanism four times in ten days. Since its inception in 1987, the breaker has only ever been triggered once, in 1997. Together with the US crash, stock markets in Europe and Asia have also plunged. FTSE, the UK's main index, dropped more than 10% on 12 March, 2020, in its worst day since 1987.[2] The stock market in Japan plunged more than 20% from its highest position in December 2019.[3] Central banks and authorities responded immediately by throwing their policy instruments into the market.[1] For example, on 15 March, 2020, the Federal Reserve (FED) announced a zero-percent interest rate policy and at least a $700 billion quantitative easing (QE) program. Following the negative responses to this policy in the market, the FED announced an unlimited QE policy eight days later. Although most stock markets have recently begun rebounding, a great deal of uncertainty remains as the pandemic continues.

To give a first-hand description of the scenario and to understand the patterns of systemic risk in financial markets, this paper explores the available data and attempts to answer the following questions: How do risks in stock markets react to the pandemic outbreak? Do systemic risks increase worldwide? What are the potential impacts of policy interventions?

The remainder of this paper is as follows. Section 2 provides a general description of the basic facts about the pandemic. Section 3 presents the statistical analysis of the data. Section 4 discusses the policy impacts. Section 5 concludes.

- COVID-19 was brought to the world's attention in January, 2020. The rapid spread of the virus and the rising number of confirmed cases trigged quick reactions from the Chinese government. On 23 January, 2020, the lockdown of the entire city of Wuhan shocked the whole world, later proving to be a very effective policy intervention by the Chinese government. One week later, the WHO declared the outbreak in China to be a public health emergency of international concern (PHEIC). At that point, the total number of confirmed cases were 7,711, with only 83 cases in 18 countries outside of China.[4]
- South Korea was the second country to experience a major outbreak of COVID-19, closely followed by Iran. It took one week for South Korea to go from 31 cases to over 1,000; and it took 12 days for Iran to go from zero cases to over 1,000. Using the data from the John Hopkins Coronavirus Resource Center, the confirmed cases are plotted over time for the six majorly affected countries (see Fig. 1). While China and South Korea are generally under control in March, the epicentre moved to Europe and the US. With the US leading the total number of confirmed cases, Italy has the highest fatality rate. Around the WHO's official announcement of a global pandemic, financial markets across the world have started to tumble. Taking the S&P 500 as an example, it reached its highest point (3386.15) on 19 February, 2020, but plunged to 2237.40 on 23 March, 2020, a fall of over 30% within one month. The standard deviation of daily returns in February was 0.0069; the number rises to 0.0268 in March.



BACK TO 2003, THE SEVERE ACUTE RESPIRATORY SYNDROME (SARS) WAS ESTIMATED TO COST THE WORLD BETWEEN 30–100 BILLION USD (SMITH, 2006). WHILE SARS WAS MAINLY IN CHINA, THE COVID-19 PANDEMIC HAS ALREADY BECOME A WORLDWIDE CRISIS, BEHAVING LIKE "THE ONCE-IN-A-CENTURY PATHOGEN" (GATES, 2020). A MUCH MORE PROFOUND IMPACT TO THE GLOBAL ECONOMY IS EXPECTED.

