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DEFI Developing Finance



WHAT IS RISK ALL ABOUT?

"CONVERTING RISKS INTO SPRINGBOARDS OF SUCCESS"

CIFE SEMINAR ROMA-BERLIN-NICE 2026-27

MICHEL-HENRY BOUCHET

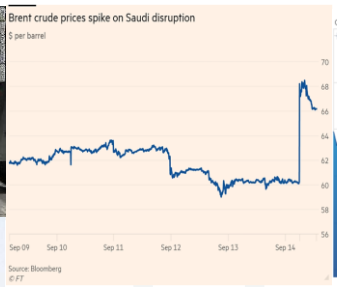
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1

CAN YOU PREDICT RISK?

RISK = UNCERTAINTY = INFORMATION DEFICIT















2

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2

2 TYPES OF CRISES:



▶ Type 1 Crisis

It emerges brutally, its timing cannot be anticipated, and it requires drastic adjustment

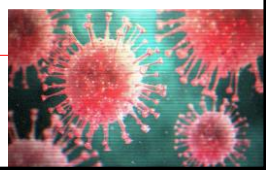
1. 1929 crisis
2. 1973 OPEC oil crisis
3. 12/2004 Asian tsunami
4. 2011 earthquake-driven Fukushima disaster
5. Twin Towers 1/11
6. Turkish lira crisis 04/2021



▶ Type 2 Crisis

It emerges brutally, it is unprecedented but probable, and it could have been expected

1. 1985 EMCs debt crisis
2. 1986 Chernobyl
3. 1999 Asian banking crisis
4. 2008 financial crisis
5. **CoviD-19 (**CIA 2005 report, Bill Gates 2015 TED talk, 2016 World Bank Facility, Obama 2016 pandemic report, 10/2019 Crimson Contagion planning)
6. **Russia's war against Ukraine**
7. **10/7/24 Hamas attack and subsequent retaliatory spiral**
8. (next) **Climate change crisis!**



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VIX = « FEAR INDEX » : 1990-END 2026

In today's fast-moving global markets, real-time decision-making is critical. The VIX Index measures the market's expectation of **future volatility** conveyed by S&P 500 Index option prices: a premier gauge of expected US equity market volatility!

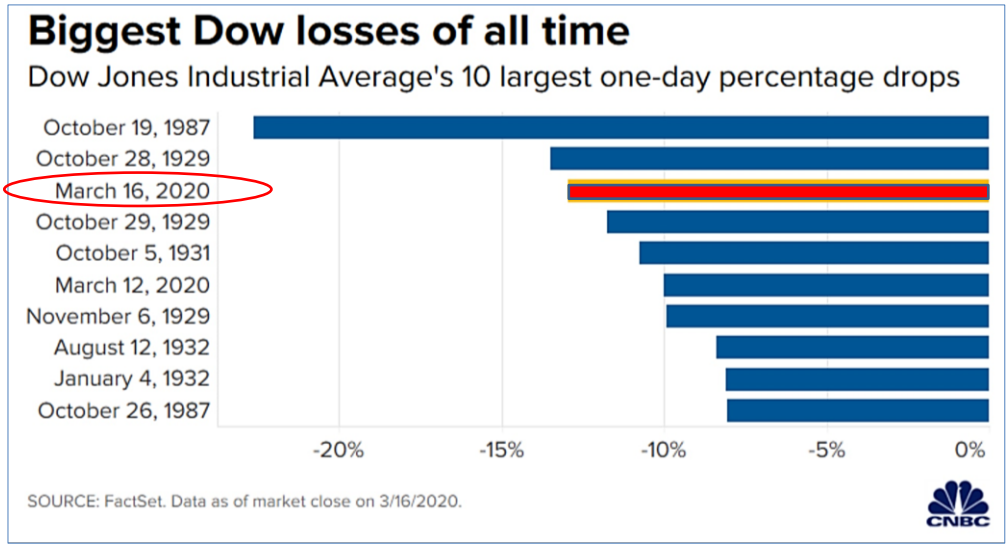


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ANTICIPATING ABRUPT STOCK MARKET DOWNTURNS
WHAT IS THE ULTIMATE TRIGGER?



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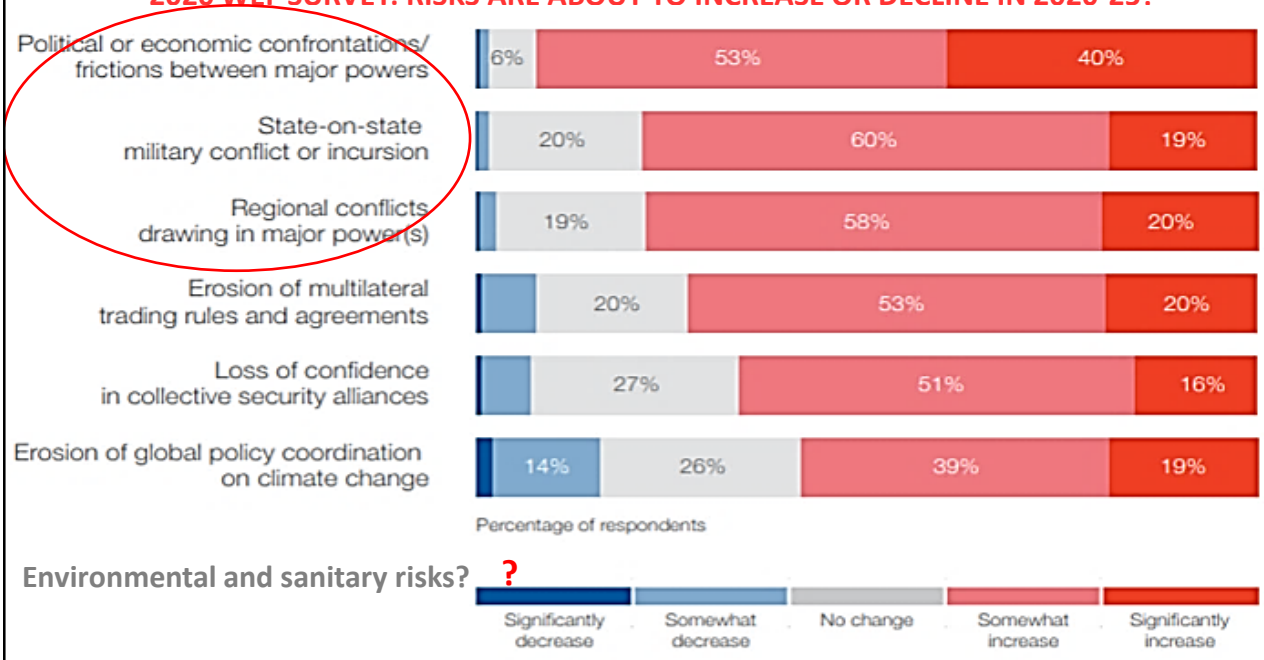


WHICH KEY QUESTIONS WILL UNDERPIN
RISK ASSESSMENT STRATEGIES?

