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SKEMA BUSINESS SCHOOL

What is Risk all about?

"Converting risks into springboards of success"
Michel Henry Bouchet

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CAN YOU PREDICT RISK?

RISK = UNCERTAINTY = INFORMATION DEFICIT



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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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WHAT IS RISK ABOUT?

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

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

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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

► **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...)

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Strong Uncertainty	Weak Uncertainty	Ambiguity	Complexity
<p>1. Substantive uncertainty = Lack of all the information necessary to make decisions with certain outcomes</p> <p>2. Fundamental uncertainty = List of possible events is not predetermined or knowable ex ante, as the future is yet to be created</p> <p>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</p>	<p>Risk = Decision-makers use homogenous data for additive and fully reliable probability distributions to measure uncertainty</p> <p>Individuals can act on the basis of a probability that is objective (any reasonable person would agree on it) and known.</p>	<p>Unforeseen contingencies and « Judgmental uncertainty » = How specifying which of a set of distributions is appropriate in a given situation?</p> <p>High ambiguity even with ample quantity of information due to conflicting opinion and evidence, or poor understanding of the causal process</p>	<p>Individuals are exposed to the occurrence of unexpected events with wide range of ramifications and risk of spill-over effects</p>

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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 the UK post-Brexit	Exchange rate depreciation	Inflation decrease	Sharp fall in commodity prices
Socio-political events:	Revolution, strikes and coup d'état	New market-oriented and pro-business government	High rate of electoral abstention	Upcoming elections
Financial events:	Nationalization of banking system	Interest rate increase	Over-valuation of tech companies	Abrupt external debt default
Spill-over events:	Regional crisis, contamination and capital flight	US economic recession	USD appreciation	Regional crisis contamination

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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^e century Renaissance = « Modern time » = merchant time = linear time of economic & financial transactions!

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THE DISCOVERY OF THE MEASURE OF RISK

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THE « DISCOVERY » OF RISK

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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

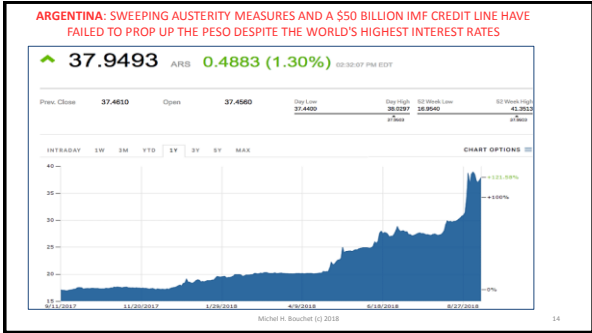
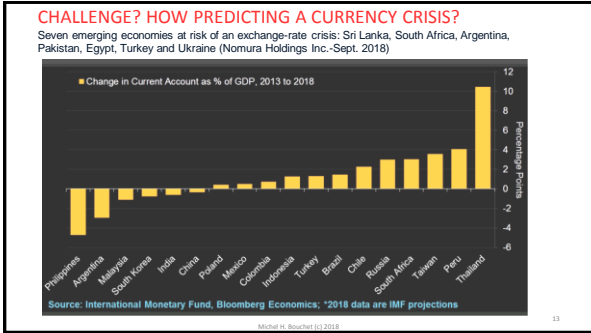
Alfred Cowles (1933): forecasting stock market prices is impossible (large gap between actual stock prices and professional forecasting)

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LOOKING TOWARD EARLY WARNING SIGNALS OF UPCOMING FINANCIAL AND SOCIO-POLITICAL CRISIS?

- ▶ IMF reports?
- ▶ Rating agencies?
- ▶ CDS prices?
- ▶ Stock market volatility
- ▶ 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?

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CHALLENGE? HOW PREDICTING A CURRENCY CRISIS?

Liquidity indicators

- ▶ Foreign-exchange reserves
- ▶ interest rates
- ▶ import cover
- ▶ debt servicing ratio

▶ **Socio-political and behavioral indicators**

- Socio-political turmoil
- Capital flight
- Bank run : number of customers withdraw their deposits simultaneously due to concerns about banking solvency

Solvency and structural indicators

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

▶ **Exogenous and global indicators**

- Systemic crisis
- Regional contagion
- Commodity prices
- Interest rate differentials
- \$/€ Exchange rate volatility

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BUT NOW 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
- ▶ Growth slowdown

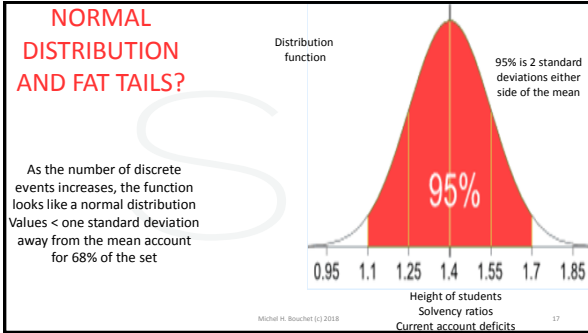
= « Gaussian law »

Abrupt turmoil and crisis

- ▶ War
- ▶ Coup d'état and Revolution
- ▶ Commodity crisis
- ▶ Exchange rate devaluation
- ▶ Bank run
- ▶ Debt crisis and default
- ▶ Nationalization & confiscation

= « fat tails and black swans »

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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 are anomalies with an abnormal distance from other values in a random sample from a population.

➤ **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 of the rest of the population. Their occurrences can be **diagnosed ex-ante**, bringing back responsibility and accountability.

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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

Income

Population cumulative distribution

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

SG Swan Chart

Mexico and trade wars (10%)

China tariff sanction (20%)

Sharp increase in bond yields (25%)

Political uncertainty (30%)

More cyber (10%)

Significant fiscal deterioration & fast track reform (5%)

Downside risks to the growth outlook

Upside risks to the growth outlook

The y-axis gives an indication of how probable we consider a risk factor to be. The size of the swans gives an indication of how important the impact of that event materializing would be in terms of its upside or downside shock to the outlook.

Source: SG Credit Asset Research/Economics

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CONCLUSION

- Transforming information into economic intelligence =
Best risk mitigation strategy!

BETTER OFF IN TUNISIA OR IN ALGERIA?



TUNISIA

- GDP Per capita = \$10500
- HDI= 97
- Life expectancy f = 77
- Infant mortality= 13/1000
- Gender inequality: 0,28
- Doing Business= **88**
- Corruption = 74



ALGERIA

- GDP Per capita=13500
- HDI= 83
- Life expectancy f= 75
- Infant mortality= 22/1000
- Gender inequality: 0,43
- Doing Business= **166**
- Corruption = **112**

MOROCCO



- GDP per capita ppp= \$7200
- HDI = 123
- Life expectancy= 74
- CPI corruption= 81
- Gender inequality = **0,49**
- Infant mortality= **23,7/1000**
- Doing Business = **68**
- FDI= **Tunisia * 2**