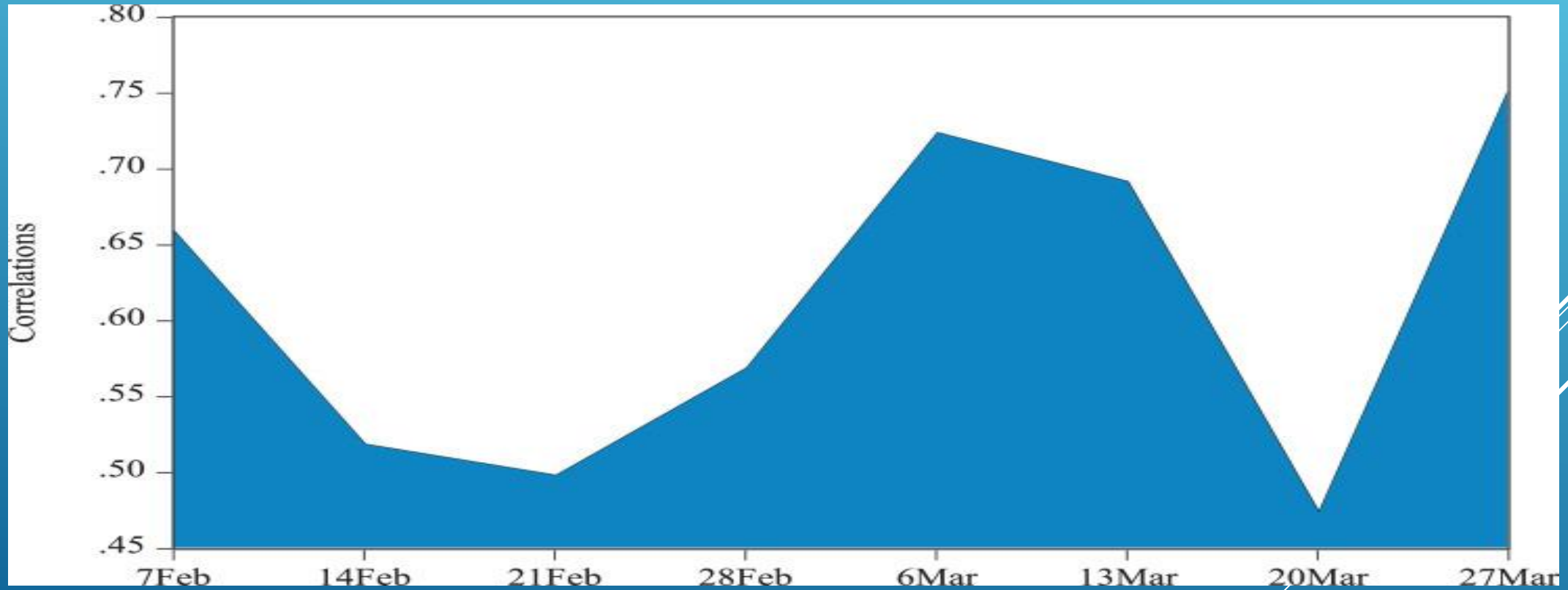
Daily data up to 27 March, 2020 were collected to explore the patterns of stock market reactions. The indexes for all stock markets across the world were downloaded from investing.com. All the data on the global coronavirus infections are from John Hopkins Coronavirus Resource Center.

THE FIRST TASK IS TO ILLUSTRATE THE RELATIONSHIP BETWEEN STOCK MARKET RISKS AND THE OUTBREAK OF COVID-19. COUNTRIES ON THE TOP 10 LIST OF CONFIRMED CASES HAVE BEEN SELECTED (ACCORDING TO THE DATA ON 27 MARCH, 2020) TOGETHER WITH JAPAN, KOREA AND SINGAPORE. IRAN IS EXCLUDED FROM THIS LIST, AS ITS STOCK MARKET DATA ARE NOT AVAILABLE. TOGETHER, THESE COUNTRIES HAVE HAD 466,693 CASES (SEE TABLE 1); THEY ALL HAVE WELL-DEVELOPED STOCK MARKETS. MARKET RISK IS CALCULATED USING STANDARD DEVIATIONS OF DAILY RETURNS. THE WHO DECLARED PHEIC STATUS IN CHINA ON 30 JANUARY, 2020, SO ONLY FEBRUARY AND MARCH ARE CONSIDERED IN THE PRESENT ANALYSIS. FOR MOST OF FEBRUARY, CHINA WAS THE CENTRE OF THE OUTBREAK. WHILE CHINA SUCCESSFULLY CONTAINED THE VIRUS FROM EARLY MARCH, THE CONFIRMED CASES IN EUROPE AND THE US HAVE STARTED TO SHOOT UP.

The statistics reported in Table 1 confirm that the pandemic has had a strong influence on stock markets. The risk levels of all the countries has increased substantially, from an average of 0.0071 in February to 0.0196 in March. Such dramatic movement cannot simply because of long-term expectations (Gormsen and Koijen, 2020), instead, it is almost certain that sentimental factors play important roles. The market sentiment in response to the outbreak can be quickly amplified through social media, which then stimulate trade activities and cause extreme price movements (Broadstock and Zhang, 2019).

Not surprisingly, China has had the highest level of standard deviation in February and the lowest in March. The US' market volatility has increased the most, with a level of standard deviation in March nearly four times higher than that in February. Interestingly, the standard deviation ranking in March is roughly consistent with the ranking of confirmed cases (excluding China). It is clear that the pandemic has led to great risk and uncertainty in the global financial markets.

Being a global health crisis, one would expect to see not only a rise in country-specific risks in stock markets, but also an increase in systemic risks. Here, correlations are used to illustrate the systemic reaction to the pandemic. Fig. 2 plots weekly return correlations among these 12 countries. They are calculated based on daily data within each week between February and March, totally eight observations.