1. What about the **time frame**?
2. What about the risk **exposure**? (investor, exporter, importer, banking, NGO, IFI)
3. What is the **type** of risk? (direct, indirect, spill-over?)
4. What is the risk **profile**, e.g., sectoral, global, economic, socio-political, institutional, country specific?
5. Can the risk be **mitigated**?
6. Can the risk consequences be **insured**? e.g. MIGA, OPIC, Coface…

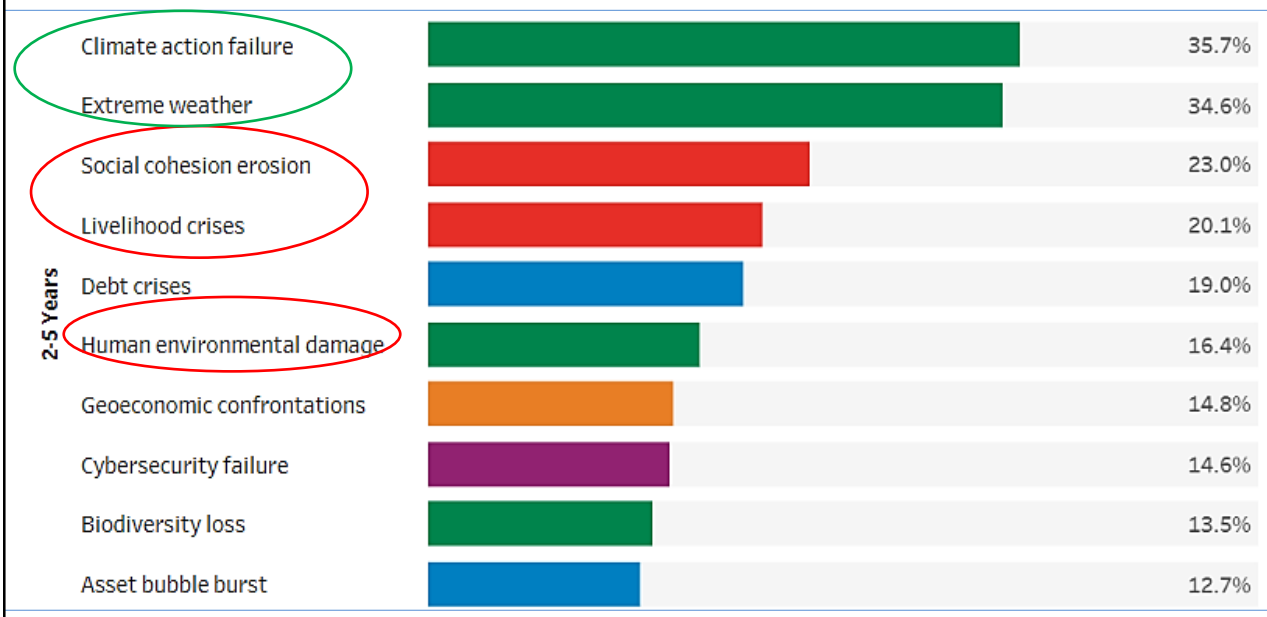
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2020 WEF SURVEY: RISKS ARE ABOUT TO INCREASE OR DECLINE IN 2020-25?



7

WEF 2023-26 GLOBAL RISK PERCEPTION SURVEY

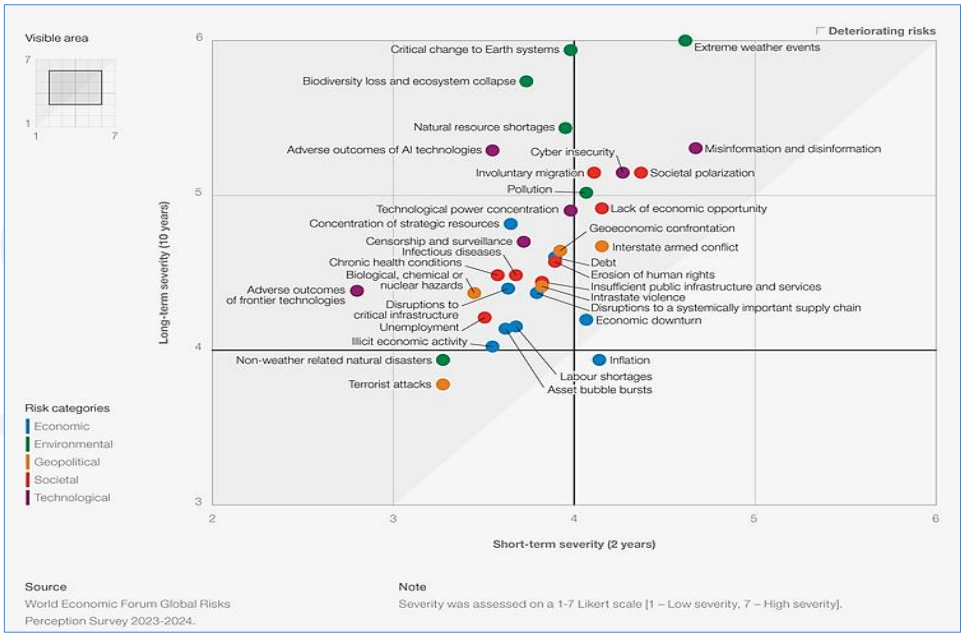


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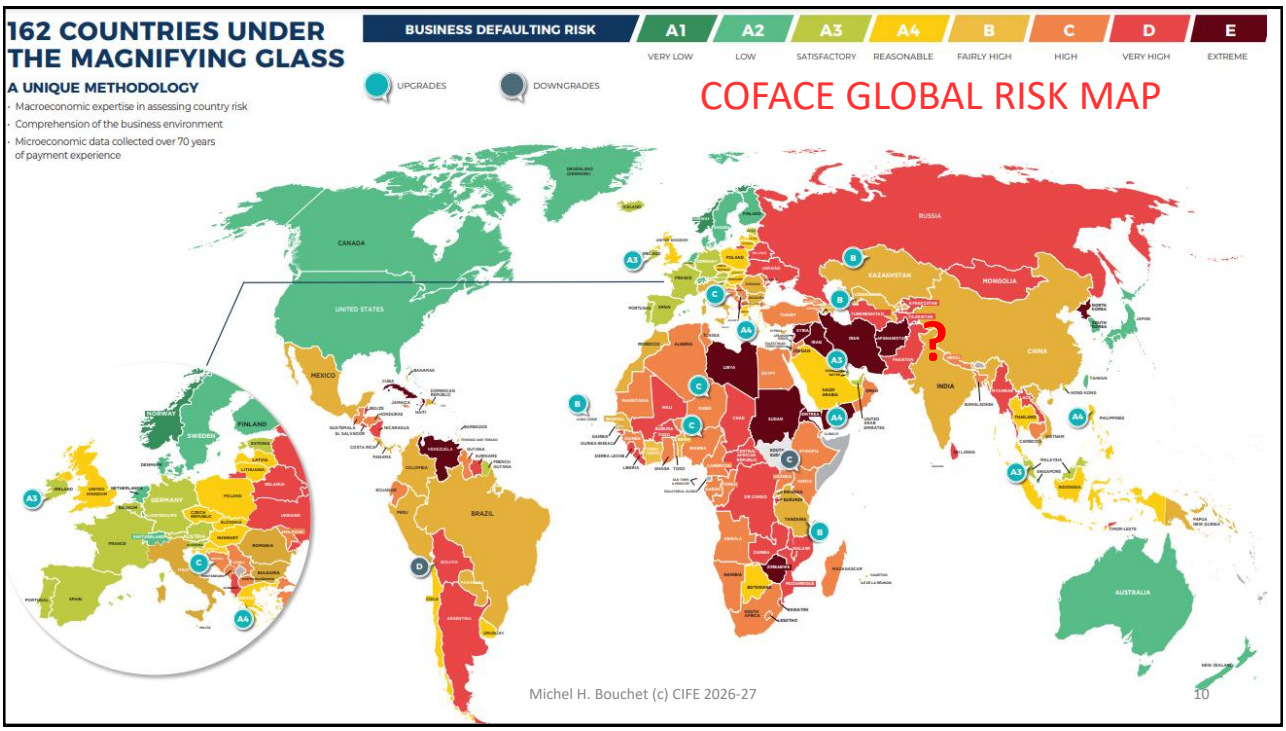
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WEF RISK PERCEPTIONS OVER 2-10 YEAR HORIZON



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COFACE GLOBAL RISK MAP



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WHAT IS RISK?

