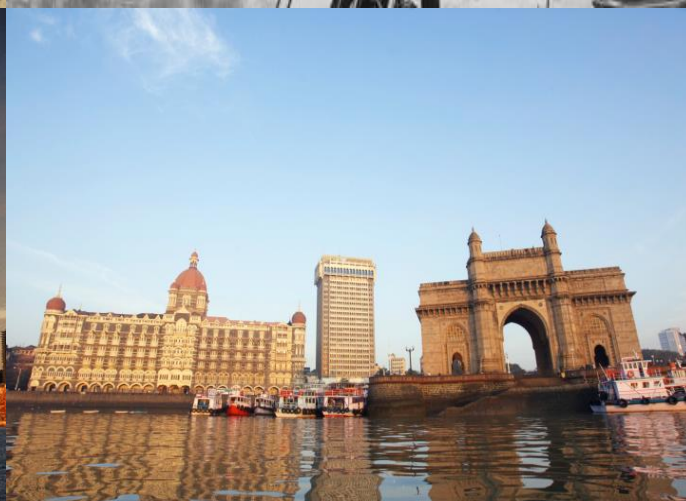


The History and Future of Global Capital Markets

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Introduction

In 2000, a distinguished capital market academic and practitioner, Andy Kalotay, lectured at a training program for incoming Citigroup interns and associates. To his astonishment, most new capital market enlistees had never heard of industry giants like Sidney Homer, Marty Leibowitz, and Henry Kaufman. Indeed, few undergraduates, MBAs, and even newly-minted Ph.D.s in finance and economics had taken even a single semester of economic/capital market history. With the tremendous help of the wonderful folks below, I began to construct this overview of the history and future of capital markets to help close this educational void and to aid in the preparation of the next generation of new capital market professionals for hopefully their long and grand careers. Although no single course of study, especially just one 90-minute introductory lecture, guarantees success in our challenging profession, a deep understanding of economic and capital market history surely raises the odds of an outstanding long-term career. Hopefully, this presentation will inspire a more thorough self-study of capital market history, perhaps beginning with the enclosed bibliography. This working draft gratefully acknowledges the contributions of thought-provoking questions from 7 years of Lehman associates and interns, the MBA students at Rice University, BNY Mellon colleagues, Marty Fridson, and especially the following:

Lale Akoner, Bryan Besecker, Theresa Chen, Paul Disdier, David Dehorn, Joe DiCenso, Scott Helfstein, Phil Lee, Steve Nagourney, Kishlaya Pathak, Hue Rock, Zoraida Robles, Kurt Schuler, Keith Stransky & team, and many summer interns and associates.

“The Great Global Capital Markets Circle Game”: A Study of the Past Helps Better Anticipate the Future; Many Events Reoccur

*“And the seasons, they go round and round,
And the painted ponies go up and down
We’re captive on the carousel of time,
We can’t return, we can only look behind,
From where we came,
And go round and round and round,
In the circle game.”*

“The Circle Game”
by Joni Mitchell

Capital Markets: Growth Industry

Global Financial Asset Choice Set:

May 31, 2016 and Projected to 2050*

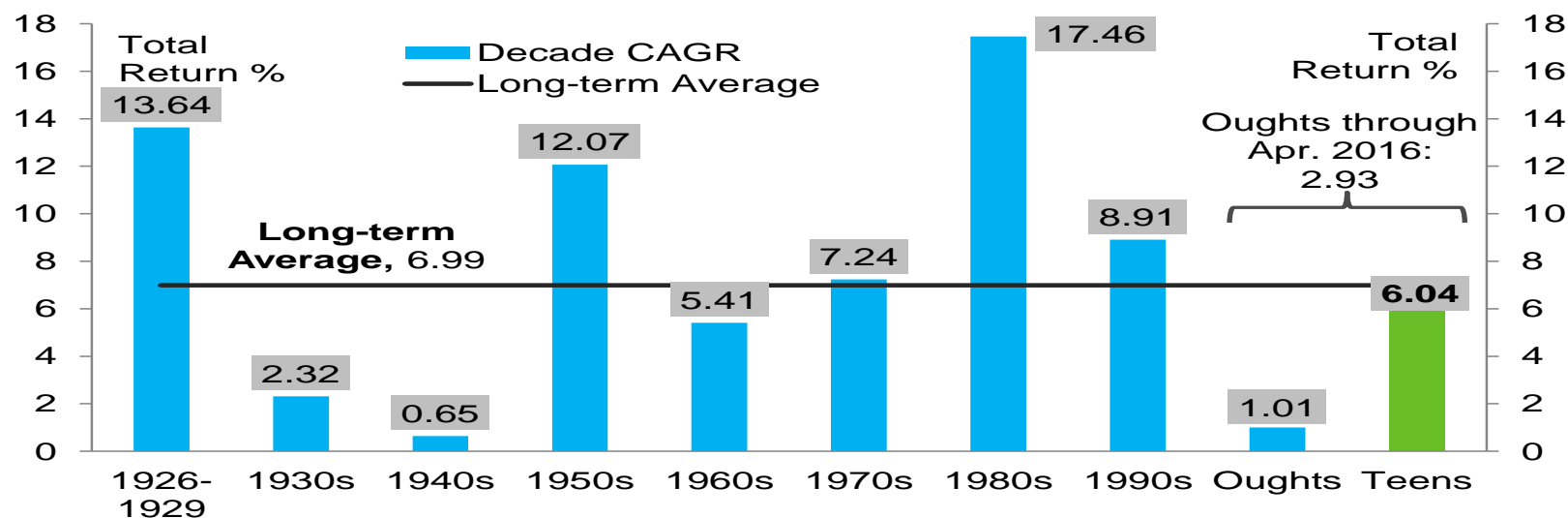
Global Cash Financial Market Value Size (U.S.\$ Billion)			
	5/31/2016	CAGR (%)	12/31/2050
Total Debt¹	128,509		1,202,155
Multiverse Index	48,989		696,111
U.S. Aggregate Index	18,940	6%	142,084
Pan-European Aggregate	14,659	8%	209,903
Asian-Pacific Aggregate	9,689	10%	261,680
Global High Yield	2,317	10%	62,584
Canadians	1,157	3%	3,216
Euro Yen	13	3%	35
Other	2,214	6%	16,609
Global Inflation-Linked Securities Index	2,518	5%	13,609
Global Capital Securities	725	2%	1,438
U.S. Municipal Bond Index	1,429	5%	7,721
Global FRNs	841	1%	1,186
Russia, India, and China Aggregate Indices	3,518	10%	95,002
Short-Term Indices	4,865	6%	36,497
Non-Agency U.S. MBS, U.S. Hybrid ARMs	641	4%	2,487
U.S. Commercial & Industrial Loans	2,060	4%	7,996
Cash and Cash-Like ⁶	62,924	5%	340,107
Total Equity	67,275		698,305
Global Common Equity ²	63,110	7%	655,073
Private Equity Funds ³	4,165	7%	43,232
Total Debt and Equity	195,785		1,900,460

Global Real Estate Asset Value		Size (U.S.\$ Billion)			
Real Estate/Land ⁴		5/31/2016		CAGR (%)	12/31/2050
Non-U.S. Real Estate		146,107		7%	1,516,558
United States		48,912		5%	264,369
Total		195,019			1,780,927
Global Derivatives ⁵		Size (U.S.\$ Billion)			
	Notional	Market Value			
Commodities	1,320	297			1,605
Gold	286	75		5%	405
Other commodities	1,034	222		5%	1,200
Currencies	70,446	2,579			30,472
Forwards and forex swaps	36,331	947		6%	7,104
Currency swaps	22,750	1,345		8%	19,259
Options	11,365	287		8%	4,109
Credit Default Swaps	12,294	421		10%	11,370
Interest Rate Contracts	384,025	10,148			274,107
Forward rate agreements	58,326	114		10%	3,079
Swaps	288,634	8,993		10%	242,886
Options	37,065	1,042		10%	28,143
Equity Derivatives	7,141	495			13,369
Forwards and swaps	3,321	147		10%	3,970
Options	3,820	348		10%	9,399
Other	17,685	558		10%	15,071
Total	492,911	14,499			345,995
Grand Total		405,302		4,027,382	

*Projected cagr as shown above based on our historically derived assumptions. 1) Barclays fixed income indices data as of May 31, 2016 except U.S. commercial and industrial loans (May 25, 2016), non-agency U.S. MBS (December 31, 2015), and cash and cash-like (see below⁶); 2) Global equity market capitalization per Bloomberg; 3) Data as of June 30, 2015 per Preqin; 4) U.S. data as of December 31, 2015 and non-U.S. real estate estimated from U.S. share of global GDP; 5) Notional amounts outstanding and gross market value data per BIS as of December 31, 2015 and may not add up exactly to total due to rounding; 6) Cash and Cash-Like: Sum of M2 money supply for Brazil, Canada, China, Eurozone, Hong Kong, India, Japan, Russia, Singapore, U.K., and U.S. and converted to U.S.\$ using most recent data and exchange rates as of May 31, 2016; dates of most recently published data do not exactly match. Global Financial Asset Choice Set intended to be a representation of various market values as defined by the footnotes above and should not be construed as a complete representation of all assets or markets. Sum of asset class components and all asset classes may not add up exactly to total due to rounding.

Source: BNY Mellon using data from FactSet, Bloomberg, Barclays Live, IMF, BIS, Preqin, Raconteur.net, and Reserve Bank of India

Nominal Financial Asset Returns¹: 1926 to April 2016

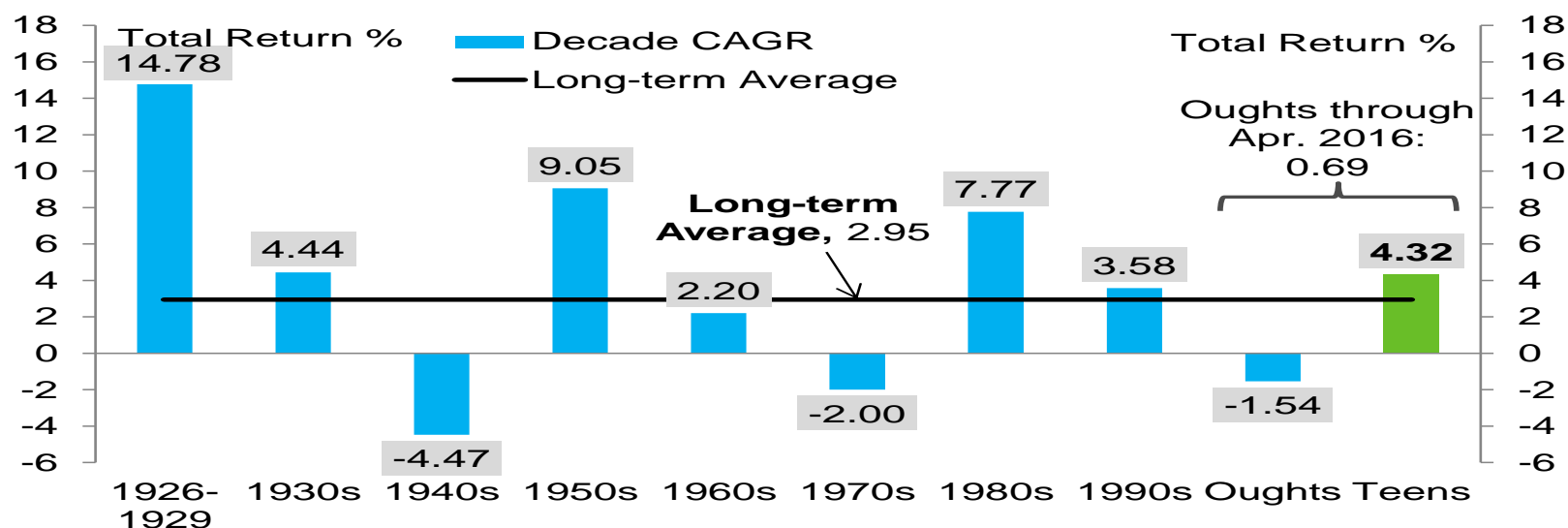


Periodic Compound Average Annual Growth Rates (%)										
	1926 - 1999	1946 - 1999	1970 - 1999	1970s	1980s	1990s	Oughts	2010 - Apr. 30, 2016	Oughts through Apr. 30, 2016	2016
Global Equity	9.34	11.19	12.11	6.96	20.77	9.09	-2.60	6.75	0.93	-1.70
Global Bond	4.79	5.48	9.07	7.16	12.03	8.08	5.84	4.47	5.30	3.64
Global Financial Asset	7.91	9.07	11.12	7.24	17.46	8.91	1.01	6.04	2.93	0.49

	1926 - Apr. 30, 2016	1980 - Apr. 30, 2016
Global Equity	7.75	8.33
Global Bond	4.88	7.88
Global Financial Asset	6.99	8.41

1) Global Financial Asset: 60% weighted return of Global Equity and 40% weighted return of Global Bond. Global Financial Asset portfolio is rebalanced monthly. Global Equity: from 1926 to 1987, Global Financial Data World Total Return Index (U.S.-dollar) is used; MSCI-Hedged World U.S.-dollar Index from 1988 to current. Global Bond: from 1926 to 1986, Global Financial Data Global Total Return Government Bond Index; from 1987 to 1989, Barclays Global Treasury Index; from 1990 to 1998, Barclays Global Aggregate Index; from 1999 to 2015, Barclays Multiverse Index is used. Global Bond U.S.-dollar hedged after 1986 and Global Equity U.S.-dollar hedged after 1987. Financial asset total return series begins in 1926; Global Equity total return except from 1988 to current; Source: BNY Mellon using data from Global Financial data, FactSet, Barclays Live, and Bloomberg

Real Financial Asset Returns¹: 1926 to April 2016



Periodic Compound Average Annual Growth Rates (%)										
	<u>1926 - 1999</u>	<u>1946 - 1999</u>	<u>1970 - 1999</u>	<u>1970s</u>	<u>1980s</u>	<u>1990s</u>	<u>Oughts</u>	<u>2010 - Apr. 30, 2016</u>	<u>Oughts through Apr. 30, 2016</u>	<u>2016</u>
Global Equity	5.11	4.97	3.96	-2.26	10.80	3.75	-5.06	5.02	-1.27	-1.83
Global Bond	0.46	-0.41	1.14	-2.07	2.78	2.79	3.16	2.77	3.01	3.50
Global Financial Asset	3.45	2.97	3.04	-2.00	7.77	3.58	-1.54	4.32	0.69	0.35

	<u>1926 - Apr. 30, 2016</u>	<u>1980 - Apr. 30, 2016</u>
Global Equity	3.92	3.32
Global Bond	0.91	2.89
Global Financial Asset	2.95	3.39

1) Global Financial Asset: 60% weighted return of Global Equity and 40% weighted return of Global Bond. Global Financial Asset portfolio is rebalanced monthly. Global Equity: from 1926 to 1987, Global Financial Data World Total Return Index (U.S.-dollar) is used; MSCI-Hedged World U.S.-dollar Index from 1988 to current. Global Bond: from 1926 to 1986, Global Financial Data Global Total Return Government Bond Index; from 1987 to 1989, Barclays Global Treasury Index; from 1990 to 1998, Barclays Global Aggregate Index; from 1999 to 2015, Barclays Multiverse Index is used. Global Bond U.S.-dollar hedged after 1986 and Global Equity U.S.-dollar hedged after 1987. Financial asset total return series begins in 1926; Global Equity total return except from 1988 to current; Source: BNY Mellon using data from Global Financial data, FactSet, Barclays Live, and Bloomberg

Global Monetary Policy to Remain Easy¹: 1998 to May 26, 2016

Tail End of
Asian
Financial
Contagion &
LTCM/Russia
(1998)

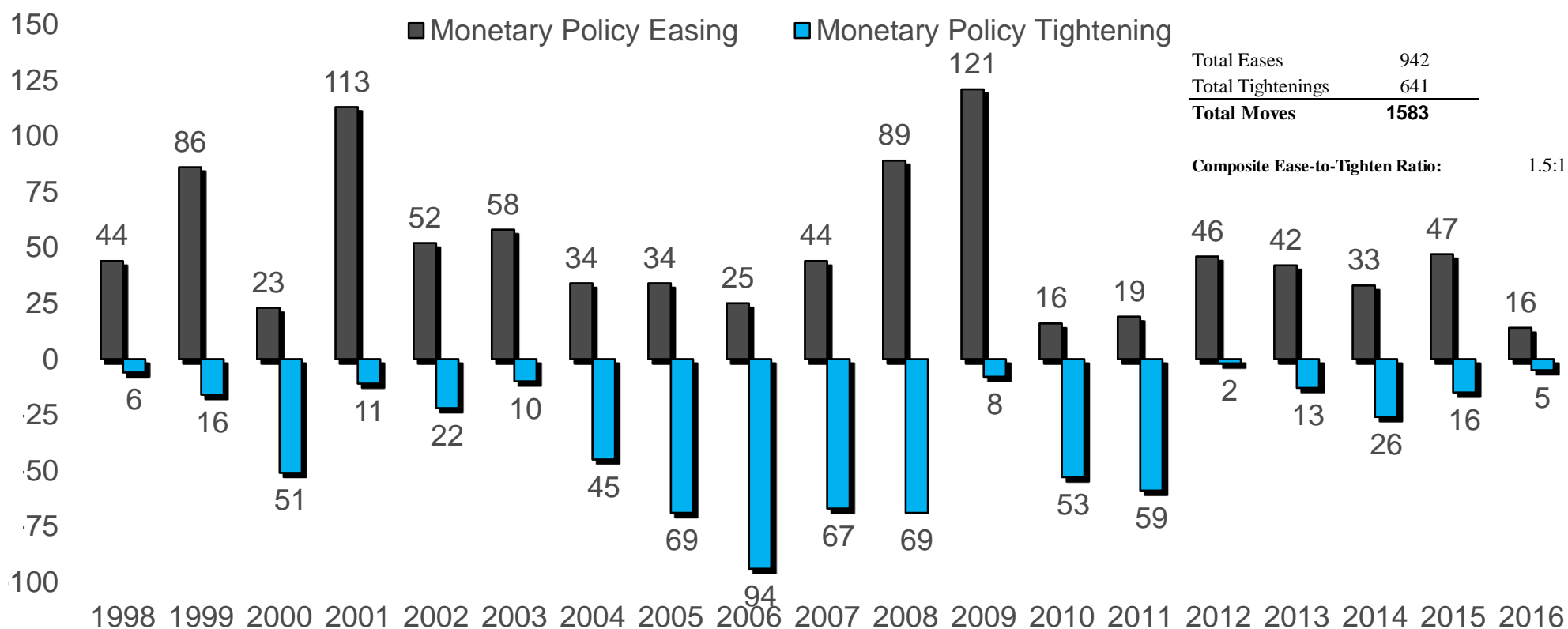
Dot.Com Bubble
Bursts

Normalization

Great
Recession
Onset

EM
Tighten
to Avoid
Inflation

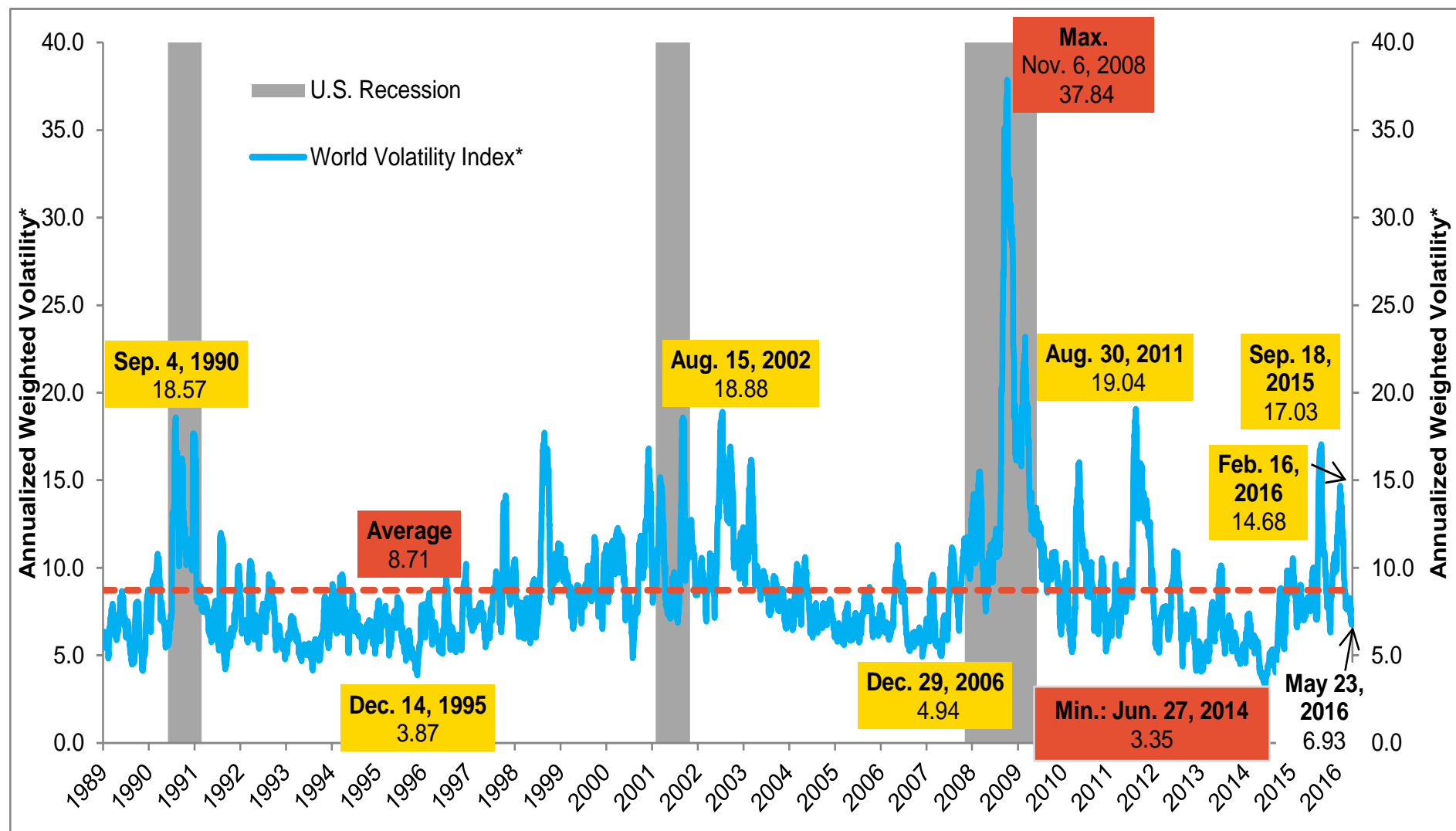
Easing
as
Growth
Slows



Ease/ Tighten	7.3:1	5.4:1	0.5:1	10.3:1	2.4:1	5.8:1	0.8:1	0.5:1	0.3:1	0.7:1	1.3:1	15.1:1	0.3:1	0.3:1	23.0:1	3.2:1	1.3:1	2.9:1	2.8:1
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Easings and tightenings refer to change in central bank target rate of select developed and emerging economies. Note: data does not reflect Twist, Quantitative Easing operations.
 Source: BNY Mellon using data from Bloomberg

Global Capital Market Volatility Cycle Becoming More Erratic: 1989 to May 23, 2016



*Weighted average of trailing 21-day return standard deviation (annualized) of commodity (10%), equity (40%), fixed income (40%), and Fx (10%). Commodity: S&P GSCI Index Spot; Equity: MSCI AC World Price Index (local currency); Fixed Income: Barclays U.S. Aggregate Index from 1989 to August 1997 (total return); Global Treasury Index (U.S.\$ Hedged, total return) from September 1997 to September 1, 2000; Barclays Multiverse (U.S.\$ Hedged, total return) thereafter; Fx: U.S. Majors Dollar Index.

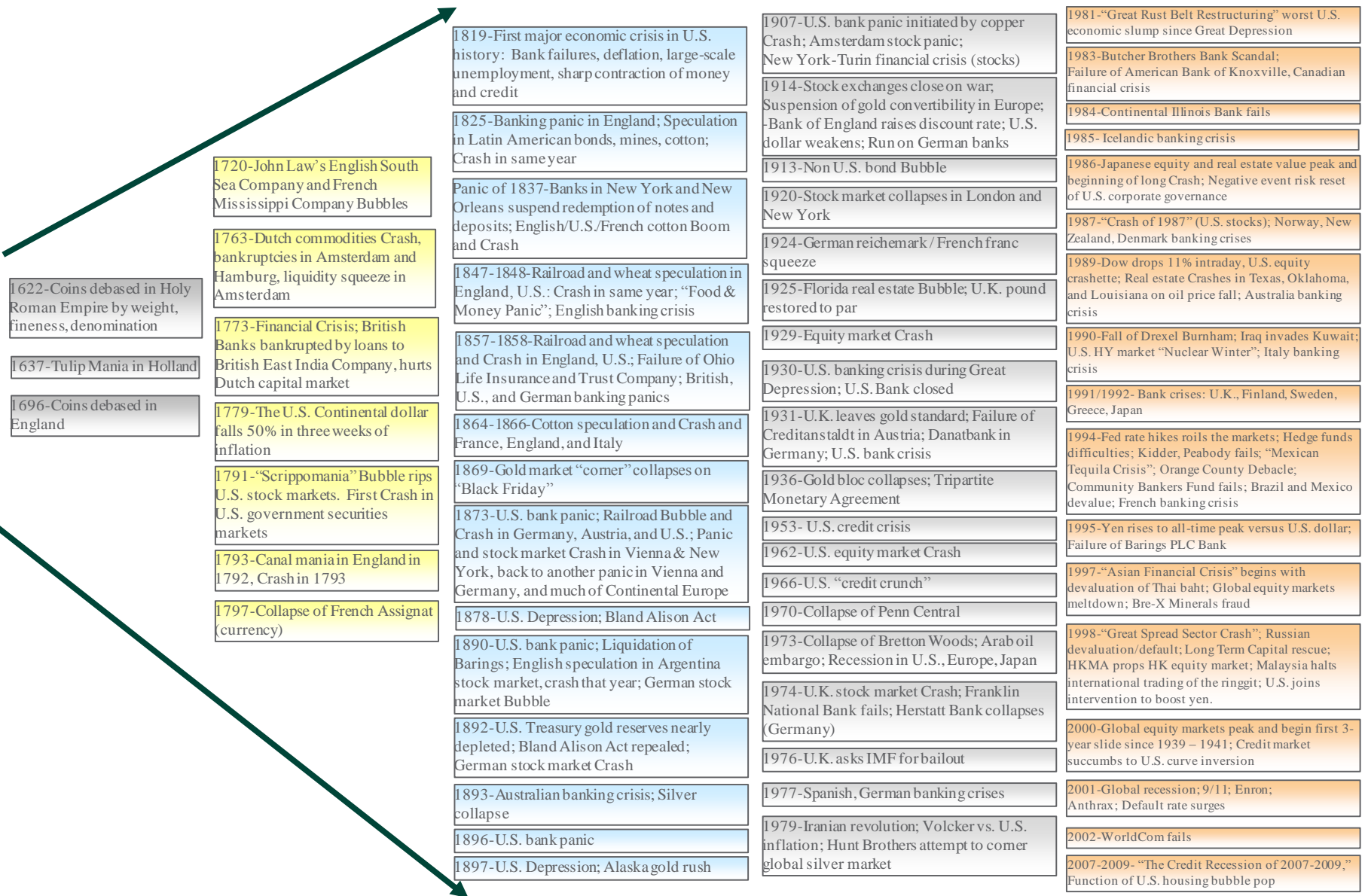
Source: BNY Mellon using data from Barclays Live, Bloomberg, FactSet, and NBER

Global Financial System Key 2016-2017 Topics

- GPR/terrorism tensions, climate change, falling China growth rate, world economic “secular stagnation,” low productivity, uneven distribution of wealth, low oil prices, rising infrastructure needs, rich valuations (equities, HY, EM), negative interest rates in Japan and parts of Europe, low liquidity, Brexit, U.S. elections
- Persistence of low financial returns and shortage of compelling higher-return antidotes
- Contending titles to define this era: The Post-Hegemonic Era; Capitalism 4.0; The Aftermath; Reform Era; Ascension of EM, Led by BRICs; Next Generation Global Financial System; The Great Deleveraging; The Latest Era of Financial Conservatism; The Second Great Contraction; The Lesser Depression; The Great Recession; The Great Transition to a More Conservative Financial Era; “The New World Political, Economic, and Market Order”
- Efficacy of substituting aggressive monetary policy (quantitative easing) for fiscal stimulus; conventional monetary policymaking depletion
- Central bank stimulative gusher enhancing real assets, depressing fiat currency values, possibly stirring strategic inflation embers
- Wisdom of taking deficit-reducing “Austerity Road” purportedly on the way back to prosperity
- Deflation risk as symbolized by negative interest rates
- Complacency about extended inflation dormancy
- Pace of European recovery
- Another possible European sovereign debt risk flare
- Rating agencies’ future role in capital markets
- Future of broker-dealer business model and drop in liquidity
- Possible perils of HFT and algorithmic trading
- Cyber-attacks
- U.S. state and local municipal credit quality deterioration mainly concluded, except for Puerto Rico
- Enhanced use of long economic/capital market history in forecasting
- Abnormally high volatilities and correlations in 2011, subsided in 2012-2014, picked up in 2015, fallen in 2016
- How reliable is the “shadow banking system?”
- Is world headed toward eventual currency and trade wars?
- Will U.K. leave the European Union in the late Teens? Brexit vote on June 23, 2016
- High structural unemployment, despite U.S. economic turnaround
- U.S. energy independence by 2020
- Geopolitical Risk: Egypt, Iran, Iraq, ISIS, North Korea, Russia/Ukraine, Syria, Venezuela
- Nation state fragmentation proposals (Scotland, Catalonia, Venice, Alaska, Texas)
- Annual Prophecy Season in October-December 2016
- Embracing new technologies and analytics, like “Big Data” and “3-D Printers”
- “Great Rotation Trade.” Just be long equities over bonds? Fruitful in 2012-2015. But are equity markets overvalued?
- Will major bond yields stay low in a “Japan multi-decade scenario” or mean revert 100 bp-to-300 bp higher by 2018-2022 during monetary policy normalization?
- China hard-landing scenario
- Chinese currency convertibility may help resolve the global economic and capital flow imbalance problems
- China is already an economic superpower and nearly recession proof over near term, but what about banking system soundness, housing, inflation, demographics, reform switch from investment to consumption
- Bursting bond (including IG and HY), EM, ETF potential bubbles, but when?
- Washington political polarization, fiscal policy, 2016 elections
- Regulatory transition: Dodd-Frank; Volcker Rule, Basel III
- Abenomics’ efficacy
- Macro hedge funds fees and returns are disappointing
- Commodities: SuperCycle revival in late Teens/Twenties
- Longevity of corporate profits recession
- Searching for next generation philosophies/methods in asset management: alternatives; frontier; active vs. passive; index shifts; smart beta

Capital Market Corrections Are All Too Common

Crash Timeline (1622 to 2016): A Major Adjustment Every 5 – 10 Years



Sources: Author's compilation from various sources

“The Knowledge Industry Framework”

"Practical men, who believe themselves to be quite exempt from any intellectual influences, are usually the slaves of some defunct economist. Madmen in authority, who hear voices in the air, are distilling their frenzy from some academic scribbler of a few years back."

-- John Maynard Keynes, *General Theory*, 1936

“The Capital Markets Framework”

“Recurrent speculative insanity and the associated financial deprivation and larger devastation are, I am persuaded, inherent in the system. Perhaps it is better that this be recognized and accepted.”

-- John Kenneth Galbraith, *A Short History of Financial Euphoria*, 1993

“I can measure the motion of bodies, but I cannot measure human folly.”

-- Sir Isaac Newton

“Capital Markets Interpretative Caution”

“There is nothing simpler than providing a new interpretation of events when the past and its consequences are already known.”

-- Soviet Marshal Zhukov

World War II Behind Closed Doors

Two Types of Capital Market History

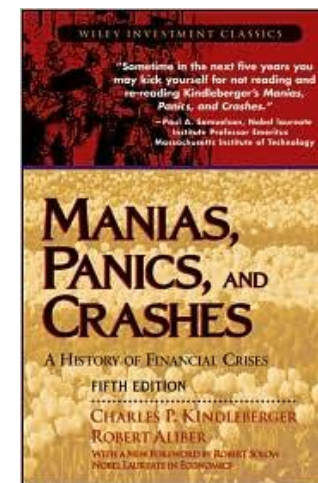
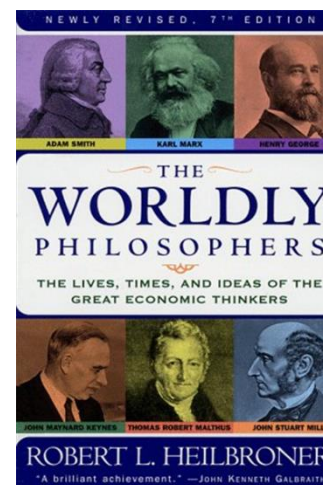
- ◆ History of events, people, institutions, market movements
- ◆ History of economic, finance, portfolio management theories/principles/analytical techniques

“Worldly Philosophers”

by Robert Heilbroner

“Manias, Panics, and Crashes: A History of Financial Crises”

by Charles Kindleberger & Robert Aliber

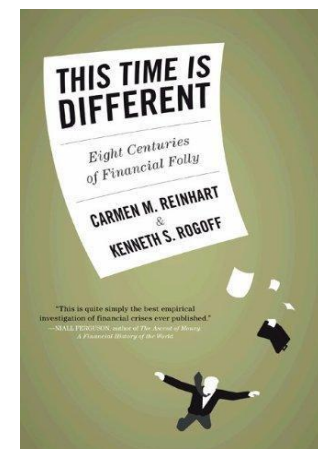
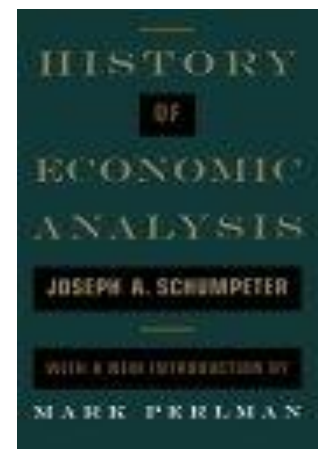


“History of Economic Analysis”

by Joseph Schumpeter

“This Time Is Different”

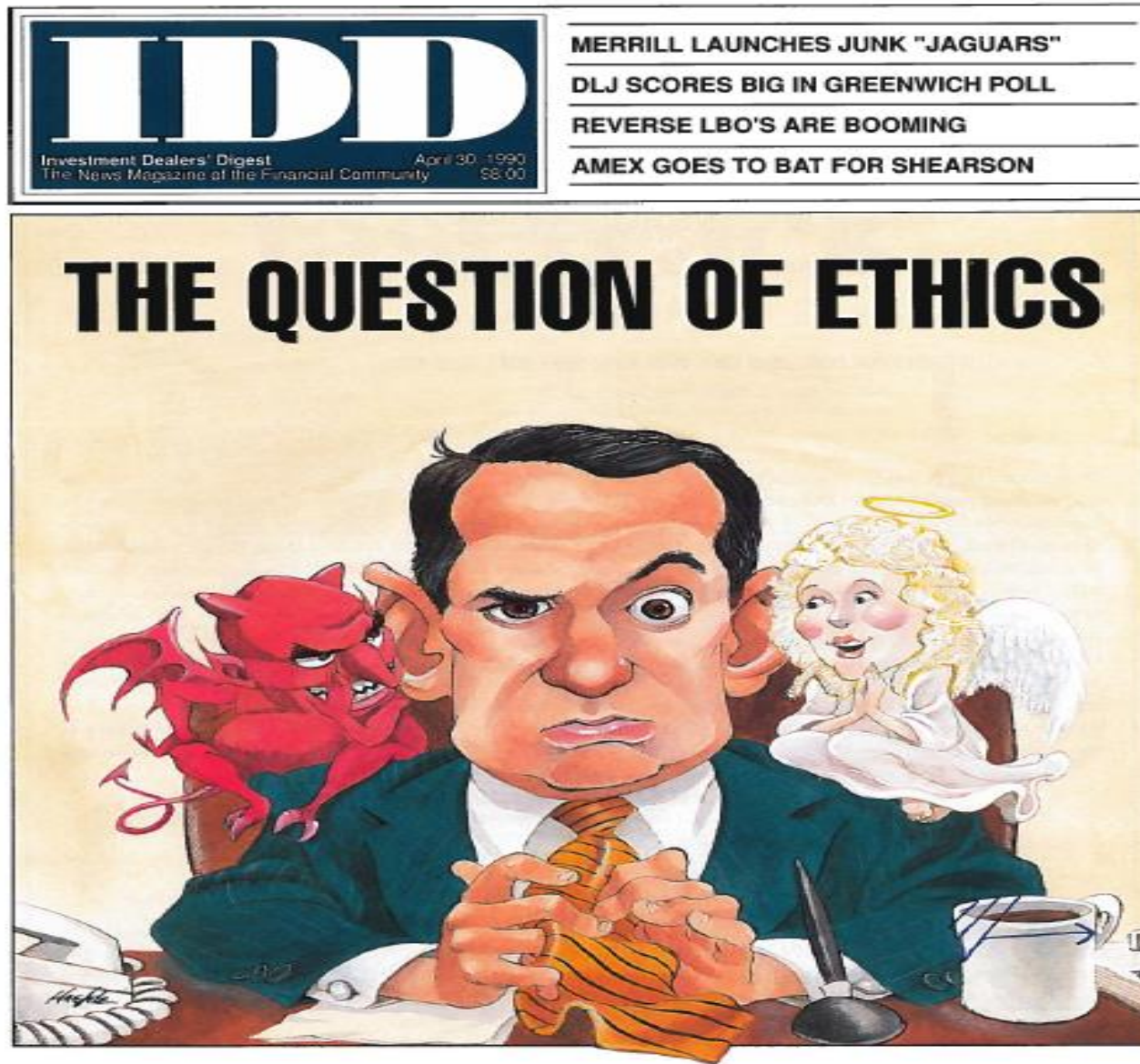
by Carmen Reinhart & Ken Rogoff



The “Ultimate” Capital Market Mistake

- ◆ Although Painful, Not:
 - ◆ Yield Chasing
 - ◆ Herd Followship
 - ◆ Economic, Sector, Credit/Issuer Misdiagnosis
 - ◆ Fraud, Corruption
 - ◆ Failure of Intelligence, Inadequate Experience
 - ◆ Models
- ◆ **HISTORICAL IGNORANCE AND THE BREVITY OF FINANCIAL MEMORY**
- ◆ How Can You Prepare for the Future Without Understanding the Past?
- ◆ Military Academies and Liberal Arts Colleges Insist on History Courses, Why not Business & Finance Curriculums?

“Some Industry Challenges Seem to Never End”



Forecast Caveat: Abundant Examples Of Past Erroneous Expectations

- ◆ Worst recession since and almost as bad as the 1930s (1973-1975, 1981/1982)
 - ◆ Equity asset class is dead (late 1970, 2000-2002, late 2008-early 2009)
 - ◆ U.S. nuclear power plants are the future (1973-1979, 2011-2014)
 - ◆ Global financial system peril from inadequate “petro-dollar recycling” (1974-1976)
 - ◆ EM’s really different this time (1976, 1983, 1992, 1995, 1998, 2003, 2007-2014)
 - ◆ Inflation will never be tamed (late 1970s)
 - ◆ Fusion energy in 25 years (1979)
 - ◆ Gold and silver can only go up (1979-1981, 2007-2013)
 - ◆ Oil will breach \$100 (1979-1981); \$200 (2007-2008)
 - ◆ Peak global oil production will occur in the early 21st century: Twilight Thesis, 1970s, 1980s, 1990s, 2000s
 - ◆ HY’s a really different asset class (1983-1989)
 - ◆ Corporate America’s underleveraged (mid-to-late 1980s)
 - ◆ Japan Inc will rule the world (1980s); China’s turn (2008-2015)
 - ◆ Electronic bypass will doom bond traders, sales, and syndicates (1980s, 1990s, 2000s, 2010s)
 - ◆ Positive carry trade can’t go wrong (late 1980s, 1993/early 1994, 2008-2015)
 - ◆ Secular decline in GPR under new American World Order (1990s)
 - ◆ British pound and Italian lira are fine (1992)
 - ◆ Structured credit products are dead (1994, 2001, 2008-2012)
 - ◆ CMOs are done (1994)
 - ◆ Dot.Com: just be long tech equities at all times (1995-March 2000)
 - ◆ Hedge Funds are doomed as a style after LTCM failure (1998)
 - ◆ Y2K will impale world economy (1997-1999)
 - ◆ Eurozone and euro will fall (1998-2001, 2009-2015)
 - ◆ Japan finally has turned the corner (various times: 1990-2015)
 - ◆ Global economy’s importing deflation from China/India (2000-2003); global economy will import inflation from EM (2008-2012)
 - ◆ Corporate governance will not be easily mended (2001/2002)
 - ◆ Waves of geopolitical event risks will smack global financial system (post-9/11)
 - ◆ Real estate’s king of all asset classes (2000-2007)
 - ◆ Alternatives are superior to conventional asset classes (2000-2007); (2010-2015)
 - ◆ Commodity Supercycle will last until late Teens/early Twenties (2003-2012)
 - ◆ Financial innovation has improved markets and will keep accelerating (2002-2007) like a kind of Moore’s law; financial innovation’s dead (2008-2012)
 - ◆ Too much regulation (1970s-2007); too little regulation (2009-2025+)
 - ◆ SARS (2003) and H1N1 (Swine Flu) (2009); possible next Spanish Flu Pandemic of 1918
 - ◆ Rise in advanced economy public debt will be inflationary and lead to higher interest rates (2008-2016)
 - ◆ Full convertibility of Chinese currency in 3-5 years (2000-2016)
 - ◆ Chinese currency will fall to 7.50-7.75 by the end of 2016
 - ◆ Unfunded pension plans present major problem (2009-2016)
 - ◆ A major U.S. muni default wave (2011) will see hundreds of billions of bankruptcies
 - ◆ Negative effects of S&P’s downgrade of U.S. government to AA+ (August 2011)
 - ◆ U.S. dollar declinism and inevitable loss of reserve currency status (2009-2012)
 - ◆ U.S. fiscal cliff is insurmountable (2011-2013)
 - ◆ Greece will leave Eurozone (2010-2015)
 - ◆ Big data will quickly lead to revolutionary disruption of business models (2012-2016)
 - ◆ China hard landing (2000-2016) coming
 - ◆ “QE infinity” in advanced economies (2014-2016)
 - ◆ Virtual currencies and Fintech will rapidly disrupt the existing financial services order (2013-2016)
-

Key Current Assumptions in 2016-2017: How Many Will Be True?