- The correlations in February are relatively low, but they increase substantially upon entering March. The highest level appears in the week ending on 6 March, 2020 when Europe and the US starting to lose control, prompting the WHO to announce a pandemic during the weekend (11 March, 2020). The correlation in the week ending on 20 March, 2020 is surprisingly low. It is obvious that investors around the world had different opinions of the US' zero-percent interest rate policy, until the new unlimited QE was announced in the following week. Although there is a worldwide market rebound in the week after, driving higher correlations, the long-term impacts of the US' policies remain unclear.
- Using the WHO's announcement of a pandemic as a breaking point to separate the sample, two heat maps show the correlations before the announcement and after are plotted (see Fig. 3). While the US and the European stock markets keep high correlations in both cases, the four stock markets in Asia behave quite differently. While only China is somehow isolated from the world before the announcement, the whole Asia group is moving away from the Europe–US group. They become more connected after the announcement (the darker blue colour). For example, South Korea is highly correlated with China and Singapore after the announcement, but not before.

- This lecture provides a simple but original statistical analysis of the impact of the COVID-19 pandemic on stock market risk. The virus has already claimed thousands of lives and brought significant challenges to countries from all over the world. The financial markets have seen dramatic movement on an unprecedented scale. The present results show that global financial market risks have increased substantially in response to the pandemic. Individual stock market reactions are clearly linked to the severity of the outbreak in each country. The great uncertainty of the pandemic and its associated economic losses has caused markets to become highly volatile and unpredictable.
- Policy reactions to contain the virus and level the stock markets are needed; however, non-conventional policy interventions, such as the US' unlimited QE, create further uncertainty and may cause long-term problems. In addition, countries are not working together to cope with these challenges, as markets in the country group studied here are responding differently to national-level policies and the general development of the pandemic. Ultimately, this tendency toward disintegration in the global community is more of a threat than the virus.

"A MARKET IN WHICH PEOPLE AND ENTITIES CAN TRADE FINANCIAL SECURITIES, COMMODITIES, AND OTHER FUNGIBLE ITEMS OF VALUE AT LOW TRANSACTION COSTS AND AT PRICES THAT REFLECT SUPPLY AND DEMAND."

Source: Wikipedia

FINANCIAL MARKET TYPES

- CAPITAL MARKETS (PRIMARY AND SECONDARY)
  - STOCK (EQUITY) MARKETS
  - FIXED INCOME (BOND) MARKETS
- FIXED INCOME (BOND) MARKETS
- COMMODITY MARKETS

FINANCIAL MARKET TYPES

- MONEY MARKETS (SHORT TERM DEBT FINANCING AND INVESTMENT)
- DERIVATIVES MARKETS (RISK MANAGMENT)
- FUTURES MARKETS

TYPES OF MARKETS

- OPEN OUTCRY (TRADING PITS): CHICAGO MERCATILE EXCHANGE
- SPECIALIST MARKETS: NYSE
- MARKET MAKERS: NASDAQ
- ELECTRONIC COMMUNICATIONS NETWORKS (ECNs): INSTINET

DATA FROM ALL MARKETS

- ORGANIZED BY:
  - FIRM.
  - COMMODITY.
  - SECURITY.
  - MARKET (GEOGRAPHICAL OR NATIONAL OR PHYSICAL).

EXAMPLES OF STRUCTURE

- BY FIRM: S&P COMPUSTAT (ACCOUNTING DATA).
- BY SECURITY: CRSP (STOCK MARKET DATA), THOMSON REUTERS (BOND DATA).
- BY MARKET: INDIVIDUAL COUNTRIES NATIONAL ACCOUNTS (E.G. GDP DATA).

RHS PRINCIPAL DATA SOURCES

- HISTORICAL
  - EQUITY/FIRM/INDUSTRY/MUTUAL FUNDS: (CRSP, THOMSON REUTERS, BLOOMBERG, S&P, MERGENT, MORNINGSTAR, IBISWORLD)
  - BONDS: (THOMSON REUTERS, BLOOMBERG, S&P, MERGENT)
  - FX/MONEY MARKET/COMMODITIES: (THOMSON REUTERS, BLOOMBERG)
  - DERIVATIVES: (OPTIONMETRICS, THOMSON REUTERS, BLOOMBERG)
  - ECONOMIC: (BLOOMBERG, THOMSON REUTERS, IHS GLOBAL INSIGHT

RHS PRINCIPAL DATA SOURCES

- REAL-TIME (ALL MARKETS)
  - BLOOMBERG
  - THOMSON REUTERS (EIKON, THOMSONONE.com, DATASTREAM)
  - OTHER WEBSITES (USUALLY DELAYED)

INCREASING PROBLEMS

- GLOBALIZATION OF MARKETS BUT NO GLOBAL FINANCIAL INFORMATION STRUCTURE.
- PRIVATE FIRMS VS. GOVERNMENTS.
- MATCHING INFORMATION FROM DIFFERENT SOURCES. NO COMMON IDENTIFIER ACROSS VENDORS, OR EVEN ON ONE VENDOR'S PRODUCTS.