▶Risk stems from all the negative consequences of the Unknown

- "Risk means more things **can** happen than will happen." Elroy Dimson
- "Risk" derives from the early Italian *risicare* = "to dare" : risk is a **choice** rather than a fate.
  (Peter L. Bernstein- *Against the Gods: The Remarkable Story of Risk*)

Risk is always related to **Uncertainty**!

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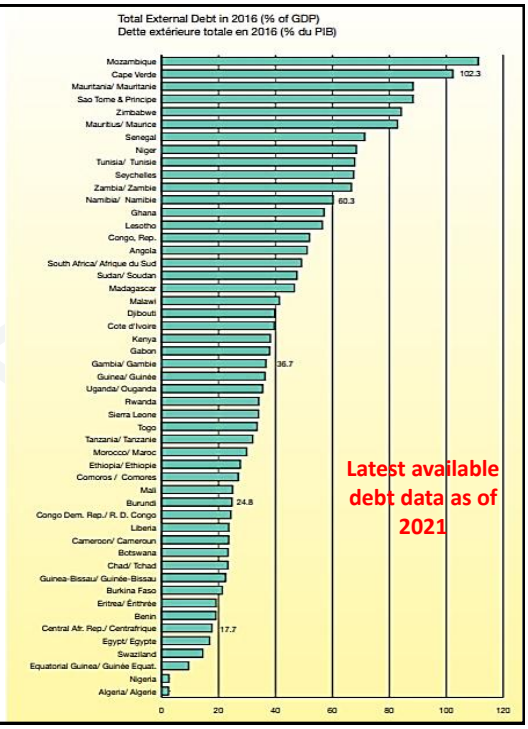
▶Risk stems from all the uncertainty regarding current or future situations, where information about the situation's outcome is insufficient, lacking or wrong

- Information availability = measure of risk (BOP, debt data, income gaps, governance, corruption…)
- Information scarcity = taking action might produce negative and costly consequences (investigation time, transaction cost, delays…)

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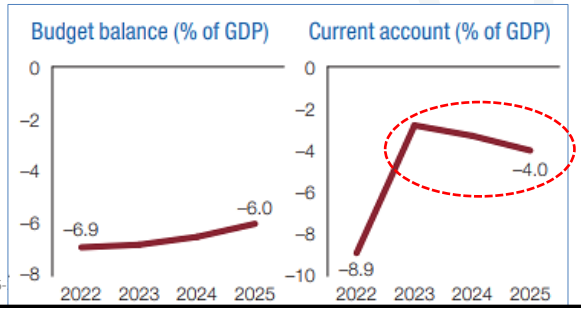
COUNTRY RISK FOR HISTORIANS!?





AFRICAN DEVELOPMENT BANK

TUNISIA



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RISK & UNCERTAINTY

- **Frank Knight**: 1921 **Risk** stems from **outcomes that are unknown** but can be tackled with probability distribution…. **Uncertainty** stems from a deficit of information, hence randomness of results. It gives rise to economic profits that perfect competition could not eliminate

- **Harry Markowitz**: 1959: Risk = probability of loss = historical volatility in returns as measured by standard deviation or Beta.

  But **risk diversification** and tolerance also matter!

- **J M. Keynes:** (Treatise on Probability 1921): **Non-linear nature** of risks and danger of expecting the future as simple projection of the past: Role of animal spirits in volatility spill-over and herd behavior

- **Ulrich Beck**: 2010: « Global risk society where current decisions and technological developments trigger **long-term global impact** » (warming, terrorism, pollution, financial deregulation…)= secular stagnation?

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Strong Uncertainty

1. Substantive uncertainty = Lack of all the information necessary to make decisions with certain outcomes

2. Fundamental uncertainty = List of possible events is not predetermined or knowable ex ante, as the future is yet to be created

3. Procedural uncertainty = Lack of complete knowledge on the part of the economic agents about the very structure of the problem they face given the available information

Weak Uncertainty

Risk = Decision-makers use homogenous data for additive and **fully reliable** probability distributions to measure uncertainty

Individuals can act on the basis of a probability that is objective (any reasonable person would agree on it) and known.

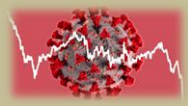
Ambiguity

Unforeseen contingencies and « Judgmental uncertainty" = How specifying which of a set of distributions is appropriate in a given situation?

High ambiguity even with ample quantity of information due to **conflicting opinion and evidence**, or poor understanding of the causal process

Complexity

Individuals are exposed to the occurrence of **unexpected events** with wide range of ramifications and risk of spill-over effects



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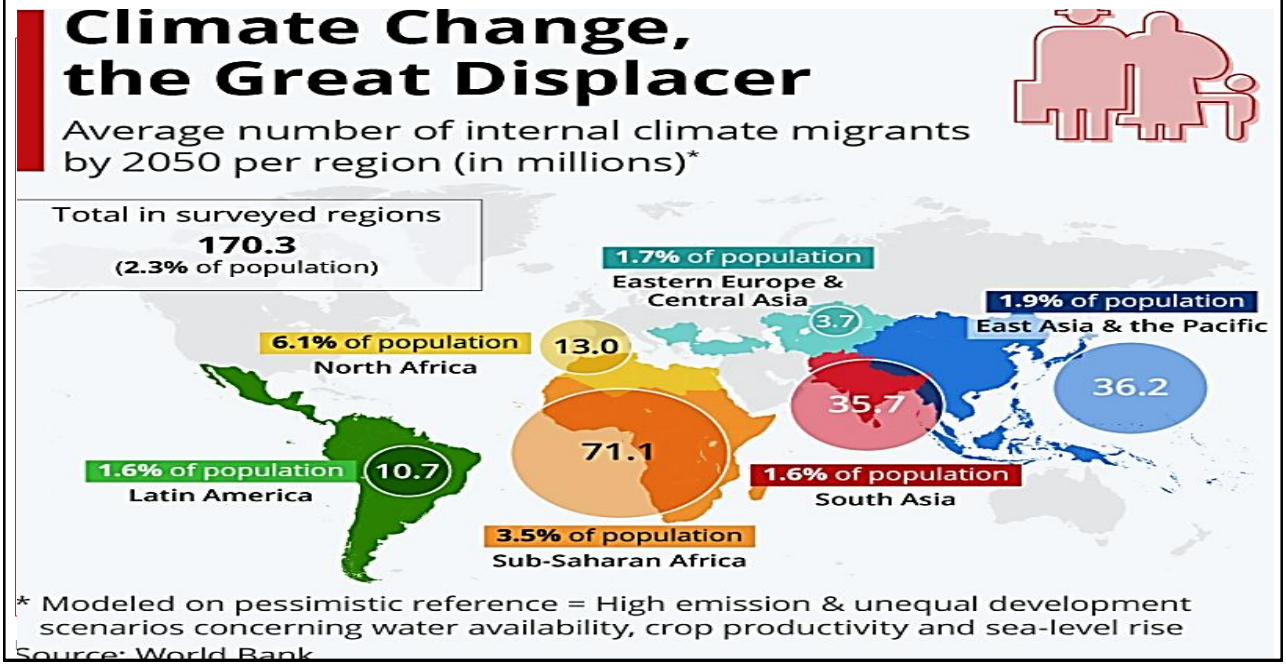
ILLUSTRATION OF COUNTRY RISK EXAMPLES OF **EVENT UNCERTAINTY**