- ◆ Financial returns will be low historically but better in the Teens and Twenties than the Oughts
 - ◆ Entitlement reform is inevitable
 - ◆ Asia and EM strategic ascendancy, but possible Bubble, and potential Chinese “Hard Landing” in the late Teens
 - ◆ This cycle’s different: “New Normal,” slow recovery for advanced economies (“secular stagnation thesis”)
 - ◆ Bloated central banks’ balance sheets pose a risk to the world financial system
 - ◆ Governments will play a bigger role in markets for a long time
 - ◆ Extended rise and then stabilization of the U.S. dollar
 - ◆ Greece may eventually leave the Eurozone
 - ◆ Financial system with bias toward moral hazard: “Too Big to Fail” vs. “Too Small to Save”
 - ◆ Unbundled Universal Banks; return of de facto Glass-Steagall
 - ◆ Increased supranational and sovereign regulatory/oversight will reduce systemic risks
 - ◆ Lower leverage, less compensation, and “derivative controls” will improve systemic performance
 - ◆ Market volumes and liquidity stay depressed
 - ◆ Volatility will edge higher as cycle ages
 - ◆ Inflation’s way over the horizon; European deflation concern
 - ◆ Protectionism and currency wars effectively underway
 - ◆ Demographics are economic destiny
 - ◆ Rise in GPR (Crimea, ISIS) following global financial crisis
 - ◆ Global finance needs to shrink relative to world GDP
 - ◆ Residential and commercial real estate revival sustains through Teens
 - ◆ Stimulus withdrawal will be possibly painful; alternatively, re-ignite economic deceleration and incite risky asset correction
 - ◆ Fiscal deficits & global imbalances will wane
 - ◆ Negative nominal and real bond yields not sustainable
 - ◆ Commodities and inflation-linkers will provide superior secular returns
 - ◆ Gold will stay around \$1,200-\$1,300
 - ◆ Global fracking means centuries more of hydrocarbon reserves
 - ◆ Usually overweight spread product
 - ◆ Sub-Sahara Africa will be a key investment frontier: 2016-2025
 - ◆ Western consumers will save more; Asian investors will save less
 - ◆ Revamped rating agency model will be better and procyclical downgrades less frequent
 - ◆ Re-worked economic and finance theories will provide better predictions; same for market quant models
 - ◆ “Big Data,” and “Smart Data” 3-D printers, and technology will change the world
 - ◆ Technological change in early 21st century is the most rapid since the late 19th century
 - ◆ Many digitally-disrupted industries and firms need to innovate or face obsolescence
 - ◆ Corporate profitability and balance sheets will remain satisfactory
 - ◆ Virtual currencies like bitcoins will gain wide acceptance
 - ◆ Main asset allocation reforms: cut fees, reduce risks but go frontier, index, quasi-index allow for more frequent liquidity gaps, minimize asset correlations, grow scale
-

Capital Market Events That Will Take Place During Your Career

- ◆ GPR shocks & military events, natural disasters, recessions & booms, inflation surges & deflation worries, more professions of environmental concern than action, trade disputes, FX crises/interventions, global capital flow reversals, seasonality, central bank policy adjustments, vol spikes, equity crashes and flights of fantasy (especially in high-growth industries like technology), rediscovery of ancient truths (“positive carry trade” does not always work) and myths, spread flares, credit catastrophes, rating agency downgrade or upgrade waves, legislative and regulatory rules changes, promulgation of “new, new approaches” to asset/risk management that often will be redecorated-old approaches (smart beta), introduction of new “quantitative holy grails,” misbehaving new investment products that do not live up to expectations, regular hyperbolic and false characterizations that market, sector, issuer valuations are “historically” the “cheapest/richest ever”
 - ◆ The slow and sometimes disruptive development of new markets, new products, new businesses, new technologies, new trading tools, new analytical methods, and new portfolio requirements
-

Biggest Rediscoveries During Your Career: Nothing's Invariant

- ◆ Over very long horizons (several decades), you will be amazed by how many major firms will vanish and how many new firms are created (Facebook, Amazon, Google, Twitter, Alibaba, etc.)
- ◆ Capital market parameters really can move in the opposite direction, sometimes after years of moving one way (see precious metals fall in late 2012-2013) and European bond yields (2016-2020)
- ◆ Market moods change: both short-term and chronic pessimism can follow chronic optimism
- ◆ Key capital market determinants change through time (oil, money supply, rates, monthly payrolls, monetary policy, currency exchange rates, etc.)
- ◆ Asset class valuations vary over the course of business cycles. Beware of the inevitable proclamations of the death of a trend/asset class (Wall Street & The City did not die in 2008/2009)
- ◆ Global capital markets really are “global”
- ◆ No one can perfectly predict the future; the best forecasters will be right around 75% over the long run and can have bad years with less than 50% accuracy; many forecasters have only one view: always positive or always negative
- ◆ “Noise trading” and “superficial topical stories” in the media are mainly meaningless for performance; best capital market operators take a “strategic view”; for example, the monthly U.S. employment report reception is overdone
- ◆ It's a “multi-factor world”: no single factor determines the price of any financial asset
- ◆ Absurdity of “methodological debates,” like quantitative vs. qualitative valuation techniques. Use both and anything else to help make better predictions
- ◆ Despite their quantitative veneers, economics/finance/capital market analyses properly belong to the social sciences. Institutional evolution and human psychology play a huge role in decision-making
- ◆ Over the long run, most “alpha/money” is made buying out-of-favor assets and selling assets that have become too over-valued
- ◆ Asset diversification really is a very good idea

Accelerated Financial Institutions Change: U.S. Acquired or Defunct Brokerage Firms from 1974 to 2016

- Halsey Stuart (1974)
 - Kuhn Loeb (1977)
 - White Weld (1978)
 - Hornblower & Weeks (1979)
 - Shearson Hayden Stone (1979)
 - Bache (1981)
 - Continental Illinois (1984)
 - A.G. Becker & Co. (1984)
 - Aubrey G. Lanston & Co. (1986)
 - Irving Securities (1988)
 - E.F. Hutton (1988)
 - L.F. Rothschild (1988)
 - Thompson McKinnon (1989)
 - First Boston (1990)
 - Drexel Burnham (1990)
 - Manufacturers Hanover (1991)
 - Bank of New England (1991)
 - Security Pacific (1992)
 - Columbia Banking Federal Savings and Loan Assoc. (1992)
 - Kidder, Peabody & Co. (1994)
 - Barings (1995)
 - Shawmut Bank (1995)
 - First Interstate (1996)
 - Chemical (1996)
 - Alex Brown (1997)
 - Dillon Read (1997)
 - Dean Witter (1997)
 - Harris Trust (1998)
 - Salomon Brothers (1998)
 - First Chicago (1998)
 - Hambrecht & Quist (1999)
 - Bankers Trust (1999)
 - Robert Fleming (2000)
 - Chase Manhattan (2000)
 - Wertheim Schroder (2000)
 - DLJ (2000)
 - Paine Webber (2000)
 - Prudential Securities (2003)
 - Bank One (2004)
 - FleetBoston Financial (2004)
 - Refco (2005)
 - ABN Amro (2007)
 - NetBank (2007)
 - IndyMac (2008)
 - Bear Stearns (2008)
 - Lehman Brothers (2008)
 - Merrill Lynch (2008)
 - Washington Mutual (2008)
 - MF Global (2011)
 - Peregrine Financial (2012)
-

Accelerated Financial Institutions Change: Non-U.S. Firms Acquired or Defunct from 1974 to 2016

- Herstatt Bank (Germany, 1974)
- Den norske Creditbank (Norway, 1990)
- Bergen Bank (Norway, 1990)
- Sparebanken ABC (Norway, 1990)
- AMRO Bank (Netherlands, 1991)
- Barings Bank (U.K., 1995)
- Lloyds Bank (U.K., 1995)
- TSB Bank (U.K., 1995)
- Banco Nacional (Brazil, 1995)
- Hambros Bank (U.K., 1998)
- Swiss Bank Corporation (Switzerland, 1998)
- Union Bank of Switzerland (Switzerland, 1998)
- Long-Term Credit Bank of Japan (Japan, 1998)
- Midland Bank (U.K., 1999)
- Yamaichi Securities (Japan, 1999)
- Union Bank of Norway (Norway, 1999)
- Christiania Bank (Norway, 2000)
- British Linen Bank (U.K., 2000)
- Grindlays Bank (U.K., 2000)
- Paribas (France, 2000)
- Crédit Commercial de France (France, 2000)
- Fuji Bank (Japan, 2000)
- Ottoman Bank (France/U.K./Turkey, 2001)
- Industrial Bank of Japan (Japan, 2002)
- Girobank (U.K., 2003)
- Unibanco (Brazil, 2008)
- Banco Itaú (Brazil, 2008)
- Kaupthing Bank (Iceland, 2008)
- Íslandsbanki (Iceland, 2008)
- Landsbanki (Iceland, 2008)
- Roskilde Bank (Denmark, 2008)
- WestLB AG (Germany, 2009)
- Dresdner Bank (Germany, 2009)
- DSB Bank (Netherlands, 2009)
- Fortis (Netherlands, 2010)
- Askar Capital (Iceland, 2010)
- Abbey National (U.K., 2010)
- Anglo Irish Bank (Ireland, 2011)
- Northern Rock (U.K., 2012)
- Banco Espírito Santo (2014)

How to Ensure a Disappointing Capital Market Career

- ◆ Restrain your curiosity; it's just about wealth accumulation
 - ◆ Try to read as little as possible
 - ◆ Ask few questions; pretend to know more than you do
 - ◆ Assume social skills win out over technical skills over the long run
 - ◆ Try not to travel internationally to learn more about regions and countries. All you need to know is in the documents and the on internet
 - ◆ Forget team; be as selfish as possible, after all, you know it all
 - ◆ Do not enroll in the CFA, CAIA programs and skip other educational opportunities (free lectures on web, virtual courses) and organizations (NYSSA, SQA, FIASI, SIFMA)
 - ◆ Be content to learn existing methods, try not to innovate
 - ◆ Ignore the evolution of the institutional framework for asset managers and financial firms: market patterns of the past 1-5 years will repeat forever
 - ◆ Avoid study of global/regional political & economic policies: Geopolitical risk and macro trends matter little to asset performance
 - ◆ Never contemplate the medium-term and long-term future: concentrate only on today, tomorrow, and next week
 - ◆ Ignore trends in technological innovation: business markets change slowly
 - ◆ Allow your language, writing, mathematical, and computer skills to atrophy. Your assistants can take care of everything
 - ◆ Most important, do not be burdened by knowing the history of your field
-

How to Abuse Financial System Data and Make Poor Decisions

- ◆ If you torture the data, then they will always confess
- ◆ Don't be selective in choosing variables for models - keep trying until you get the best fit (i.e., torture)
- ◆ Ignore survivorship bias (especially true for the U.S. and U.K. capital markets)
- ◆ Extrapolate the past without understanding the past
- ◆ Pay no attention to the institutional and historical context
- ◆ Assume that valuations are mean-reverting (i.e., always ok to buy low)
- ◆ Assume that valuations are not mean-reverting (i.e., always buy high)
- ◆ Assume that all data and analytics are 100% reliable and accurate
- ◆ Assume normal distributions and presume that standard deviation is the best measure of risk
- ◆ Assume everyone looks at data in the same way as you

Capital Market Analysis Methodology

- ◆ **Pattern recognition, using quantitative and qualitative methods**
 - ◆ History
 - ◆ Peer group analysis
 - ◆ Sovereigns (political, legal, socio-cultural, economic, demographic, natural resource, finance factors)
 - ◆ Issuers (industry management, operations, financial ratios, instrument analysis)
 - ◆ **Predict the future**
 - ◆ Pattern recognition
 - ◆ Models
 - ◆ Experience, intuition
 - ◆ **Decision-Making**
 - ◆ Blend forecasts with institutional, personal objectives and constraints
-

The Very Long-Term Importance of Geological and Climate Change in Shaping Evolution



Milankovich Cycles

- ◆ Over the course of 100,000 years, Earth's orbit moves from round (now) to elliptical
- ◆ On a 22,000-year cycle, Earth's tilt on its axis changes
- ◆ Earth wobbles around its axis on a 41,000-year rhythm

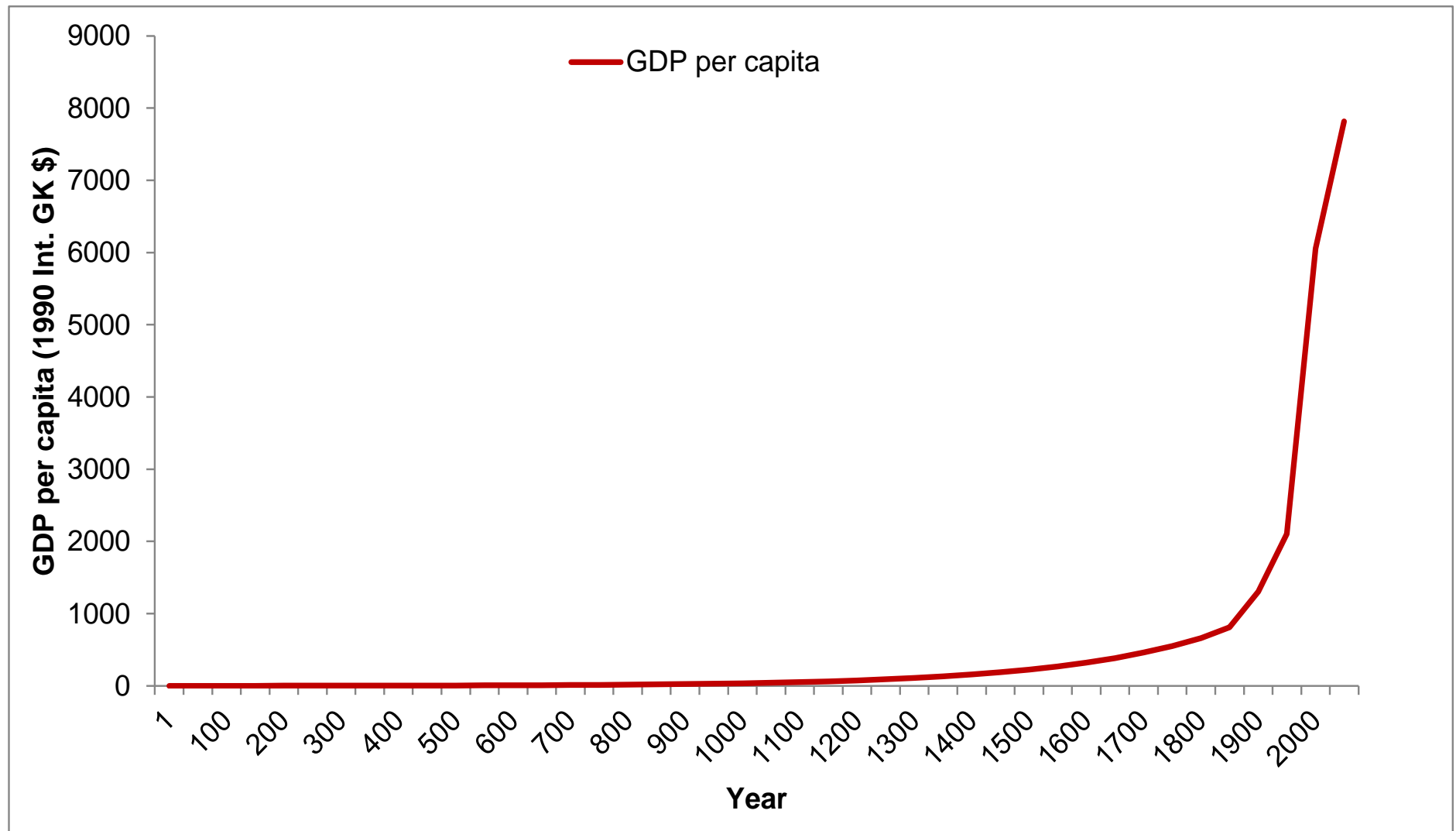
Geological Change

- ◆ During the past 50 million years, continental drift has pushed most land north of the equator: amplifies seasonality of solar radiation
- ◆ Volcanic activity has fallen

Some Effects

- ◆ No permanent ice at Earth's poles for much of history. This changed 14 million years ago at the South Pole and 2.75 million years ago for the North Pole; now reversing again
- ◆ Between 190,000 BCE when modern human appeared, there have been 40-50 ice ages
- ◆ Circa 100,000 BCE, only about 20,000 Homo Sapiens living

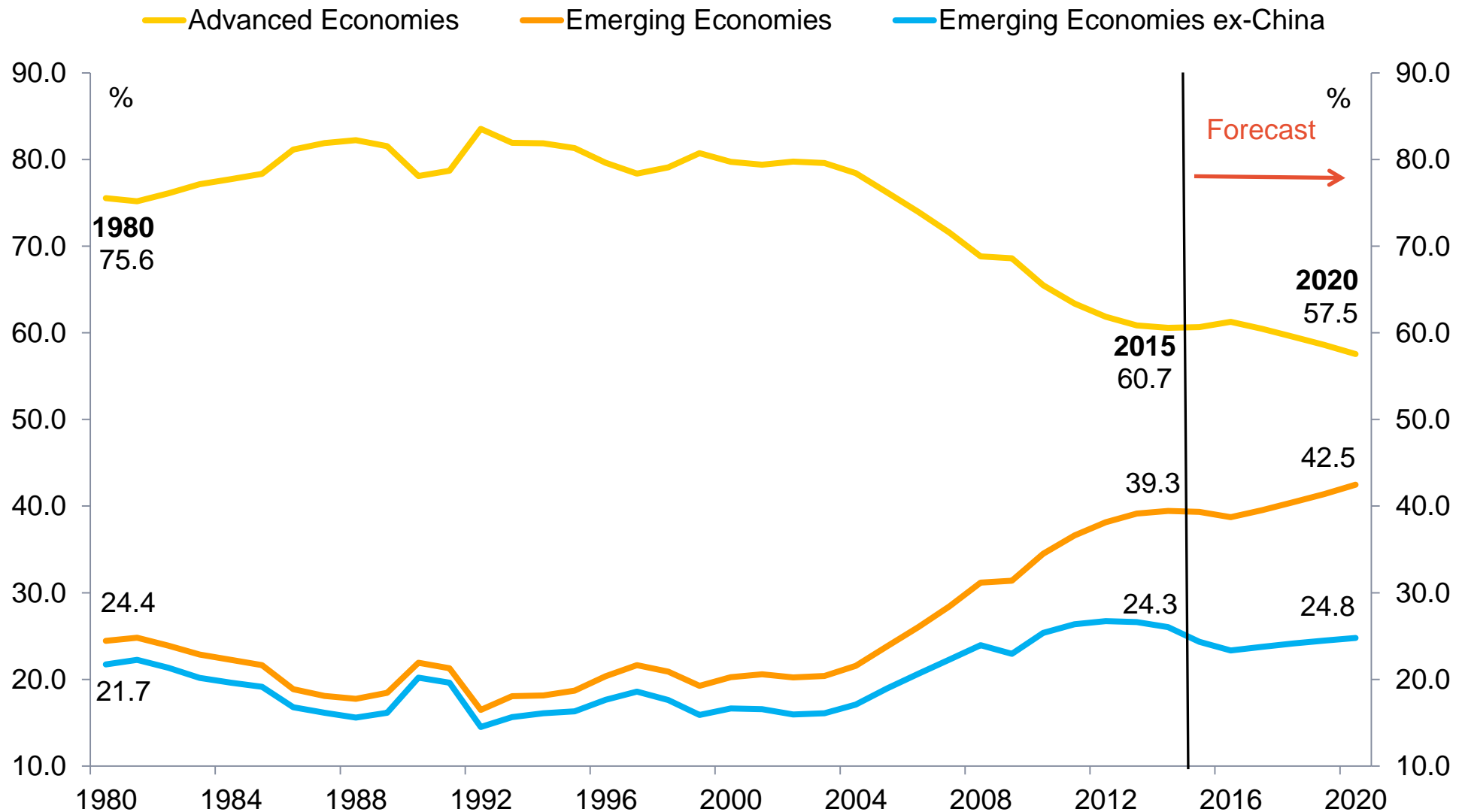
World GDP per Capita*: 1-2010 AD



*For missing data points, constant yearly growth rate is assumed. Source: BNY Mellon using data from Angus Maddison Database

Sharp Structural Shift in World Economy: The Rise of EM

Advanced vs. Emerging Economies (with and without China) Share of Global GDP



Source: BNY Mellon using data from IMF

Pre-18th Century: “Globalization,” Frontier Expansion, Induces Trade, Both Require Capital; Formation of Corporations and Funds Both Designed to Spread Risks; “The General Crisis in the 17th Century”

- ◆ 250 million years BCE, 90% of Earth life lost due to climate change caused by massive Siberian volcanoes
- ◆ 65 million years ago, asteroid strike ends 50% of species
- ◆ First use of fire by Homo erectus (1-1.5 million BCE)
- ◆ Neanderthals split off from common human ancestor (700,000 BCE)
- ◆ Approximately 78,000 years ago, first hand-made clothing
- ◆ Mount Toba eruption in Indonesia induces several years of winter and nearly ends humanity (73,000 BCE)
- ◆ Globalization begins 50,000-70,000 years ago with migration of some modern humans out of Africa
- ◆ First Americans reach America 20,000-40,000 years ago
- ◆ Boats used by maritime people in Japan (25,000-30,000 BCE)
- ◆ Hunter-gathers form “Aggregations” to trade (22,000 BCE)
- ◆ 13,000 years ago, Northern Hemisphere endured pronounced cooling after a comet strike
- ◆ Tribes emerging in some areas (11,000 BCE)
- ◆ Beginning of “New Stone Age.” Viewed as the end of the old Stone Age. Began in the Levant, West Bank (10,200 BCE)
- ◆ Most people still live in small bands (9,000 BCE)
- ◆ Domesticated livestock (9,000 BCE)
- ◆ Shift from hunter-gatherers to farming begins (9,000 BCE) in the Middle East
- ◆ Writing begins to appear in the Middle East (9,000 BCE)
- ◆ Animal trade between North Africa and Asia as early as 6,000 BCE
- ◆ Earth enters its warmest cycle and wettest cycle (6,000 BCE)
- ◆ First metal tools produced (5,000 BCE)
- ◆ Herders in Ukraine domesticate horses (4,000 BCE)
- ◆ 4,000 years ago, societies in South and West Asia suffered from drought
- ◆ World cooling (3,800 BCE)
- ◆ “Chieftoms,” precursors to modern states emerge (3,500 BCE)
- ◆ Wheel (3,500 BCE)
- ◆ First state government and first systematic writing (3,400 BCE)
- ◆ Nile Valley largest kingdom in the world (3,100 BCE)
- ◆ Bronze (an alloy of copper and a bit of tin) replaces most stone tools and weapons (3,000 BCE)
- ◆ First Pyramid built (2,550 BCE)
- ◆ Sea journeys from Mesopotamia to India through the Persian Gulf (2,500 BCE)
- ◆ Scotland’s Orkney Islands begin building rock monuments, homes, and structures. Most complete Neolithic buildings and possible basis for Stonehenge (2400-2000 BCE)
- ◆ Chariots invented in Kazakhstan (2,000 BCE)
- ◆ Cuneiform contracts for futures delivery and bearer bonds in Mesopotamia (1,750 BCE)
- ◆ Silk Road networks commerce across China, India, Middle East, and Mediterranean (1,000 BCE)
- ◆ Polynesians reach Samoa and Tonga (1,000 BCE)
- ◆ Phoenicians create trade routes in the Mediterranean (1,000 BCE)
- ◆ Invention of “token” money to replace/augment barter (500 BCE) and almost simultaneously in China under the Chou Dynasty (770-200 BCE) and in the Mediterranean countries



Pre-18th Century: “Globalization,” Frontier Expansion, Induces Trade, Both Require Capital; Formation of Corporations and Funds Both Designed to Spread Risks; “The General Crisis in the 17th Century”

(Continued)

- ◆ Geographic expansion and trade growth boost capital needs, abetted by “innovation of juristic *persona* with rights and duties like natural *persona* and whose existence is independent of owners/managers”
- ◆ Horse collars first used in China (500 BCE)
- ◆ Olympic games (776 BCE)
- ◆ Aristotle, a teacher of Alexander the Great, offers scientific proof that Earth is a sphere (340 BCE)
- ◆ Alexander the Great’s conquests expand Greek knowledge of world geography (334-323 BCE)
- ◆ Pytheas sails from the Mediterranean to Britain (325 BCE)
- ◆ China makes paper from mulberry bark (105 BCE)
- ◆ Rudimentary banking, credit and commodity (wheat) futures in Rome (100 BCE)
- ◆ Wheelbarrow invented in China (100 BCE)
- ◆ First corporations, Societas Publicanorum of Imperium Romanum
- ◆ Roman Europe population of 50-70 million, only 25-26 million by 700 (200s-300s)
- ◆ Roman Empire loses 1/2 to 2/3 of population as Empire crumbles (500s-600s)
- ◆ Plague of Justinian begins in Egypt (542)
- ◆ Irish monks travel into the Atlantic, reaching at least as far as Iceland (600-800)
- ◆ Trade and colonization follow the rapid expansion of Islam (700)
- ◆ Drought in Asia and South America (750-900) weakens Chinese and Mayan empires
- ◆ No city in Europe with a population greater than 20,000; at peak in 9th century, Rome had been 500,000 to 10 million
- ◆ First university: University of Qarawiyyim in Morocco (859)
- ◆ Poland officially becomes Christian (966)
- ◆ Vikings land in Newfoundland (989-1020)
- ◆ Leif Eriksson lands on mainland North America (1000)
- ◆ Medieval West grows economically and demographically (European population triples to 75 million-100 million) (1000-1250)
- ◆ Pope Urban II launches “The Crusade,” ignites economic boom in Western Europe (1095)
- ◆ Formal split between Roman Catholic and Greek Orthodox Christianity in the 11th century
- ◆ Magnetic compass developed in China (1119)
- ◆ Chinese introduce paper money (12th century)
- ◆ First known foreign exchange contract occurred in Genoa (1156)
- ◆ Genghis Khan founds the Mongol Empire (1206-1227), which by 1242 stretches from China to Eastern Europe
- ◆ China’s population falls about 50% from 123 million to 65 million due to plague and wars (1200-1393)
- ◆ Kiev captured by Tartars (Mongols) (1240)
- ◆ Tartars attack Poland (1241)
- ◆ Fibonacci brings Hindu-Arabic memoirs to Italy (13th century)
- ◆ First eyeglass in Italy (13th century)
- ◆ Marco Polo allegedly trades in China from 1271 to 1278 as guest of Kublai Khan
- ◆ Sicilian population rises up against French occupation (1282)
- ◆ First gun in Manchuria (1288)
- ◆ Mid-1300s, violent climate change and epidemics (“black death”) halve European population.



Pre-18th Century: “Globalization,” Frontier Expansion, Induces Trade, Both Require Capital; Formation of Corporations and Funds Both Designed to Spread Risks; “The General Crisis in the 17th Century”

(Continued)

- ◆ Labor shortages (partly by Bubonic plague in mid-1300s) and a series of poor harvests/high agricultural prices promoted minting of higher coin denominations - silver groat or fourpence in 14th century Britain and gold noble (current for 6 shillings and eightpence - fee for a doctor or lawyer)
 - ◆ Hanseatic League 13th-17th centuries help expand trade in Northern Europe
 - ◆ First Portolan maps of the Mediterranean vastly improve navigation and pave the way for “age of discovery” (1290-1350)
 - ◆ Medieval World sees acceleration of globalization (1250-1350)
 - ◆ Mariner’s astrolabe developed in Europe (1300)
 - ◆ First double-entry accounting in Italy; may have already begun in Asia (1300)
 - ◆ Accounting invented by Italian merchants in 14th century; active securities markets in Genoa, Florence, and Venice
 - ◆ Anglo-French Hundred Years’ War (1337)
 - ◆ Black Death begins on Mongolian Plateau on Lake Issyk Kul (1338-1339)
 - ◆ Edward III of England defaults on 1.365 million florins from Florentine banks (1346)
 - ◆ Plague begins in Sicily and concludes in Moscow: 25 million out of 75 million European perish (1347-1352)
 - ◆ Another plague wave sweeps world (1361)
 - ◆ Portuguese Civil War (1384)
 - ◆ China’s population falls about 50% from 123 million to 65 million due to plagues and wars (1200-1393)
 - ◆ The Medici Bank (largest bank in Europe during 15th century) was established by the Medici family of Italy (1397)
 - ◆ Kalmar Union (1397) unites Denmark, Norway, and Sweden until 1523
 - ◆ First commodity exchange, trading rice, in Osaka (1400s)
 - ◆ The cross-staff determines latitude by measuring the height of a star above the horizon (1400)
 - ◆ China sends out seven treasure fleets (1405-1433)
 - ◆ Casa di San Giorgio in Genoa, first bank in Europe (1408)
 - ◆ German tectonic knights lose in battle to conquer Poland and Lithuania aided by Tartars on July 10 (1410)
 - ◆ Atlantic slave trade (1441 to mid-19th century) involuntarily brings 11-20 million to New World
 - ◆ Gutenberg produces first printed pages (1440); prints first Bible (1452)
 - ◆ Europe produces fewer goods than 1300 (1450)
 - ◆ Fall of Constantinople (1453) to Ottoman Turks
 - ◆ Banca Monte, the oldest surviving bank in the world was established in Siena, Italy (1472)
 - ◆ Spanish Inquisition begins (1480)
 - ◆ Bartolomeu Dias rounds Cape of Good Hope (1488)
 - ◆ “New World” re-discovery (1492) invigorates “Age of Discovery” by Portuguese, Italian, Spanish, Dutch, and English mariners
 - ◆ Catholic Monarchs, Ferdinand and Isabelle, conquer The Moorish Kingdom of Granada” (1492)
 - ◆ Vasco Da Gama finds sea route from Europe to Asia (1498)
 - ◆ Contracts of survival, annuities (tontines) mainly used in Europe to finance governments (sovereign, cities, municipalities) during 1500s-1700s
 - ◆ Merchant capital and factors: Italian houses, House of Fugger in Austria in the 16th-18th centuries
 - ◆ First complete world map (1507)
 - ◆ Balboa crosses the Isthmus of Panama and is the first European to see the Pacific from the Americas (1513)
 - ◆ Cortes conquers the Aztecs (1521)
 - ◆ Magellan circumnavigation (1519-1522) in pursuit of spices
 - ◆ Pizarro leads expeditions to South America, destroys the Inca Empire (1524-1533)
-

Pre-18th Century: “Globalization,” Frontier Expansion, Induces Trade, Both Require Capital; Formation of Corporations and Funds Both Designed to Spread Risks; “The General Crisis in the 17th Century”

(Continued)

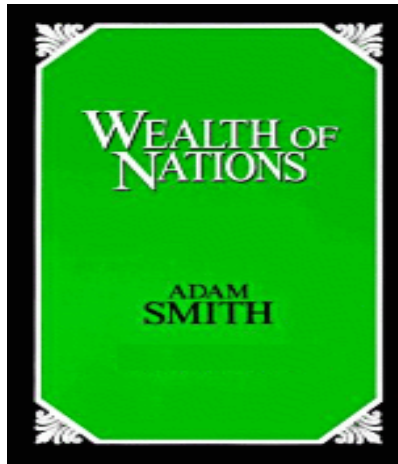
- ◆ Copernicus publishes theory that the Earth revolves around the sun (1543)
 - ◆ Schmalkaldic War (1546-1547)
 - ◆ Muscovy Company founded in London to find new trade routes to East and found new colonies (1552)
 - ◆ Spanish and French kings repudiate debt from prolonged war (1557)
 - ◆ England recession following recoinage by Elizabeth I (similar events in 1696, 1763, and 1875)
 - ◆ German Peasants' War (1524-1525)
 - ◆ French Wars of Religion (1562-1598)
 - ◆ Mercator's world map shows latitude and longitude for marine navigation (1569)
 - ◆ Eighty Years' War (1568-1648)
 - ◆ Sixteenth century expansion of the money base with opening up of massive sources of gold and silver in the Spanish American colonies. Spanish silver piece of eight is the first modern international trading currency
 - ◆ “Liberum veto” allowed just one vote, known as “the Golden Freedom,” in Polish Parliament (“Seym”) to block legislation. Helped sustain Polish “Great Magnates” but led to Polish vulnerability to foreign invasion (16th Century)
 - ◆ Amsterdam Stock Exchange established (1602)
 - ◆ Europeans enslaved estimated 2 million Africans (1600s)
 - ◆ Willem Janszoon makes first known landfall in Australia by a European (1606)
 - ◆ Dutch East India Company (1609), first common stock
 - ◆ Henry Hudson, first European to sail up N.Y. Harbor (1609)
 - ◆ First pre-modern corporations in 1600s designed to spread risks: English East India Company and Dutch East India Company
 - ◆ First modern forward, futures, options markets founded in Holland in 1600s
 - ◆ Wipper-und Kipperzeit (1619-1622) financial crisis at outset of Thirty Years' War (1618-1648)
 - ◆ Spain (Castile) declares bankruptcy in February (1627)
 - ◆ “Little Ice Age” in mid-17th century shrunk world population by one-third
 - ◆ First proto-central bank, Wisselbank (Bank of Amsterdam), formed by the Dutch in the early 1600s
 - ◆ Thirty Years' War (1618-1648)
 - ◆ Major financial crisis resulting from the beginning of Thirty Years' War; overvaluation of sterling to German monies
 - ◆ Tulip mania in Holland (1637)
 - ◆ Ottoman Empire re-conquers Baghdad, expels Iranians, and rules Iraq for most of the next three centuries (1638)
 - ◆ Irish Confederate Wars (1641-1653)
 - ◆ Start of English Civil War (1642)
 - ◆ Ottoman Empire and Venetian Republic in a state of war (1645-1669)
-

Pre-18th Century: “Globalization,” Frontier Expansion, Induces Trade, Both Require Capital; Formation of Corporations and Funds Both Designed to Spread Risks; “The General Crisis in the 17th Century”

(Continued)

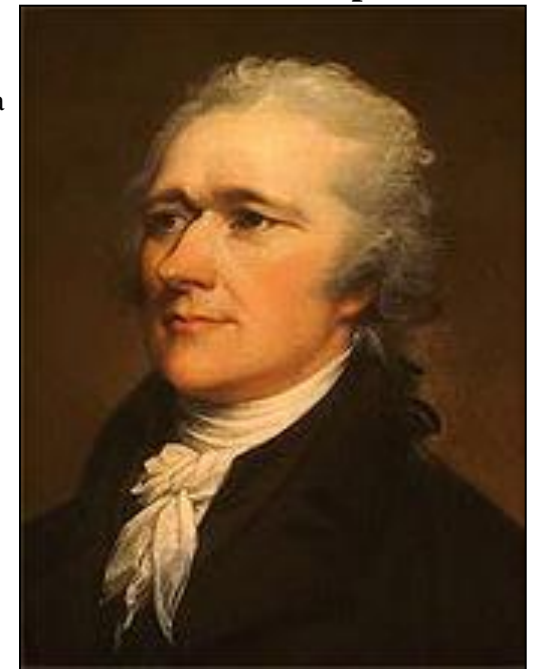
- ◆ English Civil War (1642-1651)
- ◆ Scottish Civil War (1644-1651)
- ◆ Philip IV declares Castile bankrupt (1647)
- ◆ Peace of Westphalia (1648) ends 30-Years War
- ◆ Mediterranean plague epidemic (1648-1656)
- ◆ Treaty of Pereyaslav forges close relationship between Russia and Ukraine (1654)
- ◆ Sweden attacks Poland (1655)
- ◆ Two-thirds of Istanbul destroyed in fire (1660)
- ◆ “Bills of Mortality” records London deaths. Probability and insurance fields followed (1664)
- ◆ Sweden starts world’s first central bank, “Sveriges Riksbank” (1668)
- ◆ Descriptive economics and finance texts emerge in 1600s
- ◆ William Petty-”Political Arithmetic” (1676)
- ◆ Almost one-third of the world population fell due to poor weather and civil unrest (17th century)
- ◆ War of the Holy League (1683-1699)
- ◆ Polish-Austrian-German forces defeated the Ottoman Empire at Vienna (1683)
- ◆ Bank of England founded in 1694, with assistance from Dutch via William of Orange Advisers
- ◆ Sir Isaac Newton takes over English Mint (1696) and thwarts crisis of counterfeiting and coining by prosecutions and harsh penalties, including death penalty

18th Century: Bubbles, Risk Tools Developed, Antecedents of Modern Capital Markets, Central Banks, and Economic Principles Emerge



- ◆ Dutch lead financial innovation
- ◆ Major government bond markets developed (Austria, England, France, Russia), despite and partially because of French Revolution (1789) and ensuing Napoleonic Wars (1803-1815)
- ◆ Deepening of capital markets via securitization
- ◆ Colonial plantation loans (negotiated in Holland), collateralized by plantation mortgages
- ◆ First securitizations through packaging of cash flows of illiquid claims
- ◆ Denmark, Germany, Spain, Sweden, Russia, & Latin American plantations; a forerunner to closed-end mutual funds
- ◆ Stocks: Dutch East India Co.; Dutch West India; British East India; Bank of England; South Sea Company, & A Company “For carrying on an undertaking of great advantage, but nobody to know what it is” (Mackay, Extraordinary Popular Delusions and the Madness of Crowds, p.78)
- ◆ De Moivre introduces standard deviation (1720)
- ◆ John Law’s Mississippi Company collapses (1720); South Sea Bubble (1720)
- ◆ Richard Cantillon – An Essay on Economic Theory (1755)
- ◆ The sextant measures latitude day or night and estimates longitude (mid-1700s)
- ◆ The chronometer lets ships accurately determine longitude (1760)
- ◆ AYR Bank troubles in U.K., speculation in stock of East India Co. (1772)
- ◆ Poland partitioned by Austria, Prussia, and Germany (1772, 1793)
- ◆ Eendragt Maakt Magt, a Dutch mutual fund formed in 1774 by Abraham Van Ketwich to invest in Austria
- ◆ Reconfiguration in 1774 of New World colonial possessions
- ◆ Dutch merchant and broker Adriaan van Ketwich invites subscriptions from investors to form a trust, the Eendragt Maakt Magt, with the aim of providing investment diversification opportunities to investors of limited means
- ◆ First U.K. building society founded in Birmingham in 1775
- ◆ First classical economics textbook: Adam Smith’s “Wealth of Nations” in 1776
- ◆ American Revolution (1776-1783) financed by Holland, France, Spain spurs creation of investment trusts
- ◆ First inflation-indexed bond in 1780 by Commonwealth of Massachusetts
- ◆ First human flight: the Montgolfier brothers’ hot air balloon in Paris (1783)
- ◆ Bank of New York co-founded by Alexander Hamilton on June 9, 1784
- ◆ Earliest reference to “capitalist” in Oxford Dictionary from a travel book, “Travels in France,” by Arthur Young (1792)
- ◆ Reign of Terror in France (1793)

Alexander Hamilton
Father of U.S. Capitalism



18th Century Common Sense Led to 20th Century Nobel Prizes

“....To spread as much as possible monies over good and solid securities. Because nothing is completely certain but subject to fluctuations, it is dangerous for people to allocate their capital to a single or a small number of securities.”

....Appendix to prospectus of Voordeel en Voorsigtig
(Profitable and Prudent)
Utrecht, Holland, 1776

“My Nobel prize was awarded mainly for proving that investors shouldn't put all their eggs in one basket.”