INCREASING PROBLEMS

- CRITICAL LACK OF STANDARDS AND ONTOLOGY WHICH WOULD LEAD TO A COMMON VOCABULARY AND TAXONOMY (A HIERARCHICAL CLASSIFICATION SCHEME).

EXAMPLE: WHAT DATABASE KEY?

- THE EQUITY KEY ITSELF:
  - TICKER? (NO, CAN BE REUSED).
  - CUSIP? (NO, CONFUSING , REUSABLE, AND U.S. ONLY).
  - FIRM NAME? (NO, CAN CHANGE AT ANY TIME).
- EXAMPLES: CRSP PERMNO, DATASTREAM DSCODE, THOMSON REUTERS RICs (ALL PRIVATE COMPANY DEFINED).
- NEED A UNIQUE SOLUTION……

DATABASE KEY: WHOSE KEY?

- LET'S EXAMINE CRSP PERMNO:
  - GOOD FOR EQUITIES BUT NOTHING ELSE.
  - CRSP PROPRIETARY INFORMATION.
  - PEOPLE DON'T THINK IN PERMNOS; USE TICKERS.

- WE NEED TO CREATE FOR ALL MARKET SECTORS AN EASILY UNDERSTANDABLE, UNIQUE, AND FLEXIBLE KEY SYSTEM.

EXAMPLE: DATA DEFINITIONS

- ABOUT AS MANY DEFINITIONS OF WHAT CONSTITUTES "REVENUE" AS COUNTRIES IN THE WORLD.
- INTERNATIONAL DEBT COVENANT TERMS.
- ANALYTICAL TERMS: WHAT IS "RISK" EXACTLY? WHAT IS THE EXACT DEFINITION? WHAT IS THE STANDARD QUANTITATIVE MEASURE OF ANY FINANCIAL CONCEPT?
- ANY FINANCIAL INSTRUMENT SHOULD BE ABLE TO BE DEFINED PRECISELY USING TERMS WHICH CAN BE INPUT TO MODELS.

INTERNATIONAL ISSUES

- VAST AMOUNTS OF INTERNATIONAL TRADING OF SECURITIES.
- INDIVIDUAL COUNTRIES USE DIFFERENT CONVENTIONS:

  (ACCOUNTING, REPORTING, NAMING, ETC.).
- GLOBAL ECONOMY DEMANDS ACCESS TO GLOBAL DATA AND COMMON DEFINITIONS AND METRICS ARE ESSENTIAL TO COHERENT MODELING.

OTHER DATA AND DATABASE ISSUES

- DATABASES OFTEN LIMITED BY WHAT IS REPORTED TO AGENCIES; E.G. US SEC.
- SEC STANDARDS ARE OFTEN NOT STANDARD.
- THE NEEDS OF THE INVESTING PUBLIC SHOULD DICTATE REPORTING STANDARDS.

  E.G. COMPANY PRODUCT DATA?

  WHAT DOES FINANCIAL DATA LOOK LIKE FOR PEPSICO CEREAL PRODUCTS VS. POST CEREALS?

RESULT: CONFUSION

- LOTS OF DATABASE DESIGNS (WITH DIFFERENT KEYS), NETWORK STRUCTURES,SEARCH ENGINES.

- USEFUL DATA OFTEN MISSING/HARD TO FIND.

RESULT: CONFUSION

- NO COMMON ONTOLOGICAL FRAMEWORK.
- THIS LEADS TO DIFFICULTIES IN MODELING AND ANALYZING RISK OF VARIOUS FINANCIAL INSTRUMENTS.
- CONFIDENCE IN THE TRANSPARENCY AND ACCURACY OF DATA AND ANALYSES IS CRITICAL TO AVOIDING FINANCIAL MARKET CRISES.

- Private Sector Agreement Highly Unlikely.
  - Competitive Advantage.
  - High Levels of Investment. (Why should I give it away for free, or change?)
- Government Imposed Standards Are Needed.
- International Standards Are Essential In a Global Market.
- A Huge Incredibly Comples Task – Not Happening Soon.

WHAT IS THE SOLUTION?

WHAT DOES THIS MEAN FOR YOU

- DEMAND FOR PEOPLE WITH I.S. AND FINANCE KNOWLEDGE/DEGREES IS HUGE.
- SPECIFICALLY WHAT YOU NEED TO KNOW OR UNDERSTAND:
  - FINANCIAL,ACCOUNTING, ECONOMIC DATA.
  - THE VENDOR PRODUCT (E.G. BLOOMBERG OR THOMSON REUTERS EIKON), ESPECIALLY THE EXCEL ADD-IN AND THE VENDOR'S FUNCTIONS.
  - EXCELLENT SQL AND VBA SKILLS.
  - NETWORK AND DATABASE DESIGN.

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