Country Risk Event	Strong uncertainty ?	Weak & measurable uncertainty	Ambiguity ?	Complexity ?
Economic events	FDI decision in post-Brexit UK	Exchange rate depreciation	Inflation decrease; growth slowdown	Sharp fall in oil prices Corona Virus
Socio-political events	Revolution, strikes and coup d'état	New market-oriented and pro-business government	High rate of electoral abstention	Upcoming elections; mounting corruption
Financial events	Nationalization of banking system	Interest-rate increase	Over-valuation of tech companies QE & ultra-low rates	External debt default
Spill-over events	Regional crisis contamination	US economic recession	€/USD volatility	Regional competitive devaluations Systemic crisis

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ECONOMIC AND SOCIO-POLITICAL + REGIONAL CONTAMINATION



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THE DISCOVERY OF RISK



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XIII° CENTURY: GRADUAL SHIFT FROM CIRCULAR TIME TO LINEAR TIME

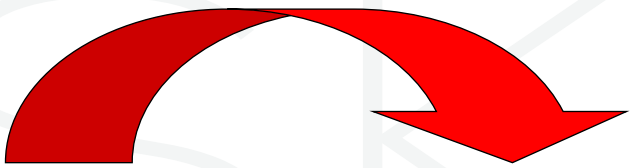
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RISK HAS TO DO WITH **UNCERTAINTY** REGARDING THE FUTURE, HENCE THE NEED OF TACKLING FUTURE PROSPECTS!





« Ancient times » = circular time... until the Middle Age

XV° century Renaissance = « Modern time » = Merchant time = linear time of economic & financial transactions + secular progress





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HOW TIME BECAME MONEY: CLOCKS, CAPITALISM AND WEALTH:

MEN INVENTED CLOCKS TO MEASURE THEIR DAYS — BUT THEY ENDED UP MEASURING MEN!



The story of Europe's adoption of the mechanical clock is a long one.

At the end of the Middle Age, many towns had clocks on public display. At least 25 towns in England did by 1400. In the countryside, perhaps about half of parish churches had clocks by 1700. At that point, England was overtaking the Dutch — the previous leaders — when it came to advanced design.

Clocks were intrinsic to the flourishing of the natural sciences in the later 17th century. Measurement brought confidence and underpinned the growth of the European empires. Clocks helped navigators reckon latitude and eventually longitude and thus bolstered the might of imperial navies. Time was being mastered, and with it the globe!

The meaning of time changed too. It was to be spent producing, making, working. Time, now, was **money!** Factory workers were expected to "clock in", and for this daily routine they used a new gadget: **work time recorders** to assess punctuality and attendance. They represent a world where work is time- not task-determined. Productivity became the key of modern Capitalist Market-Economy.

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THE « DISCOVERY » OF RISK: THE FOUNDING FATHERS



Pascal 1654



Fermat 1654

Questions related to gambling, particularly about dice games: Pascal and Fermat approached these problems with a mathematical lens, employing recursive methods to analyze possible outcomes of various scenarios: groundwork for probability theory!



J. Bernoulli-1713

The law of large numbers guarantees stable long-term results for the averages of some random events. The empirical probability of success in a series of trials will converge to the theoretical probability!

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THE « DISCOVERY » OF RISK & PROBABILITY: THE MODERNS



Franck H. Knight-1921



A. Kolmogorov-1933

The probability of neither heads nor tails, is 0.
The sum of the probability of heads and the probability of tails, is 1



Markowitz 1959

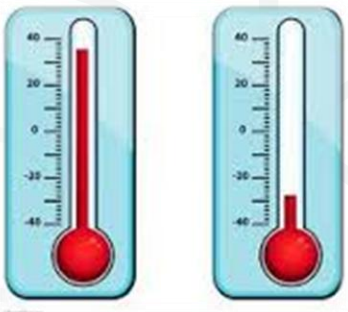


M. Scholes 1990



B. Mandelbrot 1990

THE DISCOVERY OF THE **MEASURE** OF RISK













NICOLAS DE CONDORCET: 1765: PROBABILITY DISTRIBUTION AND STATISTICS (BEGINNING OF BIG DATA?)

Robert Brown: Scottish botanist: in 1827, while examining grains of pollen suspended in water under a microscope, Brown observed minute particles ejected from the pollen grains, **executing a continuous jittery motion**

Jules Regnault (1863): « Le calcul des chances » : random walk model of stock price variations (good/bad speculation)

Louis Bachelier (1900): **stock price forecasting** is impossible due to endless number of influences though it is possible to study **probability distribution of price variations** (sigma) = volatility risk

Alfred Cowles (1933): forecasting stock market prices is impossible (large gap between actual stock prices and professional forecasting)

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LOOKING TOWARD EARLY WARNING SIGNALS OF UPCOMING CRISIS

THE CANARI IN THE COAL MINE?



- IMF & WB + UN reports?
- Rating agencies?
- CDS prices?
- Stock market volatility
- Vix Index
- Spreads and yields
- Minsky's speculative bubbles and herd-instinct
- B. Mandelbrot's fractal geometry
- N. Taleb's Black Swans
- D. Sornette's Dragon-Kings (extreme events)
- Capital Flight?
- Cife governance barometer?

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MEASURING « EXPECTED UNCERTAINTY »?

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MEASURING « EXPECTED GLOBAL ECONOMIC UNCERTAINTY » 2007-25

Monthly Index with 3 underlying components

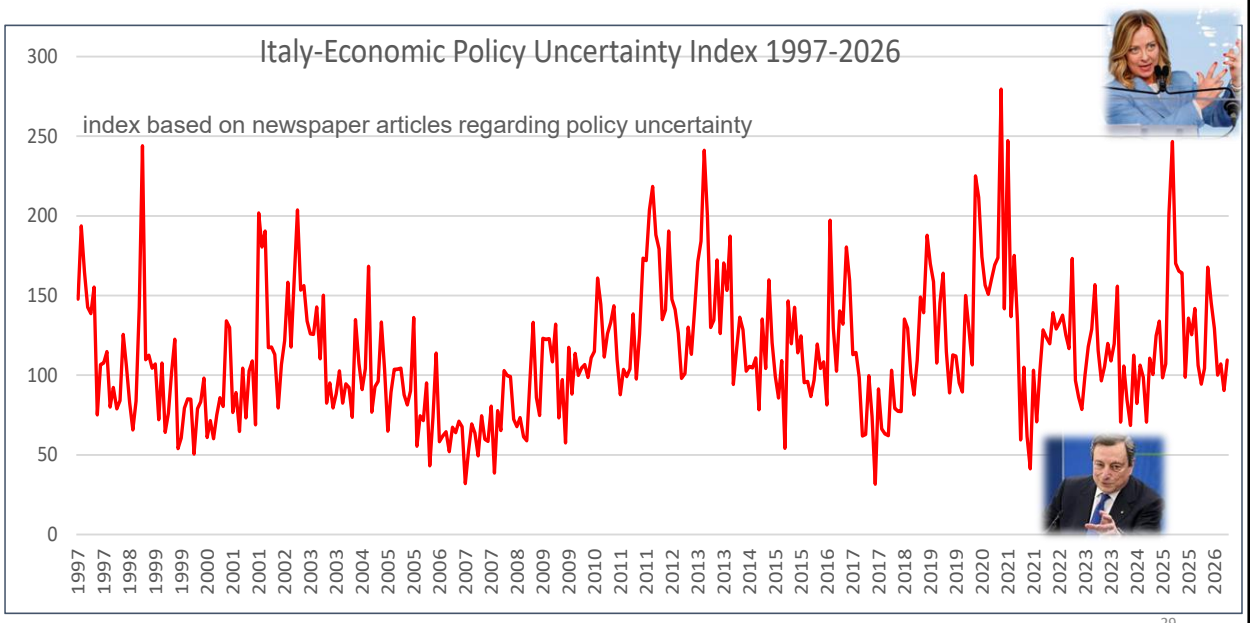
1. EIU coverage of policy-related economic uncertainty.
2. number of federal tax code provisions set to expire in future years.
3. disagreement among economic forecasters as a proxy for uncertainty.