James Tobin, 1981 Winner of the
Nobel Prize in Economics

Capital Market Objectives

Before the 19th Century

- ◆ Capital raising: channeling savings
- ◆ Risk mitigation
- ◆ Income smoothing
- ◆ Business expansion without tying up capital
- ◆ Liquidity creation
- ◆ Personal loans, government debt, stocks
- ◆ Trading mutual funds (first mutual fund in 1774 had 20-25 securities, diversification for smaller investors)
- ◆ Annuities (Tontines)
- ◆ Plantation loans, antecedents of MBS, ABS
- ◆ Securitization, mutual funds, plantation loans

19th, 20th, 21st Centuries

- ◆ Economic stimulus (Monetary Policy and Cyclical “Fiscal Accordion”)
- ◆ Economic insurance
- ◆ Economic development
- ◆ Tax burden shifting
- ◆ Systemic Risk Analyses and Mitigation
- ◆ Stabilization and Positive Policy Promotion via World Bank, IMF, EIB, KFW, GSEs, IADB, ADB, SWFs, Municipal tax policy
- ◆ Globalization: International Division of Labor

18th – 19th Centuries: Industrial Revolution Supersedes Agricultural Supremacy



- ◆ Canals, railroads, telegraph, petroleum, electric lighting, telephones usher in age of innovation; modern corporation evolves to finance expansion
- ◆ Initial demographic worries (Malthus, 1798)
- ◆ Peak colonialist period by major powers in late 19th Century
- ◆ Early explanations of economic, finance, capital markets, principles, introductions of trade theory, marginalism, and fierce Marxist/socialist critiques
- ◆ Endless debates over “Theory of Value”
- ◆ England first to manufacture iron using coal instead of charcoal (1709)
- ◆ British government forbids craftsmen from emigrating (1719)
- ◆ Frequent economic crashes, bubbles (South Sea Company, 1720)
- ◆ “Canal Manias” in England, Europe
- ◆ First U.K. cotton-spinning mill (1760s)
- ◆ French and Indian War (1754-1763)
- ◆ Currency Act of 1764 prohibits American colonies from paper money issuance
- ◆ American Revolution (1776)
- ◆ Bank of New York founded on June 9, 1784 by Alexander Hamilton & partners
- ◆ French Revolution (1789)
- ◆ Jeremy Bentham – principle of utility (1789)
- ◆ Alexander Hamilton, first U.S. Treasury Secretary, consolidated state debts under central U.S. government (1790)
- ◆ First Bank of the United States (1791), lasts until 1811
- ◆ Bank of New York common stock first to trade on New York Stock Exchange (1792)
- ◆ First self-locomotion steam engine in Cornish, England on Christmas Eve (1801)
- ◆ Jean-Baptiste Say – A Treatise on Political Economy (1803)
- ◆ Napoleonic Wars (1803-1815)
- ◆ Russia defeats Sweden, ending the latter’s dominance of northern Europe (1809)



19th Century Global Relative Value Analysis/Geopolitical Risk Charting Effects of Onset of Crimean War in 1854

<u>Security</u>	<u>Peak Price</u>	<u>Date</u>	<u>Trough Price</u>	<u>Date</u>	<u>% Change</u>
British 3.0% consols	101.38	12/1852	85.75	4/1854	-15%
French 4.5% rentes	105.25	2/1853	89.75	3/1854	-15%
Austrian 5.0% metalliques	84.62	12/1852	64.25	12/1854	-24%
Prussian 3.5% bonds	94.50	12/1852	84.25	12/1854	-11%

Source: "The House of Rothschild." Niall Ferguson, p. 72

1800-1900: Nation State Unification Wars, Canals, Mining Railroads, Telegraph Spur Capital Needs

- ◆ Miners rush to “get rich quick in American West”; canals, steamships, and railroads cut transportation costs; government reduces tariffs; global economic integration accelerates
 - ◆ Beginning of business consolidations (railroads, banking)
 - ◆ The “excesses” of the U.S. Robber Barons (e.g., Jim Fisk, Jay Gould) lead to legislative/regulatory reforms
 - ◆ Accelerated development of economic science: Mill, Jevons, Walras, Austrian school
 - ◆ Investment choice set limited mainly to government bonds, railroad stocks, and bonds
 - ◆ Water utilities, gas lighting, horsecar lines either privately-held or municipally-owned
 - ◆ The Rothschild family establishes banking in Europe (Austria, England, Naples, France)
 - ◆ Robert Fulton’s steam engine moves from Manhattan to Albany (1807)
 - ◆ Farmers Exchange Bank of Gloucester, Rhode Island, First Chartered Bank in U.S. to fail (1809)
 - ◆ Charter for First Bank of U.S. expires (1811)
 - ◆ City Bank of New York (Citicorp) founded (1812)
 - ◆ U.S. goes to war with Britain on June 18, 1812
 - ◆ Napoleon invades Russia (1812)
 - ◆ Great Stock Exchange fraud in London on false claim of British victory over Napoleon (1814)
 - ◆ Treaty of Ghent ends Napoleon wars with Britain (1815); ushers in an age of “Laissez Faire Capitalism” that lasts until 1914
 - ◆ Second Bank of the U.S. chartered (1816)
 - ◆ United provinces of Rio de La Plata declare independence from Spain; Buenos Aires is capital (1816)
 - ◆ David Ricardo’s “The Principles of Political Economy and Taxation” (1817)
 - ◆ New York Stock Exchange formally founded (1817), supersedes Buttonwood Agreement of 1792
 - ◆ Erie Canal construction begins (1817); completed in 1825
 - ◆ First U.S. manufacturing firm in corporate form: Boston Manufacturing Company (1819)
 - ◆ U.S. panic, prices fell 30.6% between 1818-1821. Money supply falling, fiscal contraction as U.S. paid off debts mainly to non-U.S. investors, collapse in market for commodities, and European specie convertibility resumed (1819)
-

1820s: Industrial Revolution Quickens Arrival of Railroad Age

- ◆ Non-existent or inadequate regulation of capital markets
- ◆ Malthus publishes *Principles of Political Economy* (1820)
- ◆ Brazil gains independence from Portugal (1822)
- ◆ First Trust company in U.S.: Farmers Fire Insurance and Loan (1822)
- ◆ Dutch merchant banking house, Hope & Co., invents foreign depositary receipts in 1824, which helps globalize markets, includes U.S. railroad bonds
- ◆ U.K. financial crisis (1825)
- ◆ Erie Canal completed (1825)
- ◆ Six partner restriction on U.K. banks lifted (1826)
- ◆ U.S. Panic breaks out in July based on interlocking corporate financial leverage; law had not kept pace with innovations (1826)
- ◆ First photograph in France (1826)
- ◆ Baltimore & Ohio railroad formed (1828); railroad age arrives in 1830s
- ◆ Independence of Spanish colonies in the Americas (1820s)

1830s: Vast Infrastructure Development Projects, Especially Railroads, Unable to be Financed By Single Individual or Institution; First Great U.S. Depression (1837)

- ◆ U.S. real estate and commodity speculation boom fed by state banks printing money (1835)
- ◆ Concept of Earth “Ice Age” introduced by geologists (1830s)
- ◆ First U.S. sailing clipper ship (1832)
- ◆ Great Wall Street fire (1835)
- ◆ U.S. entirely pays off national debt (1836)
- ◆ Republic of Texas founded on defeat of Mexico at San Jacinto (1836)
- ◆ Jacksonian Populism ends Second Bank of the U.S. (1836) and leads to crash-susceptible U.S. until the arrival of Fed in 1913
- ◆ U.S. and U.K. alternate in crisis (1836-1839)
- ◆ U.S. panic wiped out 343 out of 859 banks (1837)
- ◆ No federal U.S. paper money issues; notes in circulation issued by banks; counterparts a problem (1837-1863)
- ◆ Second Bank of U.S. charter expires (1836) due to populist opposition from President Jackson
- ◆ U.S. canal, turnpike, real estate corrections, and abandonment of U.S. central bank triggers Panic and five following years of depression. Washington does not intervene (1837)
- ◆ United Provinces of Central America dissolve into separate states (1839)
- ◆ First U.S. local government bond default: Mobile, Alabama (1839); 12 more follow by 1842



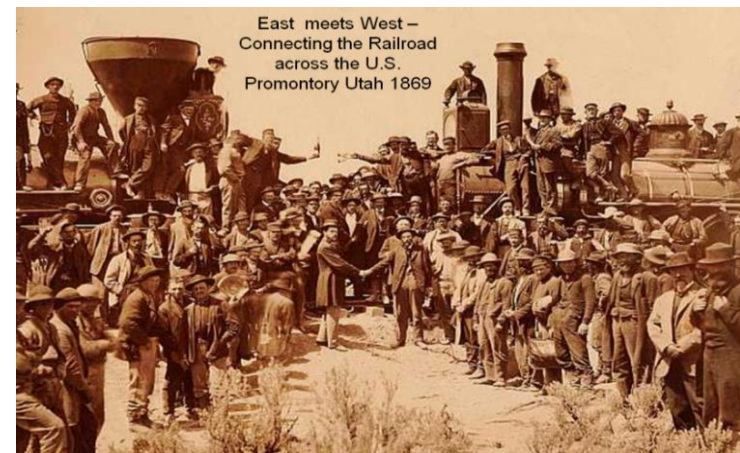
1840s: Rating Agency Antecedents; European Famine; U.S. Expansion Following War with Mexico; California Gold Rush

- ◆ In 1841, Lewis Tappan founds first credit reporting agency (Mercantile Agency), antecedent of Dun & Company (1859) and ultimately parent of Moody's (1962-2000)
- ◆ China cedes Hong Kong to Britain (1841)
- ◆ First Opium War forces China to open to British merchants (1839-1842)
- ◆ Mutual Life Insurance in New York sells first U.S. mutual life policy (1843)
- ◆ The Economist first published (1843)
- ◆ Foreign banks begin operating in China (1845)
- ◆ Texas annexed by the U.S. (1845)
- ◆ British Corn Laws introduced in 1815 and repealed in 1846
- ◆ Nine U.S. states default on infrastructure projects (canals)
- ◆ Famine in Ireland, Switzerland, and Germany (1847)
- ◆ John Marshall discovers gold in California on January 18, 1847, Gold Rush follows
- ◆ Revolutions sweep Europe (1848)
- ◆ French Revolution of 1848
- ◆ John Stuart Mill – Principles of Political Economy (1848)
- ◆ Under Treaty of Hidalgo, U.S. acquires large chunk of the West from Mexico for \$15 million (1848)
- ◆ Mexico cedes Southwest to U.S. (1848) following war
- ◆ Modern roots of CBOT (1848), contracts (1865)
- ◆ John Bradstreet founds a credit reporting agency (1849)



1850s & 1860s: Crimean War; Railroad Expansion Fuels Rise of Corporate Bond Market; U.S. Civil War & Reconstruction; U.S. “Robber Barons”; Suez Canal Opens

- ◆ U.S. railroad’s gigantic financial needs give birth to global corporate bond market as financing pours in from Europe
- ◆ Lehman Brothers founded (1850); RIP (2008)
- ◆ Railroads from Eastern U.S. reach Chicago (1850s)
- ◆ In Germany, mortgage-backed bonds issued by privately-held mortgage banks (Landschaften) and a national monopoly bank (Credit Foncier)
- ◆ Wells Fargo founded (1852)
- ◆ Crimean War (1854-1856), precursor to world wars of 20th century
- ◆ U.K. enacts Limited Liability Act for shareholders (1855-1856)
- ◆ The Ottoman Bank was founded in Istanbul (capital of the Ottoman Empire) as a joint venture between British, French, and Ottomans (1856)
- ◆ U.S. Panic of 1857 triggered by fall of Ohio Life Insurance & Trust from \$2 million embezzlement
- ◆ German Monetary Union (1857-1866)
- ◆ Darwin’s “Origin of Species” (1859)
- ◆ Edwin Drake discovers oil near Titusville, Pennsylvania on August 28 (1859)
- ◆ Carrington Event on September 2. Extreme solar flare knocks out telegraph lines (1859)
- ◆ Cobden Chevalier Treaty (1860) authorizes free trade between France and U.K.
- ◆ Late 1860s. Battle for control of Erie Railroad highlighted the frequent fights for corporate control
- ◆ U.S. issues first Treasury Notes (\$50 million) in July 1861
- ◆ China begins borrowing from foreign investors (1861)
- ◆ Wallachia and Moldavia united to form Principality of Romania (1861)
- ◆ Homestead Act (1862) opened up federal land to farm use and paved the way for farm bubble, contributed to Great Depression
- ◆ U.S. Civil War (1861-1865); U.S. currency depreciates as Gold Standard abandoned
- ◆ Mobs riot in New York to protest Civil War draft (1863)
- ◆ Confederacy issued a 20-year bond denominated in both British pounds and French francs, also convertible into cotton (1863)
- ◆ Congress passes National Association Bank Act, creating national bank system. Office of the Comptroller of the Currency (OCC) is established (1863)
- ◆ U.S. prints “Greenbacks” to finance the Civil War (1863)
- ◆ Shortage of cotton from American South induces Russia to expand south into Central Asia (1860s)
- ◆ Pasteurization of milk and other products extend longevity (1864)
- ◆ On October 20, 1864, President Lincoln formally established Thanksgiving as a national holiday
- ◆ First Trans-Atlantic Cable (1866)
- ◆ Shanghai stocks trade (1866)
- ◆ Overend, Gurney crash in U.K. on May 11; stock market crash in Berlin on May 1 (1866)
- ◆ “Dual Monarchy” in Austria/Hungary (1867)
- ◆ Latin Monetary Union formed by Italy, France, Belgium, Switzerland, and Greece (1867-1927)
- ◆ First stock ticker (1867)
- ◆ Meiji Restoration in Japan (1867)
- ◆ Karl Marx-Das Kapital (1867-1894)
- ◆ Companies Act of 1867
- ◆ Austrian-Hungarian monetary union (1867-1917/1918)
- ◆ Erie Railway War (1868)
- ◆ Poor’s Manual of the United States (1868)
- ◆ First U.K. mutual fund, “Foreign & Colonial Government Trust” (1868)
- ◆ Suez Canal opens; Russia occupy Central Asia (1869)
- ◆ U.S. Transcontinental Railroad completed (1869)
- ◆ Jay Gould schemes to drive the price of gold up; Erie railroad control war peaks (1869)
- ◆ Gold market collapses, “Black Friday” (1869) in gold corner by Jim Fisk and Jay Gould
- ◆ Cornelius “Commodore” Vanderbilt contributes to Panic (mainly in gold)



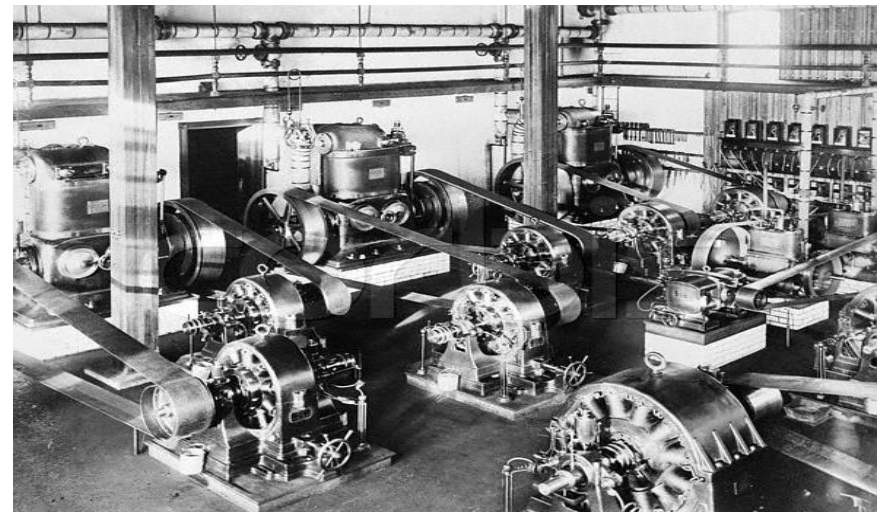
1870s: U.S. Reconstruction After Civil War; Oil Age Begins; Long Depression of 1873-1897

- ◆ Cornelius Vanderbilt amasses a transportation fortune
- ◆ Franco-Prussian War (1870)
- ◆ Deutsche Bank founded (1870)
- ◆ Standard Oil of Ohio founded (1870)
- ◆ Japan first floats foreign bonds (1870s)
- ◆ Marginal Utility Revolution set off by Menger, Jevons, Walras (1870s)
- ◆ First Chinese joint stock company (1870s)
- ◆ U.S. tries to import European-style mortgage-credit bonds (1870s)
- ◆ U.S. Mortgage Company founded to market HY mortgage bonds to European investors (1870s)
- ◆ Creation of National Association of Insurance Commissioners, setting the stage for state regulation of insurers (1871)
- ◆ “Paris Commune,” radical socialist government from March 18 to May 28, 1871
- ◆ Gold standard adopted by Germany & Japan (1871); France & Spain in (1876)
- ◆ U.S. bank panic (1873) and Australian correction usher in “Long Depression” of 1873-1897 in U.S. and Europe; U.S. state & local government default surge (1873-1879)
- ◆ U.S. depression followed end of post-Civil War reconstruction and completion of transcontinental railroad (1873); Missouri, Kansas, Texas railroad fails as well as Jay Cooke’s firm
- ◆ “Crime of 1873”: U.S. Coinage Act called for a return of Gold Standard and demonetizing silver
- ◆ Scandinavian monetary union (1873)
- ◆ Jay Cooke unable to meet obligations and sets off a panic (1873)
- ◆ Leon Walras – General Equilibrium Theory (1874)
- ◆ Mumbai (Bombay) Exchange founded; the oldest stock exchange in India as well as Asia, established as “The Native Share & Stock Brokers Association” (1875)
- ◆ U.S. Resumption Act of 1875: U.S. Government resumes payment in gold for legal tender; significant deflation ensues
- ◆ “Where are the Customers’ Yachts?” posed by William Travers in Newport Rhode Island (1875)
- ◆ Telephone patented (1876), first phone call
- ◆ Francis Galton introduces regression to the mean (1877)
- ◆ Russo-Turkish War (1877)
- ◆ Thomas Edison invents the phonograph (1877)
- ◆ Congress of Berlin (1878)
- ◆ City of Glasgow Bank fails (1878)
- ◆ U.S. depression (1878)
- ◆ Tokyo Stock Exchange founded on May 15, 1878



1880s: A Golden Age of Capitalism, Electricity, Emigration, New Statistical Methods; International Gold Standard (1879-1914)

- ◆ Henry George proposed importance of real estate on business cycle (1879)
- ◆ Edison develops practical electrical lighting (1879)
- ◆ Foundations of modern global economy forged under banner of capitalism
- ◆ Long deflation, 11 U.S. business cycles (1879-1914)
- ◆ Massive European emigration to U.S.
- ◆ Technological advances: electricity, telephone, oil, steel
- ◆ Era of U.S. business titans: J.P. Morgan, Andrew Carnegie
- ◆ London: world capital of finance
- ◆ International Congresses on disarmaments eventually formed a League of Nations to outlaw war
- ◆ General Equilibrium Theory (Walras) and marginalism sweep economics; still mainly a “textbook-driven science”
- ◆ Commercialization of science (1880s)
- ◆ U.K., France, Germany world’s largest exporters of capital (1881-1913)
- ◆ Standard Oil Trust created by John D. Rockefeller (1882)
- ◆ Bank of Japan founded (1882)
- ◆ Dow Jones & Co. formed (1882)
- ◆ Krakatoa erupts (1883)
- ◆ Charles Dow devises the first stock average (1884)
- ◆ Panic of 1884 caused by fall of Grant & Ward
- ◆ Berlin Conference partitions Congo region among European colonialists (1885)
- ◆ Interstate Commerce Commission, first U.S. regulatory agency, intended to regulate U.S. railroad rates (1887)
- ◆ Wilhelm II becomes King of Prussia and German emperor (1888)
- ◆ Financial Times founded (1888)
- ◆ Slavery abolished in Brazil and another influx of European emigration begins (1888)
- ◆ End of Latin American and Caribbean slavery triggers a huge emigration of Calcutta-area Indians as servants
- ◆ Wall Street Journal founded (1889)
- ◆ Max Weber’s Sozialökonomik (Social Economics) vs. Methodenstreit feud polarized economics into theoretical vs. historical methods (1880-1910)



An Early Electric Generator

1890s: First Golden Age of Capitalism, Electricity, Immigration, New Statistical Methods; International Gold Standard (1879-1914)

- ◆ One-third of U.S. railroad mileage goes through bankruptcy in 1890s
 - ◆ U.S. bank panic (1890); Bank of England rescues Barings Brothers from Argentine Loans (1890)
 - ◆ Sherman Anti-Trust Act (1890) designed to battle U.S. monopolies
 - ◆ Alfred Marshall publishes “Principles of Economics” (1890)
 - ◆ First U.S. major merger wave (1890)
 - ◆ The end of frontier announced by U.S. Census Bureau (1890)
 - ◆ Plague swept China and India (1890s)
 - ◆ Shanghai Share Brokers Association established, creating China’s first stock exchange (1891); renamed Shanghai Stock Exchange (1904)
 - ◆ National Bank of China founded (1891)
 - ◆ First traveler’s check cashed by an executive from American Express on August 5 (1891)
 - ◆ French form union of Indochina (Vietnam, Cambodia, and Laos (1887 and 1893))
 - ◆ Swedish economist Knut Wicksell delivers a synthesis and critique of Classical Economics (1893)
 - ◆ First auto built in the U.S. at Springfield, Illinois, by Duryea Brothers (1893)
 - ◆ Panic of 1893 induced by failure of Philadelphia and Reading Railroad; J.P. Morgan helps President Cleveland by raising gold in Europe to restore systemic liquidity
 - ◆ 1800 U.S. firms merged into 93 in rapid industrialization (1894-1904)
 - ◆ U.S. imposes 2% tax on incomes above \$4,000 (1894)
 - ◆ Sino-Japanese War over Korea (1894-1895)
 - ◆ William Jennings Bryan Cross of Gold Speech (1896)
 - ◆ Nicholas II crowned czar in Russia (1896)
 - ◆ Dow Jones hits lowest level ever on August 8 at 28.48 (1896)
 - ◆ Alaska Gold Rush (1897)
 - ◆ Greco-Turkish War (1897)
 - ◆ U.S. Depression (1893-1897); state & local government default wave (1893-1899)
 - ◆ U.S. merger wave (1896-1900) on end-of-century enthusiasm
 - ◆ Last hurrahs of expansion colonialism: Spanish-American War (1898: Cuba & Philippines become U.S. protectorates); Boer War (1899)
 - ◆ “Open Door” policy in China (1899)
 - ◆ A.M. Best Co. established (1899)
-

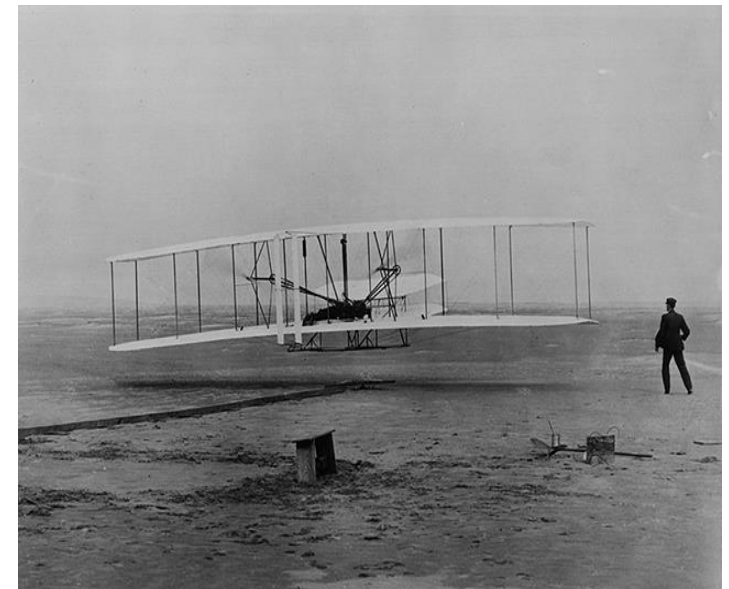
Late 19th/Early 20th Century: Innovations and Corporate Consolidation Spur Deepening of Capital Markets; Gold Standard; Frequent U.S. Panics Lead to Fed

First Model T Ford



- ◆ European imperial rivalries in last stages of colonialism
- ◆ Arms race (Dreadnoughts) battleships
- ◆ Idyllic, interrelated world where economics thought to prevent European Great Powers from warfare
- ◆ Golden Age of laissez-faire capitalism, gold standard, no exchange controls, or customs barriers
- ◆ Emigration (nine million from Europe to U.S.)
- ◆ Trust-Busting in the U.S., fear of excessive concentration of economic power
- ◆ Cinema; Cubism; Futurism
- ◆ U.S. moves from agrarian to industrial-based economy
- ◆ Last gasp of classical economics
- ◆ “Muckraker” U.S. journalists expose poor conditions in meat-packing and drug industries

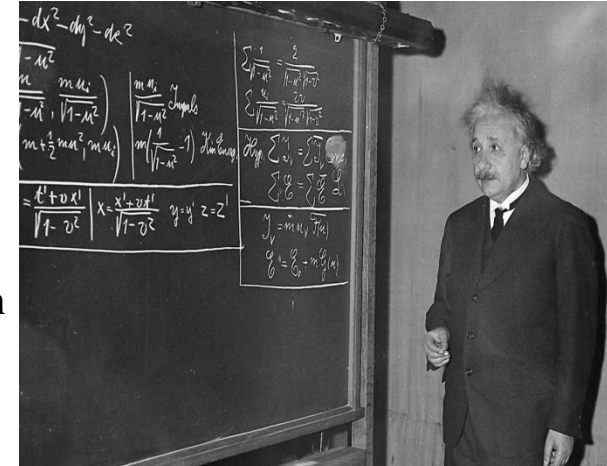
- ◆ 13 Panics in U.S. from 1814-1914
- ◆ Rating agencies founded, starting with Moody’s Investors Service (1900)
- ◆ Share of exports in world trade reaches a peak not surpassed until 1970
- ◆ Boxer Rebellion in China (1900)
- ◆ N.Y.C. Subway work begins (1900)
- ◆ U.S. adopts gold standard (1900)
- ◆ Jules Regnault (1863) and Louis Bachelier – random character of stock prices (1900)
- ◆ Oil discovered in Texas (1901)
- ◆ Victrola phonograph introduced (1901)
- ◆ J.P. Morgan organizes mergers of Carnegie Steel, Federal Steel, American Steel to form U.S. Steel (\$1.4 billion capitalization) in March (1901)
- ◆ Northern Pacific Panic precipitated by battle for control between Edward Harriman and J.P. Morgan (1901)
- ◆ First radio transmission across the Atlantic (1901); broadcasts begin (1909)
- ◆ Triple Entente (France, Russia, U.K. in 1907) arrayed against Triple Alliance (Germany, Austria-Hungary, Italy in 1902) as Europe’s “Great Powers” compete
- ◆ First human flight by Wright Brothers; French inventors claim prior flights
- ◆ “Rich Man’s Panic” of 1903
- ◆ Electrocardiograph (1903)
- ◆ Panama declares independence from Colombia (1903)
- ◆ Panama Canal construction begins (1904)



Kitty Hawk, NC, December 17, 1903
Orville Wright's first airplane flight

Late 19th/Early 20th Century: Innovations and Corporate Consolidation Spur Deepening of Capital Markets; Gold Standard

- ◆ Japanese/Russian War (1904-1905): settlement partial basis for WWII
- ◆ Foreshadowing the technology equity boom in the 1990s, early 20th century investors reached for speculative investments in mining, autos, and wireless telegraph (radio) (1900-1920)
- ◆ Einstein's Special Theory of Relativity (1905)
- ◆ First Moroccan Crisis ends, brokered by U.S. (1905)
- ◆ First savings bank in China founded, Sin Chun Bank (1906)
- ◆ 1907 Panic initiated by copper crash, also known as the NY-Turin financial crisis, with Knickerbocker Trust failing, resolved by J.P. Morgan
- ◆ International Peace Conference at the Hague (1907)
- ◆ Anglo-Persian oil (BP) strikes oil in Iran (1907)
- ◆ The world's first MBA program established, with a faculty of 15 and 33 students (Harvard University, 1908)
- ◆ In 1903, Ford begins production of automobiles (Model T introduced 1908)
- ◆ Moody's begins publication of ratings, railroads only, as issuer disintermediation from banks grows corporate bond market (1909)
- ◆ Korea Central Bank founded (1909), rechartered in 1950
- ◆ Moody's begins publication of yield averages by investment-grade rating categories (1909)
- ◆ Siam (Thailand) surrenders property to Britain (1909)
- ◆ Japan annexes Korea, Portuguese monarchy ousted, Mexican revolution (1910)
- ◆ Secret meeting on Jekyll Island, Georgia, lays basis for Federal Reserve Act (1910)



1910-1919: New World Order Following Great War and Treaty of Versailles

- ◆ Chinese revolution, Sun Yat Sen overthrows Qing dynasty, Republic founded (1911)
- ◆ Kansas (1911) enacts first modern state securities law, requiring registration of most new securities issues offered within the state as well as licensing of people engaged in the securities business. Other states follow
- ◆ Standard Oil broken up (1911)
- ◆ “Principles of Scientific Management” by Fredrick Winslow Taylor (1911)
- ◆ Triangle Shirtwaist Fire (1911) buttresses social reform efforts and a young Frances Perkins, first woman cabinet official, and architect of Social Security in 1930s
- ◆ First Balkan War (1912-1913)
- ◆ The Federal Reserve System (Fed) created on December 23, 1913
- ◆ Pujo Committee Reviews Trust Banks (1912)
- ◆ Investment Bankers Association of America (1912)
- ◆ Ford Model T assembly line starts on December 1, 1913
- ◆ Fitch founded investors service (1913)
- ◆ Quantum mechanics introduced by Bohr (1913)
- ◆ Zipper invented (1913)
- ◆ X-rays (1913)
- ◆ London Stock Exchange closes for first time in its history on July 31, 1914 with onset of “Great War”; NYSE closes in December (1914)



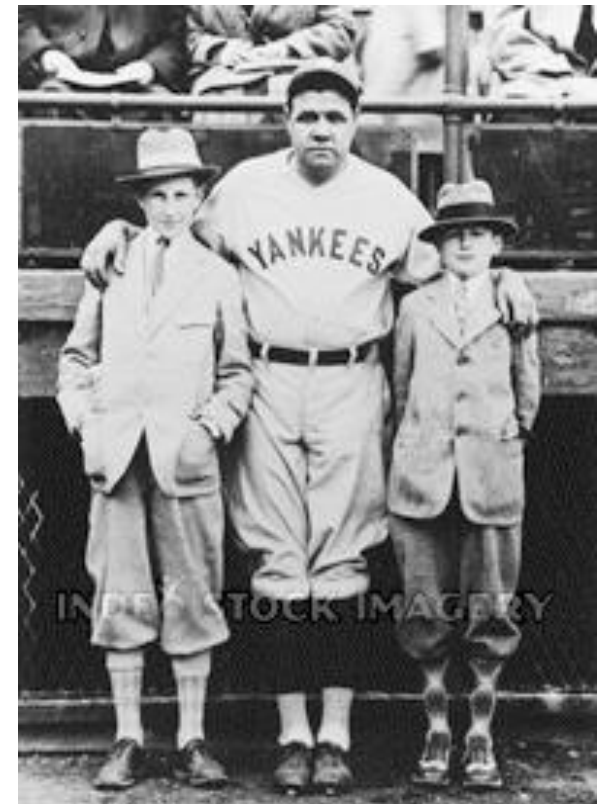
1914-1918: “The Great War” & “The Great Disruption”; Breakup of Austro-Hungarian and Ottoman Empires; Russian Revolution



- ◆ Predecessor of Merrill Lynch created (1914)
- ◆ Panama Canal opens (1914)
- ◆ “The Great Disruption” (World War I) 1914-1918, equity exchanges close first four months
- ◆ Lusitania sunk (1915)
- ◆ Einstein’s General Theory of Relativity (1915)
- ◆ Sykes-Picot Agreement on May 16, 1916 partitions Ottoman Empire into modern boundaries
- ◆ Poor’s Ratings begin (1916)
- ◆ Russian Revolution (1917)
- ◆ End of many European monarchies (1917 on)
- ◆ U.S. enters WWI on April 16, 1917
- ◆ Birth of modern repo. Fed Reserve banks need to extend credit to banks during a period when the commercial paper market was not open (1917)
- ◆ Treaty of Versailles, Paris Peace Conference (1919)
- ◆ First bond traded on NYSE (1919)
- ◆ Support for British sterling and French franc abandoned (1919)
- ◆ Start of U.S. Prohibition (1919)
- ◆ Asiatic American Underwriters Founded (1919)
- ◆ First state and local government bond ratings by Moody’s (1919)
- ◆ Poland exists as nation for the first time in 126 years until German invasion on September 1, 1939 and Russian invasion on September 17, 1939. After German attack on Russia in mid-1941, Germany occupied Poland until expelled by Russian army in 1944-1945
- ◆ U.S. becomes global financial leader, displacing war-depleted Great Britain

1920s: Recovery, Speculative Excess, & Crash

- ◆ Last pinnacle of British imperial power: free trade regulated through Bank of England's administration of gold standard
- ◆ "The Uneven Economic Recovery" from the Great War
- ◆ Bauhaus, abstract art, surrealists, alienation
- ◆ Descriptive finance literature abounds
- ◆ Political agitation: growth of Marxist political/economic ideology, especially in Europe
- ◆ Dow Jones quadruples in burst of speculative excess, aided by stock speculators
- ◆ Central bankers still perfecting their craft
- ◆ Equities fall (1920), U.S. Depression (1920/1921)
- ◆ U.S. Women's Suffrage (1920)
- ◆ City Equitable, under Gerard Bevan, engages in fraud by misstating balance sheet to make acquisitions of London Brokers (1920)
- ◆ Turkey gives up Iraq and Palestine, which become British mandates. Syria and Lebanon become French mandates (1920)
- ◆ John von Neumann begins to develop game theory; unlike the physical sciences, agents (individuals) interact (1920)
- ◆ Russian-Polish War (1920) won by Poland
- ◆ Wall Street bombing, 38 killed (September 16, 1920)
- ◆ Shanghai Securities and Commodities Exchange (1920)
- ◆ Radio broadcasting begins (1920)
- ◆ Second major U.S. major merger wave (1920s)
- ◆ Repo used to help extend credit to nonbank dealers to foster secondary market beginning for bankers acceptances (1920s)
- ◆ Darville-Johnson bond yield chart (1920); patent Shanghai Chinese Merchant Exchange (1921)
- ◆ Chinese government declares bankruptcy on October 9, 1921
- ◆ Futures Trading Act of 1921 passed to regulate futures trading activity
- ◆ Germany leaves gold standard (1921)



1920s: Recovery, Speculative Excess, & Crash

- ◆ Mussolini takes Rome, Washington Disarmament Pact, Standard begins to issue ratings (1922)
- ◆ Soviet Union established by Communist Party (1922)
- ◆ German hyperinflation in Weimar Republic (1922, 1923)
- ◆ Standard Statistics develops its first equity index of 233 U.S. based companies (1923)
- ◆ Treaty of Lausanne sets the boundaries for modern Turkey and supercedes 1920 Treaty of Sevres that called for formation of Kurdish state (1923)
- ◆ Norinchukin Bank founded (1923)
- ◆ Alfred Sloan becomes GM CEO (1923)
- ◆ Edwin Hubble finds galaxies outside the Milky Way (1923)
- ◆ Mass Fi & State Street Research create first open-ended U.S. mutual funds, Fitch begins to issue ratings (1924)
- ◆ The first U.S. mutual funds are established in Boston (1924)
- ◆ Dawes Plan (1924): America lends money to Germany to help repay debts to victorious allies of WWI
- ◆ Florida real estate bubble (1925); Britain returns to gold standard
- ◆ Frozen foods introduced (1925)
- ◆ J.P. Morgan creates first ADR's (Selfridges, 1927)
- ◆ Sound movies (1927)
- ◆ Benjamin Graham writes to John Rockefeller, Jr. in June to request a special dividend by cash-rich Northern Pipeline. This serves as a template for more aggressive shareholder activism (1927)
- ◆ Latin Monetary Union (Belgium, France, Greece, Italy, Spain, Switzerland) of 1867-1927 fails on lower gold content in coins (debasement)
- ◆ Kuhn, Loeb banker Paul Warburg warns about high equity values in 1927
- ◆ Motorola founded (September 25, 1928)
- ◆ Penicillin discovered (1928)
- ◆ October stock market crash (October 29, 1929)
- ◆ The two Shanghai exchanges merged into the Shanghai Stock Exchange (1929)
- ◆ Stalin five-year economic plan initiated (1929)
- ◆ Refrigerator introduced (1920s)



1930s: Great Depression/Prelude to Second World War/TV/Jets

- ◆ Global depression: regulatory and legislative responses to protect financial system
 - ◆ Part of Europe disintegrates into fascism and totalitarianism
 - ◆ New Realism; color film
 - ◆ Dust Bowl in U.S. Plains states
 - ◆ Roger Babson predicts equity crash on September 5 at a business conference. The NYSE fell 3% due to “Babson Break.”
Renowned Yale economist Irving Fisher famously announced two weeks before the Crash “Stocks have reached what looks like a permanently high plateau.” (1929)
 - ◆ U.S. state & local government default wave (1929-1937)
 - ◆ Radar introduced (1930s)
 - ◆ Bank of International Settlements created (1930)
 - ◆ Smoot-Hawley Tariff enacted; Bank of U.S. fails (1930)
 - ◆ Brazilian government bankruptcy due to coffee price supports; inflation surge begins; government revolt (1930)
 - ◆ Irving Fisher – Theory of Interest (1930)
 - ◆ 7,000 U.S. banks fail (1930-1933)
 - ◆ S&P 500 loses 43.34% (1931)
 - ◆ Scandinavian Monetary Union (1873-1931) falters
 - ◆ U.K. abandons gold standard (1931)
 - ◆ Banking crisis in Germany and Austria; Creditanstalt fails in Austria (1931)
 - ◆ FRB mandate debt require independent credit ratings (1931)
 - ◆ Japan invades Manchuria (1931)
 - ◆ Discovery of East Texas oil field leads to U.S. oil glut
 - ◆ Federal Home Bank Act of 1932 creates Federal Home Loan Bank system
 - ◆ Saudi Arabia Kingdom founded by Abdul Aziz bin Saud (1932)
 - ◆ Central Bank of Turkey founded (1932)
 - ◆ Ivan Krueger, “Match King,” empire begins to unravel (1932)
 - ◆ “New Deal” social legislation begins during FDR’s 100 days to restart U.S. economy (1933)
 - ◆ “There must be an end to speculating with other people’s money”: FDR, 1933
 - ◆ Creation of Fed's Open Market Committee (1933)
 - ◆ World Economic Conference (June and July 1933)
 - ◆ U.S. leaves gold standard (1933)
 - ◆ Home Owner's Loan Act of 1933 grants Federal Home Loan Bank Board oversight of thrifts (1933)
 - ◆ Glass-Steagall separates commercial/investment banking (1933)
 - ◆ Tennessee Valley Authority (1933) created as a public power corporation as part of “New Deal”
-



1930s: Great Depression/Prelude to Second World War/TV/Jets

- ◆ Dun and Bradstreet merge (1933)
- ◆ Hitler assumes power in January 1933, annexes Austria in 1938
- ◆ SEC founded under U.S. Securities Acts of 1933 and 1934
- ◆ Principles of modern security analysis articulated by Ben Graham; Graham & Dodd publish “Security Analysis” (1934)
- ◆ U.K. defaults on first World War debt to U.S. (1934)
- ◆ Germany defaults on Dawes Plan debt (1934)
- ◆ Turing conceives modern computer (1935)
- ◆ U.S. Social Security Act (1935)
- ◆ Reserve Bank of India established (1935)
- ◆ “Modern” economics founded; end of classical economics with Keynes’s “General Theory” in 1936
- ◆ Spanish Civil War (1936)
- ◆ “Comprehensive Bond Values” purchased by John Nuveen & Co. for municipal securities (1936)
- ◆ 35% of Soviet bonds sold in N.Y. in 1920s are in default
- ◆ France leaves gold standard (1936)
- ◆ U.S. Comptroller of the Currency mandates bond ratings use by banks (1936)
- ◆ Japan invades China (1937)
- ◆ New York Society of Security Analysts founded (1937)
- ◆ Marco Polo Bridge Incident (July 7, 1937)
- ◆ Brazilian coup established and economy placed under military control (1937)
- ◆ Thomas Rowe Price founds investment advisor, T. Rowe Price
- ◆ Duration first formulated by Frederick Macaulay (1938)
- ◆ Munich conference grants Czechoslovakia decolonization (1938)
- ◆ FNMA founded (1938)
- ◆ Only U.S., U.K, Holland, Belgium, Sweden, Italy, & Japan were capital exporters (1938)
- ◆ Oil found in Saudi Arabia and Kuwait (1938)
- ◆ Richard Whitney, former president of the NY Stock Exchange, convicted of embezzlement (1938)
- ◆ World War II begins on September 1, 1939 with German invasion of Poland
- ◆ TV introduced (1939)
- ◆ Color movies arrive (1939)
- ◆ First jet aircraft (1939)
- ◆ First helicopter (Sikorsky) (1939)
- ◆ First FM Radio broadcast on July 18, 1939



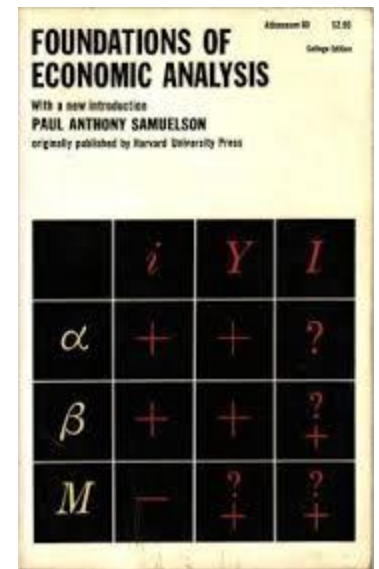
1940s: World War II Ends and Cold War Starts; Asian & European Reconstruction Era Begins; Decolonization Commences

- ◆ Common Culture, Existentialism
- ◆ U.S. savings rate soars during World War II
- ◆ U.S. Investment Companies Act (1940)
- ◆ “Where are the Customers’ Yachts?” by Fred Schwed Jr. (1940); “Booms Go Boom”
- ◆ Conclusion of World War II breeds concern about an economic plunge back into recession /depression
- ◆ Richard and Maurice McDonald open a hamburger restaurant in San Bernardino (1940)
- ◆ Touchtone dialing invented by AT&T (1946), but not rolled out until the 1970s
- ◆ Japan takes over Shanghai and the exchange ceases operation (1941). The exchange restarted after WWII but was again shut down in 1949
- ◆ Lend-lease bill passed to aid U.S. allies in Europe (March 1941)
- ◆ Standard & Poor’s merge (1941)
- ◆ Pearl Harbor, U.S. enters World War II (December 1941)
- ◆ SEC establishes rule 106-5 against insider trading (1942)
- ◆ Poland-Ukrainian conflict (1943-1947)
- ◆ Joseph Schumpeter – creative destruction (1942) and History of Economic Analysis (1954)
- ◆ Bretton Woods: 44 Nations gather to launch World Bank & IMF (July 1944)
- ◆ Hayek publishes “The Road to Serfdom” (1944)
- ◆ “Financial Analyst Journal” debuts in January 1945
- ◆ Sukarno declares Indonesia to be independent (1945)
- ◆ Big Three set post-World War II order at Yalta (February 1945)
- ◆ Ho Chi Minh declares Vietnam independent (1945)
- ◆ Microwave oven (1945)
- ◆ Nuclear weapons (August 1945); WW II ends (September 1945)
- ◆ U.N. founded (1945)
- ◆ First U.S. private equity firms (American Research and Development and J.H. Whitney) (1946)



1940s: Quantitative Economics/Finance Begins to Supersede “Syllogistic Qualitative Antecedents”

- ◆ Communist cell at U.S. Treasury (mid-to-late 1940s) includes Harry Dexter White, chief U.S. delegate at Bretton Woods
- ◆ U.S. corporate bond yields reach all-time lows (1946) until 2011-2016
- ◆ ENIAC, world’s first commercial computer (1946)
- ◆ Britain nationalizes health care (1946)
- ◆ The Philippines gain independence from U.S. (1946)
- ◆ Quantification of economics and finance accelerates; Paul Samuelson publishes “Foundations of Economic Analysis” (1947)
- ◆ Decolonization begins with India, Pakistan (August 1947), Indonesia (1949)
- ◆ India and Pakistan partitioned (1946)
- ◆ Cold War starts (1947)
- ◆ Transistor invented (1947)
- ◆ Investor Jack Dreyfus founds a brokerage house, Dreyfus & Co. (1947)
- ◆ Polaroids arrive (1947)
- ◆ General Agreement on Tariffs and Trade (GATT) takes effect on January 1, 1948
- ◆ Marshall Plan for Europe launched, Truman Doctrine; Burma becomes independent (1948)
- ◆ Paul Samuelson publishes “Economics: An Introductory Analysis” (1948)
- ◆ Berlin blockade (1948)
- ◆ Israel founded, Korea divided (1948)
- ◆ Communist China founded (1949)
- ◆ NATO formed; Germany divided into East and West (1949)
- ◆ Newfoundland formally joins Canada (1949)
- ◆ Jones Hedge Fund founded by Alfred Winslow Jones (1949), viewed as first modern hedge fund



1950s: The Post-War Healing, Reconstruction of Europe and Asia, Consumerism, Industrial to Information Age; Birth of Modern Finance; Fixed Exchange Rate Era of Bretton Woods

- ❑ Baby Boom Peaks
- ❑ Suburbanization; “Organization Man”
- ❑ Consumerism, TV, & tech revolution
- ❑ First credit cards
- ❑ Risk management improves
- ❑ Fed’s “lean against the wind” monetary policy (1950s/1960s)
- ❑ Lessons of 1930s constrain risk taking
- ❑ Institutional investing blossoms
- ❑ President Eisenhower initiates U.S. Interstate Highway System in an example of “big infrastructure”
- ❑ Capitalism vs. socialism vs. communism, “Red Scare” in U.S. (1950s)
- ❑ Corporate pensions begin shift to equities (1950s)
- ❑ Compartmentalization of U.S. bond market in response to increased legislative requirements (1950)
- ❑ GM president Charles Wilson launches GM Pension Fund, emulated by thousands of firms. Diversification and equities favored, becomes the basis for ERISA Act of 1974 (1950)
- ❑ John Nash eventually wins a Nobel Prize for game theory (1950)
- ❑ Robert Schuman, French Foreign Minister, proposes European coal and steel community (1950) that paves way to euro (1999)
- ❑ Korean War (1950-1953) fought to a stalemate
- ❑ India’s Planning Commission established (1950) and first five-year plan period (1951-1956)
- ❑ Hickman’s NBER credit study (1951) provides basis for high-yield market take-off in the 1980s
- ❑ Accord between U.S. Treasury and Fed loosens “peg” on U.S. government interest rates (1951)
- ❑ “Proxyteer Movement” uses proxies to gain corporate control (1951)
- ❑ Modern finance founded with Harry Markowitz’s “Portfolio Theory”, making risk the center of investment decision-making: “Investing is a bet on an unknown future.” mean-variance portfolio selection (1952)
- ❑ First hydrogen nuclear bomb tested on November 1, 1952 on the Pacific Island of Elugelab (1952) by the U.S.