Source= IMF, Stanford, Chicago + Northwestern-Kellog School universities (143 countries)

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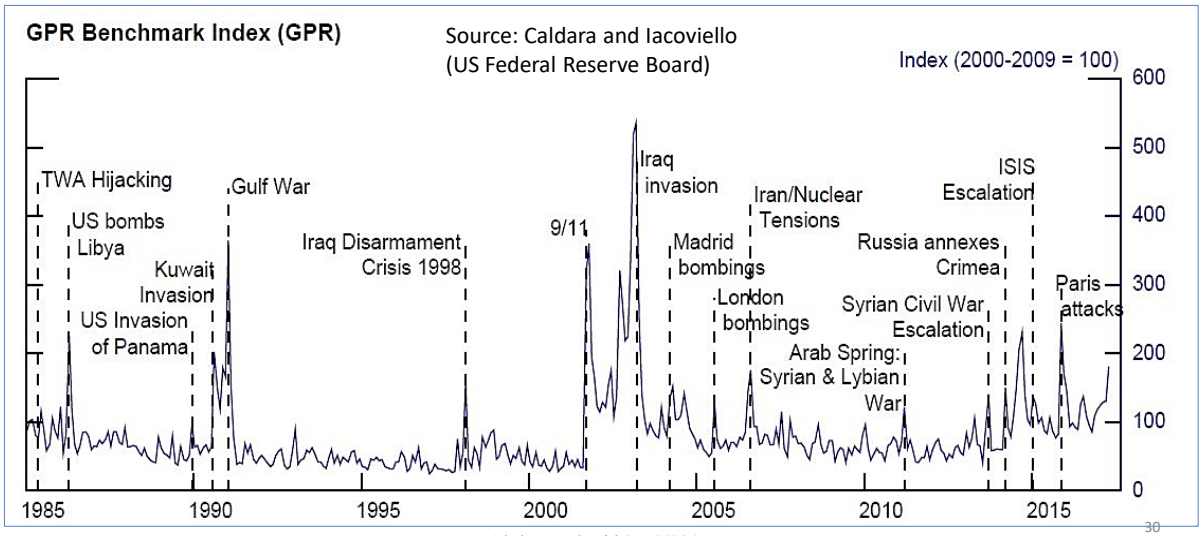
THE UPS AND DOWNS OF ECONOMIC POLICY RISK & UNCERTAINTY



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THE GEOPOLITICAL RISK INDEX

MONTHLY INDEX OF GEOPOLITICAL RISK COUNTING THE OCCURRENCE OF WORDS RELATED TO GEOPOLITICAL TENSIONS IN 11 LEADING INTERNATIONAL NEWSPAPERS. THE INDEX IS NORMALIZED TO AVERAGE A VALUE OF 100 IN THE 2000-2009 DECADE. KEY INPUTS = GEOPOLITICAL RISK, MILITARY-RELATED TENSIONS, NUCLEAR TENSIONS. WAR THREATS AND TERRORIST THREATS, TERRORIST ACTS OR THE BEGINNING OF A WAR.



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CHALLENGE? HOW PREDICTING AN ABRUPT **SOCIO-POLITICAL CRISIS**?



Liquidity indicators

- Inflation
- Foreign-exchange reserves
- interest rates differential
- Non-compressible import cover
- Debt servicing ratio and current account deficit

Solvency and structural indicators

- Debt levels (Debt/GDP, Debt/X, ST Debt)
- Worsening terms of trade
- Productivity's protracted weakness

➢ **Socio-political and behavioral indicators**

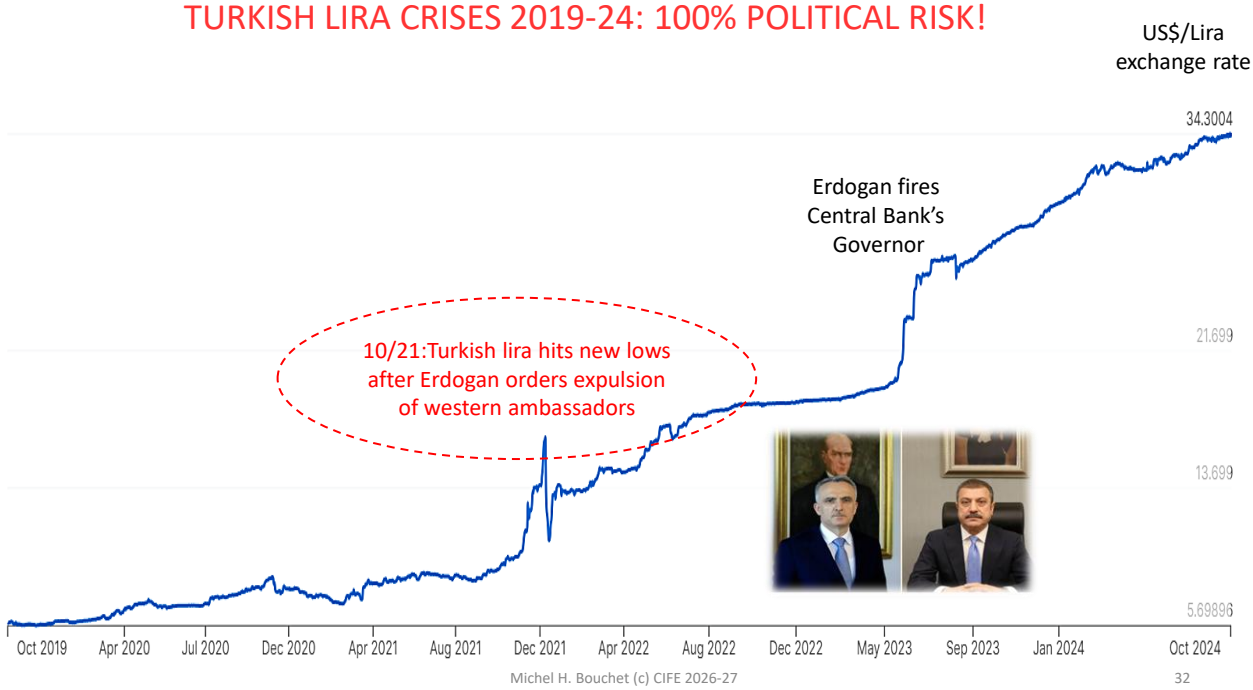
- Corruption and institutional weaknesses
- Political turmoil
- Capital flight
- Bank run : number of customers withdraw their deposits simultaneously due to concerns about banking solvency

➢ **Exogenous and global indicators**

- Systemic crisis
- Regional crisis contagion
- Commodity prices
- $ Exchange rate volatility

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TURKISH LIRA CRISES 2019-24: 100% POLITICAL RISK!



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POLITICALLY-DRIVEN VENEZUELAN DEBT PRICE (2021-23)



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BUT HOW TACKLING AN « ABNORMAL » RISK?

LARGE, ABRUPT, AND OUTSIDE THE STANDARD TOOLKIT OF RISK INDICATORS?



Gradual trend of mounting riskiness

- Liquidity indicators
- Solvency ratios
- Ratings and rankings
- Surveys and polls
- Behavioral change
- Institutional weaknesses
- Growth slowdown

= « Gaussian law »

Abrupt turmoil and crisis

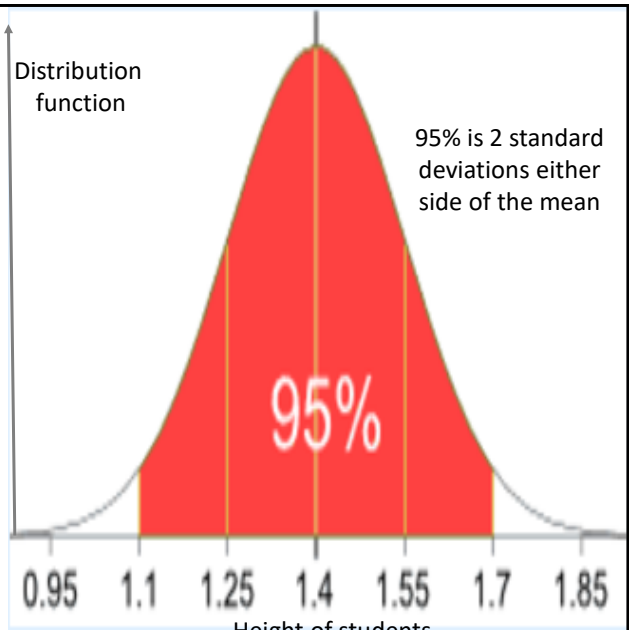
- War
- Coup d'état and Revolution
- Pandemic crisis (Ebola, HIV, Covid-19)
- Commodity crisis
- Sharp Exchange rate devaluation
- Bank run
- Global virus contamination
- Debt crisis and default
- Nationalization & confiscation

= « Fat tails and Black swans »

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BELL-SHAPED CURVE NORMAL DISTRIBUTION AND FAT TAILS?

As the number of discrete events increases, the function looks like a normal distribution
Values < one standard deviation away from the mean account for 68% of the set



Height of students
Solvency ratios
Current account deficits

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WHAT ABOUT RARE BUT CONSEQUENTIAL RISK AND FAT TAILS?

►Measuring average height

We select randomly two persons on earth and their total height is … 4 m

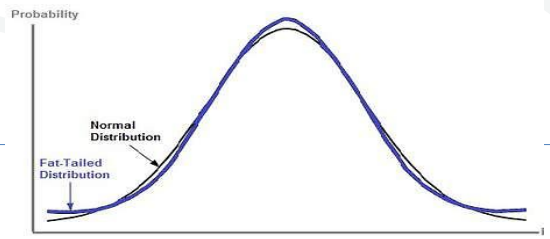
What is the most likely correlation between them??



►Measuring growth inequality within and between rich and poor nations?

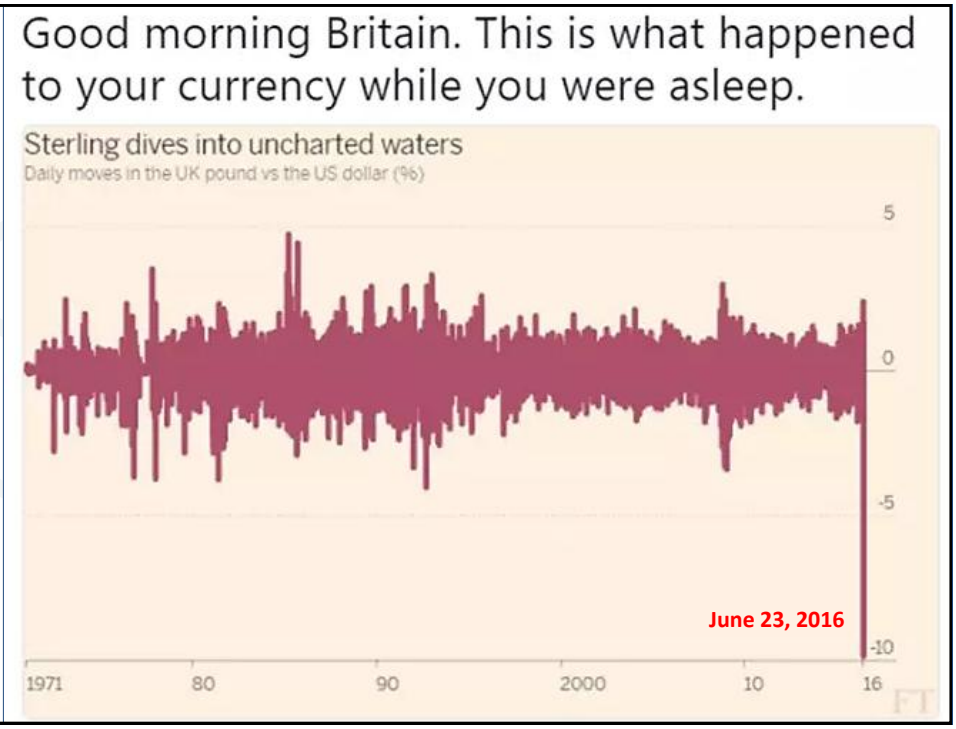
We select randomly two persons on earth and their combined income is $40 million: What is the most likely correlation between them?

Globally an additional 88 million to 115 million people fell into extreme poverty in 2020, a number that could rise to 150 million in 2021-22.



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FAT TAILS: OUTSIDE THE COMFORT OF THE « BELL CURVE »



Source: FT John Authers

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BLACK SWANS AND DRAGON KINGS

- **Nassim Taleb's Black Swans**: Major catastrophes are just events that started small and did not stop growing to develop into extreme sizes. These events are **unpredictable**! Black Swans are quantified by heavy-tailed distributions of event sizes ("fat tails" in Gaussian distributions). These outliers come from a small number of observations with a very large impact!





- **Sornette's Dragon Kings**: Very large in impact and born out of unique origins: non-linear systems. These **extreme events** are generated by herd-instinct, feedbacks, and unsustainable super-exponential acceleration before collapse. DKs are beyond the extrapolation of the fat tail distribution. Their occurrences **can be diagnosed ex-ante**, bringing back responsibility and accountability.

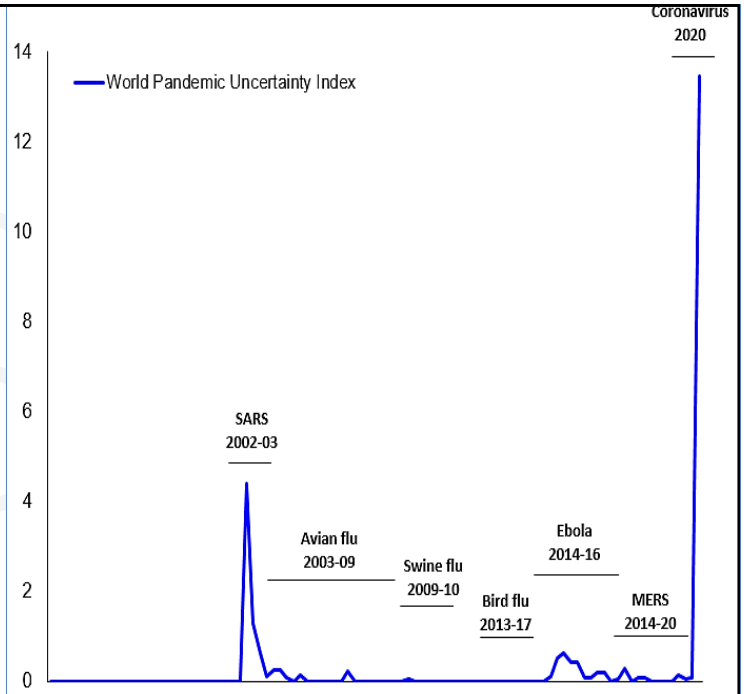
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THE WORLD PANDEMIC UNCERTAINTY INDEX 1996-2020

Note: The WPUI is the number of times that a word out of 100,000 in a given EIU country report mentions the word uncertainty near a word related to pandemics or epidemics. A higher number means higher global uncertainty around pandemics/epidemics and vice-versa. The numbers for 2020Q1 are based on the reports for March or the latest available. The WPUI is a sub-index of the World Uncertainty Index (https://worlduncertaintyindex.com/).