Levittown, New York

1950s: Regional and Global Economic Integration Designed to Reduce GPR Risks of First-Half of 20th Century

- ◆ New York Stock Exchange ceases its 10 am to 12 pm trading operations on Saturdays (1952)
 - ◆ DNA mechanism discovered by Crick & Watson (1953), basis for enormous subsequent innovation in life sciences
 - ◆ Iranian regime change to inhibit nationalization of oil (1953)
 - ◆ Multiple currency exchange rate introduced in Brazil and import-substitution industrialization (1953)
 - ◆ First IBM Computer (1953)
 - ◆ Japan begins growing at 9% rate (1953-1971 average)
 - ◆ First “Godzilla” movie in 1954
 - ◆ Contentious battle for control of New York Central Railroad by Robert Young (1954)
 - ◆ U.S. Treasury adopts quarterly auction cycle (1954)
 - ◆ Arrow and Debreu – existence of general equilibrium (1954)
 - ◆ Soviet Union transfers Crimea to Ukraine (1954)
 - ◆ Israel & Iceland issue inflation-linked bonds (1955)
 - ◆ Birth control pill (1955)
 - ◆ Polio vaccine (1955)
 - ◆ Japan joins GATT (1955)
 - ◆ The first U.S.-based international mutual fund is introduced (1955)
 - ◆ Hungarian Revolution & Suez Crisis (1956)
 - ◆ Ford Motor goes public (1956)
 - ◆ Container shipping era begins with the first shipment by Malcom Purcell McLean from Newark to Houston on April 26, 1956
 - ◆ U.S. Bank Holding Act of 1956 prohibits bank holding companies from controlling multiple U.S. commercial banks and from engaging in activities other than banking, managing banks or activities “closely related” to banking through affiliates (1956)
 - ◆ Korean Stock Market founded (1956)
 - ◆ Robert Solow – growth theory (1956)
 - ◆ James Tobin – separation theorem, liquidity preference (1957)
 - ◆ European Investment Bank founded (1957)
 - ◆ The S&P 500 Index created (1957)
 - ◆ Sputnik on October 4, 1957 kicks off space race (1957)
 - ◆ Treaty of Rome (1957)
 - ◆ First hostile takeover: Reynolds acquires British Aluminum (1958)
 - ◆ First pacemaker (1958)
 - ◆ Boeing 707 (1958) opens up rapid intercontinental travel
 - ◆ Euro dollar market forms as Soviet Union stores dollars in Paris instead of New York market, eventually moves to London (1958)
 - ◆ Franco Modigliani and Merton Miller provide theory of corporate finance and define equilibrium in financial markets (1958)
 - ◆ First venture capital limited partnership: Draper, Gaither, and Anderson (1958)
 - ◆ Computer chip patented (1959)
 - ◆ Cuban Revolution (1959); Castro takes over Cuba
-



1958 Morning Star Thunderbird

Evolution of Financial Analysis: A Sample of “Fascinating” *Financial Analyst Journal* Articles from the 1940s and 1950s

- ◆ “Air Conditioning”
- ◆ “Titanium: A Metal With a Future”
- ◆ “Whiskey: An Industry Developing Stability and Investment Status”
- ◆ “Investment Opportunities in Hosiery”
- ◆ “An Analyst Looks At a Port”
- ◆ “The Investment Outlook for Uranium”
- ◆ “A Trip to the Thew Shovel Company”
- ◆ “The Outlook for Uranium”
- ◆ “Decline of the American Woolen and Worsted Industry”

1960s: Space Race/Vietnam War/Chinese Cultural Revolution/Modern Finance Extended



- ◆ Buoyant global economic growth
 - ◆ Radicalism
 - ◆ Integrated circuits
 - ◆ Birth of SEC activism (1960-1964)
 - ◆ Laser introduced (1960)
 - ◆ Third U.S. merger wave (1960s)
 - ◆ U.S. enacts Real Estate Investment Trust Act on September 14 that allows retail investors to buy shares in commercial real estate (1960)
 - ◆ Equities: the “Go – Go Years” for “Nifty Fifty”
 - ◆ Global capital market flow analysis invented
 - ◆ Theoretical rationale for euro by Robert Mundell
 - ◆ Performance/risk attribution by Barr Rosenberg
 - ◆ OPEC founded in 1960
 - ◆ Freedom Riders in U.S. south in favor of civil rights (1961)
 - ◆ Bay of Pigs: fiasco invasion of Cuba (April 1961)
 - ◆ Sidney Homer joins Salomon Brothers after a long career at Scudder, Stevens & Clark (1961); hires legendary chief economist Henry Kaufman (1962)
 - ◆ German Banking Act of 1961 returns industry to pre-1939 footing
 - ◆ Unsuccessful “Operation Twist” by Fed (1961-1965)
 - ◆ Negotiable CD’s pioneered by Citibank (1961)
 - ◆ Citi becomes the first major bank to move to Midtown from Financial District in lower Manhattan, begins Wall Street North (1961)
 - ◆ Central Bank swaps instituted under the Bade Agreement (1961)
 - ◆ Kennedy Administration cracks down on Big Steel (1962)
 - ◆ Cuban Missile crisis (1962)
 - ◆ Moody’s acquired by Dun & Bradstreet (1962)
 - ◆ Bernie Cornfeld creates Investors Overseas Services (IOS) in 1962, a non-U.S. family of mutual funds that eventually collapses under rogue financier Robert Vesco in 1971
 - ◆ Association agreement signed between Turkey and European Economic Community (EEC) in 1963
 - ◆ First CFA exam (June 15, 1963)
 - ◆ “Great Salad Oil Swindle” almost sinks American Express (1963)
 - ◆ Civil Rights March on Washington (1963)
-

1960s: Space Race/Vietnam War/Chinese Cultural Revolution/Modern Finance Extended

- ◆ Milton Friedman – A Monetary History of the U.S. (1963)
- ◆ American Express Salad Oil Scandal breaks on 19 November (1963)
- ◆ Singapore & Malaysia unite for two years (1963)
- ◆ The first European Eurobonds issued in 1963 by Italian motorway network , Autostrade
- ◆ Salomon bond strategist, Sidney Homer, publishes “A History of Interest Rates: 2,000 B.C. to Present” in 1963
- ◆ Kennedy Administration imposes tax on non-U.S. owners of U.S. fixed income securities (1963); Eurobonds born (S.G. Warburg)
- ◆ U.S. Civil Rights Act (1964)
- ◆ Gary Becker – human capital (1964)
- ◆ Malcolm X assassinated (1964)
- ◆ Bill Sharpe’s theory of asset pricing, where risk plays a key role (1964)
- ◆ Jack Treynor performance measurement, Mossin, Lintner also aided Sharpe (1964)
- ◆ First Bullet Train (Japan) 1964
- ◆ Gordon Moore, co-founder of Intel, predicts that semi-conductor capability will double every 18 months (1965)
- ◆ Warren Buffett takes over Berkshire Hathaway (1965)
- ◆ Japan becomes 3rd largest economy & enters recession (1965)
- ◆ Eugene Fama introduces efficient market hypothesis, which suggests why markets are hard to outperform (1965)
- ◆ Dreyfus becomes one of the first mutual funds companies to go public (1965)
- ◆ U.S. Voting Rights Act (1965)
- ◆ Medicare and Medicaid introduced in U.S. (July 1, 1966)
- ◆ Inflation edges up (1966)
- ◆ Q Group founded (1966) to pursue quantitative finance
- ◆ France leaves NATO (1966)
- ◆ McGraw-Hill acquires S&P (1966)
- ◆ Indian economic crisis due to foreign aid withdrawal and rupee devalued (1966)
- ◆ Pop Counter Culture: Cultural Revolution in China (1966-1976)
- ◆ ASEAN formed (1967)
- ◆ Muriel Siebert becomes first woman to buy a seat on NYSE (1967)
- ◆ Israel-Arab Six-Day War on West Bank (1967)
- ◆ U.K. pound devalued (1967)



- ◆ First heart transplant (1967)
- ◆ First ATMs in Sweden and U.K., first ATM machine in Japan in mid-1960s
- ◆ Green Revolution: application of scientific methods to agriculture leading to significant increase in crop yields (1967-1978)
- ◆ Assassinations of Martin Luther King (1968) and two Kennedys (1963, 1968)
- ◆ Les Événements in Paris (1968)
- ◆ FNMA subdivided into GNMA & FNMA (1968), Fannie trades publicly
- ◆ Wall Street back-office paper mess (late 1960s)
- ◆ Hungarian Revolution (1968)
- ◆ Federal Reserve Bank of Philadelphia launches business outlook survey (May 1968)
- ◆ Peak of the Conglomerate Boom (1966-1968)
- ◆ Oil discovered in Prudhoe Bay, Alaska (1968)
- ◆ On September 30, 1968, the first Boeing 747 rolled out
- ◆ Litton Industries’ earnings miss triggers unraveling of the Conglomerate Boom (1968)
- ◆ First U.S. ATM (1969)
- ◆ Leasco (Computer Leasing) fails to take over Chemical Bank (1969)
- ◆ Space Race: Neil Armstrong & Buzz Aldrin first to walk on the moon (July 1969)
- ◆ TOPIX (Tokyo Stock Price Index) created on July 1 (1969)
- ◆ Woodstock Music Festival (August 1969)

1970s: Inflation, Stagflation, Inception of Modern Financial Derivatives, Disintermediation, Mutual Funds, Deregulation, U.S. Rust Belt Restructuring, Cracks in the Neoclassical Paradigm



- ◆ Financial problems spur capital market innovation
- ◆ Rise of conservatism in Anglo economies
- ◆ Triumph of Chicago School of Economics
- ◆ China begins economic reforms
- ◆ Bond rating models & credit scoring models popularized by Ed Altman of NYU
- ◆ Cracks in neoclassical economic model
- ◆ Emerging market bank debt stumbles
- ◆ Sell-side debt research comes into vogue (Homer, Kaufman, Leibowitz at Salomon Brothers)
- ◆ Kaufman, first Street economist to rely on Fed Flow of Funds data
- ◆ First super computer (1970s)
- ◆ Special Drawing Rights (SDRs) created in response to Triffin Dilemma (1970)
- ◆ European Economic Community agrees to gradual economic and monetary union (1970)
- ◆ Freddie Mac and first MBS created (1970)
- ◆ Donaldson, Lufkin & Jennrette (DLJ) becomes first Wall Street firm to go public (1970) with 800,000 share IPO. DLJ then acquired by Equitable Insurance in 1985
- ◆ Brown and Bent launch first money market fund (1970), the Primary Fund
- ◆ Fiber optic cables introduced (1970)
- ◆ Penn Central collapse (1970); a boost for rating agency/sell side research
- ◆ Devastating cyclone hits Bangladesh on November 13, 1970. Estimated 230,000 perish
- ◆ East Pakistan (Bangladesh) declares independence from West Pakistan. West Pakistan cracks down, with 200,000 deaths and 6 million Bengalis fleeing into India. In turn, India invades East Pakistan and wins 13-day war (1971)
- ◆ U.S. bond yields exceed 8.00%; yield book tables cannot handle
- ◆ Repos expand in high vol, high-rate environment (1970s)
- ◆ Total return investing in fixed income (PIMCO) (1971)
- ◆ “Nifty Fifty-style” fades (1971)
- ◆ Strategic Arms Limitations Treaty (SALT) (1971)
- ◆ Birth of U.S. municipal bond insurance by Ambac (1971)
- ◆ NASDAQ founded, first index fund (Wells Fargo) (1971)
- ◆ Citibank introduces floaters as large business loans to replace prime (1971)
- ◆ First Intel microprocessor (1971)
- ◆ On August 15, U.S. dollar no longer convertible into gold; helped breakdown fixed exchange rates, initiated modern era of globalization and led to launch of financial futures (1971)
- ◆ Douglas North – institutional change (1971)
- ◆ Marty Leibowitz at Salomon Brothers, Wall Street’s first bond quant, publishes “Inside the Yield Book” (1971), Wall Street’s most important bond book ever. Stokes the quantification of Wall Street research and asset management
- ◆ Securities Industry Association formed from IBAA and Association of Stock Exchange Firms (1972)
- ◆ Intel 8008 microprocessor chip revolutionized electronics (1972)
- ◆ Financial Accounting Standards Board (FASB) founded in 1972
- ◆ First e-mail (1973)
- ◆ Federal Financing Bank (1973)
- ◆ Bar codes debut in U.S. (1973)
- ◆ Floating exchange rates premier (March 1973)
- ◆ Early quantitative tools such as total return sensitivity analysis developed to support active portfolio management (Barr Rosenberg, Barra, 1973)
- ◆ Arab-Israel War (October 1973); OPEC quadruples oil prices
- ◆ Oil shock drastically curtails Brazil’s terms of trade; 16.2% inflation results (1973)
- ◆ Global banking industry consolidated into fewer mega firms to meet capital requirements and cut costs (1970s-2016)
- ◆ Video games begin at arcades then TV’s (1970s)

1970s: Inflation, Stagflation, Inception of Modern Derivatives, Disintermediation, Mutual Funds, Deregulation, U.S. Rust Belt Restructuring, Cracks in the Neoclassical Paradigm

- ◆ Total return bond indices founded at Lehman (Kuhn Loeb) and Salomon (July 1973)
- ◆ Fischer Black, Myron Sholes and Robert Merton introduce the theory of option pricing (1973)
- ◆ Oil skyrockets 4-fold in 1973 and another leap in 1979 (Iranian Revolution); inflation follows
- ◆ Herstatt Bank failure in Germany (1974)
- ◆ U.S. Commodity Futures Trading Commission Act of 1974 moves authority over futures markets from the Secretary of Agriculture to the CFTC (1974)
- ◆ ERISA, Journal of Portfolio Management, & Watergate denouement (1974)
- ◆ Daniel Kahneman and Amos Tversky lay foundations for behavioral finance (failures of invariance, framing, and “Illusion of Validity”) (1974)
- ◆ Floaters introduced to the U.S. debt market (1974)
- ◆ Portfolio Analysis System, the predecessor to Lehman PC Product & POINT, introduced (1974)
- ◆ Over-the-counter market for options on fixed-income instruments began with standby commitments (mid-1970s)
- ◆ SEC coins term “nationally-recognized statistical ratings organizations” NRSRO (1975)
- ◆ The first PCs & Schwab founded (1975)
- ◆ VCR introduced (1975)
- ◆ Altair 8800 PC appears on the cover of *Popular Electronics* magazine (1975)
- ◆ Petro-dollar recycling concern by the West (mid-1970s)
- ◆ Financial Futures arrive (1975)
- ◆ Vanguard founded (1975) by Jack Bogle
- ◆ Wall Street fixed equity commissions end (May 1, 1975)
- ◆ LaGuardia Airport terrorist bombing - 11 killed (Dec. 1975)
- ◆ New York City fiscal crisis (1975) and Cleveland (1978)
- ◆ Securities Act Amendment passed by Congress (1975)
- ◆ Arbitrage Price Theory (Ross, 1976)
- ◆ Lehman U.S. Aggregate Index (1976), backdated from 1986
- ◆ Kohlberg, Kravis, Roberts & Co (KKR) created (1976)
- ◆ Vanguard introduces S&P 500 fund (1976)
- ◆ First Apple PC (1976)
- ◆ Surprise default of U.S. retailer, W.T. Grant (1976)
- ◆ First index mutual fund launched by Vanguard (1976)
- ◆ Public Securities Association (renamed Bonds Market Association in 1997) split off from SIA (1976)
- ◆ KKR LBO’s A.J. Industries (1977)
- ◆ Oldrich Vasicek – term structure of interest rates - one factor short-rate model (1977)
- ◆ U.S. Community Reinvestment Act (1977) to prevent “redlining” in provision of mortgages to minorities
- ◆ Bond futures contracts developed (1977)
- ◆ Citibank introduces its first ATM in Queens, N.Y. (1977)
- ◆ First brokerage cash management accounts (1977)
- ◆ TRS-80 PC appears; Apple makes first color PC (1977)
- ◆ J. P. Morgan’s Broad Index Secured Trust Offering (BISTROs) (1977)
- ◆ Texas International issues the first modern junk bond (\$30 million) by Drexel under the direction of Michael Milken
- ◆ Early bond calls at par begin under U.S. electric utility maintenance and replacement fund (M&R) provisions first occurs (1977-1978)
- ◆ Off-balance sheet “trust financing” of natural gas and nuclear fuel inventory becomes common for U.S. utilities (late 1970s)
- ◆ “Letter-of-credit backed bonds” earn Aaa ratings and presage rise of structured credit over next 3 decades
- ◆ U.S. Bankruptcy Reform Act of 1978
- ◆ China’s Deng Xiao Ping opens door to economic modernization (1978)
- ◆ U.S. airline deregulation begins (1978)
- ◆ U.S. Rust Belt Restructuring (1977-1982)
- ◆ ECU, prelude to euro, born (1979)
- ◆ Sony Walkman debuts (1979)
- ◆ VisiCALC: first spreadsheet introduced on October 17, 1979
- ◆ Three Mile Island accident (1979) derails U.S. commercial nuclear power plants
- ◆ Brazilian second oil shock exacerbates balance of payments and external debt problem; IMF imposes five year austerity program (1979)
- ◆ Federal Housing Administration introduces graduated payment mortgages (GPMs) (1979)
- ◆ U.S. Department of Labor clarification of ERISA (1974) allows venture capital investing (1979)
- ◆ Egypt and Israel sign peace treaty; Soviet forces invade Afghanistan (1979)
- ◆ Farm Credit System entities began issuing debt on consolidated basis as “joint and several obligations” of FFCBS (1979)
- ◆ Benchmark portfolios introduced (late 1970s and early 1980s)
- ◆ Fed Chairman Paul Volcker (1979-1987) attacks stagflation



Structural Transformation of the U.S. Economy

Category	Previous	1970
One-room schoolhouse	200,000 (1916)	1,800
School enrollment	6.9 million (1870)	45.6 million
Average days in school	78.4 (1870)	161.7
High school degrees (%)	2.0% (1870)	75.6%
College enrollment	52,600 (1870)	7.6 million
Total population	3.9 million (1790)	204.9 million
Birth rate per 1,000 women (15-44)	278 (1804)	87.9
Life expectancy at birth (men)	46.3 years (1900)	67.1
Life expectancy African-American males	32.5 years (1900)	61.3
Peak immigration	1.286 million (1914)	373,326
Ireland	221,253 (1851)	1,583
Italy	285,731 (1907)	27,369
Poland	95,089 (1921)	2,013
Finance	90,000 (1900)	397,000
Blacksmiths	220,000 (1900)	10,000
Mining	660,000 (1900)	164,000
Doctorate		
Physics	31 (1920)	1,655
Economics	22 (1920)	853
Railroad passengers	1.269 million (1920)	279,469

Source: BNY Mellon using data from U.S. Census

Refining Security Cash Flows Through Pooling and Securitization: “The Finance Innovation” of the 1980s



1980s: End of Cold War, Globalization, Disintermediation, Technology, Capital Market Innovation (CMOs, ABS, Swaps, High Yield); Wall Street Bond Trading & Product Innovation Skyrocket; Wall Street Capital Boosted by IPO's

- ◆ LBOs unwind many U.S. conglomerate manufacturers and under-leveraged firms (1980s)
- ◆ Fourth U.S. major merger wave (1980s)
- ◆ Lech Walesa founds Poland's solidarity union (1980)
- ◆ CNN, first all-news channel (1980)
- ◆ Iraq invaded Iran on September 22 (1980)
- ◆ GM loses money for the first time since 1921 (1980)
- ◆ Many banks stumble to fulfill their global aspirations (1980s)
- ◆ Tri-party repo market born in response to dealer failures (1980s)
- ◆ Japan Inc rules (mid-to-late 1980s)
- ◆ HY origination included deferred payments like PIKs (mid-1980s)
- ◆ Triumph of Quantitative Economic & Finance Theory
- ◆ Active total return management and mutual funds blossom
- ◆ Booming U.S. budget deficits in early 1980s
- ◆ Tough times for U.S. electric utilities (building nuclear power plants) and U.S. banks (hurt on positive carry trade), LDC, HLT, and Oreo debt
- ◆ Introduction of "Immunization," "Dedication," and GIC's (Guaranteed Investment Contracts) to lock in high yield (early 1980s)
- ◆ CFA program globalized
- ◆ Globalization of debt markets
- ◆ Cable TV mainstreamed
- ◆ Turkey adopts a package of economic stability measures known as the "January 24 Decisions." Turkey abandons price controls, adopts a free trade policy, and ends a fixed exchange rate regime (1980s)
- ◆ Gold reaches \$834 (1980), not surpassed until 2000s
- ◆ End of Regulation Q (1980) paves way for U.S. banking crises in mid-to-late 1980s
- ◆ Biotech industry arguably born on October 14 with Genentech IPO (1980)
- ◆ Concepts of modified-adjusted duration, convexity, indexing, and duration controlled approaches developed (1980-1985)
- ◆ Moody's creates "Letter-of-Credit Backed Bond Internal Ratings Committee" to rate new off-balance sheet financing; precursor to structured credit in the 2000s
- ◆ First U.S. municipal index created (1980)
- ◆ Zeros publicly issued in U.S. corporate markets (1981)
- ◆ Japan agrees to limit auto sales to U.S. for 3 years (1981)
- ◆ Tay Act encourages thrifts to take losses on mortgage portfolios; \$1.0 trillion dumped and encourages rise of MBS



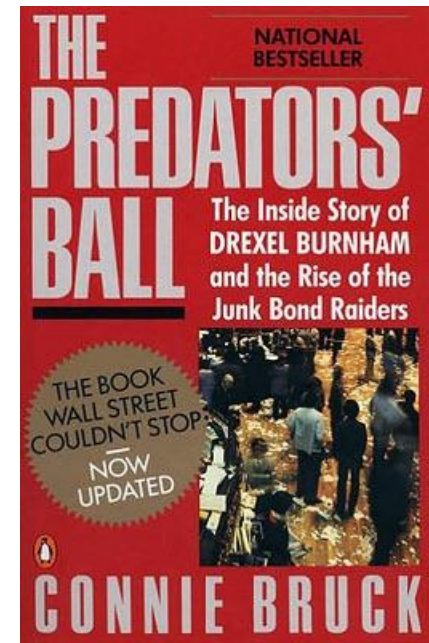
Berlin Wall



- ◆ Major investment banks commit more resources to assist in primary debt issuance and provide secondary market liquidity (1981)
- ◆ Osborne, first portable PC at 25 pounds; IBM PC launched (1981)
- ◆ Salomon does first interest rate swap (1981)
- ◆ Stealth aircraft (F-117) introduced (1981)
- ◆ Daniel Kahneman – choice in decision-making theory (1981)
- ◆ Arrival of MTN's and 401K's (1981)
- ◆ Chrysler introduced "dedicated" bond portfolio (1981)
- ◆ SEC adopts Rule 415 to speed debt origination (March 1982)
- ◆ Merrill enters retail CD business (1982)
- ◆ Globalization of rating agencies (1982 & beyond); Moody's adds modifiers (1,2,3) to its rating symbols
- ◆ Rediscovery of LBO's by Drexel and Michael Milken and expanded use of financial leverage to boost corporate efficiency but also manufactures event risk (1980-1989)
- ◆ Creation of public high-yield corporate market (1980 & beyond)
- ◆ First Bloomberg terminals (1982)
- ◆ Sallie Mae first issued floating-rate securities based on bond equivalent yield on 91-day Treasury bills (January 1982)
- ◆ First Samurai bank deal for 20 billion yen for Dow Chemical arranged by Smith Barney (1982)
- ◆ U.S. Treasury puts/calls options on CBOT (1982)
- ◆ Mexico, Brazilian, Argentine bank failures following sharp devaluation (1982)
- ◆ IBM and World Bank first currency swap via Salomon (1982)
- ◆ Student Loan Marketing Association does first rate swap via Shearson (1982)
- ◆ A&P shifts from defined benefit to defined contribution plan (1982)
- ◆ Rise of financial engineering; swaps mainly designed initially to lower new issuance costs rather than manage liabilities
- ◆ In U.S., financial firms dominate debt origination, while utilities wane

1980s: Birth of Modern HY Market; Corporate Raiders Era Leads to Excess Financial Leverage, Banking Crisis, Biotech

- ◆ TIGERS, CATS, LIONS, JAGUARS (1982)
- ◆ Argentina and U.K. clash in Falklands (1982)
- ◆ Honda begins production in U.S. – Ohio (1982)
- ◆ First corporate poison pill created by Marty Lipton to defend El Paso Natural Gas from Burlington Northern (1982)
- ◆ CME begins trading futures based on the S&P 500 (1983)
- ◆ Washington Public Power Supply System, largest muni default ever at the time (1983)
- ◆ Malaysia enacts Islamic Banking Law that paves the way for Islamic Bonds (1983)
- ◆ Garman and Kohlhagen – FX option pricing (1983)
- ◆ First cell phone (Motorola) (1983)
- ◆ International Organization of Securities Commissions (IOSCO) founded (1983)
- ◆ String Theory (1984)
- ◆ Continental Illinois fails (1984)
- ◆ Securitization extends to boats, cars, home equity, credit cards, franchise agreements (1985)
- ◆ U.S. Treasury STRIPS (1985)
- ◆ Liquid Yield Option Note introduced by Merrill Lynch (1985)
- ◆ Plaza Accord drives down dollar (1985)
- ◆ Carl Icahn seeks to acquire Phillips Petroleum (1985)
- ◆ Russian “Perestroika” economic policy introduced by Gorbachev (1985)
- ◆ Fixed income option valuation and OAS arrive in 1985
- ◆ Istanbul Stock Exchange founded (1985)
- ◆ 1986-1989 “heterodox economic shocks” in Brazil introduced to curb 248% CPI (1985)
- ◆ Cox, Ingersoll, and Ross – extension of Vasicek model to avoid negative interest rates (1985)
- ◆ E.F. Hutton check kiting scandal (1985)
- ◆ Barr Rosenberg launches Rosenberg Institutional Equity Management after selling BARRA. RIEM becomes one of the most successful quant “Alpha Factory” of the 1980s. Rebalanced throughout the day (1985)
- ◆ Morningstar begins mutual fund ratings (1986)
- ◆ General Electric acquires 80% of privately-held Kidder, Peabody & Co.
- ◆ Microsoft goes public (1986)
- ◆ LIBOR (London Interbank Offered Rate) organized by British Bankers Association for dollar, yen, sterling. By 2012, calculated in 10 currencies and 15 maturities. Also TIBOR (Tokyo-Based) yen rate and Euribor (Brussels-Based) euro rate. Benchmark for \$350 trillion of products in 2012 (1986); taken over by equity exchanges in wake of Libor scandal (2008-2012)
- ◆ British Big Bang (1986)
- ◆ GM buys out Ross Perot for \$700 million (1986)
- ◆ Call & tender efficiency analysis introduced by Andy Kalotay at Salomon brothers (1986)
- ◆ Introduction of CMOs (1983), ABS (1986)



1980s: Birth of Modern HY Market; Corporate Raiders Era Leads to Excess Financial Leverage, Banking Crisis, Biotech

- ◆ First MBS index created by Lehman Brothers (1986)
- ◆ Stripped MBS introduced by Fannie Mae (1986)
- ◆ U.S. Tax Reform Law of 1986
- ◆ GM and Texas Teachers adapt dynamic hedging (1986)
- ◆ Marty Siegel, Denis Levine, Ivan Boesky- Insider Trading Scandal: Raider Boesky pays Kidder, Peabody banker and Drexel banker for M&A information (circa 1986, 1987)
- ◆ Financing build out of U.S. cable systems
- ◆ Early but failed attempt at corporate derivatives (October 1987)
- ◆ Fed grants subsidiaries of bank holding companies permission to underwrite commercial paper (June 1987)
- ◆ FACO – Farm Credit Financial Assistance Corporation created by Congress to recapitalize FFCBS (1987)
- ◆ Competitive Equality and Banking Act passed by Congress (1987)
- ◆ Chairman Greenspan era begins at the Fed (1987)
- ◆ Heath, Jarrow, and Morton – forward rates (1987)
- ◆ Equity crashes (Octobers in 1987 and 1989)
- ◆ Central Bank of Turkey begins open market operations (1987)
- ◆ E. F. Hutton bought by Shearson Lehman Brothers (December 2, 1987)
- ◆ Salomon exits CP and muni businesses (October 1987)
- ◆ 28 firms become U.K. gilts market makers on Big Bang
- ◆ Imperial Savings issues first CDO through Drexel for \$100 million
- ◆ First SIV (Alpha Finance) in 1988; Second SIV (Beta Finance) in 1989
- ◆ RJR buyout (1988)
- ◆ Bankers Trust restates earnings due to FX option trade erroneous marks (1988)
- ◆ Hunt Brothers corral then lose in silver market (1988)
- ◆ The Great Disinflation (1981-2016) orchestrated by the Fed and other major central banks
- ◆ Public Service Co. of New Hampshire unable to finance soaring costs of Seabrook Nuclear Power Plant construction project, files for bankruptcy (1988)
- ◆ “Too many banking strategies are based on hope, not hard analysis.” Jean Rosseau, Consultant, 1989
- ◆ “Forward planning in this business is futility.” Alan Greenberg, Bear Stearns CEO, January 1989
- ◆ Money market preferred, medium-term notes become more popular (1989)
- ◆ Glasnost and Perestroika; end of the Cold War (1989)
- ◆ New Zealand central bank first to begin inflation targeting (1989)
- ◆ Brazil debt payment suspension; Brady Plan-aided debt restructuring begins (1989)
- ◆ Poland elects first non-communist government in Eastern Europe following World War II (1989)
- ◆ Japanese equity market peaks at 38,915 in 1989, not to be surpassed for more than a quarter century
- ◆ Financial Institutions Reform, Recovery, and Enforcement Act (FIRREA) passed by Congress (1989) allows commercial banks into investment banking
- ◆ Resolution Trust Corporation to bail out depositors at failed S&Ls with initial capital of \$50 billion (1989); nonetheless 3,000 institutions still fail



The Biggest Tactical Propagators of Capital Market Volatility

- ◆ Cyclical state of the economy: impact on risk premia
 - ◆ Fluctuations in capital market sentiment
 - ◆ Shifts in central bank policy
 - ◆ Rise and fall of industries and issuers' fortunes
 - ◆ Issue characteristics (floaters, calls, sinking funds, dividend payout, etc.)
 - ◆ Rating agencies actions, policies
 - ◆ Shocks (wars, terrorism, political events, oil, liquidity, EM markets)
 - ◆ Legislative/regulatory/tax changes and arbitrages
 - ◆ Pre-and post elections
 - ◆ Variations in time horizons by different classes of investors, issuers, and central banks
 - ◆ Technical levels: presence of trend following quant trading shops, vol breakouts, moving averages, etc.
 - ◆ Seasonality: quarter-end effects, year-end effects, vacation time diminution of liquidity, Q1 vs. Q3, tax-loss selling
-

1990s: Japan's "First Lost Decade"; "The New Paradigm/Pre-Y2K Decade"; Internet Goes Mainstream

- ◆ Behavioral finance comes of age
- ◆ In debt portfolio management "Core plus" investing (crossovers (split HY and IG) & non-local currencies) supersede "core investing"; equity ETFs introduced
- ◆ Absolute return investing style rediscovered by key endowments and plan sponsors
- ◆ Fractals, chaos theory, neural nets, wavelets, artificial intelligence theory
- ◆ Cloning
- ◆ PC expansion
- ◆ Lost decade for Indian stocks despite pick up in growth rates post liberalization
- ◆ Liability-Driven Investment strategies start in U.K. as a result of changes in regulatory framework (IAS 19)
- ◆ Inception of the modern Shanghai Stock Exchange and the Shenzhen Stock Exchange. A Shares: Quoted in local currency; B Shares: Quoted in U.S.\$ (December 1990). Until 2002, only domestic Chinese investors could purchase shares. Now qualified foreign institutional investors can purchase both A & B shares with certain limitations
- ◆ Black, Derman, and Toy – one-factor short-rate model with lognormal distribution (1990)
- ◆ German reunification (1990)
- ◆ Drexel Burnham fails (1990); HY "nuclear winter" follows
- ◆ International banks reach overcapacity in effort to build global and capital markets business (1990)
- ◆ J.P. Morgan allowed by Fed to underwrite new security offerings (1990)
- ◆ 40-year bond offering by REFCORP (1990)
- ◆ American Express transfers \$1.0 billion into Shearson Lehman Hutton to save firm (February 1990)
- ◆ EJV (Electronic Joint Venture) founded with six partners (Salomon, First Boston, Goldman, Morgan Stanley, Citibank, Lehman) to compete with Bloomberg. Sold to GFIC in 1995.
- ◆ Disintermediation of emerging-debt market from banks to Brady Bonds (early 1990s)
- ◆ Scandinavian and U.S. banks go through a rough patch (1990-1991)
- ◆ Iraq invades Kuwait (1990); Gulf War I ensues (1991)



- ◆ Apartheid repealed in South Africa (1991)
- ◆ GIC-backed bonds suffer (1991)
- ◆ Brazil returns to international bond market with \$250 million, 13.50% 2-year Petrobras Eurobond issue (1991)
- ◆ Dissolution of the Soviet Union (1991)
- ◆ Croatia & Slovenia declare independence (1991)
- ◆ Internet/Web created (1991)
- ◆ Balance of payments crisis and rupee de-valued (1991)
- ◆ Principal Component Analysis introduced (1991)
- ◆ The Federal Depository Insurance Corporation Improvement Act passes in U.S. Congress (1991)
- ◆ Goldman Sachs commodity index introduced, backdated to 1970 (1991)
- ◆ Violations of auction process by a trader at Salomon forces Treasury officials to scrutinize primary dealers more closely and reconsider auctioning procedure (summer 1991)
- ◆ India undergoes Structural Adjustment Program. Radical liberalization and globalization ushered in (which tentatively started in early 1980s) (1991-1993)

1990s: Triumph of Financial Assets & Technology (Internet) While in Search of New World Order

- ◆ Lira, Sterling currency crises; breakdown of ERM (1992)
- ◆ SEC rule 2a-7 implemented (1992)
- ◆ Arrival of credit default swaps and quantification of credit (1992)
- ◆ IRS allows income from notional principal contracts to be excluded from the Unrelated Business Tax (July 1992)
- ◆ Russia joins the IMF and World Bank (1992)
- ◆ The Maastricht Treaty, prelude to euro (1992)
- ◆ Deregulation in August by Bundesbank (1992)
- ◆ Stanford economist John Taylor proposes a rule to set the Federal Funds rate. Henceforth, known as the “Taylor Rule” (November 1992)
- ◆ Energy Policy Act of 1992
- ◆ Yugoslavian implosion (1992)
- ◆ HomeFirst engineers first U.S. reverse mortgage CMO (1992)
- ◆ Oslo Peace Accord (1993)
- ◆ Using futures,, Metallgesellschaft loses \$1.3 billion on oil price rise (1993)
- ◆ Eugene Fama and Kenneth French – size and value deviations from CAPM (1993)
- ◆ The first exchange-traded fund (ETF) shares are issued (1993)
- ◆ AIMR promotes performance standards (1993)
- ◆ Over 35% of all new U.S. municipal issues came with bond insurance (1993) from AMBAC, MBIA, etc.
- ◆ U.S. and European banks slowly rebound (early 1990s)
- ◆ Orange County bankruptcy and Mexican peso crisis (1994)
- ◆ Free trade agenda advanced; North American Free Trade Agreement (January 1, 1994)
- ◆ CMO and EM asset classes stress-tested (1994)
- ◆ Askin Asset Management fails (1994)
- ◆ Mellon Bank acquires Dreyfus (1994)



- ◆ Currency crisis in Turkey; output falls 6% and inflation rises to three digit levels (1994)
- ◆ World Trade Organization (WTO) founded on January 1, 1995, replaced GATT
- ◆ Turkey enters EU Customs Union (1995)
- ◆ Netscape Communications goes public on August 9th and marks the birth of the internet stock sector (1995)
- ◆ Rogue traders (Joe Jett in Treasuries) lead to firm failures by Kidder Peabody (1994), and Barings (Nick Leeson, 1995)
- ◆ “Plano Real”; new Brazilian Real currency introduced, pegged to the U.S. \$ (1995)
- ◆ Spring Street Brewing executed internet IPO (1995)
- ◆ Dayton Accord (Bosnia) (1995)
- ◆ Sarin gas attack on Tokyo subway (March 20, 1995)
- ◆ Barclays buys Wells Fargo investments (1995)
- ◆ CMO technique extended to credit; CLOs (1996)
- ◆ CRM program begins (1996)
- ◆ M&A boom (second half of 1990s)
- ◆ Rogue trader at Sumitomo loses \$2.6 billion trying to corner copper market
- ◆ Using term coined by Yale economist Bob Shiller, Fed Chairman Greenspan warns of irrational exuberance on December 6, 1996
- ◆ Wall Street syndicate size shrinks from up to 60 firms to just a few
- ◆ U.K. to Europe channel opens (1996)
- ◆ “Reverse Plaza Accord”: Value of yen lowered by 60%-leads to Asian financial crisis in 1997

1990s: Behavioral Finance Fully Arrives; Asian Financial Crisis (1997); LTCM Failure (1998)

- ◆ Asian Financial Crisis (1997) starts with Thailand devaluation of Baht and “crony capitalism”: many Thai, Korean, and Malaysian banks fail
- ◆ Hong Kong returned to China (1997)
- ◆ Brazil’s C bonds tumble briefly to \$49 (1997)
- ◆ Sub-prime auto lenders fail (Mercury Finance & Jayhawk Finance) in 1997
- ◆ First dealer electronic trade consortium formed, TradeWeb (1997); electronic government bond trading (1998)
- ◆ London Stock Exchange introduces electronic trading service (1997)
- ◆ Sheep cloning (1997)
- ◆ G-7 becomes G-8 with addition of Russia (1997)
- ◆ Russian devaluation & default; Long Term Capital Management implosion leads to Great Spread-Sector Crash (August 1998)
- ◆ AMEX and NASDAQ merge (1998)
- ◆ Last U.S. estate tax anticipation (“Flower Bonds”) matured (1998)
- ◆ Nomura pioneers commercial mortgage-backed securities, but market collapses in mid-2008
- ◆ Dow Jones–AIG commodity Index formed, backdated to 1991
- ◆ U.S. style securitization migrates to Europe and Asia
- ◆ Tech, venture capital, “B2B”, internet bubbles (late 1990s)
- ◆ “Pre-Y2K paranoia” (1998, 1999)
- ◆ Darrel Duffie – CDS valuation (1999)
- ◆ Birth of Global Aggregate and U.S. Universal Indices (1999) at Lehman Brothers
- ◆ Glass-Steagall repealed in U.S. (1999)
- ◆ European Monetary Union (1999) from Maastricht Treaty (1992)
- ◆ End of lost decade for Japanese economy



2000 –2009: Black Swan Decade; Twin Systemic Rinsings: Equities (2000-2002) and Credit (2007-2016); End of 3-Decade “Debt Gilded Age”; Clash of Modern Mercantilism with Western Consumerism; “The Oughts”; Tech/Equity/Credit Party’s Over; Onset of Great Recession; Rapid EM Economy Convergence to Advanced Economy Status