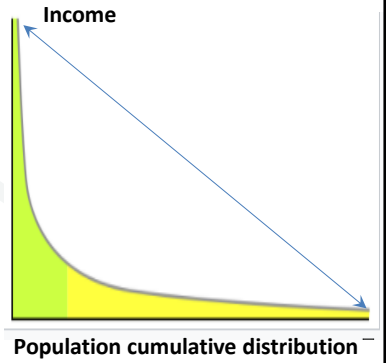


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POWER LAWS AND EXTREME RISKS?

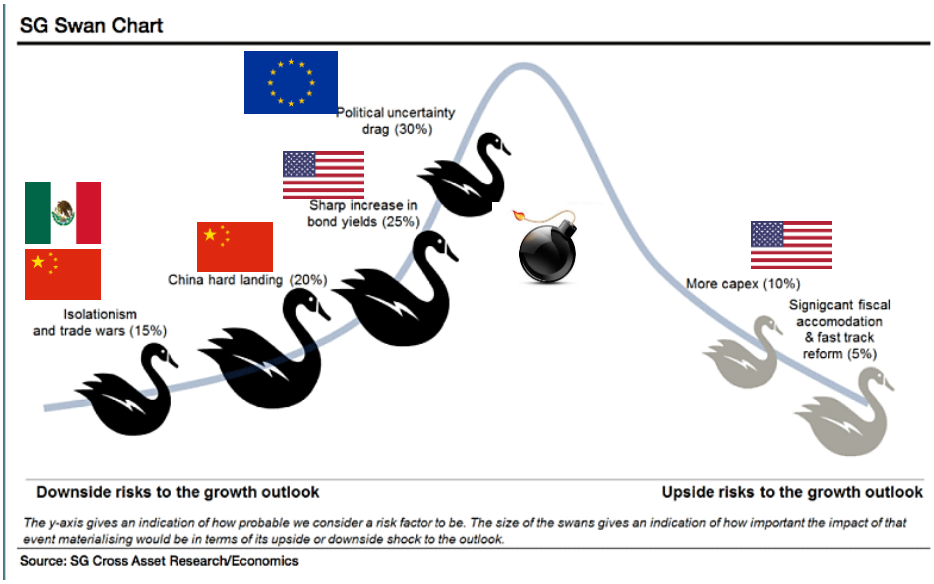
Power law probability distributions = Functional relationship between 2 quantities, where a relative change in one quantity results in a proportional relative change in the other quantity, independent of the initial size of those quantities: one quantity varies as a power of another.

- Considering the area of a square in terms of the length of its side, if the length is doubled, the area is multiplied by a factor of four!
- Car exhaust is distributed according to a power-law among cars : very few cars contribute to most contamination
- Wealth gap and Pareto distribution: The net worth of Americans is distributed according to a power law with an exponent of 2 (the average income hides fat-tails!)
- Power-law distributions are plotted on doubly logarithmic axes, which emphasizes the upper tail region ("extreme events")
- Log-log plot and power-law graph of cumulative distribution of ranking of popularity: right= long tail and left= the few that dominate, also known as the 80-20 rule



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HOW DOES A GLOBAL BANK LIKE SOCIETE GENERALE MEASURE THE RISK OF « **BLACK SWANS** »?



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CONCLUSION

▶Transforming information into knowledge & economic intelligence = Best risk mitigation strategy!

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IMF + COFACE + UNDP + TI + WORLD BANK
BETTER OFF IN ITALY OR IN SPAIN?

ITALY

- GDP Per capita = $45,900/$66,000 ppp
- HDI= 29/182
- Life expectancy f = 85,5
- Infant mortality= 3/1000
- Gender inequality: 0,07
- Doing Business= **58/190**
- Corruption = **52/180** ⇩

- **Debt/GDP = 137%**
- **Unemployment = 6,6%**
- **Budget Deficit: -3,3%**

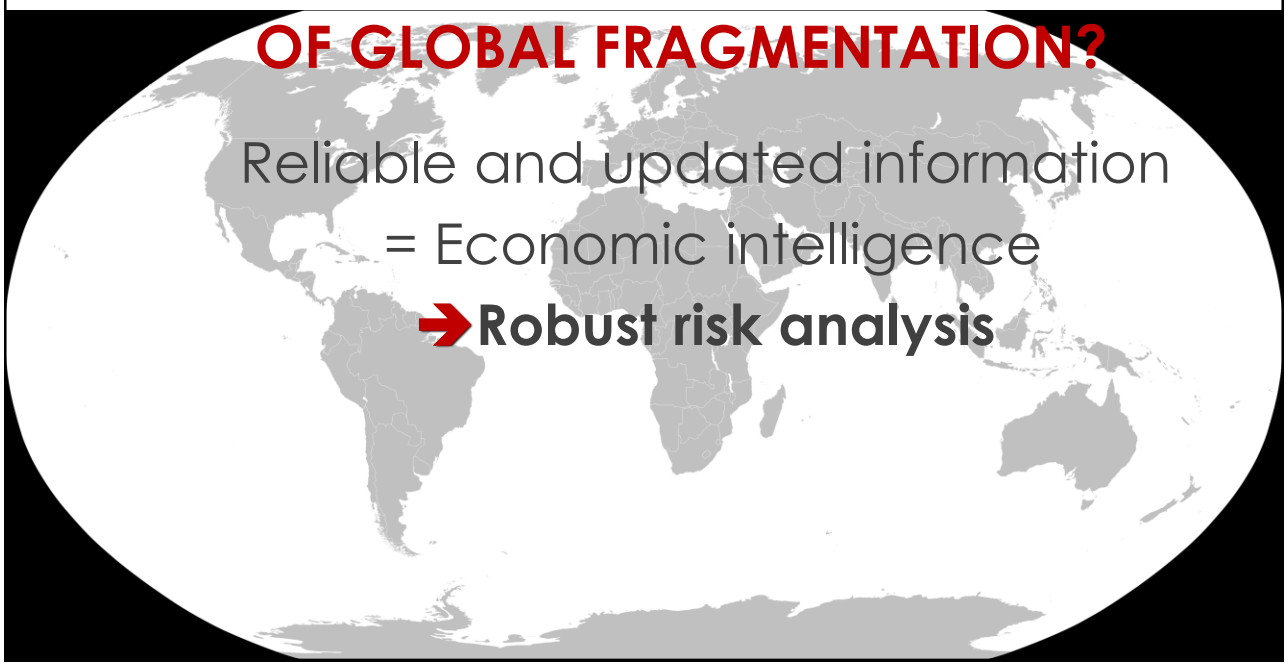
SPAIN

- GDP Per capita =$41,800/$60,100 ppp
- HDI= 28/182
- Life expectancy f= 86
- Infant mortality= 2,5/1000
- Gender inequality: 0,07
- Doing Business= **30/190**
- Corruption = **49/180** ⇩

- **Debt/GDP 2026 = 102%**
- **Unemployment= 10%**
- **Budget Deficit = -2,9%**

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COUNTRY RISK ASSESSMENT IN AN AGE OF GLOBAL FRAGMENTATION?



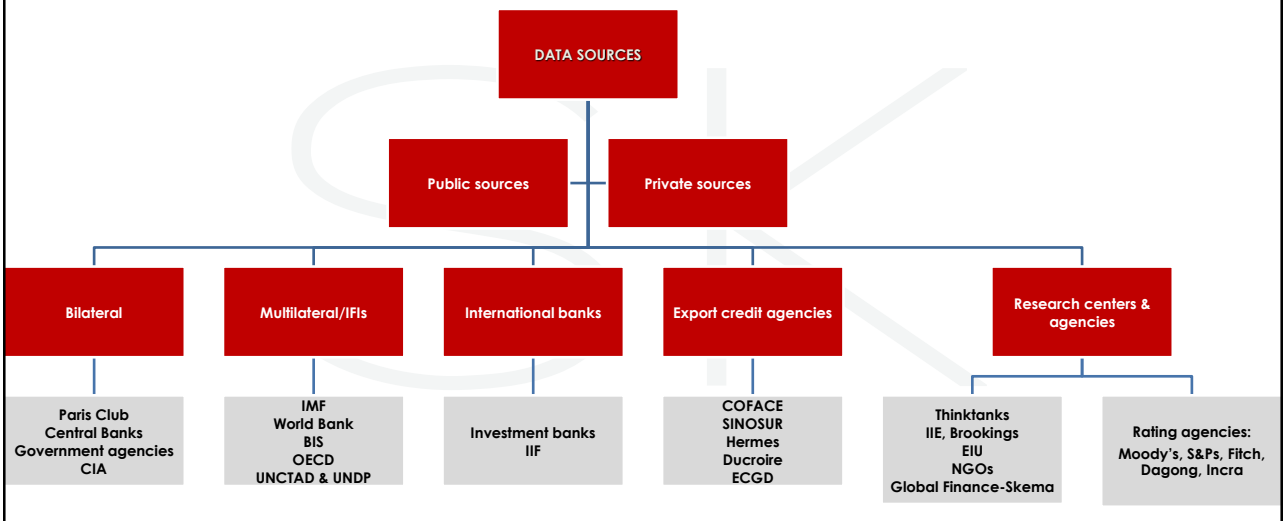
Reliable and updated information

= Economic intelligence

➔ **Robust risk analysis**

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MAJOR SOURCES OF COUNTRY RISK INTELLIGENCE

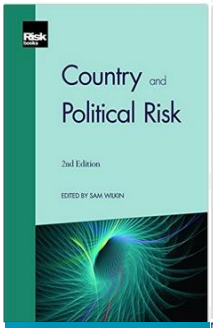


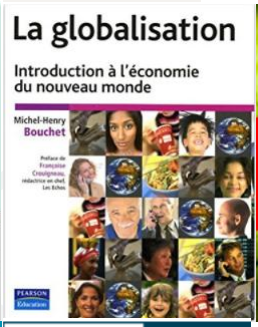
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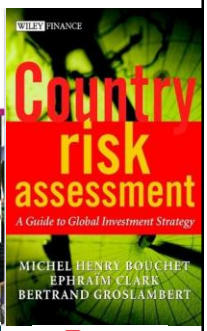
INFORMATION SOURCES & ANALYSIS

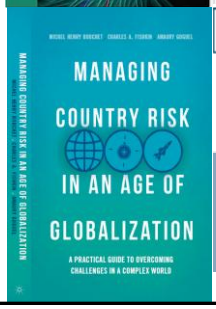
BIS · DEFI DEVELOPING FINANCE · OXFORD ECONOMICS

IMF, World Bank, IFC & MIGA
UNCTAD & UNDP
Fed Reserve Bk of St Louis
BIS, OECD, EBRD, EIB
Coface, Euler-Hermes
Moody's, S&P, Fitch, Dagong
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COFACE + UNDP + TI + WORLD BANK= BETTER OFF IN TUNISIA, MOROCCO OR ALGERIA?



TUNISIA

- **GDP per capita = $5050/16020 ppp**
- HDI= 105/182
- Life expectancy f = 77,4
- Infant mortality= 13/1000
- Gender inequality: **0,28**
- Doing Business= **78/190**
- CPI Corruption = **91/180**
- MDPov Index: 1,3% of pop



ALGERIA

- **GDP per capita=$6900/19700**
- HDI= 96
- Life expectancy f= 78
- Infant mortality= **22/1000**
- Gender inequality: **0,43**
- Doing Business= **157/190**
- CPI Corruption = **109/180**
- MDPov Index: 2,5%



MOROCCO

- **GDP per capita = $5140/12430**
- HDI = 120
- Life expectancy= 77
- Gender inequality = **0,49**
- Infant mortality= **23,7/1000**
- Doing Business = **53/190**
- CPI corruption= **91/180**
- MDPov Index: 8%

UNDP 2026: Pop vulnerable to muldimentional poverty (health, housing, education, food…)



SUCCINCT CROSS-COUNTRY COMPARISON



▶KOSOVO

Population: 1,8 million GDP=€10 b
GDP per capita ppp: $21,600
GDP growth: 3,8% CAD -7,7%
Large trade deficit -30% gdp R/M= 2,5 months
IMF SBA ($20 m) large E&Os
Unemployment 15% Ext. debt: 40%gdp
UNDP HDI= 0,79 GINI= 0,30
Econ Freedom Index: 61 (same as Italy)
Corruption: 76/180 (same as China)
MPI% = 9%



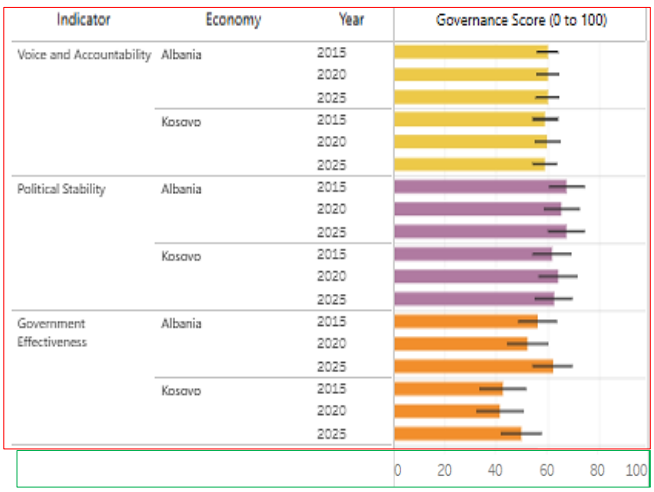
▶ALBANIA

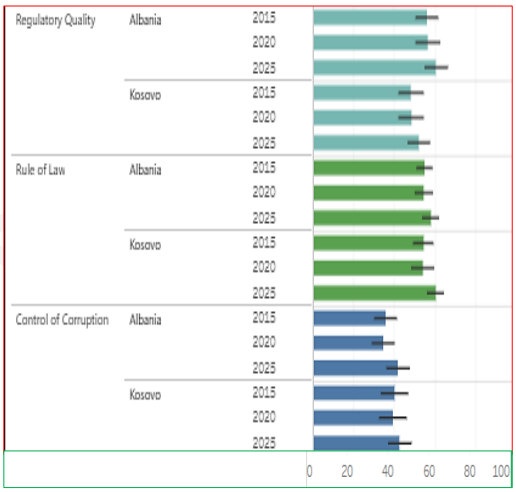
Population: 2,7 million GDP: €23 b
GDP per capita ppp: $28,800
GDP growth: 3,3% Unemployment: 11%
Public debt: 60% gdp CAD: -4,5%
Trade deficit: -10% gdp
External debt: 50% gdp R/M: 6 months
UNDP HDI= 0,78 GINI= 0,32
Eco Freedom Index: 65
Corruption: 91 (same as Tunisia)
MPI% = 2,1%

in June 1999 Kosovo under the rule of an interim international administration.
New phase of reconstruction, recovery and development

Michel H. Bouchet (c) CIFE 2026-27

WORLD BANK
GLOBAL GOVERNANCE INDICATORS 2026





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