- ◆ Post-bubble capitalism purification (corporations, Sarbanes Oxley 2002), research, mutual funds yet significant capital market trade/capital flow imbalances, excessive financial institution leverage; higher geopolitical risk; end of private defined benefit programs in U.S., conversion to defined contribution; end of post-Glass-Steagall “broker-dealer” model; conversion of bond markets to e-markets; more debit cards, but cash will not disappear given the demand for privacy; global warming could rise by 2-6 degrees over 21st century; global corporate consolidation; “business model restructuring”; toward a world of near-perfect information flows (big data arrives)
- ◆ China liberalization of financial institutions and foreign exchange quickens
- ◆ Shift to absolute return strategies by many institutional investors
- ◆ Low absolute and relative traditional financial asset returns; search for antidotes in Alternative assets
- ◆ Rise of state capitalism, exchange rate management
- ◆ Unification of heretofore fragmented debt and equity markets
- ◆ China, India, and credit default swaps mainstreamed into world capital markets; rapid expansion of world labor supply invites deflation conjectures over 2001-2016
- ◆ Asset securitization further transforms traditional investment banking and lending function



Shanghai

2000 - 2009: Clash of Civilizations (9/11); Purification Triumph of Capitalism; Rebirth of Inflation Worries; “Derivatization of Credit”

- ◆ Y2K transformation non-event (2000)
- ◆ Dot.com bubble peaks: NASDAQ hits record of 5,048 on Mar. 10, 2000; algorithmic trading soars
- ◆ First complete map of human genome code (2000)
- ◆ Euronext formed via merger of Paris, Amsterdam, & Brussels exchanges (2000)
- ◆ West Bank tensions erupt (2000)
- ◆ NY Fed introduces business survey (April) with data back to July 2001
- ◆ Commodities Futures Modernization Act (2000)
- ◆ U.S. government surplus expected to last as far as the eye can see (2000) but did not
- ◆ AOL buys Time Warner for \$162 billion, largest merger in the U.S. history (2000)
- ◆ Hedge fund boom (2000-2008) & rise of Alternative assets; Portable Alpha strategy proliferation
- ◆ U.S. recession (March – November 2001) predates 9/11
- ◆ World Trade Center & Pentagon struck (Sep. 11, 2001)
- ◆ Anthrax attack in U.S. (beginning Sep. 18, 2001)
- ◆ The term BRIC (Brazil, Russia, India, China) coined by Goldman Sachs to convey enthusiasm about EM investing
- ◆ U.S. enters Afghanistan in pursuit of terrorists (October 2001)
- ◆ China joins WTO (December 2001)
- ◆ Enron collapse (December 2, 2001) spawns corporate governance crusade
- ◆ U.S. equity markets moved to decimal pricing (2001)
- ◆ Economic crisis in Turkey; real GDP falls by 5.7%, CPI soars to 54.9%, and unemployment rises to 10% (2001)



2000 - 2009: Alternatives (HF and Private Equity), Absolute Return, Alpha/Beta Separation Stampede to Offset Low Returns; Vast Accumulation of Capital in SWFs and by Central Banks

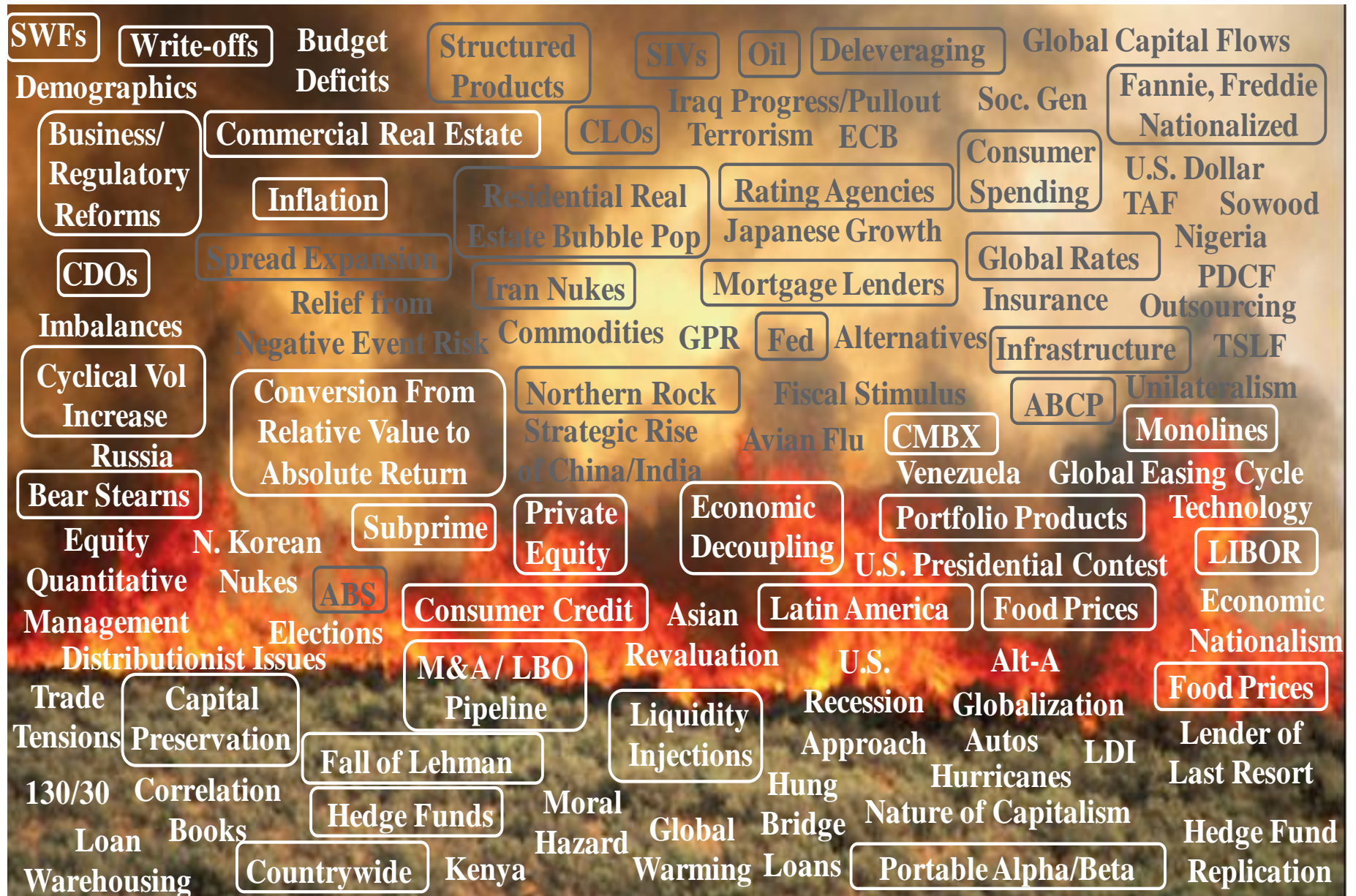
- ◆ Euronext acquired LIFFE (2001)
 - ◆ Enactment of the Economic Growth and Tax Relief Reconciliation Act (EGTRRA) of 2001 significantly expands retirement savings opportunities for millions of working Americans.
 - ◆ “CDOs-Squared” introduced (2000-2001)
 - ◆ Trains & Tracers examples of structured credit (2002) taken too far
 - ◆ WorldCom fails (2002), single worst year for global credit markets since 1930s (before 2007, 2008)
 - ◆ Credit markets move from “sufficient concentration” (10-20 names in a portfolio) to “sufficient diversification” (100-200 names in a portfolio) (2002)
 - ◆ Sarbanes-Oxley Act (2002) aims to improve U.S. corporate governance
 - ◆ Turkey’s AKP government comes to power. IMF implements stabilization program and economic recovery begins along with structural reforms (2002)
 - ◆ SuperMontage, an integrated order display and execution system, rolled out at NASDAQ (2002)
 - ◆ Human genome complete (2003)
 - ◆ Wall Street Independent Research boosted by \$1.4 billion settlement agreement between investment banks and New York Attorney General Spitzer (2003) for overly optimistic equity research
 - ◆ SARS erupts (November 2002 – July 2003)
 - ◆ Chartered Alternative Investment Association founded (2002)
 - ◆ Period of extended rupee appreciation (2002-2007) reflects strong Indian growth and EM demand
 - ◆ Gulf War II topples Iraq government (2003)
 - ◆ Parmalat collapse in Italy (2003)
 - ◆ Debt ETFs launched (2003)
 - ◆ Iraq pacification (2003-2011) by allied coalition has mixed results
 - ◆ As a result of global trade and capital flow imbalances, 1995-2013, Sovereign Wealth Funds and central banks from export-driven economies acquire massive reserves in the Oughts topping \$10.0 trillion
 - ◆ Portable alpha and 130/30 HF strategies become common (2004)
 - ◆ China begins to cool overheating (2004)
 - ◆ Global real estate bubble (2004-2007), partially financed in U.S. by subprime mortgage securities and SWF/CB suppression of interest rates by buying U.S. Treasuries; mortgage credit standards virtually repealed with “Liar” and “No Doc” loans common
 - ◆ Global currency & curve conundrum (2005-2007); Fed tightens to little effect on yield curves
 - ◆ Chinese revaluation begins in 2005 and slows in 2008
 - ◆ London underground bombings (July 7, 2005)
 - ◆ REFCO fails in October (2005)
-

2000- 2009: Subprime Housing Debt Collapse and Mammoth Real Estate Bubble Burst Ignite “Credit Wildfire” of 2007 and Morphs into Credit Recession & Outright Global Recession (2007-2009), Sets off Slew of Financial Institution Failures

- ◆ German Landesbanks progressively lose state guarantees after July (2005)
 - ◆ Kyoto protocol on climate change (2005)
 - ◆ Atlantic hurricanes: Dennis, Emily, Katrina, Rita, Wilma; New Orleans devastated (Summer 2005)
 - ◆ Avian Flu alarm (2005/2006)
 - ◆ Maestro Greenspan retires (2006); Chairman Bernanke era begins
 - ◆ End of quantitative easing in Japan (2001-2006)
 - ◆ Amaranth, a U.S. hedge fund, loses \$6.6 billion in natural gas market (September 2006)
 - ◆ North Korea nuclear test (2006)
 - ◆ Twitter launched (July 2006)
 - ◆ Peak of Credit Structured Product Era (DPCs): ABN AMRO introduces Constant Proportion Debt Obligation (CPDO) (2006), which flounders (2006-2007)
 - ◆ Facebook introduced September 2006
 - ◆ NYSE and Tokyo Stock Exchange form alliance on January 31, 2007
 - ◆ First rumbles of credit bubble burst risk (February 2007)
 - ◆ First iPhone (June 2007)
 - ◆ Bank of New York and Mellon Financial merge on July 1, 2007
 - ◆ NYSE acquires Euronext (France, Belgium, Portugal, Netherlands) (2007)
 - ◆ Lehman Brothers enters into \$22 billion deal to buy real estate from Archstone-Smith Trust (October 2007). After sales, Lehman retained 25% interest
 - ◆ Royal Bank of Scotland (RBS) acquires ABN Amro (October 2007)
 - ◆ Subprime housing debt collapse ignites the “Great Credit Risk Reset” & “CDO Fuss” (July 2007), extends into 2008/2009 Credit Recession
-



“The Credit Recession of 2007-2009”: Unusual in its Assault More on “Alleged” High Quality Than Low Quality



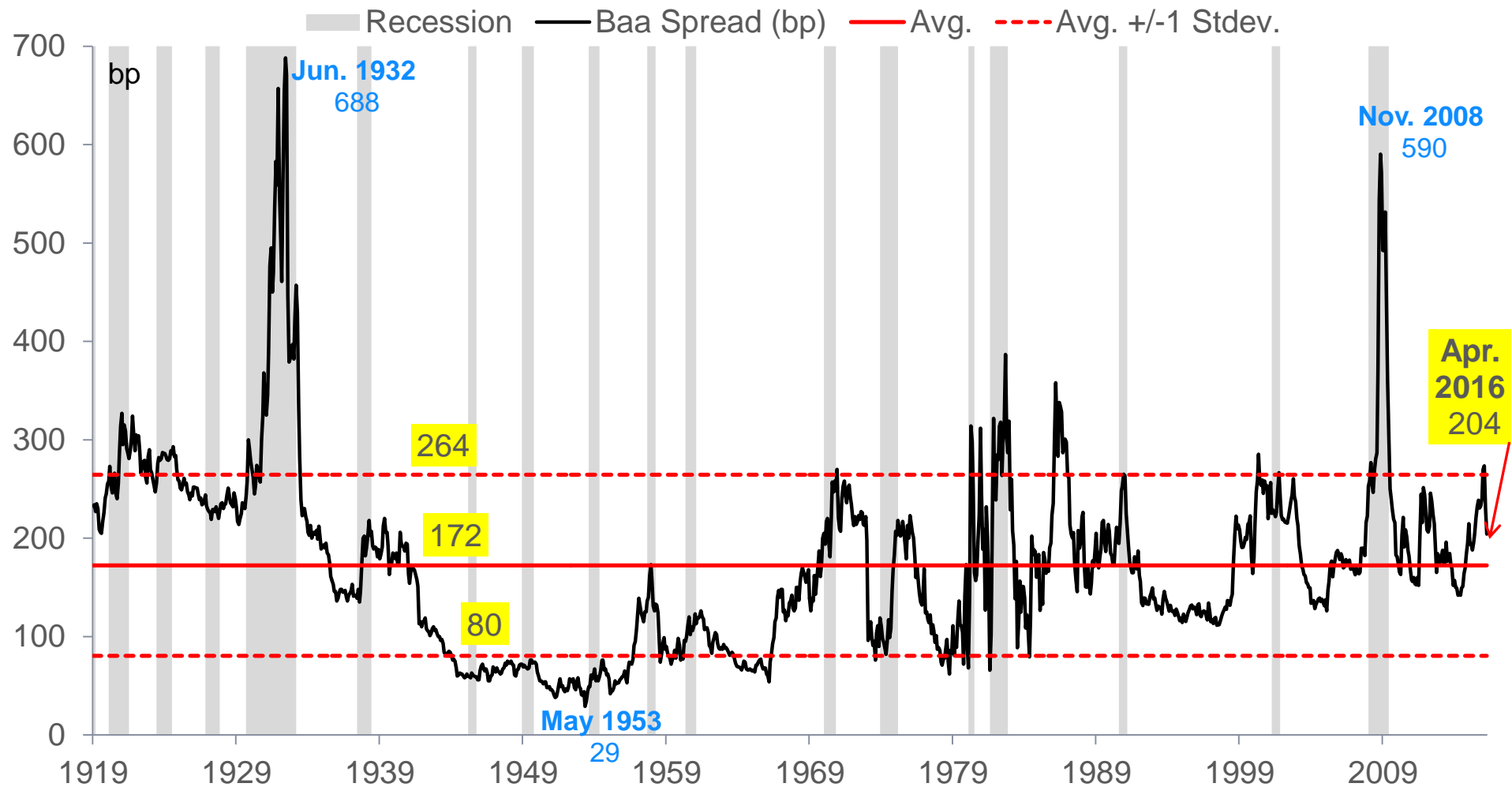
The Primary Causes of the “Great Recession” of 2007-2009

- ◆ No single factor, multiple catalysts
- ◆ Rapid systemic innovation, especially introduction of new credit products, had major unintended consequences
- ◆ Excessive and extended expansive monetary policy by central banks following equity correction of 2000-2002 and 9/11
- ◆ Non-U.S. central bank purchases of U.S. Treasury securities, recycling export surpluses with U.S., lowered U.S. interest rates; central banks were not in the bubble-bursting business
- ◆ Low interest rates fueled a global real estate boom; intensified by recent sour experience with equities over 2000-2002
- ◆ “Originate and distribute credit model” weakened credit standards
- ◆ Unscrupulous mortgage originators extended loans to highly-unqualified buyers
- ◆ Funds for mortgage loans boosted by bundling and subsequent issuance of structured mortgage and corporate securities
- ◆ Structured credit pools were stuffed with highly-risky tenders by some Wall Street firms
- ◆ Broker-dealers became massively over-leveraged, with intra-quarter capital ratios as low as 2%, in pursuit of profit growth
- ◆ Too much short-term debt
- ◆ Arrival of Credit Default Swaps (CDS) ramped up credit leverage
- ◆ Rating agencies over-rated structured credit product
- ◆ Regulators did not grasp the magnitude and inter-connected amount of systemic financial leverage
- ◆ Investors were overly “yield-hungry” in a low-yield environment

Credit Risk Models

- ◆ 1974: Merton Framework
- ◆ 1976: Structural Form Models-Black and Cox (Complete Capital Structure)
- ◆ 1977: Interest Paying Debt-Geske
- ◆ 1984: Short & Long-Vasicek, KMU
- ◆ 1993: Reduced Form Models (Exogenous Risk from PB)-Jarrow & Turnbull
- ◆ 1993: Nielsen, Sai-Requejo, Santa Clara
- ◆ 1993: Kim, Ramaswamy, Sundaresan
- ◆ 1995: Hull & White
- ◆ 1995: Longstaff & Schwartz
- ◆ 1999: Duffie & Singleton

The Cyclical Nature of 30-Year U.S. Baa Industrial Spreads¹: 1919 to April 2016



1) U.S. 30-year Treasury historical yield: Federal Reserve's 10-15 year Treasury Bond index from 1919 to 1975, 20-year Treasury bond from 1976 to January 1977, and 30-year Treasury bond thereafter; Source: BNY Mellon using data from Global Financial Data and Bloomberg

2000-2009: Commodity SuperCycle Decade: Commodity Price Explosion to July 2008; Success of EM Economies and Markets (Until 2008 in Equities); Rise of Socially Responsible Investing

- ◆ Iceland sovereign & bank sector risk apparent (late 2007/early 2008)
- ◆ Fed cuts interest rates by 50 bp to 4.75% (September 2007) and 450 bp by December 16, 2008
- ◆ Run on U.K's Northern Rock; first run on a British bank since the collapse of Overend and Gurney in 1866 (September 2007)
- ◆ Two Bear Stearns HFs file for bankruptcy after 90% losses (July 2007)
- ◆ FINRA (Financial Industry Regulatory Authority) founded on July 30, 2007; successor to NASD
- ◆ U.S. Municipal Monoline Insurers (MBIA, AMBAC, ACA, subprime mortgage lenders, and SIVs) flounder (2007)
- ◆ BoA acquires Countrywide for \$4.0 billion in January (2008)
- ◆ Societe General loses \$7.1 billion on unauthorized trades by a single trader (2008)
- ◆ U.S. Student Loan Act of 2008 consolidates funding and improves availability (2008)
- ◆ Fed intervenes to arrange J.P. Morgan acquisition of Bear Stearns (March 14-17, 2008); launches Primary Dealer Credit Facility
- ◆ Commodity price boom peaks; run on IndyMac in July 2008
- ◆ Aracruz, Brazilian pulp firm, loses \$2.5 billion in Fx
- ◆ U.S. Treasury makes explicit Fannie and Freddie guarantees (July 13, 2008), but nationalizes and moves them into conservatorship on September 7, 2008
- ◆ Beijing Olympics (August 8, 2008)
- ◆ Oil price surges to \$147 in July 2008, then collapses
- ◆ Russia moves into Georgia (August 2008)
- ◆ Lehman enters bankruptcy on September 15, 2008; global credit panic begins and lasts until September 2008
- ◆ AIG on verge of failure (September 15, 2008), supported by U.S. government
- ◆ Goldman and Morgan Stanley become bank holding companies (September 20, 2008)
- ◆ WAMU receivership (September 25, 2008)
- ◆ Wells Fargo buys Wachovia (October 2008)
- ◆ Global credit market panic: September 2007 & September 2008-March 2009
- ◆ U.S. allocates \$17 billion to save GM and Chrysler in December 2008



2000-2009: Climate Change/Energy Policy Emerge as Top Strategic Priorities; Proliferation of Late Oughts Bailouts Invites Capitalism Reform and Progressive Tilt to Redistribution

- ◆ Troubled Asset Relief Program (TARP) enacted by U.S. Congress on October 3, 2008 provides \$700 billion to banks
- ◆ Term Asset-Backed Securities Loan Facility (TALF) of November 25, 2008 backs ABS
- ◆ Cloud Computing begins to take off (2008)
- ◆ G-8 enlarged to G-20 (2008)
- ◆ U.S. QE1 announced on November 25, 2008 (ended March 31, 2010)
- ◆ \$50 billion Madoff Ponzi scam (December 2008)/Stanford Group (2009)
- ◆ Credit Card Act of 2009 protects U.S. consumers from manipulation
- ◆ Public-Private Investment Program on March 23, 2009 aids toxic assets
- ◆ Global credit panic ends mid-March 2009
- ◆ Contested Iran election in June 2009 spurs brief “Green Revolution”
- ◆ Baby Boomers begin to retire en masse (2005-2025)
- ◆ The “Great Recession” *formally* ends (June 2009); Global Capital Markets rebound (2009)
- ◆ Brazil offers \$10 billion to IMF to aid developing countries (2009)
- ◆ Uber founded (2009)
- ◆ Swine flu (H1N1) worry (2009)
- ◆ Global economic malaise and major financial system architectural reforms (2008-2020)



Teens: “The Recovery & Adjustment Decade”; “The Great Transition to A More Conservative Financial Era”; “The Great Deleveraging and Derisking”; “Financialization”

- ◆ Early decade regime of torrid EM growth, anemic AE economic expansion, oil & food price inflation and then subsiding, precious metals bubble then burst, “prosperity through fiscal austerity,” greater regulatory oversight of financial service firms through Dodd-Frank, Volcker Rule, Vickers Rule, Financial Transaction Tax proposed in Europe; greater transparency, more capital, more liquidity, less risk, financial-institution business model recalibration, U.S. residential housing correction greater than the Great Depression; climate change and water resource constraint regain prominence in 2H of Teens; “Big Data”; technology & analytics enhancements inspire economic measurement and portfolio management creativity; advent of 3-D printers, nanotechnology, drones, smartphones; fintech; rise of passive investing and failure of active investing
 - ◆ Shanghai World Expo in 2010 further triumphs Chinese economic ascension
 - ◆ iPad introduced in March 2010
 - ◆ Massive BP oil spill in Gulf of Mexico in 2010
 - ◆ “Flash Crash” of May 6, 2010: Dow plunges 1,000 points (9%) and recovers in minutes. Single largest intra-day move in history. Algorithmic trading indicted
 - ◆ NY Fed releases white paper calling for Tri-Party Repo Reform (May 17, 2010)
 - ◆ Greece receives first bailout: 110 billion euros in May 2010
 - ◆ Instagram launched (2010)
 - ◆ Office of Financial Research (OFR) a part of U.S. Treasury, founded on July 21, 2010
 - ◆ Conservative Tea Party movement helps increase focus on U.S. fiscal reform (2010)
 - ◆ QE2 announced in U.S. (November 3, 2010)
 - ◆ Dodd-Frank enacted (July 2010), with opposition unwind attempts in 2011-2017
 - ◆ Overblown U.S. muni default conjecture in early 2011 proves fallacious over 2011-2013 despite some notable California defaults (Vallejo, Stockton, San Bernadino) and Detroit
 - ◆ U.S. “Double-Dip Thesis” contemplated in mid-2010; vanquished by QE2 mention (August 2010); reconsidered again in mid-2011, concludes in October 2011; returns briefly in mid-2012
 - ◆ Beginning January 1, 2011, every single day over 10,000 U.S. baby-boomers will reach age of 65; this will continue for 19 years
 - ◆ Greece, Ireland, Portugal receive EU, ECB, IMF, EFSF assistance (2010-2012), thereby questioning then assuring the endurance of the euro
 - ◆ Oil price shock in early 2011; pricing divergence between Brent and WTI attributed to MENA geopolitical unrest
 - ◆ “Arab Spring”: revolutionary 2011 regime changes in Tunisia, Egypt, Libya, and Yemen; Syrian civil war starts in 2013; uncertain outcomes for international relationships; partially gives rise to ISIS/ISIL in 2014
-



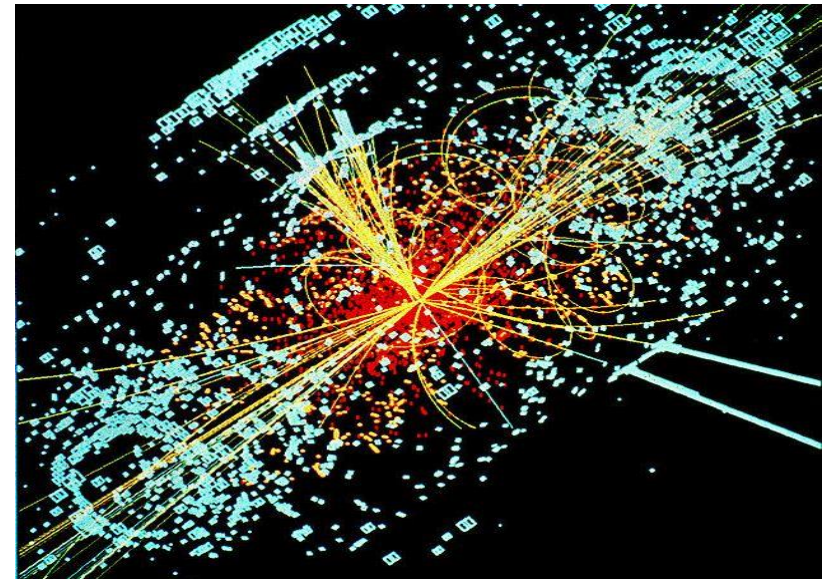
Teens: Capitalism Fine Tuned, With Increased Role for State; Global Fiscal and Monetary Policy Normalization; Asymmetric Global Growth, Global Capital Flows; Greece and Eurozone Futures Unclear; Financialization

- ◆ Japanese earthquake and tsunami (March 2011) dent “green acceptance of nuclear power” (Japan, Germany)
- ◆ Greece effectively defaults in mid-2011 but negotiations drag on in 2012-2016
- ◆ Osama Bin Laden addressed (May 1, 2011)
- ◆ “European Contagion” spreads to Italy and Spain (July 2011);
ECB responds on August 8, 2011 with massive buying program of Italian and Spanish debt; follows up with enhanced Long-Term Refunding Operation (LTRO) on December 8, 2011 and another supplemental LTRO in February 2012
- ◆ U.S. narrowly avoids default on August 2, 2011 and is downgraded on August 5 from AAA to AA+ by S&P; Moody’s watchlisted (2012) for possible cut, then confirms in 2013
- ◆ Gold reaches \$1,900.20 on September 5, 2011, cools to \$1,051.10 on December 17, 2015
- ◆ Swiss Central Bank pegs EUR/CHF to 1.20 on September 6, 2011
- ◆ UBS rogue trader loses \$2.0 billion (September 2011)
- ◆ Fed launches Operation Twist 2.0 on September 21, 2011 (end December 31, 2012)
- ◆ Surprise bankruptcy of MF Global on October 31, 2011; \$1.2 billion of customer funds unaccounted for
- ◆ “Occupy Wall Street” (OWS) group formed in fall of 2011 to protest financial institutions and 99%-1% wealth divide and quickly gains global traction; partially morphs into the basis for senator Bernie Sanders’ presidential campaign in 2016
- ◆ Second Greek bailout deal (130 billion euros) arranged on February 21, 2012
- ◆ Internationalization of the Chinese Renminbi, in preparation for full convertibility circa 2020, will slowly erode U.S. dollar’s status as sole reserve currency
- ◆ High correlations and high volatility across markets in 2011 impede diversification and performance. Correlations, trading, and vol drop in 2012-2014. BNY Mellon Global Volatility Index hit 1989-2016 low of 3.35 on June 27, 2014 versus long-term average of 8.71
- ◆ ETF assets surpass \$2.4 trillion by 2014: further encroaching on mutual funds industry



Teens: Grand Convergence of EM to AE (Advanced Economies); Structural Unemployment Persists in West; Alternatives, EM, ETFs Enjoy Highest Investment Management Flows; Financialization

- ◆ U. S. Treasury introduces negative bill yields and 2 floaters (2011-2014)
- ◆ To comply with new capital standards in 2012, European banks forced to downsize through asset sales and disintermediation
- ◆ 60th anniversary in 2012 of Markowitz's formulation of modern portfolio theory ("Portfolio Selection," Journal of Finance, March 1952)
- ◆ Greece teeters on edge of leaving eurozone through 2012-2015
- ◆ France and Germany consider Financial Transaction Tax (Tobin Tax) of 0.2% in August 2012-2016
- ◆ J.P. Morgan risk hedging group reveals surprise loss of \$2.3 billion in May 2012 thanks to "London Whale," \$5.4 billion mark taken in Q2 2012; thereby promotes application of Volcker Rule
- ◆ Eurozone entered recession (2012) and exited (2014)
- ◆ 500 largest U.S. firms coping with pension fund gap estimated at \$450 billion billion, aided by equity market rally of 2012-2014
- ◆ Following "BRIC," EM investing enthusiasts derive "MIST": Malaysia/Mexico, Indonesia, South Africa/South Korea, Turkey/Thailand
- ◆ U.S. Supreme Court upholds ObamaCare in June 2012
- ◆ Existence of Higgs Boson particle confirmed (June 2012)
- ◆ Big cap, multinational, dividend paying stocks popular in 2009-2016
- ◆ Barclays senior management replaced following disclosure of Libor fudging; other banks involved (June-July 2012)
- ◆ Syrian Assad-regime teeters on collapse in 2012, still lingers in 2016
- ◆ SEC considered new regulations that may hurt \$2.7 trillion money market fund industry
- ◆ ECB lowers deposit rate to zero leading European MMF's to close new business (July 5, 2012)
- ◆ Markets fretted in 2012 about U.S. "fiscal cliff" in 2013
- ◆ London Olympics (July 2012)
- ◆ Knight Capital almost fails (July 2012), leading to more concern about algorithmic-induced Flash Crashes (U.S. hearings on HFT)



Teens: Multipolar Geopolitical World; China's Manifest Economic Destiny; Decade of Peak Boomer Retirements Straining Entitlement Systems; Persistence of the Great Foreboding; Fracking; Financialization

- ◆ Standard Chartered accused of money laundering for Iran (July 2012)
- ◆ U.S. housing market finally bottoms in 2012
- ◆ Rogue trader with Rochdale Securities loses \$1.0 billion on Apple shares purchase (2012)
- ◆ Rental-backed housing bonds debut (2012), with rating agency concern about supporting data
- ◆ Greece almost leaves Eurozone, effectively devaluing and defaulting (2012-2015)
- ◆ Severity of European recession surprises on downside; further cools world economic growth and stokes China hard-landing scenario (2012-2016)
- ◆ In early 2013, specter of currency wars (yen weakens from 75 to 103) and automation/robotic supply shock to labor markets tempers bullishness
- ◆ Market worries in early 2013 transition from U.S. sequestration, Cyprus, Italian elections, and European economic health to Fed tapering of easy monetary policy, Chinese economic growth, EM and risky market correction potential
- ◆ A return to capital controls, a form of protectionism, may occur in the Teens for some economies
- ◆ Washington attempted fiscal reform in 2013 and eventual cuts in entitlements & higher taxes
- ◆ Huge demonstrations in Turkey and Brazil (June 2013) point to social unrest
- ◆ ObamaCare implementation delayed one year in July 2013
- ◆ Industry settles on a new replacement index for LIBOR in 2013 under the aegis of a dual track-system comprising survey-based lending rates along with transaction-linked indices
- ◆ Cyprus effectively defaults and haircuts some bank depositors (March 2013)
- ◆ 50th anniversary of first CFA exam (June 15, 1963) in 2013
- ◆ Edward Snowden releases classified NSA documents (June 2013); highlights cyber vulnerability
- ◆ Military coup in Egypt (July 3, 2013) replaces Muslim Brotherhood government
- ◆ Big data becomes big deal in 2013
- ◆ U.S. “fiscal cliff” turns out to be more a puddle than the Grand Canyon (2013)
- ◆ End of agricultural trade subsidies according to WTO (2013)
- ◆ Detroit defaults (\$20 billion) in July 2013
- ◆ U.S. Department of Justice files \$5.5 billion civil action against S&P (2013) for faulty CDO ratings in mid-Oughts
- ◆ Fed and ECB deploy additional monetary policy stimulus (QE3 September 12, 2013 and OMT (Outright Monetary Transaction)



U.S. Transformations from 1970 – 2013

	<u>1970</u>	<u>2013</u>
• Life expectancy (male) in 40s*	55.5	67.1
• Meat consumption (lbs. per capita)*	149.6	103.3
• Oil (U.S.\$ per barrel)*	\$17.96	\$99.17
• Male weight (40s)*	177.6	200.6
• U.S. 10-year Treasury*	7.35%	2.34%
• Coffee (gallons per capita)*	33.4	25.0
• U.S. dollar to British pound*	\$2.39	\$1.66
• One person households*	17%	27%
• Milk consumption (gallons per capita)*	31.1	19.0
• Soda consumption (gallons per capita)*	24.3	45.0
• DJIA*	842	16,573
• Alcohol consumption (gallons per capita)*	2.60	2.25
• % of adults who are cigarette smokers**	37.4%	19.0%
• Gasoline (U.S.\$/gallon)	\$0.36	\$3.47
• % of households with TV***	95.3%	97.1%
• % of households with internet use at home****	0.0%	74.8%
• % of households with a computer at home****	0.0%	78.9%

*Source: Quartz

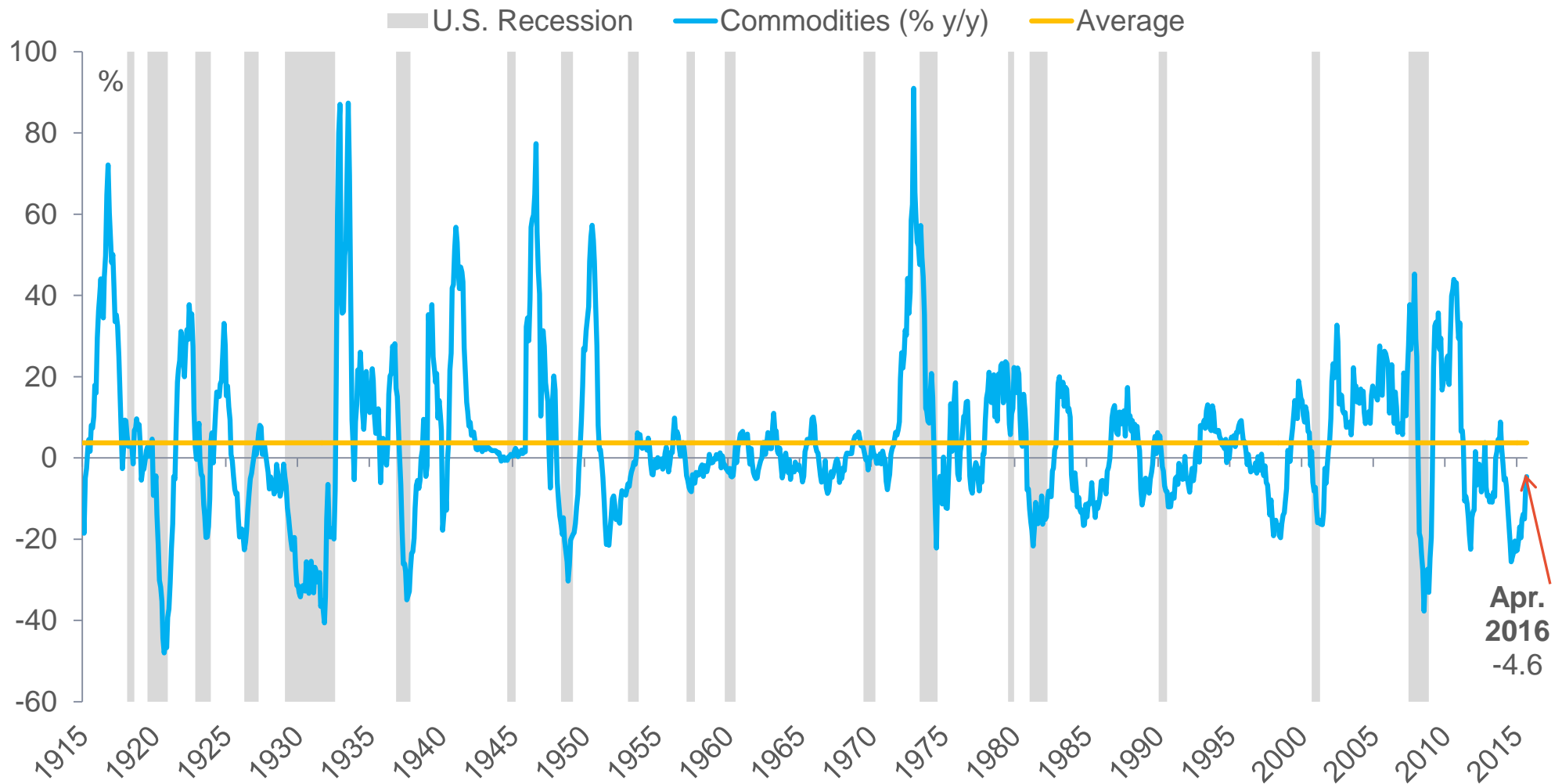
**2011 substituted for 2013 (Source: Center for Disease Control and Prevention, National Health Interview Survey, 2011)

***2012 substituted for 2013 (Source: The Nielsen Company)

****2012 substituted for 2013 (Source: U.S. Census Bureau)

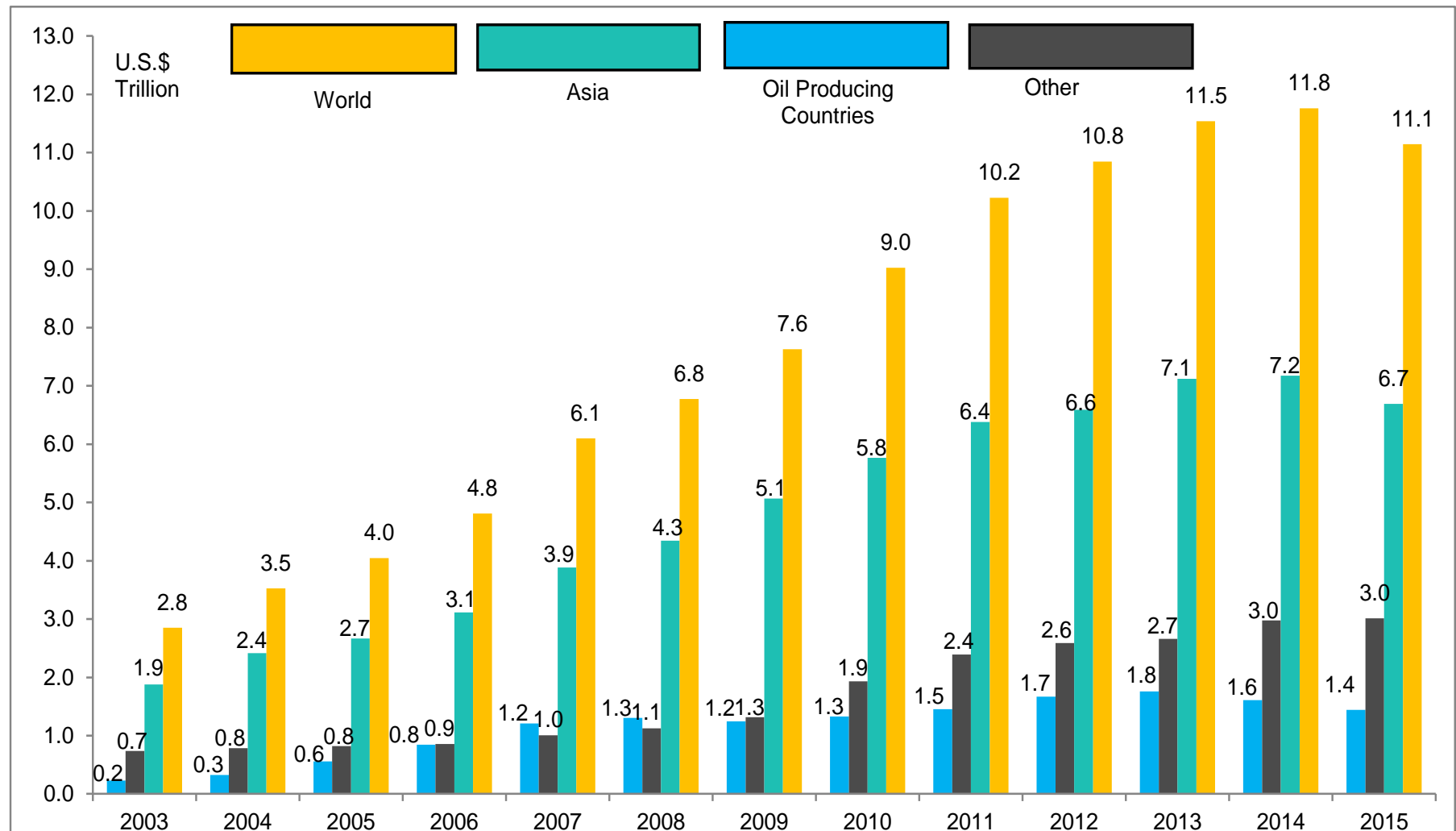
Source: BNY Mellon using data from Quartz, Center for Disease Control and Prevention, The Nielsen Company, and U.S. Census Bureau

Commodity Prices* (% y/y): August 1915 to April 2016



Monthly data; *Thompson Reuters Core Commodity Equal Weight Index with extension by Global Financial Data; Source: BNY Mellon using data from Global Financial Data and NBER

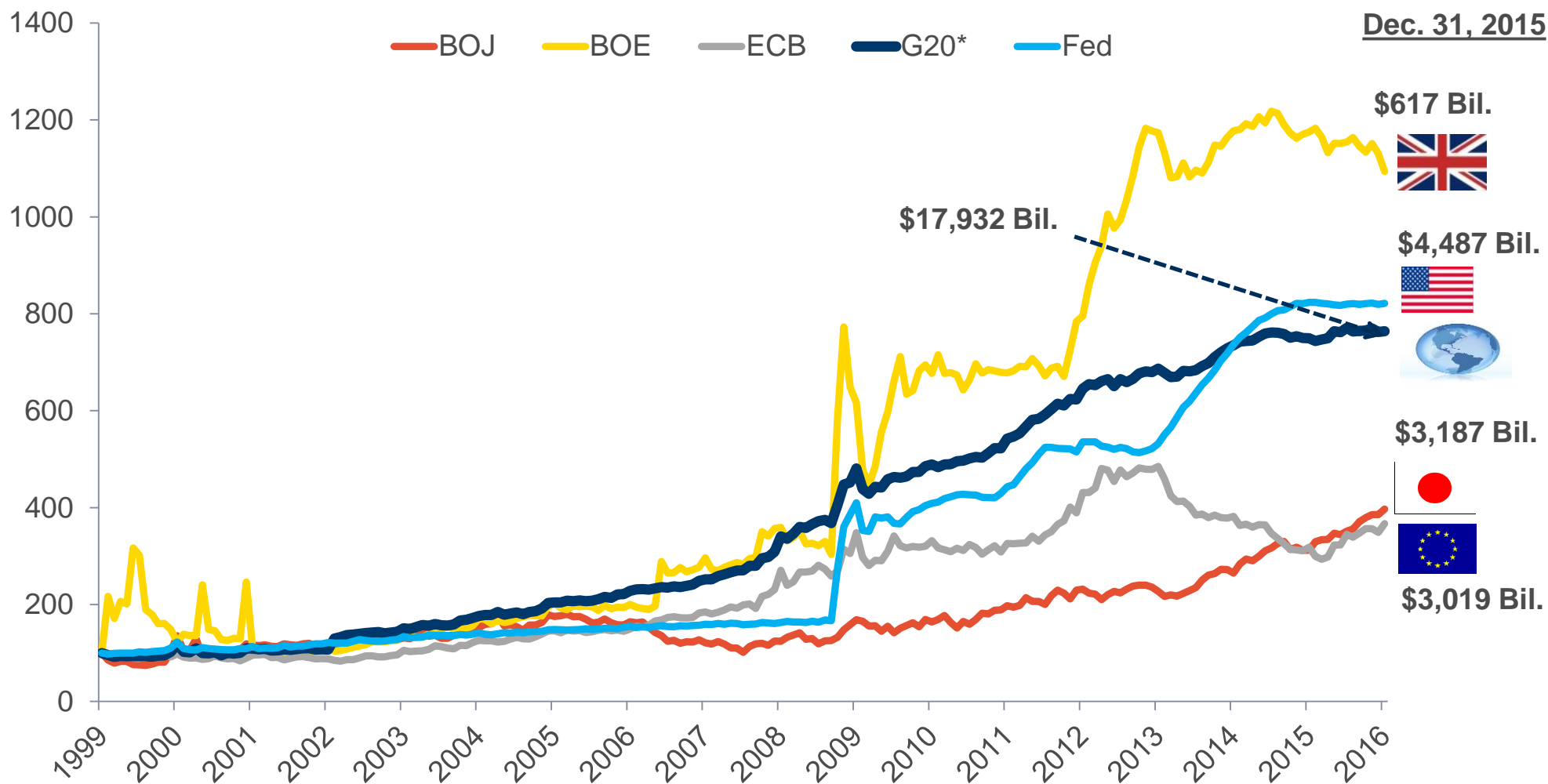
Central Bank Foreign Exchange Reserves¹ (U.S.\$ trillion): World, Asia, & Oil Producers: 2003 to 2015



1) Excludes gold; may not add to total due to rounding; Asia countries include China, Japan, India, Taiwan, South Korea, Singapore, Hong Kong, Malaysia, Thailand, Indonesia, Philippines, Laos, Cambodia, Pakistan; Oil Producing countries include Algeria, Angola, Ecuador, Kuwait, Libya, Nigeria, Qatar, Saudi Arabia, U.A.E., Venezuela, Russia, Norway. 2015 estimates per IIF for Venezuela, Qatar, Nigeria, and Algeria. Latest data available is used for 2015 for all countries. Source: BNY Mellon using data from Bloomberg and IIF.

Record G-4 Central Bank Asset Accumulation

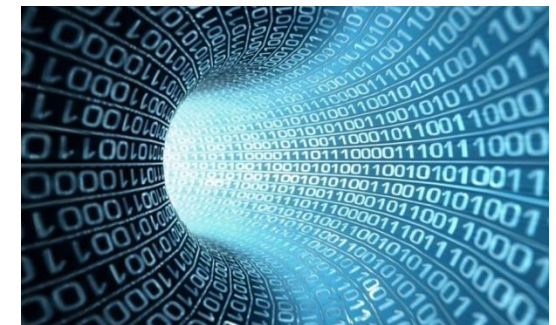
Central Bank Total Assets (U.S.\$): 1999 (indexed to 100) to 2015



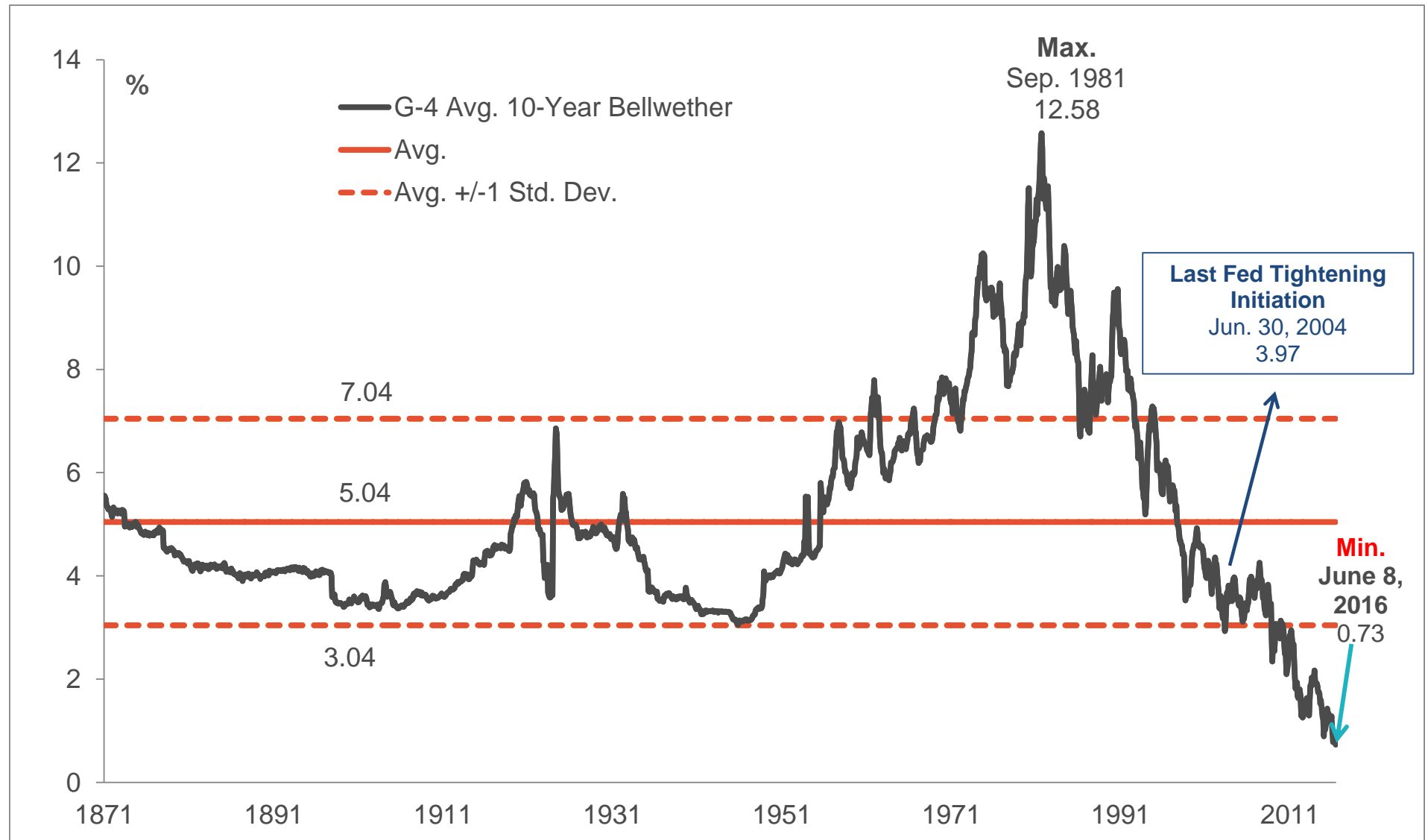
Central bank total assets converted to U.S.\$; *Includes Reserve Bank of Australia, Bank of Canada, European Central Bank, Bank of Japan, Bank of Mexico, Central Bank of Russia, Bank of England, and Federal Reserve from 1999 to present. Also includes People's Bank of China from February 2002 to present, Reserve Bank of India from November 2005 to present, and Central Bank of Brazil from 2008 to present; Source: BNY Mellon using data from various central banks, Bloomberg, and FactSet

Teens: Multipolar Geopolitical World; China's Manifest Economic Destiny; Decade of Peak Boomer Retirements Straining Entitlement Systems; Persistence of the Great Foreboding; Fracking; Financialization

- ◆ 2013: 40th anniversary of creation of Bond Total Return indices (July 1973) by Kuhn Loeb-Lehman-Barclays and Salomon Brothers
- ◆ 2013: 40th anniversary of Yom Kippur War (October 1973) and OPEC quadrupling of oil price
- ◆ Summer opening of ice-free Arctic Northwest Passage in 2013 cuts shipping costs from Europe to Asia
- ◆ Fed's 100th anniversary in December 2013
- ◆ Fed begins tapering of asset purchases in January 2014 and finishes in October 2014
- ◆ U.S. Treasury launches floating-rate notes (2014), first new structure since TIPS (1997)
- ◆ Budgetary-imposed military retrenchment by the U.S. encourages multipolar geopolitical world
- ◆ China becomes world's largest economy for the first time in 2 centuries (late Teens) and continues to enhance its raw material supply chain
- ◆ Chairman Bernanke leaves Fed on expiration of term on January 31, 2014, replaced by Janet Yellen
- ◆ 70th anniversary of Bretton Woods in 2014 and creation of IMF and World Bank (July 1944)
- ◆ Cyber-currencies like bitcoins become popular (Q1 2014); Apple Pay debuts in Q3 2014
- ◆ Russia annexes Crimea (March 2014)
- ◆ Wall Street Journal celebrates 125th anniversary (2014)
- ◆ "Capital in the 21st Century" published by Thomas Piketty (2014) argues against increased wealth concentration
- ◆ Exponential rise of Big Data helps reconfigure global economic system
- ◆ Retiring Boomers with inadequate savings create a new downward economic mobility demographic
- ◆ Brazil boosted by hosting World Cup (2014) and Olympics (2016)
- ◆ Centennial of World War I in late July/early August 2014 inspires remembrance
- ◆ Russia separatists in Ukraine shoot down Malaysian aircraft (July 2014)
- ◆ "Flash Rally" in U.S. Treasury market on October 14, 2014 leads to 16 bp rally in U.S. 10-year Treasury over 12 minutes and then a subsequent yield rebound
- ◆ "Commodity-producing nations like Brazil and Russia enter recession (2015-2017)
- ◆ Cyber attacks intensify, with many U.S. firms breached during 2014, 2015
- ◆ Another showdown between Israel and Hamas on Gaza (July/September 2014)
- ◆ ISIS/ISIL attempt to fragment Iraq (July 2014-to indefinite); U.S. coalition begins air attacks in September 2014
- ◆ Russia/West exchange sanctions (Q2, Q3 2014) over Ukraine



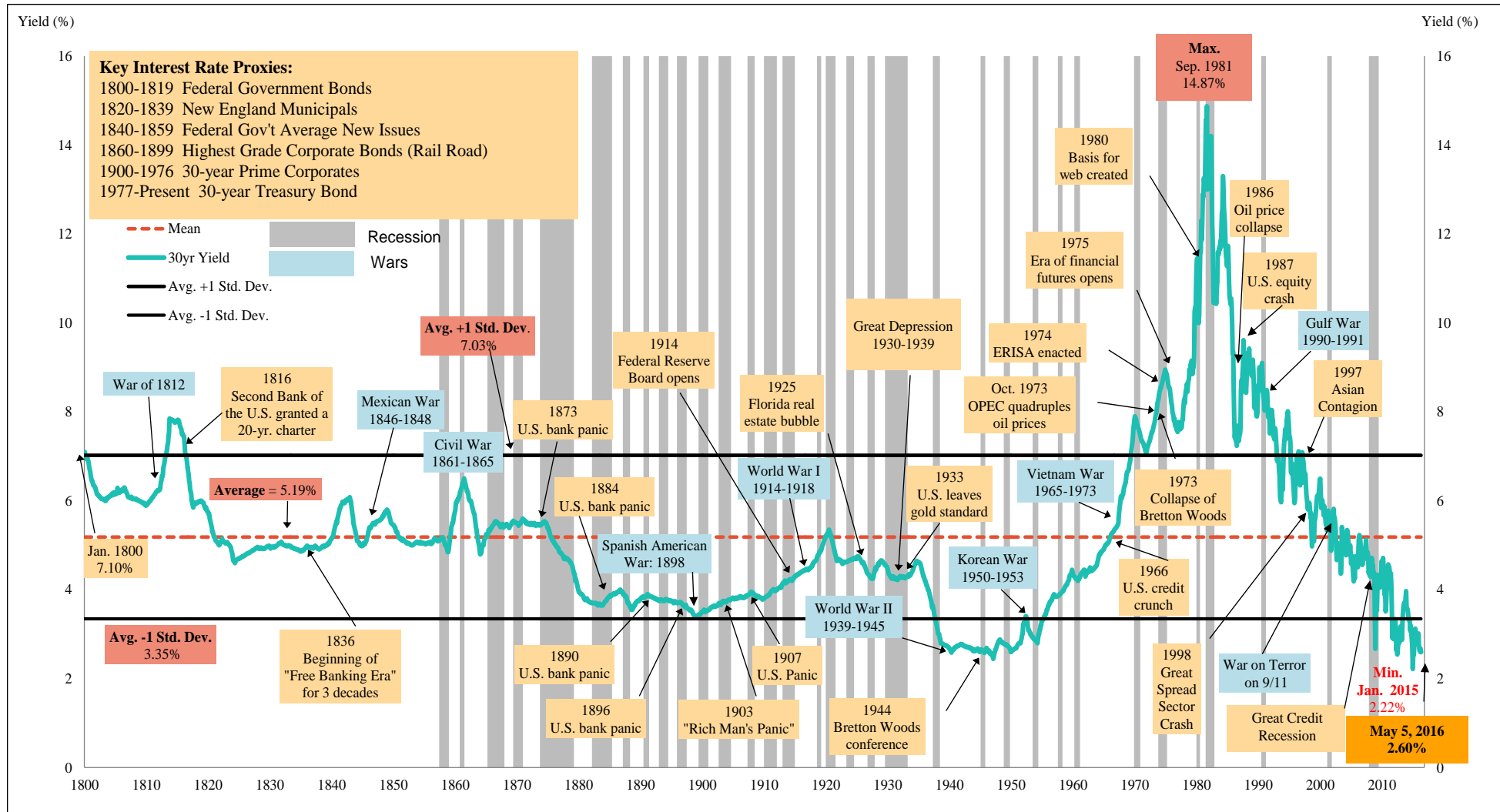
Record Low G-4¹ Rates: 1871- 2016



1) Germany, Japan, U.K., and U.S.; closest substitute available used when 10-year government bond yield data unavailable;

Source: BNY Mellon using data from Global Financial Data and Bloomberg

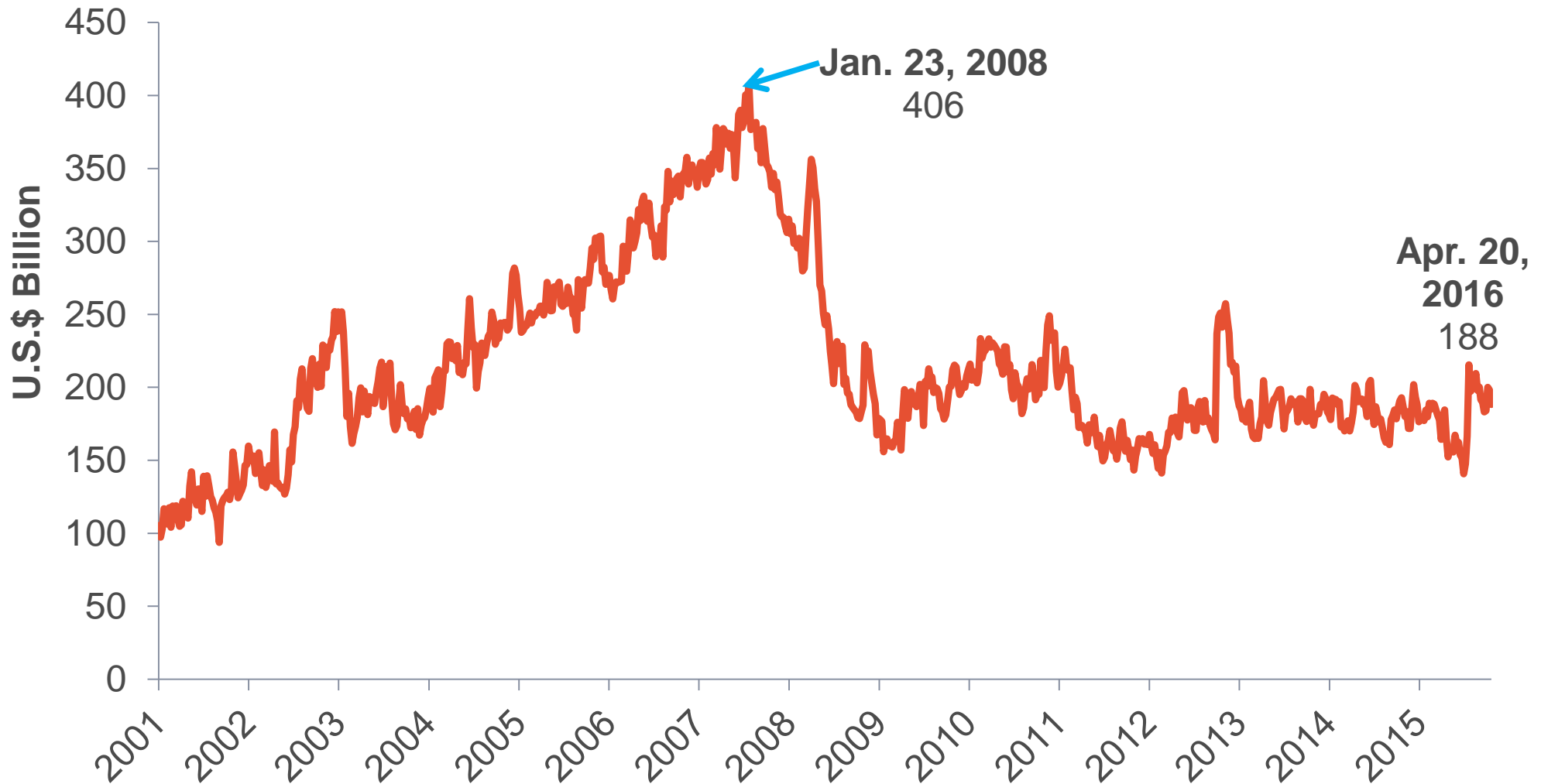
A History of Long-Term U.S. Interest Rates, U.S. Recessions, and World Military Conflicts: 1800 to May 5, 2016



Source: BNY Mellon using data from Global Financial Data

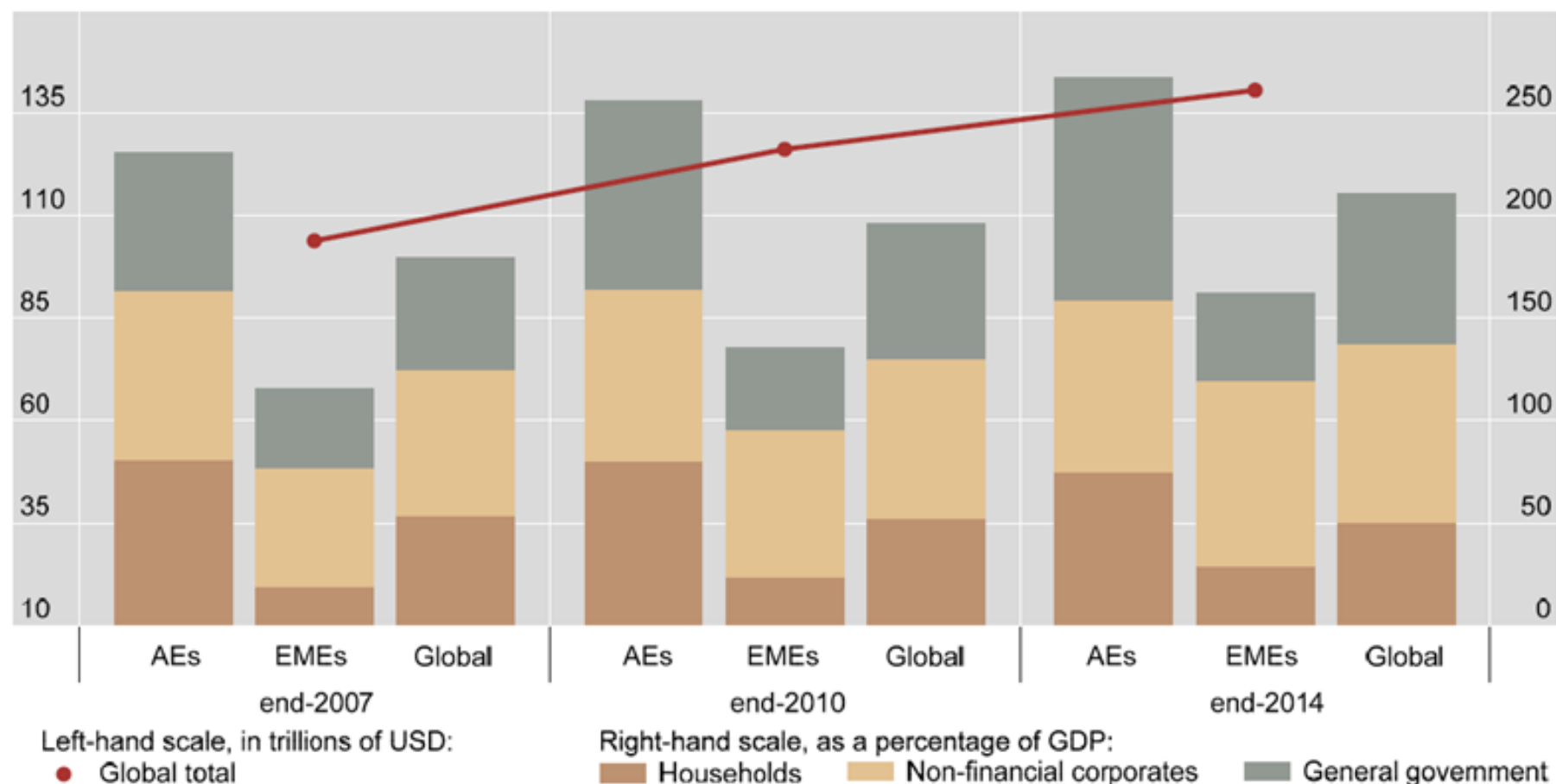
Policy-Induced Deleveraging Hurting Market Liquidity

U.S. Primary Dealer Net Positions of Bonds¹



1) Excludes securities issued by the U.S. Treasury; Source: BNY Mellon using data from New York Federal Reserve

Global Debt Levels Continue to Rise



The global sample of countries includes: Argentina, Australia, Brazil, Canada, China, the Czech Republic, Denmark, Germany, France, Greece, Hong Kong SAR, Hungary, India, Indonesia, Ireland, Italy, Japan, Korea, Malaysia, Mexico, Netherlands, Norway, Poland, Portugal, Russia, Saudi Arabia, Singapore, Spain, South Africa, Turkey, the United Kingdom and the United States. AEs = advanced economies; EMEs = emerging market economies.

Source: BNY Mellon using data from BIS

Teens: Multipolar Geopolitical World; China's Manifest Economic Destiny; Decade of Peak Boomer Retirements Straining Entitlement Systems; Persistence of the Great Foreboding; Fracking; Rise of Virtual Currencies and FinTech; Financialization

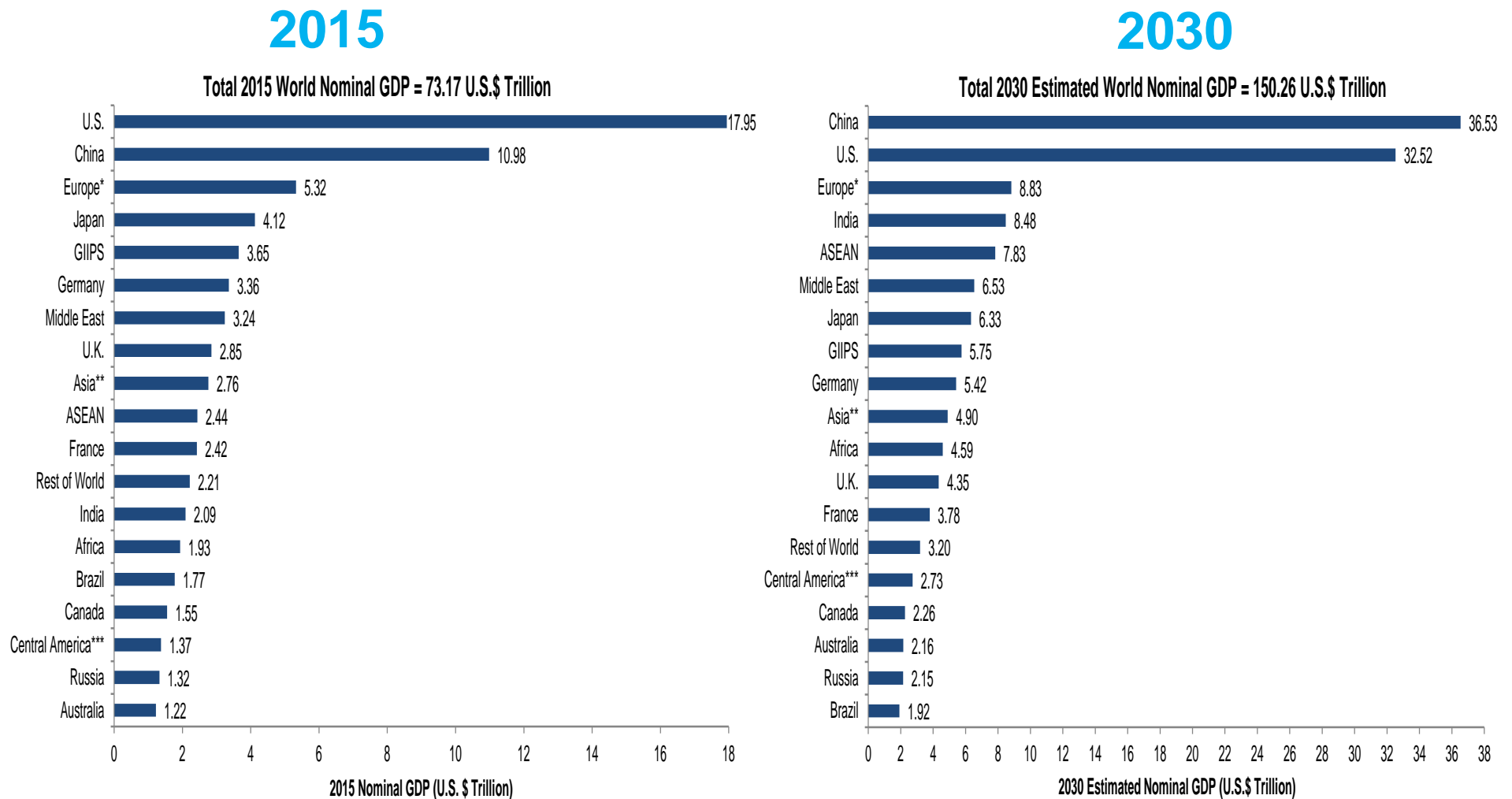
- ◆ Scotland votes to stay in U.K. (September 2014)
 - ◆ After initial West African outbreak in March 2014, first confirmed U.S. Ebola case and death (Dallas, Texas, September 30, 2014)
 - ◆ Hong Kong demonstrations for more autonomy from Beijing (October 2014)
 - ◆ Europe's Rosetta satellite lands on a comet on November 12, 2014. First human landing on a comet
 - ◆ Swiss Central Bank chops currency peg to euro of 1.20 in January 2015 and goes on to lose \$23.05 billion in 2015
 - ◆ Possible military showdown with Iran by U.S. and/or Israel averted by nuclear deal on July 14, 2015
 - ◆ 175,000 CFA's by 2020; 178,00 enrolled in program in 2015
 - ◆ Some major plan sponsors back away from hedge funds given high fees and mixed performance (2015-2016)
 - ◆ European Central Bank announces Quantitative Easing Program on January 22, 2015 that runs from March 2015-September 2016 (Since extended on March 10, 2016)
 - ◆ Negative yields proliferate across European and Japanese yield curves (2014-2016); G-4 10-year Treasury yields average lowest reading since inception of time series in 1871
 - ◆ Sudden risky asset correction in August-September 2015, followed by Q4 2015 rebound and then correction in January-mid-February 2016 and then rebound
 - ◆ Fed commences initial cyclical tightening on December 16, 2015; first hiking cycle start since June 2004
 - ◆ BOJ announces negative interest rate policy (NIRP) on January 9, 2016
 - ◆ Asian Infrastructure Investment Bank open on January 16, 2016 in Beijing, China
 - ◆ Trans-Pacific Partnership (TPP) signed on February 4, 2016; ratification uncertain
 - ◆ Major terrorist operations in Paris (November 2015) and Brussels (March 2016)
 - ◆ Some large European banks manifest problems (Q1 2016)
 - ◆ Apple has first down quarter (Q1 2016) in 13 years
 - ◆ Oil supply surplus drives oil into mid-\$20s (January 2016), rebounds into mid-\$40s (April 2016)
 - ◆ Panama papers leaked, reveal possible offshore tax avoidance (April 2016)
 - ◆ U.S. imposes limitations on corporate inversions (April 2016) after M&A bonanza of 2015
 - ◆ Paris agreement on climate change signed by 177 U.N. members on April 22, 2016
 - ◆ 50th anniversary of Q Group (April 2016)
 - ◆ Puerto Rico defaults (May 2016)
 - ◆ Brazilian President Rousseff headed toward impeachment (May 2016)
 - ◆ U.K. votes on whether to stay in European Union or leave ("Brexit") on June 23, 2016
 - ◆ Bloomberg acquires Barclays/Lehman Global Family of Indices (June 2016)
 - ◆ Rio Olympics (summer 2016) partially threatened by Zika virus (early 2016)
-



Teens: Multipolar Geopolitical World; China's Manifest Economic Destiny; Decade of Peak Boomer Retirements Straining Entitlement Systems; Persistence of the Great Foreboding; Fracking; Rise of Virtual Currencies and FinTech; Financialization

- ◆ Epic U.S. presidential election in November 2016
 - ◆ FinTech and direct lending expected to transform financial institutions business models over the late Teens and Twenties
 - ◆ Bitcoin and Blockchain may revolutionize capital market transfer systems in late Teens and Twenties
 - ◆ Low financial asset returns persist in 2015-2016, probably through Teens
 - ◆ Iterative fine-tuning (2015-2019) of first-round, Great Recession-induced new regulations
 - ◆ Deflation worries in 2014-2016 (Eurozone) followed by expected moderate reflation in late Teens
 - ◆ Thanks to fracking, oil & gas production boosted in many nations to the detriment of energy exporters in the Middle East and Russia (2014-2025)
 - ◆ Global climate “weirding” supposition (2014-2100): unusual weather patterns often falsely attributed to climate change rather than randomness
 - ◆ Stimulated by lowest rates in at least a century and a half, Great Recession & Aftermath subsides over 2016-2020; higher advanced economic growth tendencies in 2H of the Teens offset by stimulus withdrawals
 - ◆ Fed chair Janet Yellen’s term expires in January 2018
 - ◆ MiFIDII (Markets in Financial Instruments Directive) implementation by European Council on January 3, 2018
 - ◆ Countdown to next global recession hitting sometime between 2018-2022
 - ◆ Basel III fully implemented (2019)
 - ◆ General escalation of geopolitical risk (2010- 2020)
 - ◆ Only 5-7 major broker-dealers in U.S. still standing by 2020-2025; liquidity provision remains weak, encouraging electronic bypass
 - ◆ With fully-convertible currencies, Chinese and Indian debt enters Global Aggregate Index in approximately 2020-2022
 - ◆ U.S. PBGC may run out of money by 2030 without additional infusions by U.S. government
 - ◆ China and U.S. agree to limit carbon emissions by 2035
 - ◆ U.S. Government financing of burgeoning student loans consumes 25% of net U.S. Treasury financing by late Teens
 - ◆ Japan’s fiscal policy possibly becomes more problematic in the Twenties
 - ◆ Commercial and residential real estate peaks over the late Teens /early Twenties
 - ◆ Global credit markets remain dependent upon shadow banking system
 - ◆ Possible “Bubbles of the Teens”: bonds; precious metals; ETFs; EM; and Alternatives
 - ◆ Significant and probably contentious U.S. presidential election in 2020
 - ◆ Food and especially water shortages arise (2025); California water shortage in 2014/2015 abates on heavy 2015-2016 rains
 - ◆ Chinese entitlements will take a bigger share of its economy than the U.S. (2040)
 - ◆ Machine intelligence will surpass humans by 2030-2050 in so-called “singularity”
 - ◆ Robots will take over a large part of the global work force by 2050
 - ◆ Some megacities have population of 140 million (2100)
 - ◆ Medical advances may allow some people to live centuries by late 21st century
 - ◆ East regains lead over West in social development (2100)
-

World GDP Geographic Breakdown: 2015 vs. 2030¹ Estimated



Only includes countries with available IMF estimates through 2021. 1) 2030 projected GDP calculated using 2015-2021 nominal CAGR derived from IMF nominal GDP projections in U.S. \$: U.S. \$ at current market prices per IMF; Sum of geographic regions may not exactly add to world total due to rounding; *Europe: Excluding GIIPS (Portugal, Italy, Ireland, Greece, Spain), Germany, France, U.K.; **Asia: Excluding ASEAN, India, China, and Japan; ***Central America: Includes Mexico; Source: BNY Mellon using data from IMF

Twenties: A Tailwind After Two Decades of Headwinds

- ◆ Geopolitical risk still remains elevated compared to the 1990s in the immediate aftermath of the end of the Cold War
 - ◆ World economy will be due for next recession, with 11 years passing by 2020 since the end of the Great Recession 2009
 - ◆ The next recession likely will be milder than 2007-2009, but risk-averse capital markets may react just as much as the Great Recession given structural reduction in liquidity
 - ◆ The next recession will be prompted by a geopolitical shock or adverse reaction to economic policymaking (like eventual normalization, including the end of negative yields)
 - ◆ World economic and productivity growth will rebound from 2000-2019 mediocrity as the structure of the world capital and labor markets better adjust to the late 20th/early 21st century innovation surge. Rise of robots remains structural long-term risk
 - ◆ The fine-tuning of modern capital market oversight will span the Twenties
 - ◆ Nominal and real financial asset returns will exceed 2000-2019 averages
 - ◆ Internet of Things and Big Data flourish
 - ◆ Possible retirement crisis: insufficient assets to cover retirement liabilities for some private and public pension plans, combined with some mis-hedging of defined contribution plans, impinges financial position of some retirees
 - ◆ Africa yet again rediscovered as area of investment opportunity
 - ◆ Increased emphasis on long horizon and green investments
-

The Future History of Global Capital Markets

Brute Force in Early-to-Mid Industrial Age



**All
Fundamentals,
Technicals,
Prices, Indices,
New Issues,
Retirements
(Calls, Tenders,
Maturities)**



**Real-Time
Portfolio
Adjustments
Executed
Through Global
Virtual
Exchange**

Desktop AI Optimization Subject to Flexible Portfolio Constraints



Moore's Law*

2008
2010
2016
2025
2050

PC Chip Speed

500 GHz
1,260 GHz
20,159 GHz
1,290,159 GHz
134,217,728,000 GHz

* Processing Speed doubles approximately every 18 months

The Errors of Nineteenth Century Yield Maximization Still Being Applied in Early 21st Century

“Such vicissitudes, beginning with irrational speculation and ending with a commercial crisis, have not hitherto become less frequent or less violent with the growth of capital and the extension of industry...Rather they may be said to have become more so: in consequence, it is often said, of increased competition; but, as I prefer to say, of a low rate of profit and interest, which makes capitalists dissatisfied with the ordinary course of safe mercantile gains.”

– John Stuart Mill, *Principles of Political Economy*, 1848

Overview of Next Generation Global Financial System

- ◆ Late 20th/Early 21st Century Global Capital Market Developments
 - Deregulation/Re-Regulation
 - Derivitization/Deceleration
 - Globalization/Acceleration
 - Privatization
 - Triple A¹ & Triple I Doctrine²
 - Disintermediation/Quickening in Europe/Asia
 - Securitization/Renormalization
 - Portfolio Philosophy Modernization
 - Parsing Beta Into Many Forms Like “Smart Beta”
 - Pension Fund Capitalism: Defined Benefit to Defined Contribution
 - Active to Passive Investing
 - Faster Equity Trading
 - Quantification
 - Technology
 - SRI
 - Big Data
 - Shift to Electronic Bond Trading
- ◆ The First Neo-Modern Credit Market Correction: Quadruple Bottom in Q1-2009, Q2-2011, mid-2012, mid-2014 (Eurozone & Japan)
 - The Great Recession of 2007 – 2015
- ◆ Institutional Aftermath: 10-15 Year Process (2007-2020); Full Adjustment to 2025
- ◆ The Beginning of the 21st Century More Conservative Capital Market Order
 - Everything’s Ripe for Re-Interpretation, especially capitalism and strategic portfolio strategy
- ◆ Encroachment of Algorithmic/Quant Approaches on Classic Fundamental Value-Based Portfolio Methods
- ◆ Portfolio Strategy: *Tactical and Strategic Asset Allocation; End of Siloization*
 - Tactical: Wariness of Another Risk Aversion Phase in Mid-to-Late Teens
 - Decline of Strategic Opportunities in IG and HY Credit, EM, Frontier, and Alternative markets
 - 2007 – 2020 Will Be Recalled for “Systematic Credit Cleansing”
 - Brighter Strategic Outlook for the Twenties

1) Triple A’s: alternatives; absolute return; alpha/beta separation

2) Triple I’s: innovation; infrastructure; inflation-linked

Lessons (Re-)learned So Far From Great Recession (2007-2009)

- ◆ Inadequate “Big Picture thinking” about economic/capital market evolution and risk
- ◆ Like industries and individual firms, global economic and global financial systems periodically require tweaking and even major overhaul
- ◆ Ignorance/ignoring rich capital market history of past two centuries can be highly hazardous to portfolios
- ◆ Global trade and capital flow imbalances are not sustainable infinitely
- ◆ Residential and commercial real estate valuations do not continuously escalate and are highly correlated
- ◆ Re-occurring systemic and idiosyncratic credit misdiagnoses continue to plague world financial system
- ◆ Government, financial institution, and consumer financial leverage have risk limits and need to be recalibrated lower
- ◆ Excessive reliance on short-term financing
- ◆ Complete consideration of high fluctuations in liquidity
- ◆ Originate and distribute business model weakens credit system
- ◆ Regular fallibility of institutions (certain financials, rating agencies, regulators), financial risk models, risk surveillance
- ◆ Antiquated regulatory and government oversight methodologies need overhaul, with enhanced global coordination and additional scrutiny of rating agencies and certain types of Alternative managers
- ◆ Rate of financial innovation exceeded “comprehension speed limit”
- ◆ Inter-asset class correlations can be disturbingly high
- ◆ Hazards of yield maximization and understaffed asset management firms
- ◆ In Bruner & Carr’s *“The Panic of 1907: Lessons Learned,”* the following cited: complexity of system architecture; buoyant growth for a while; inadequate safety buffers; adverse leadership; real economic shock; excess fear & greed and strange behaviors; failure of collective action (little changed over the ensuing century)

The Structural Aftermath of “The Great Recession”: The Beginning of the 21st Century Capital Market Order

“Invisible Hand” Becomes More Visible

- ◆ Prevent future financial system disruptions from spilling over into real economy with “too big to fail” financial institutions owning a put back to taxpayers
- ◆ Identify and better monitor systemically important financial institutions (SIFI)
- ◆ “Post-bubble conservatism” for “Neo-Modern credit markets”
- ◆ Shift of government legislative/regulatory pendulum toward more oversight
- ◆ More conservative consumer finance
- ◆ Lower financial leverage for certain classes of financial institutions; especially broker-dealers
- ◆ Global mortgage origination process: less low-quality capacity, more caution
- ◆ Rating agencies: more conservative, additional regulatory involvement
- ◆ Greater emphasis on in-house fundamental credit analysis
- ◆ Structured credit products: medium-to-long term resurrection in more conservative form
- ◆ Acceleration of disintermediation; especially in Europe and Asia
- ◆ Attempt to better coordinate cross-border regulatory and economic policymaking
- ◆ Virtues, efficacy, even existence of efficient markets questioned
- ◆ Re-appraisal of strategic liquidity premia; likely extended era of volatile risk premia
- ◆ Better appreciation of limits to empirical models, improved blend of macro & micro models
- ◆ Slower capital formation and productivity growth
- ◆ Anxiety about extended natural resource competition, inciting stubborn commodity inflation (food), higher interest rates
- ◆ Extended restraint for advanced world growth and breed new found tolerance for inflation (like Japan, Europe)
- ◆ Strategic shift in balance of power away from U.S.
- ◆ Temporary, not permanent, stall in the pace of financial market innovation
- ◆ Real progress on multi-generational issues such as energy and climate change derailed by slow growth
- ◆ Asset management philosophy: acceleration into alternatives and alpha/beta separation; reduced management fees, higher barriers to entry for new Alternative managers
- ◆ Everything’s up for re-interpretation

Strategic Positives for Global Financial System

- ◆ While still prone to regular corrections, potentially more stable global financial system
 - ◆ Toward fiscal rectitude at most government, business, and consumer entities
 - ◆ Business cycle history convincingly points to full recovery from Great Recession over the long run
 - ◆ Derisking, delevering, downsizing world financial system, while improving transparency
 - ◆ Eurozone destiny will be defined
 - ◆ Along with much of EM, China/India's long-term economic elevation in 21st century to AE status (Grand Convergence)
 - ◆ Eventual enlargement of reserve currencies to include China
 - ◆ Taming of inflation and deflation
 - ◆ Enhanced scope for entrepreneurs
 - ◆ Better capitalized financial institutions, starting in the Teens
 - ◆ Sounder oversight of global financial markets: Wall Street & City to be renamed Regulatory Road
 - ◆ Naked short-selling ended
 - ◆ Possible crowded field for Alternatives
 - ◆ Rise of Frontier investing
 - ◆ Global currency unification possible in some electronic form (possibly cyber-currencies like bitcoins)
 - ◆ Improved macro and micro research processes
 - ◆ Better use of technology to search for new data sets (big data) to generate alpha and to aid in risk management
 - ◆ Improved business-cycle diagnostics
-

Strategic Positives for Global Financial System

- ◆ Nature of 21st century financial system refined, particularly the role of government on economy
- ◆ Higher financial asset returns, even allowing for global yield curve adjustment to higher ranges in mid-Teens
- ◆ The exact same mistakes of the previous decade seldom are repeated in the following decade; like generals preparing for the last war, portfolio policies often geared to avoiding the most recent “severe learning lessons”
- ◆ Older learning lessons can be re-cycled to a new generation
- ◆ The visibility of the “invisible hand”
- ◆ Weaning of financial institutions and certain industrial sectors from government assistance
- ◆ The resumption of capital market innovation will be hailed, with potential learning lesson consequences
- ◆ Subjective “letter ratings” displaced by real-time market ratings
- ◆ Capital flow accumulations likely to still favor SWFs and central bank reserves
- ◆ Demographics/entitlement reform
- ◆ Climate change remediation begins to exert real effects on capital markets
- ◆ Coping with nuclear proliferation and thinking about possible mid-century resource wars
- ◆ The next asset management fashions will be introduced

Key Strategic “Wonder” Questions

- ◆ Coping with geopolitical risks
- ◆ Next big technological breakthroughs
- ◆ Lack of progress in business cycle diagnostics and anticipation, can and how will big data help?
- ◆ Should financial institution leverage be more formally regulated
- ◆ Ability to reduce unprecedented monetary stimulus without inducing late-Teens recession
- ◆ Are bonds, precious metals, ETFs, EM, and Alternatives in “bubble territory”?
- ◆ Will the “next big economic seismic upheaval” take 8 decades to show up (2080s)?
- ◆ Can shale live up to its promise?
- ◆ Slow methodological convergence across global capital markets
- ◆ Endurance in conviction of “preventive oversight”
- ◆ Persistence of SWF/central reserve accumulation rates
- ◆ Lack of real global energy/climate change plans
- ◆ Inevitability of higher savings rates in many developed nations
- ◆ Effects of demographic and entitlement reform shifts
- ◆ Rate of human capital development and migration
- ◆ End of singular reserve currency status for dollar
- ◆ Obsolescence of traditional total return management; full embrace of new technologies and strategies
- ◆ Sufficiency of alpha, especially with reduced financial leverage; which beta to use
- ◆ Possibility of eventual resource wars
- ◆ Continuation of vestigial conflicts from millennial-old divides in theology and political philosophy
- ◆ Structure of global economy by 2025, 2050
- ◆ Will the Chicago Cubs ever win the World Series again? (perhaps in 2016)

Key Contributions to Economics and Finance Theory

1676: William Petty - Political Arithmetic	1965: Eugene Fama - efficient market hypothesis
1755: Richard Cantillon - An Essay on Economic Theory	1970-2013: Marty Leibowitz - quantification of research
1776: Adam Smith - Wealth of Nations	1971: Douglas North - institutional change
1789: Jeremy Bentham - principle of utility	1973: Fischer Black, Myron Scholes, Robert Merton - option pricing model
1803: Jean-Baptiste Say - A Treatise on Political Economy	1976: Stephen Ross - arbitrage pricing theory
1817: David Ricardo - Principles of Political Economy and Taxation	1977: Oldrich Vasicek - term structure of interest rates - one-factor short rate model
1848: John Stuart Mill - Principals of Political Economy	1977: Kydland and Prescott - time inconsistency
1863: Jules Regnault; 1900: Louis Bachelier - random character of stock prices	1981: Daniel Kahneman - choice in decision-making theory
1867-1894: Karl Marx - Das Kapital	1982: Robert Engle - ARCH and GARCH
1874: Leon Walras - General Equilibrium Theory	1983: Garman and Kohlhagen - FX option pricing
1890: Alfred Marshall - Principles of Economics	1985: Cox, Ingersoll, and Ross - extension of Vasicek model to avoid negative interest rates
1898: Knut Wicksell - natural rate of interest; capital theory: 1901-1906	1985: Mehra and Prescott - equity risk premium puzzle
1918: Gustav Cassel-Law of One Price	1987: Heath, Jarrow, and Morton - forward rates
1919: Heckscher-Ohlin (1933) Trade Theory	1990: Black, Derman, and Toy - one-factor short rate model with lognormal distribution
1930: Irving Fisher - Theory of Interest	1993: Eugene Fama and Kenneth French - size and value deviations from CAPM
1942: Joseph Schumpeter - creative destruction and History of Economic Analysis - 1954	1999: Darrell Duffie - CDS valuation
1944: Friedrich Von Hayek - The Road to Serfdom	2000: Robert Shiller - Irrational Exuberance (1996-1997)
1948: Paul Samuelson - Economics: An Introductory Analysis; quantification of economics	2007: Niall Ferguson - History (1995)
1950: John Nash - game theory	2008: John Geanakoplos: "Leverage Cycle Theory"
1952: Harry Markowitz - mean-variance portfolio selection	2008: Rogoff and Reinhart - economic history
1954: Arrow and Debreu - existence of general equilibrium	2009: Akerlof and Shiller - Animal Spirits (1980s)
1956: Robert Solow - growth theory	2009: Failure of counter-cyclical policy -'New Normal', 'D-Process'
1957: James Tobin - separation theorem, liquidity preference	2009: Harrison and Rutström- Reconciliation of expected utility and prospect theories
1958: Franco Modigliani (consumption theory in 1954) and Merton Miller - capital structure irrelevance	2007-2014: Ben Bernanke - aggressive, unconventional monetary policy
1961: Robert Mundell: optimal currency areas	2014: Thomas Piketty's $r > g$ (rate of return on capital is generally higher than the rate of economic growth) postulation in "Capital in the 21st Century"
1961: John Muth - Rational Expectations	2015: Negative nominal and real interest rates stimulate growth and equities
1962-1963: Mundell - Fleming Model	
1963: Milton Friedman - A Monetary History of the U.S.	
1964: Jack Treynor - Performance measurement	
1964: Gary Becker - human capital	
1964: William Sharpe - capital asset pricing model	

Key Founders of Financial Theory

The Modern Neoclassical Paradigm

John Maynard Keynes



Paul Samuelson



Milton Friedman



Benjamin Graham
Founder of Modern
Security Analysis



Modern Financial Theory Architects

Harry M. Markowitz



William F. Sharpe



Key Founders of Modern Global Markets Practices

Sell-Side Research

Henry Kaufman



Martin Leibowitz



Global Investing

John Templeton



Option Valuation

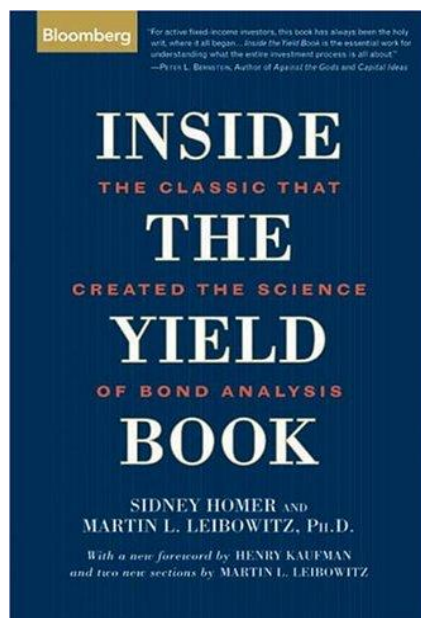
Fischer Black



Myron Scholes



Robert Merton



Key Founders of Modern Global Markets Practices

The Ultimate Investor
Warren Buffett



Relative Value
Bill Gross



Technology
Michael Bloomberg



Hedge Fund Visionary
George Soros



Mutual Funds
Jack Bogle of Vanguard



COURTESY: VANGUARD

Nobel Laureates in Economic Sciences

1969 Ragnar Frisch, Jan Tinbergen	1992 Gary S. Becker
1970 Paul A. Samuelson	1993 Robert W. Fogel, Douglass C. North
1971 Simon Kuznets	1994 John C. Harsanyi, John F. Nash Jr., Reinhard Selten
1972 John R. Hicks, Kenneth J. Arrow	1995 Robert E. Lucas Jr.
1973 Wassily Leontief	1996 James A. Mirrlees, William Vickrey
1974 Gunnar Myrdal, Friedrich August von Hayek	1997 Robert C. Merton, Myron S. Scholes
1975 Leonid Vitaliyevich Kantorovich, Tjalling C. Koopmans	1998 Amartya Sen
1976 Milton Friedman	1999 Robert A. Mundell
1977 Bertil Ohlin, James E. Meade	2000 James J. Heckman, Daniel L. McFadden
1978 Herbert A. Simon	2001 George A. Akerlof, A. Michael Spence, Joseph E. Stiglitz
1979 Theodore W. Schultz, Sir Arthur Lewis	2002 Daniel Kahneman, Vernon L. Smith
1980 Lawrence R. Klein	2003 Robert F. Engle, Clive W.J. Granger
1981 James Tobin	2004 Finn E. Kydland, Edward C. Prescott
1982 George J. Stigler	2005 Robert J. Aumann, Thomas C. Schelling
1983 Gerard Debreu	2006 Edmund S. Phelps
1984 Richard Stone	2007 Leonid Hurwicz, Eric Maskin, Roger Myerson
1985 Franco Modigliani	2008 Paul Krugman
1986 James M. Buchanan Jr.	2009 Elinor Ostrom, Oliver Williamson
1987 Robert M. Solow	2010 Peter Diamond, Dale Mortensen, Christopher Pissarides
1988 Maurice Allais	2011 Thomas Sargent, Christopher Sims
1989 Trygve Haavelmo	2012 Alvin E. Roth, Lloyd S. Shapley
1990 Harry M. Markowitz, Merton H. Miller, William F. Sharpe	2013 Eugene Fama, Lars Peter Hansen, Robert J. Shiller
1991 Ronald H. Coase	2014 Jean Tirole
	2015 Angus Deaton

Source: Nobelprize.org

The Derivatives Hall of Fame

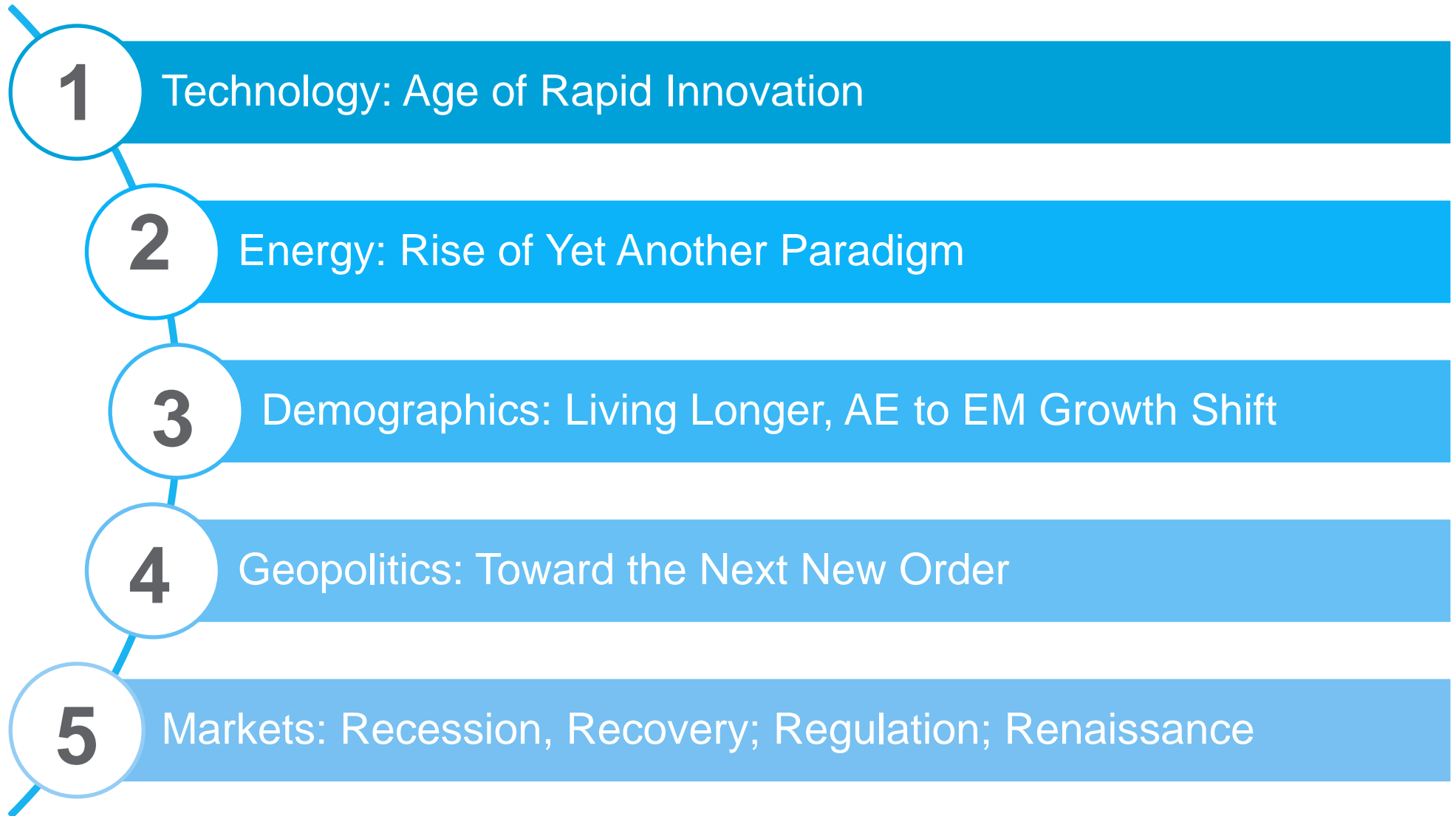
- ◆ Leo Melamed
- ◆ Richard Sandor
- ◆ Myron Scholes
- ◆ Allen Wheat
- ◆ Conrad Voldstad
- ◆ Edson Mitchell
- ◆ Derrick Tullett
- ◆ Robert Merton
- ◆ Merton Miller
- ◆ Jorg Franke
- ◆ Lisa Polsky
- ◆ Mark Rubenstein
- ◆ Patrick de Saint-Aignan
- ◆ Oldrick Alfons Vasicek
- ◆ Bill Brodsky

The 48 Members of The FIASI Hall of Fame

1995	Martin Leibowitz
1996	Fischer Black, Bill Gross
1997	Andrew Kalotay, Henry Kaufman, Sidney Homer
1998	H. Russell Fraser, Wayne Lisky
1999	John Bogle, Richard Wilson
2000	Martin Fridson, Daniel Fuss, Harold Goldberg
2001	Edward Altman, Lewis Ranieri, Eunice Reich-Berman
2002	Frank Fabozzi, Abner Goldstine, Oldrich Vasicek
2003	Jack Malvey, Leo O'Neill
2004	Patricia Cook, Robert Jarrow, Dexter Senft
2005	Larry Fink
2006	Angelo Mozilo
2007	Margaret Cannella, Kenneth Leech, Robert Merton
2009	Keith Anderson, Laurie Goodman, John Hull
2010	Bob Levine, Bob Litterman, Kathleen Yoh
2011	John Finnerty, Mohamed El-Erian
2012	Bob Auwaerter, Chow Kiat Lim, Glenn Reynolds
2013	Jim Grant, Rick Rieder
2014	Curtis Arledge, Joyce Chang, Harry Markowitz
2015	Michael Bloomberg
2016	Ned Johnson III, Howard Marks

Source: Fixed Income Analysts Society, FIASL.org

“The Great Transformations in the Early 21st Century”



“The Road to 2050”



“The Best Way To Predict The Future Is To Invent It”
Steve Jobs

A Humility Reminder

Highly-Unforecastable 20th-21st Century Events

January 1, 1900

- Manned flight (1903), commercial jet travel (1952), space flight (1960), moon landing (1969)
- Great War (1914-1918)
- World War II (1939-1945)
- Radio (early 1900s), TV (1928), PC (1976), Internet (1991)
- Penicillin, polio vaccine, transplants, genetics
- India independence (1947), end of British Empire, global decolonization
- Scale of global securities markets

January 1, 2000

- 9/11
- Iraq War (2003)
- Social Media Explosion (2005-)
- Great Recession (2007-2009)
- Miniscule interest rates (2008-)
- Big Data (2008-)
- Arab Spring (2011-2015)
- Russia annexes Crimea (2014)
- Possible combination of Syria and Iraq (ISIS, 2014-2020)
- SARS (2003), Avian Flu (2003), Ebola (2014), Zika (2016)

Hardly “Apocalypse Now” in Mid-to-Late Teens



The Strategic Worries of the Early 21st Century Reflected in Popular Culture

24/The Blacklist/Homeland (TV)

- Nuclear Weapon Detonation
- Biological and Chemical WMD
- Arms Smuggling
- Terrorism
- Middle East, North Korea, Iran, Russia, Pakistan
- Narcotic Syndicates
- Organ Harvesting
- Government Coups
- Human Trafficking
- Computer System Hacking

Movies

- Alien Invasion/Contact
- Sea Monsters
- Time Travelers
- Nuclear War Aftermath
- Robots
- Super-Intelligent Machines
- Authoritarian Police State
- Black Holes
- Asteroid Strikes
- Supernovas
- Solar Flares
- Electromagnetic Impulse
- Genetically and Machine Enhanced Villains and Heroes
- Zombies/Vampires
- Pandemics

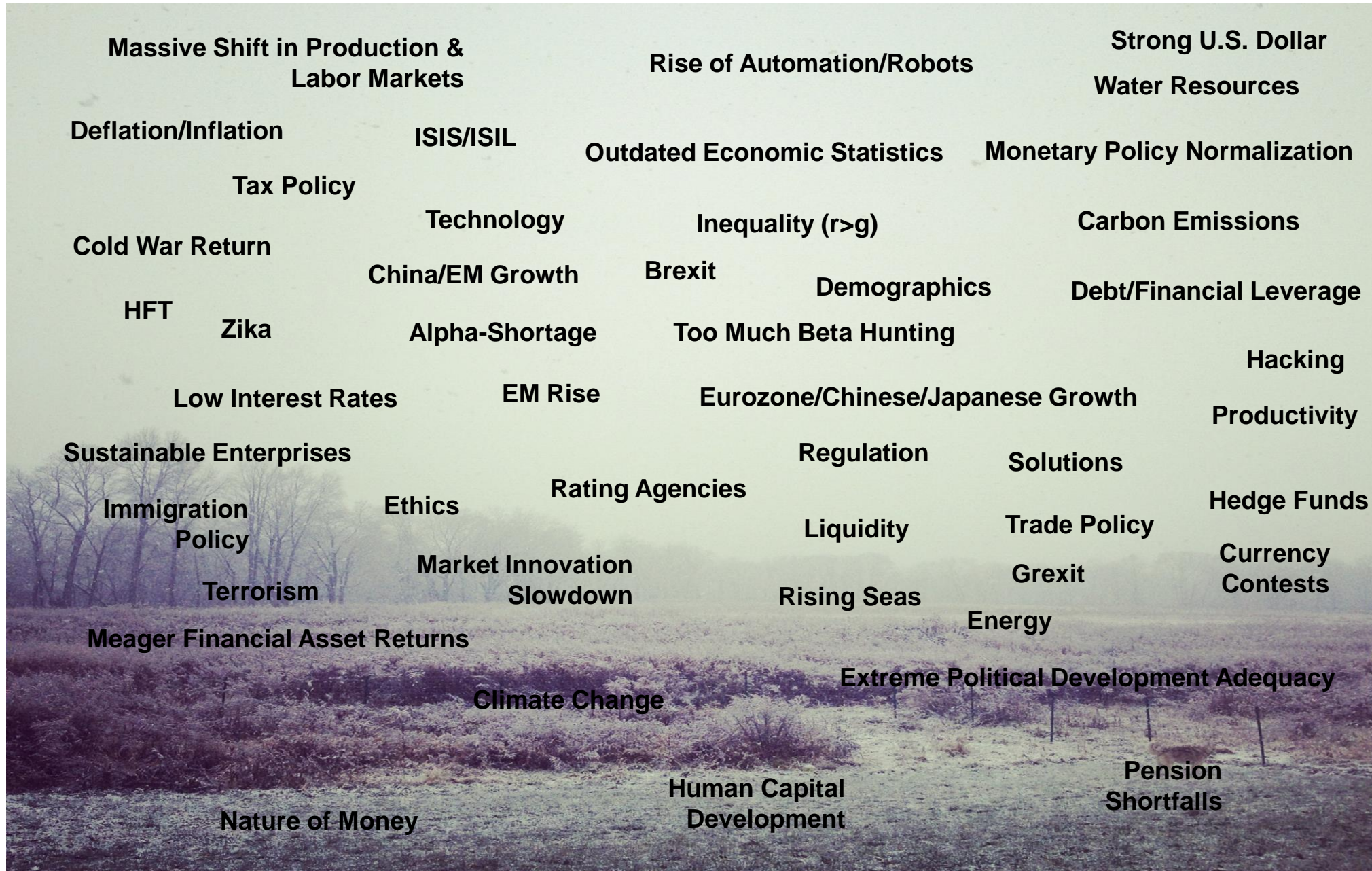
PBS/Books/Articles

- Nuclear Power
- Yellowstone/Idaho Super Volcano
- Permafrost Methane Release
- Mass Extinction Events
- Climate Change
- Super Earthquakes, Hurricanes, Tornadoes, Floods
- Serial Killers
- Wars
- Life After Humans
- The End of the Universe

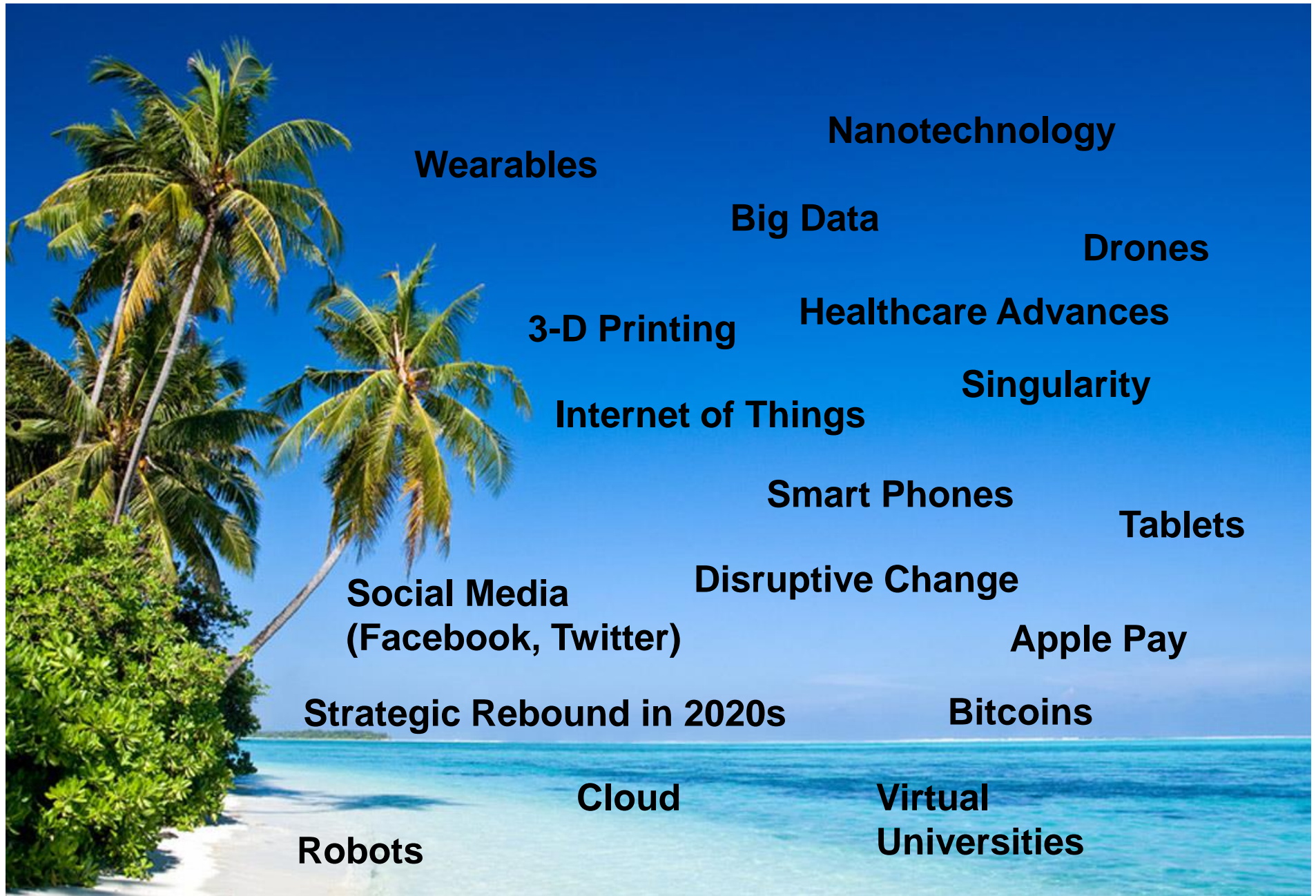
Popular Culture Spills Over into Market Terminology During the Teens

- Great Recession
- New Normal
- Secular Stagnation
- New Mediocrity
- Lost Decade
- Miserabilism
- Valuation Acrophobia
- Risk Hypochondria

The Multi-Worries of Early 21st Century Finance



One of the Best Times Ever to Be in Capital Markets



Walter Russell Mead

“Just as the 20th century unleashed good and evil beyond the ability of 19th century humanity to comprehend or cope with, so too the 21st century will witness unimaginable blessings and horrors. With bodies and even souls remade by the marvels of genetic engineering and the fusion of the biological and mechanical kingdoms, our descendants may inhabit mental and physical universes only dimly imagined today.”

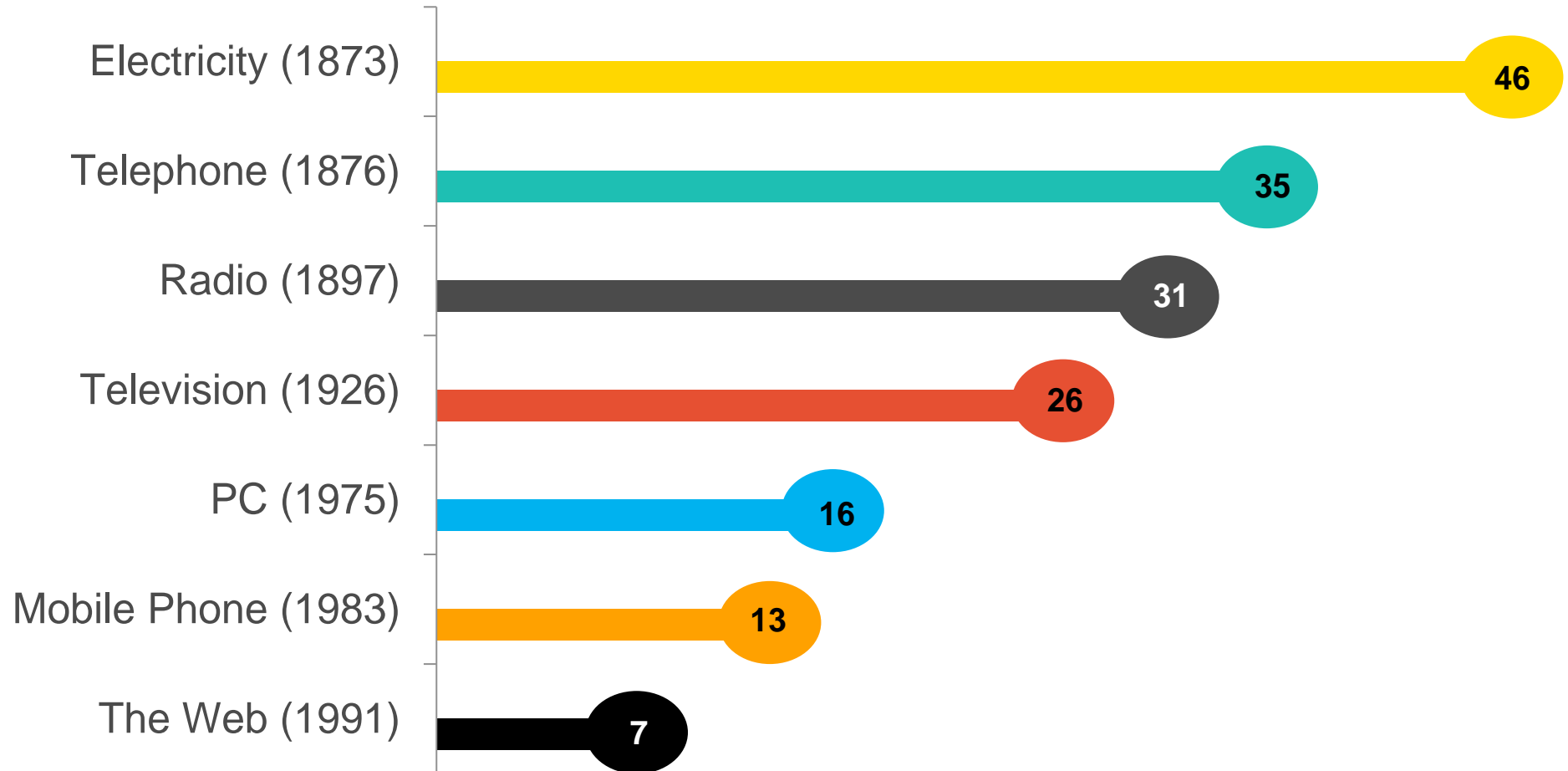
Source: Study Group on U.S. Foreign Policy Phase II: With God on Our Side: American Apocalypse and the Mall at the End of the World. Staff: Walter Russell Mead, Henry A. Kissinger, Senior Fellow for U.S. Foreign Policy, and Timothy S. Shah, Former Adjunct Senior Fellow for Religion and Foreign Policy July 1, 2002 - October 1, 2007

Innovation Acceleration Since Late 20th Century

- Amazon founded in 1994
- First cloned mammal, Dolly, born in 1996
- First hybrid vehicle by Toyota in 1997
- Google founded in 1998
- Stem cell research breakthroughs in 1999
- First iPod released in 2001
- Wikipedia launched in 2001
- Human genome project completed in 2003
- Skype (2003), Facebook (2004), Twitter (2006) founded
- First iPhone released in 2007
- Large Hadron Collider building completed in 2008
- Bitcoin introduced by Satoshi Nakamoto in 2009
- Kepler space telescope launched in 2009
- First iPad released on April 3, 2010
- 3-D printing available commercially since early 2010s
- Higgs Boson particle proposed in 1964, discovered in 2012
- U.S. BRAIN initiative begins in 2014; Apple pay in 2014
- Wearable technologies (Teens), Apple watch (April 2015)

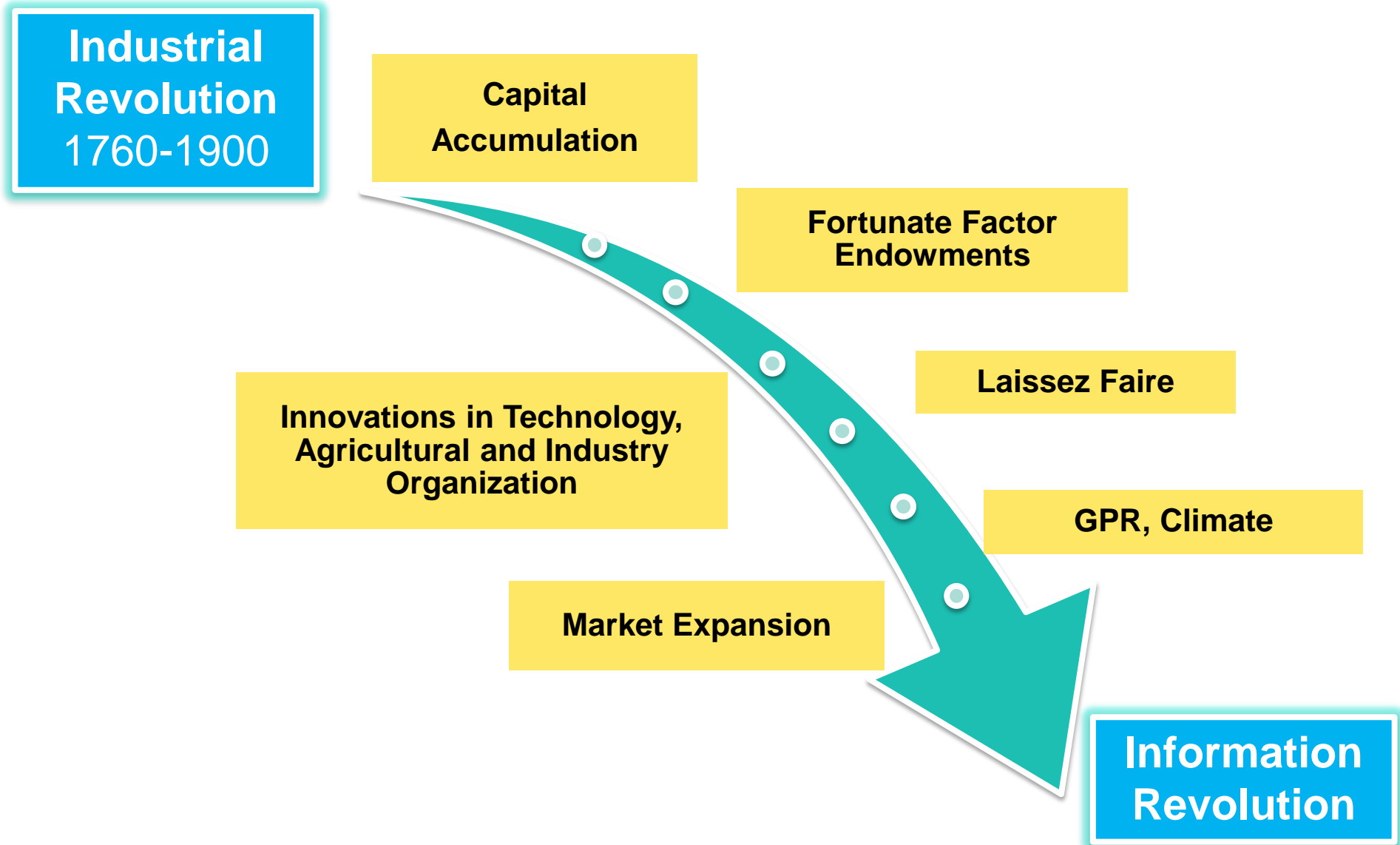
Technology Adoption Acceleration

Years Until Technology Used by 25% of American Population



Source: BNY Mellon using data from Pew Research

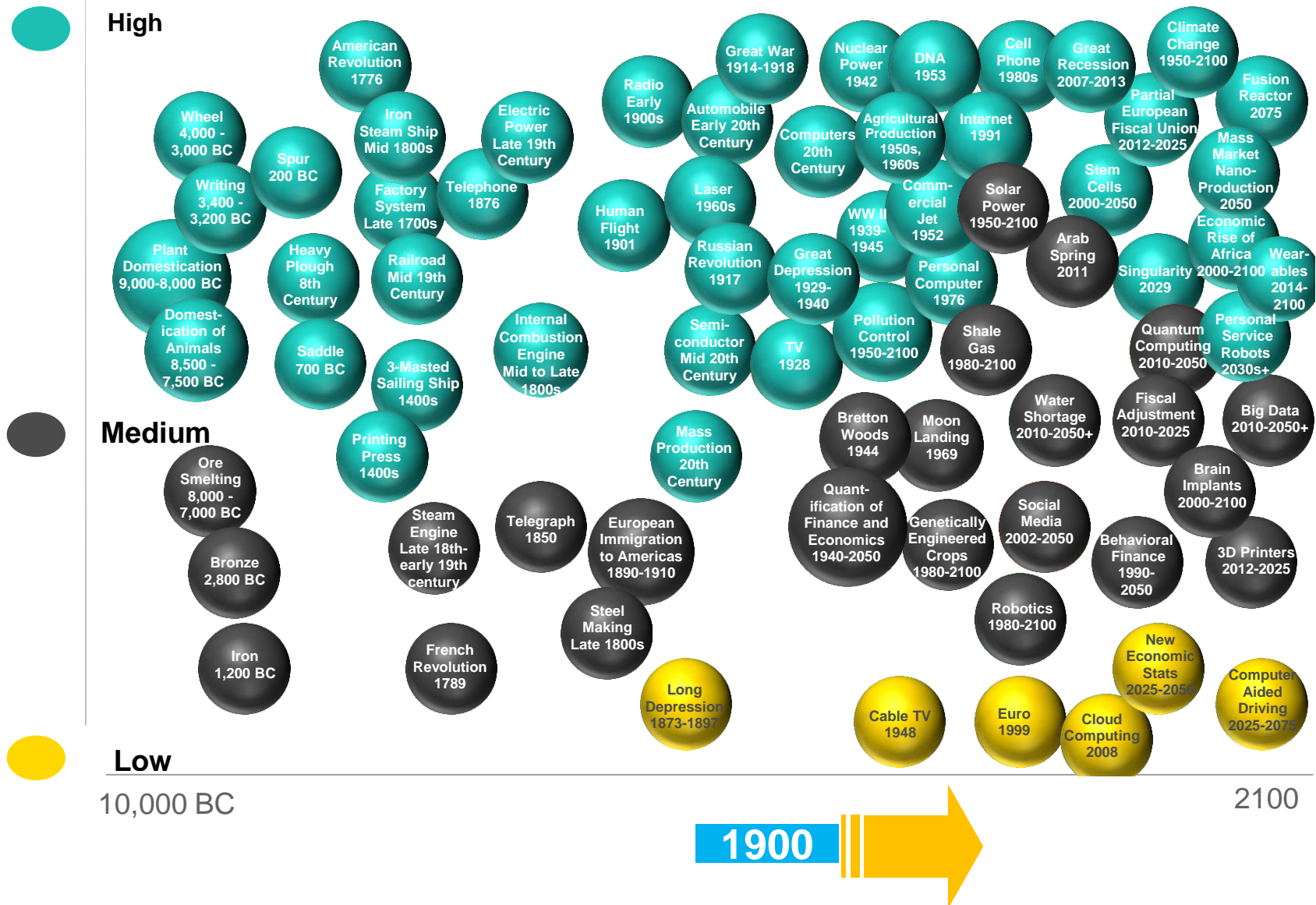
Strong Parallels Between Industrial Revolution vs. Information Revolution



Source: Hartwell, R.M. "The Causes of the Industrial Revolution: An Essay in Methodology." *Economic History Review*. August 1, 1965.

“The Great Disruptors”

Major Technological Changes & Geopolitical Events: 10,000 BC to 2100



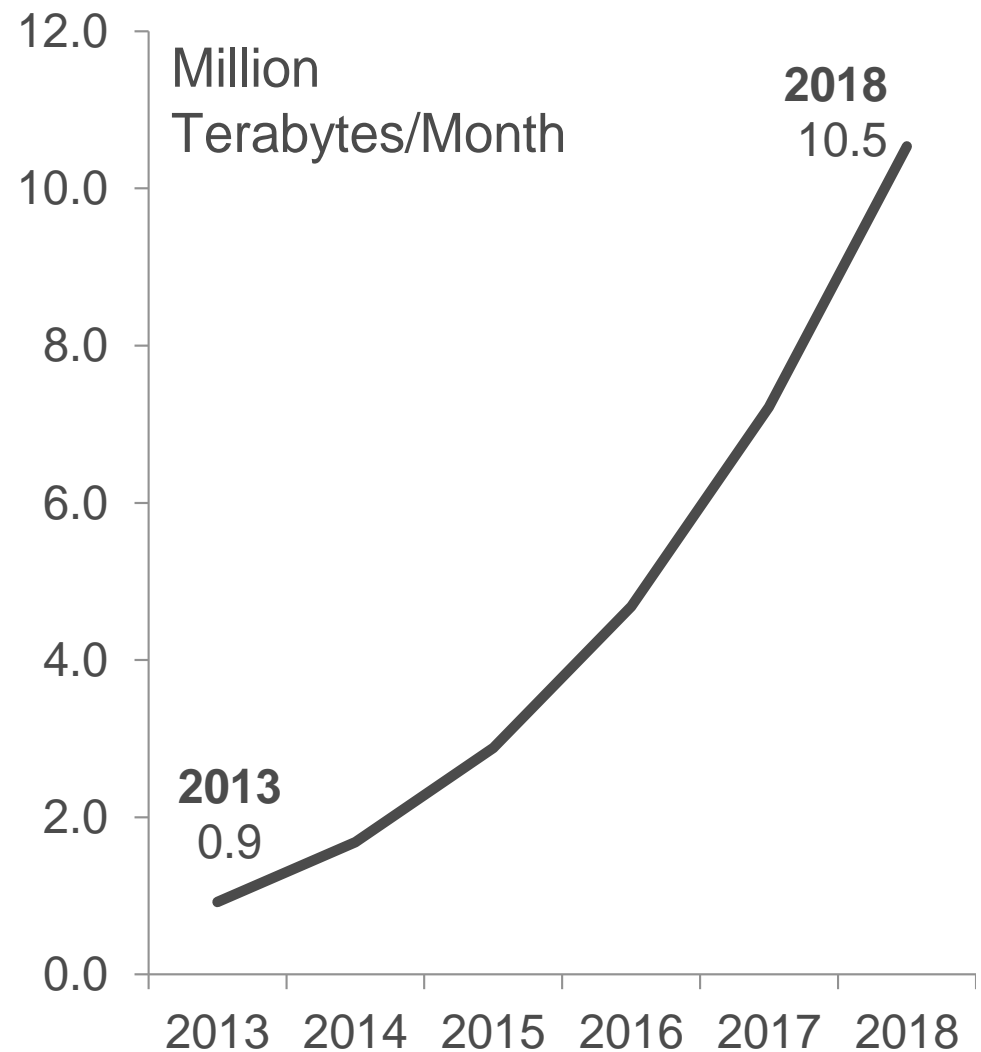
The Next Billion Internet Users

- 2.4+ billion people connected to internet; expected to double between 2005-2020
- Majority of growth expected in EM
- Breakthrough in battery life key to getting next billion people online
- New tablets/phones need to be interconnected to all 'devices'
- Average African subscriber spends 10% of wages on data plan
- In EM-mobile internet adoption, sufficient performance quality of devices key
- Most of Facebook revenue after 2015 will come from EM
- In Venezuela and Colombia, roughly 75% of population on-line use Twitter
- In Nigeria, 40% of population under 18 accounts for 60%-70% of mobile users
- Seeing a transition to “sharing economy” – i.e. UBER (car ownership)
- Free online access to virtual universities will erode demand for some institutions
- Increased online access raises government and corporate transparency and accountability
- Significant amount of money and planning spent calculating U.S. CPI using outdated survey-based methodology. CPI should be calculated in a smarter and more digital manner, imagine worldwide and calculated using pictures
- More reliable info on Twitter than CNN
- Mobile devices provide access point; enables way to have voices heard and participate in new digital economy

The Next Billion Internet Users

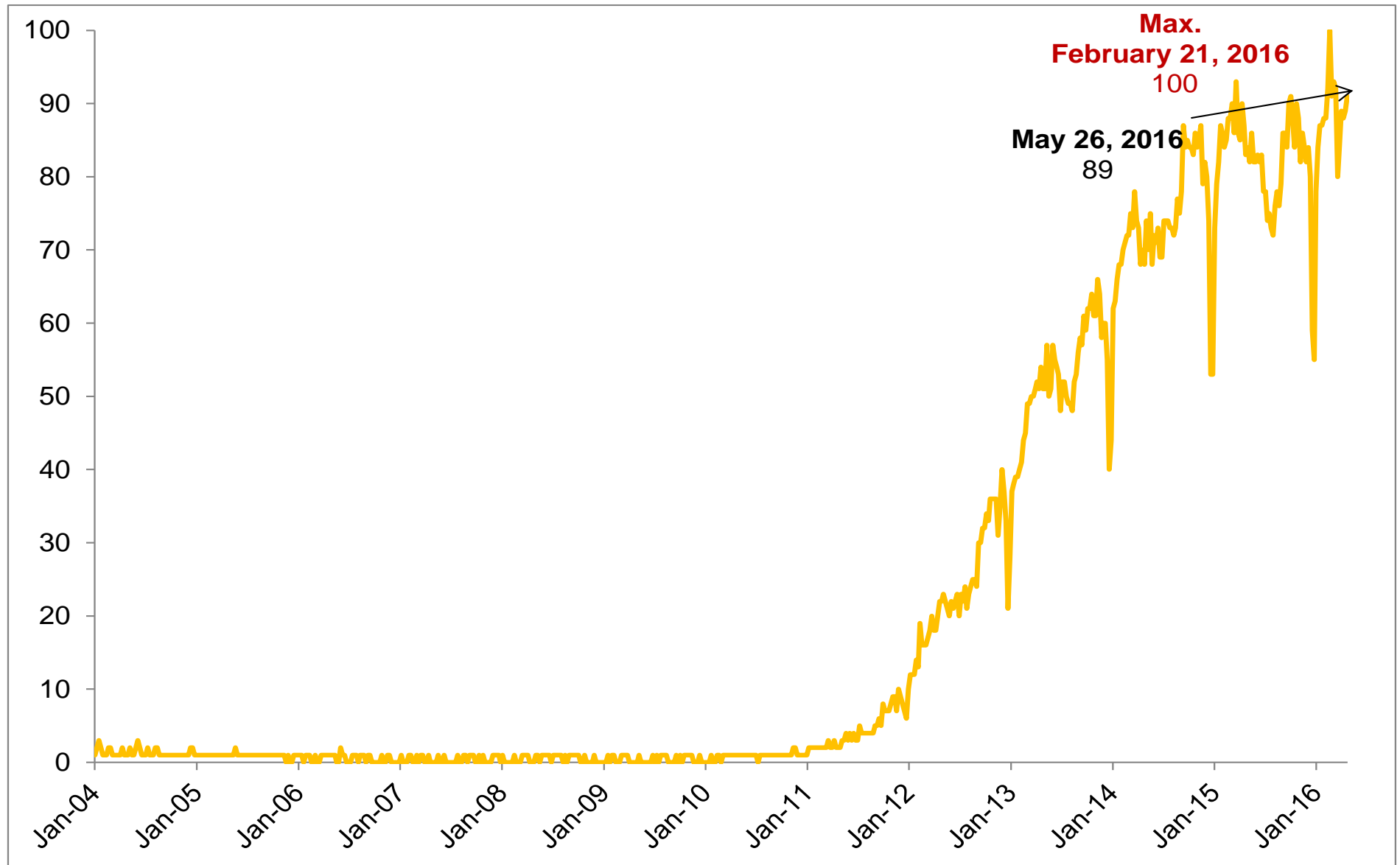
- Conundrum of implications having more people connected: workers together produce better outcomes while at same time billion+ people joining marketplace in disparate locations and can add value but not in same proximity
- E-commerce; still <10% of retail commerce done online; what has really changed is consumer service expectations
- Brazil: urban population growth increasing traffic; mothers using E-commerce to shop for infant supplies
- Credit card usage little-to-none in many EM countries
- Alternatives to credit score: use mobile phone data to create credit profiles and then provide loans
- Largest per capita/consumer country of YouTube usage = Saudi Arabian women for educational purposes
- 50% of employment in the U.S. comes from small businesses. Technology enables entrepreneurship
- In EM, the prohibitive costs of entrepreneurship often slow innovation

Global Smartphone Data Traffic



Source: BNY Mellon using data from Bloomberg

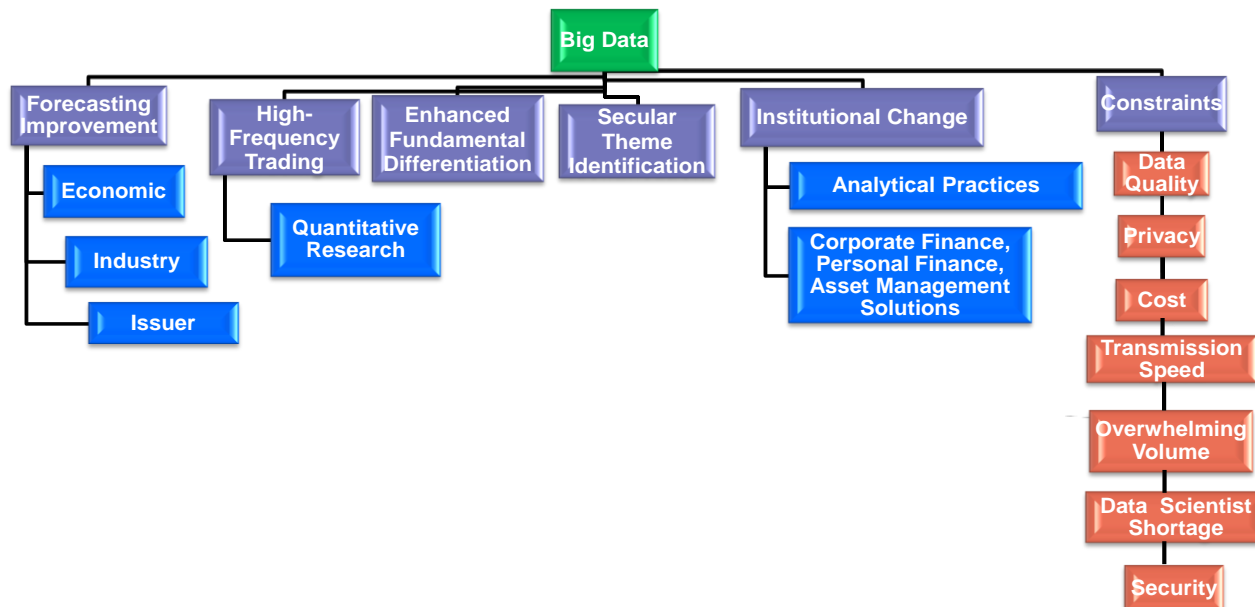
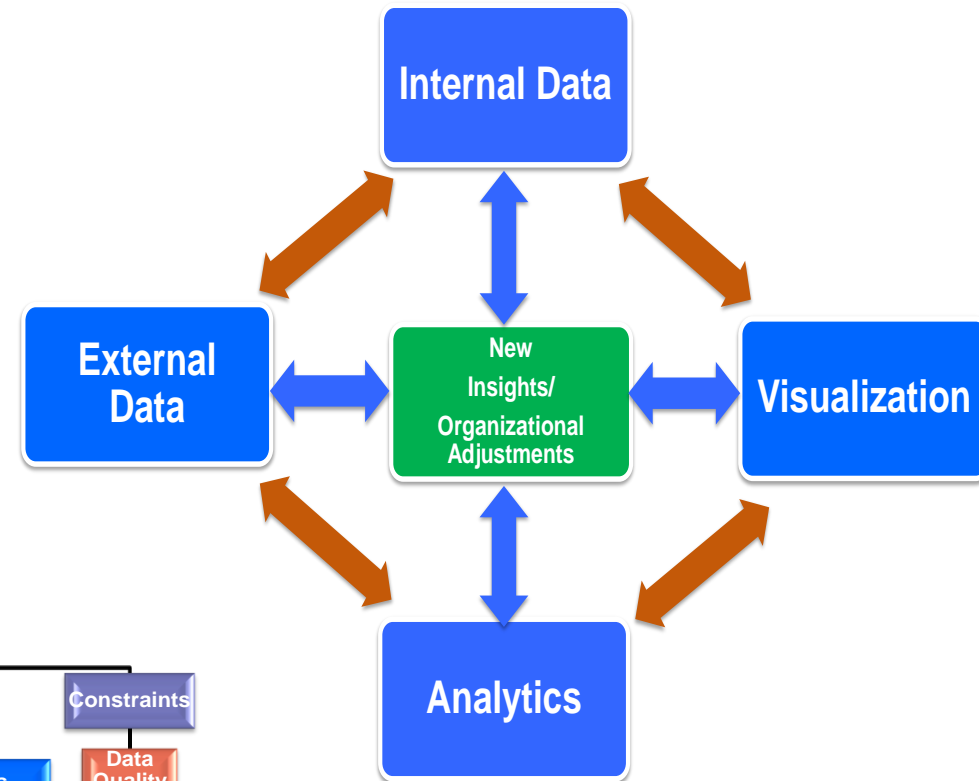
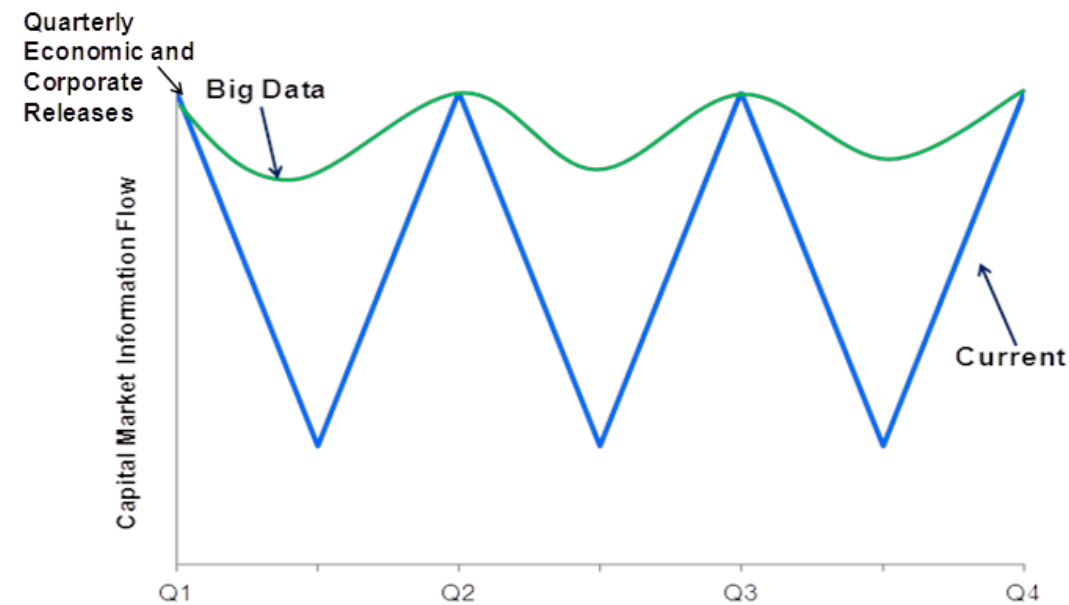
Global Web Search Curiosity About Big Data¹



1) Data through May 26, 2016. Google insight data reflects total Google searches for Big Data. The data is normalized and scaled with 100 being set as the maximum volume that the search results have yielded in the time frame shown. All other values are relative to the max volume of searches, for example, if the value in the chart has fallen from 100 to 50, the interest has halved. Source: BNY Mellon using data from www.google.com/trends

Big Data: Future Alpha Driver?

Smoother and More Granular Information Flow



Big Data Doesn't Solve All Problems

*“Not everything that can be counted counts, and not everything that counts can be counted.” -- **Albert Einstein***

*“Data-driven predictions can succeed, and they can fail. It is when we deny our role in the process that the odds of failure rise. Before we can demand more of our data, we need to demand more of ourselves.” -- **Nate Silver***

Key Examples of Big Data Global Financial System Inquiries

- Which geopolitical risks will impact global financial markets?
- How will the global economic and financial system evolve over the early-to-middle 21st century? “Who is producing what, when, where?”
- Will big data enable more precise real-time measures, models, and visualizations of macroeconomic, industry, corporate, and market performance, risk, and volatility?
- Will new information lead to the invention of new policymaking tools?
- Are directional changes in social media trends and capital flows leading, lagging, or coincident performance indicators?
- Would analyses of broader macro classifications generate new investment strategies?
- Are there regular “timing effects” (elections, auctions, M&A, IPOs, credit supply, key data releases) for markets and by asset class?
- Do markets behave differently during triple-witching hours globally versus locally?
- On a real-time basis, how much debt is outstanding in all forms (short term, long term, public, private)?
- Can “event effects” (central bank policy change, ratings changes, earnings surprises, M&A, etc.) be anticipated and incorporated into investment strategies?
- Can big data spawn new generations of financial products?
- How does adoption of big data methods alter corporate finance and asset management practices?

Science & Technology: Faster Processing of Exponential Increase in Data; Boom in Real-Time Decision Making

- Advances in artificial intelligence, quantum and genetic computing, genetic engineering, epigenetics, genomics, socioeconomics, neuroeconomics, neurology, life sciences, nanomedicine, robotics, internet, nanotechnology, data accumulation, big data
- Nature of dark matter and dark energy discovered
- Nature of gravity fully defined
- Robotics, especially for security, services, medical, and domestic and old-age assisted living, becomes a major industry
- “De-extinction” possible for species where DNA preserved (saber-tooth tigers, mammoths)
- Brain activity map (BAM) helpful
- Potential privacy incursion from increased data accumulation surveillance (life-logging), cloud
- Tyler Cowen thesis: easy technology gains made
- Attack world’s biggest problems vs. small advances in social media and mobile apps
- Smart dust
- Virtual self confers electric immortality
- Commercial fusion reactors finally arrive
- New technology interfaces
- Silver economy for older demographic



Healthcare: Gigantic Longevity Extensions

- 45,000 year old human genome reconstructed
- A child born circa 2000 may live to 95-105 on average; a child born in 2050 may expect a 125-150 year life-span
- Stem cells will be used to replace organs (especially in cardiovascular and liver disease), to overcome paralyses from spinal injuries, and to cure neurological ailments like Alzheimers
- Computers will be the size of a blood cell, monitoring and fixing body cells and extending human life span. Sensors will be able to record/replace memories
- Entire genome of each person will be able to be sequenced. Diets will be based on individual genome characteristics; disease prediction and prevention mainstay of medicine. Proteins and brain will be fully analyzed
- Bio-engineered personalized drugs and nanotechnology, new medications
- Introduction of new classes of antibiotics to counter 100% resistant bacteria in late Teens
- Parents will be able to select elements of their offspring’s genetic makeup
- High-resolution bionic eyes; internet-enabled contact lenses
- Possible memory deterioration from information availability at fingertips; implantable memory chips will solve
- Smart clothing will include biometric sensors
- Given the need for cost containment, public health care assistance to the very old will be limited in some nations
- Self-determined, end-of-life assistance facilities will become common in some nations
- Synthetic life kit
- Medical supply robots
- Artificial life creation to solve medical problems



Science & Technology: Information Supply Shock

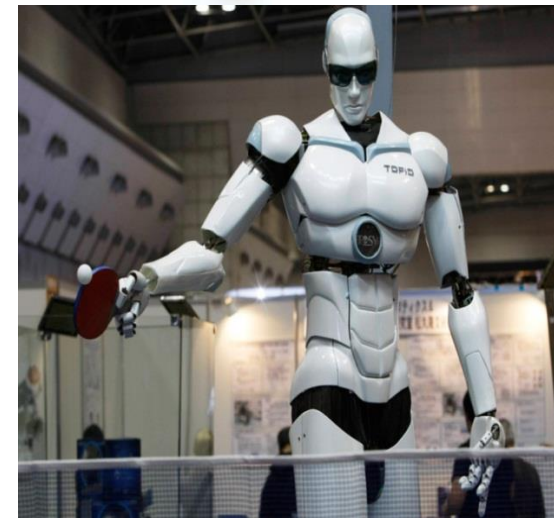
- Hamburgers in test tubes
- Advanced materials
- Replacement cells
- 1,000 year life spans: some internet entrepreneurs have set out to conquer death
- Ingestible knowledge pills
- Smart tattoos
- Brain-computer interfaces
- Meltable internal bio-batteries
- Cyber pills that communicate to medical professionals
- Healing chips
- Security robots introduced in Silicon Valley

Communication: Social Media Interaction Keeps Growing Exponentially, Completely-Wired-World at Real-Time Speed by End of Teens (Google)

- 2.4 billion connected to the internet globally (~40% of total population); worldwide internet traffic projected to keep rising rapidly driven by mobile in emerging markets (EM)
- 30 billion U.S. things (thermostats, vehicles, electric meters) will be connected to the web by 2020 (Verizon)
- By 2015, 1.3 billion global workers will be mobile
- Well before 2050, smartphones are likely to receive and transmit data from sensors in their owners' bodies
- Phone batteries charged with kinetic energy will never die
- Mobile phones will not exist separately. Instead, integrated into objects people carry (e.g., a ring, a bracelet) or embedded into human bodies
- Smartphone saturation, implanted
- Windows that can serve as media screens
- Compound lens cameras
- Google X's Project Loon to begin delivering internet service to Southern Hemisphere in 2015. Four other technologies (low-orbiting satellites, metamaterial antennas, solar powered drones, television "white spaces") to deliver wireless Internet services to remote corners of the Earth

Media

- End of hard-copy print
- Floating holographic 3-D images



Source: BNY Mellon using data from Megachange: The World in 2050 (The Economist)

Science & Technology

Transportation: Further Expansion of International Travel

- Cars, trucks will include automated and driver-free options
- All fleet and 50% of personal autos will be powered by electricity instead of gasoline
- Space travel may be possible through space elevators, leading to formation of space habitats
- Private space exploration
- Asteroid mining
- Manned military aircraft will be mainly replaced with drones
- Hypersonic commercial aircraft will shrink the travel time between nations
- Supersonic train travel
- Automobile seat sensors to detect medical emergencies

Singularity: Sentient Machines Will Enter Workforce

- By 2029, machines may be able to match the intelligence of humans (Ray Kurzweil)
- Robotics: source of coming greatest labor supply shock of all time
- Thoughts will be transmitted from one brain to another by electronic sensors
- Genetic computers will become mainstream
- Public 3D printing stations will be available to print clothes, toys, and unfortunately, weapons
- Artificial intelligences will be consulted for corporate management, financial, medical, management, and legal advice
- Superconductivity
- Flexible electronics made of graphene
- Electronic interface with brains
- Transient dissolvable electronic sensors
- Wearable electronic sensors
- Strategic threat of super-intelligent machines

Space Exploration Privatized

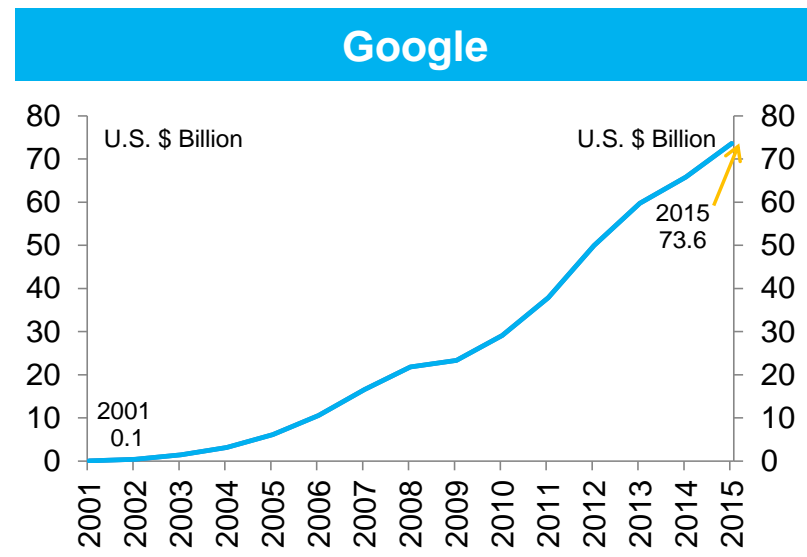
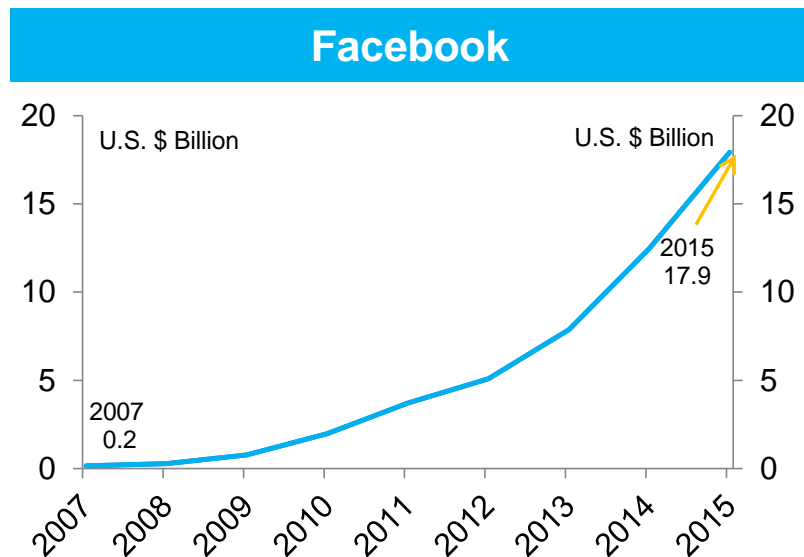
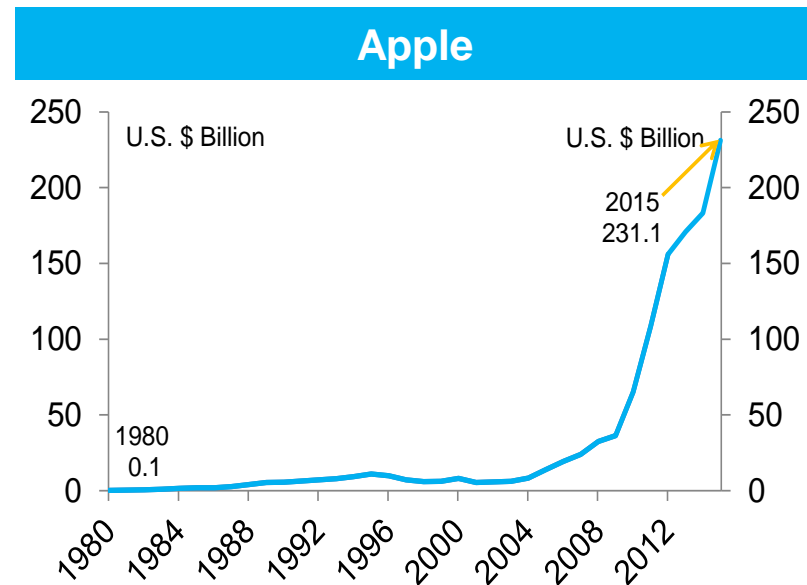
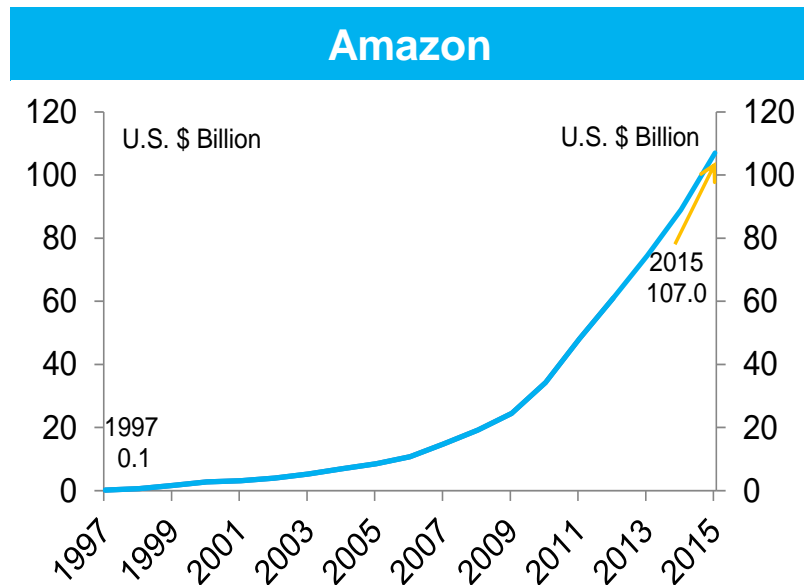
- Greater privatization of space travel
- Humans will have visited Mars, possibly led by SpaceX's Elon Musk
- First moon colony will be in operation, possibly by China
- Interstellar travel even on the drawing boards at NASA
- Every star may have planets, some inhabitable



Source: BNY Mellon using data from Megachange: The World in 2050 (The Economist)

Shifting Face of New “Big Tech”

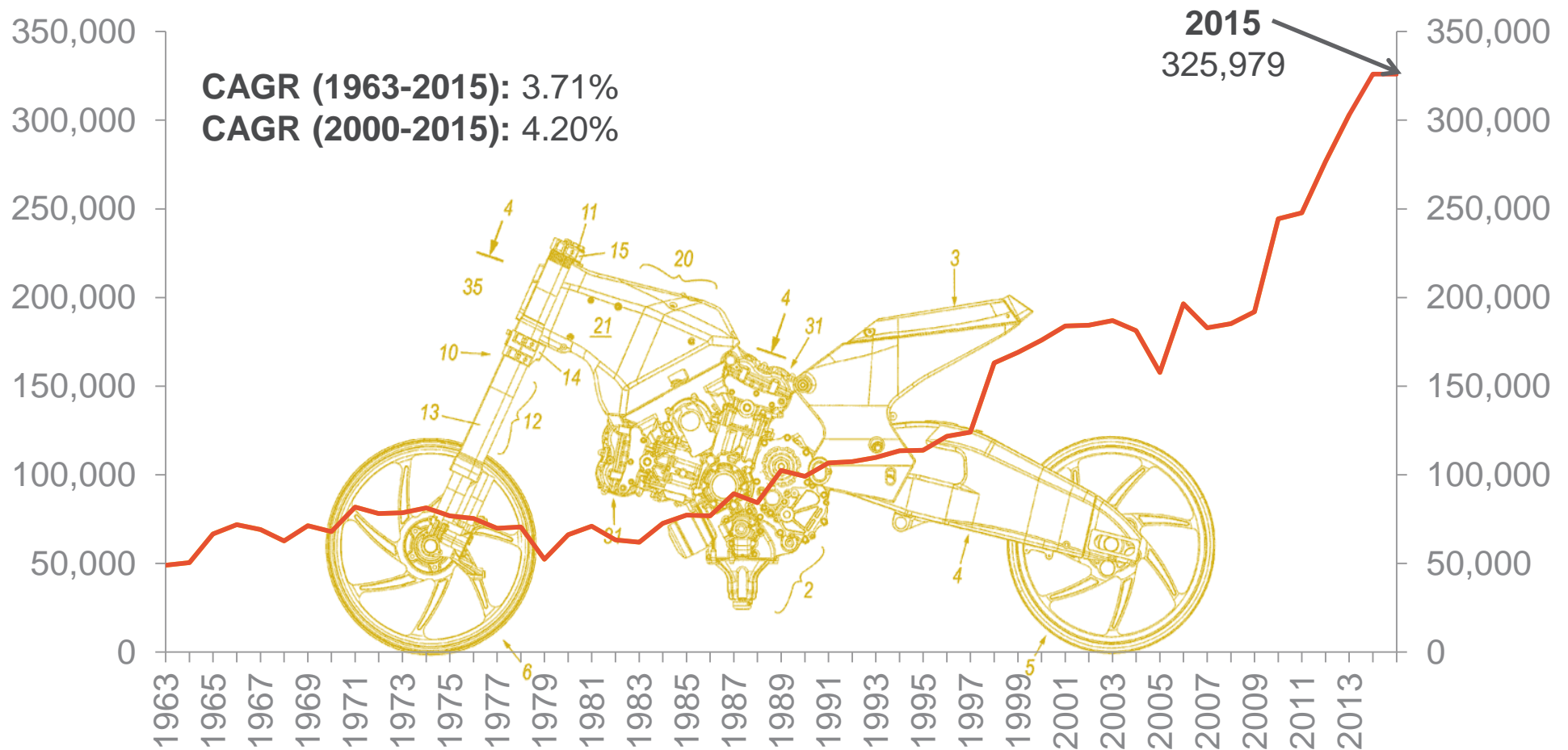
Amazon, Apple, Facebook, and Google Revenue¹



1) Fiscal year revenue for each above-listed company
Source: BNY Mellon using data from FactSet

Quickening Innovation to Raise Productivity

U.S. Total Patent Grants



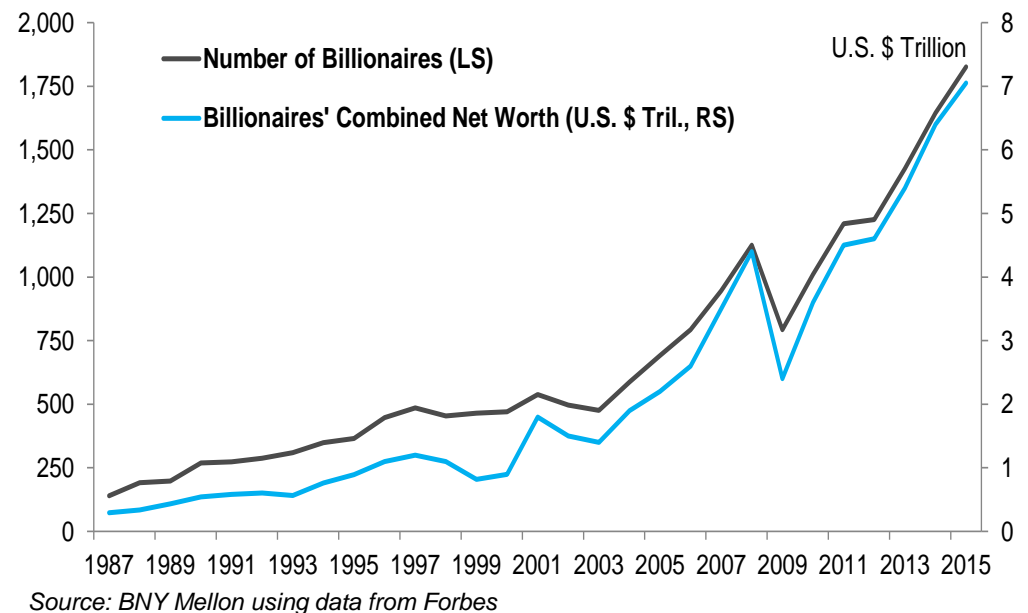
Source: BNY Mellon using data from U.S. Patent and Trademark Office

“Contested Modernities”

Society: Global Cultural Convergence; But Inequalities Persist

- Fragmented multipolar world
- More than 50% of world population in urban areas for first time ever
- Decriminalization of many illegal drugs
- Improved criminal rehab
- Right-to-die with doctor assistance movement; 10,000 baby boomers will turn 65 each day for next 19 years
- China, India, and U.S. are projected to be the world's largest traders in 2050
- Near full-acceptance of same-sex marriage
- Continued human capital development, with full online courses (failure of many small private secondary schools)
- Major increase in international tourism
- Rise in business start-ups and entrepreneurial careers
- “Life-logging” becomes common
- “Virtual Legacy” creation
- Lost generation of unemployed youth in Europe and and U.S. during the Teens tilts society towards conservative work ethic, delays household formation
- Rates of obesity beginning to decline in industrial economies, particularly North America
- Increased stratification of wealth, income, education and opportunities
- 1932-1970s: top 10% share of U.S. income fell from 40%-45% (1913-1932) to 31%/32%; reversed under Reagan
- Revoking the social contract, stagnant middle class wages due to erosion of real minimum wage by inflation; immigration; decline in labor unions
- Democratization of workplace
- Rise of data scientists
- Corruption still an impediment to economic development
- More telecommuters and outsourced contractors
- Doubling of 65+ U.S. workforce (2012-2022)
- City car and city home
- Social Security and Medicare remained strong, but employer pensions and health care fell
- Toward the creation of a more sustainable social safety net for AE and EM
- By 2100, some major metropolitan areas may have populations of 140 million

Combined Net Worth and Number of Global Billionaires: 1987 to 2015



New Energy Paradigm: Slow Weaning From Fossil Fuel

- End of oil/natural gas shortage predictions, for now
- Fracking vs. Environment
- U.S. energy “independence”
- Transfer of wealth from producers to consumers
- Slower funds accumulation for oil-producing central banks and SWFs
- Future of OPEC less certain
- Alternative energy conversion encouraged in many nations
- Electric transportation rises
- Late 21st century introduction of commercial fusion reactors



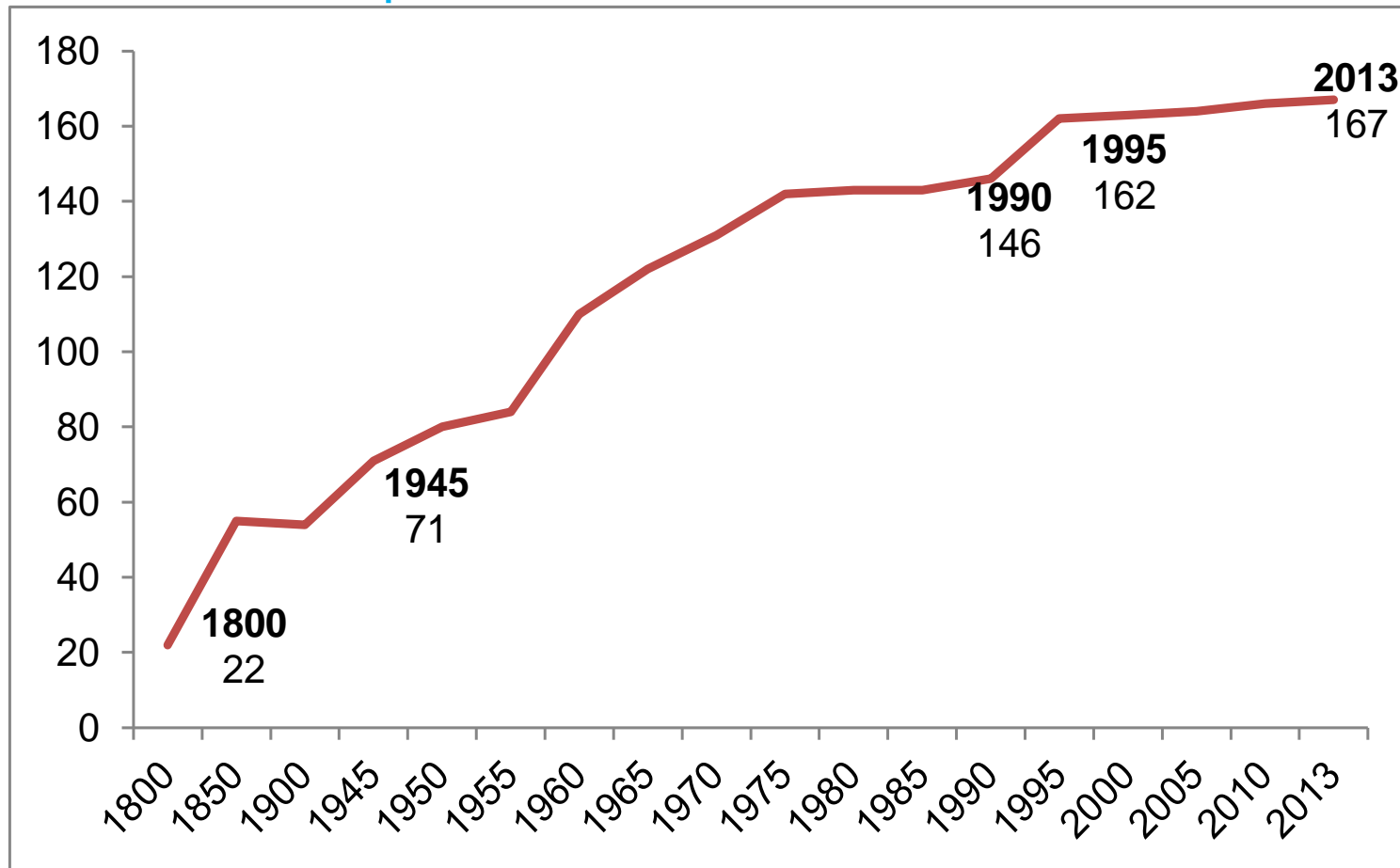
Demographics: Another New World

- 7.3 billion to 9.0-12.0 billion people by 2100
- Economic difficulties may induce behaviors (obesity, substance dependence, suicide), thereby curbing longevity expansion in some societies
- Baby Boomers progression to retirement and then old age (2010-2050)
- Generation X, Y step up
- Millennials coping with new global economic paradigm
- Transcendentals follow Millennials
- Last finites (150, 500, 1000 year life spans for some persons maybe in sight)
- Electronic immortals
- Longevity extension not universal
- Broader distribution of longevity
- Population & financial asset redistribution from Western AE to select EM
- Growth shift: Atlantic to Asia and Africa
- Comparative nation analyses (Negatives vs. Positives)



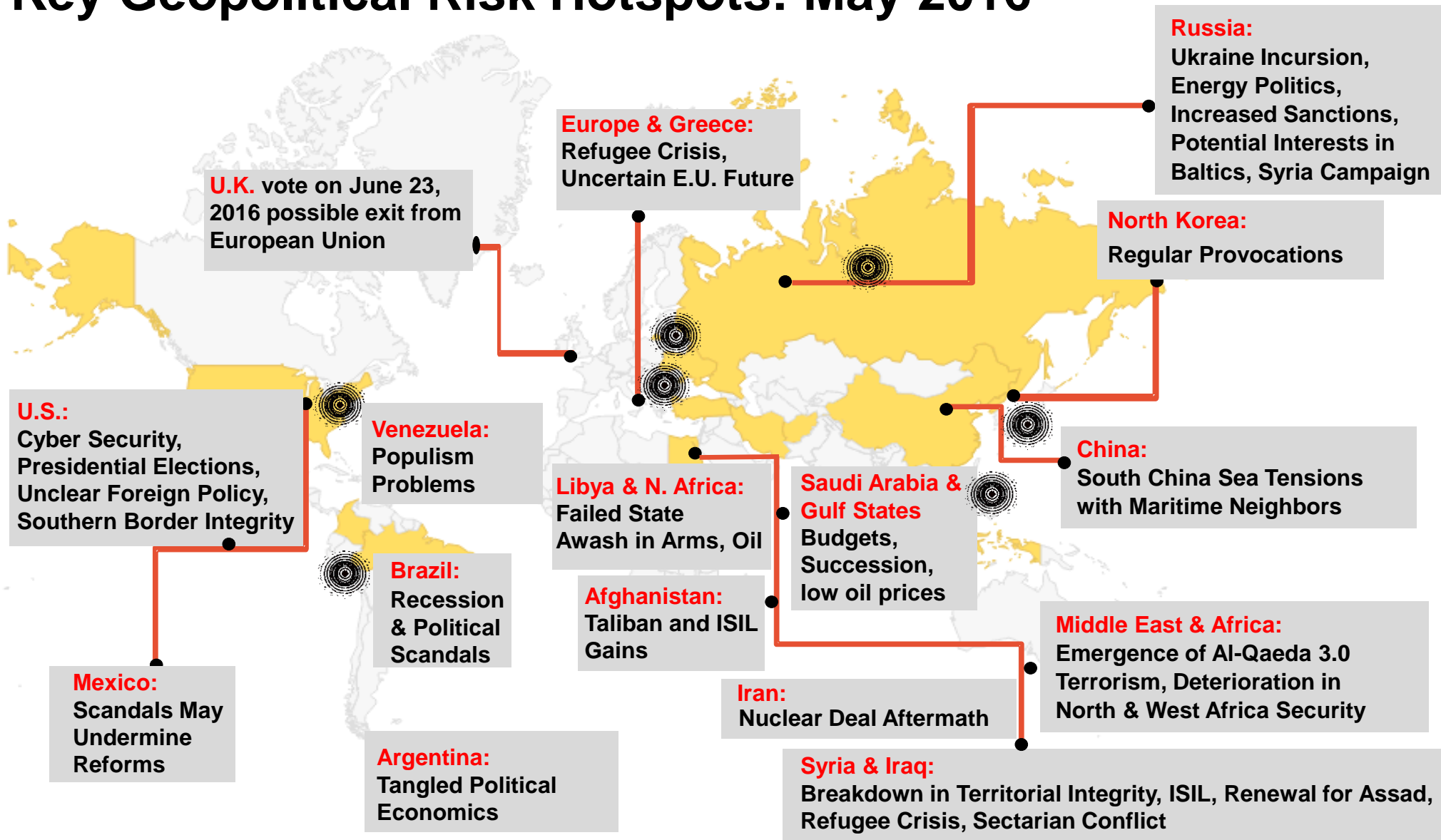
Rise of Independent Nations=Higher Geopolitical Risk

Number of Independent States in the World: 1800 to 2013



INCSR's Polity IV dataset covers all major, independent states in the global system over the period 1800-2013 (i.e., states with a total population of 500,000 or more in the most recent year.) Source: BNY Mellon using data from Center for Systemic Peace, INCSR

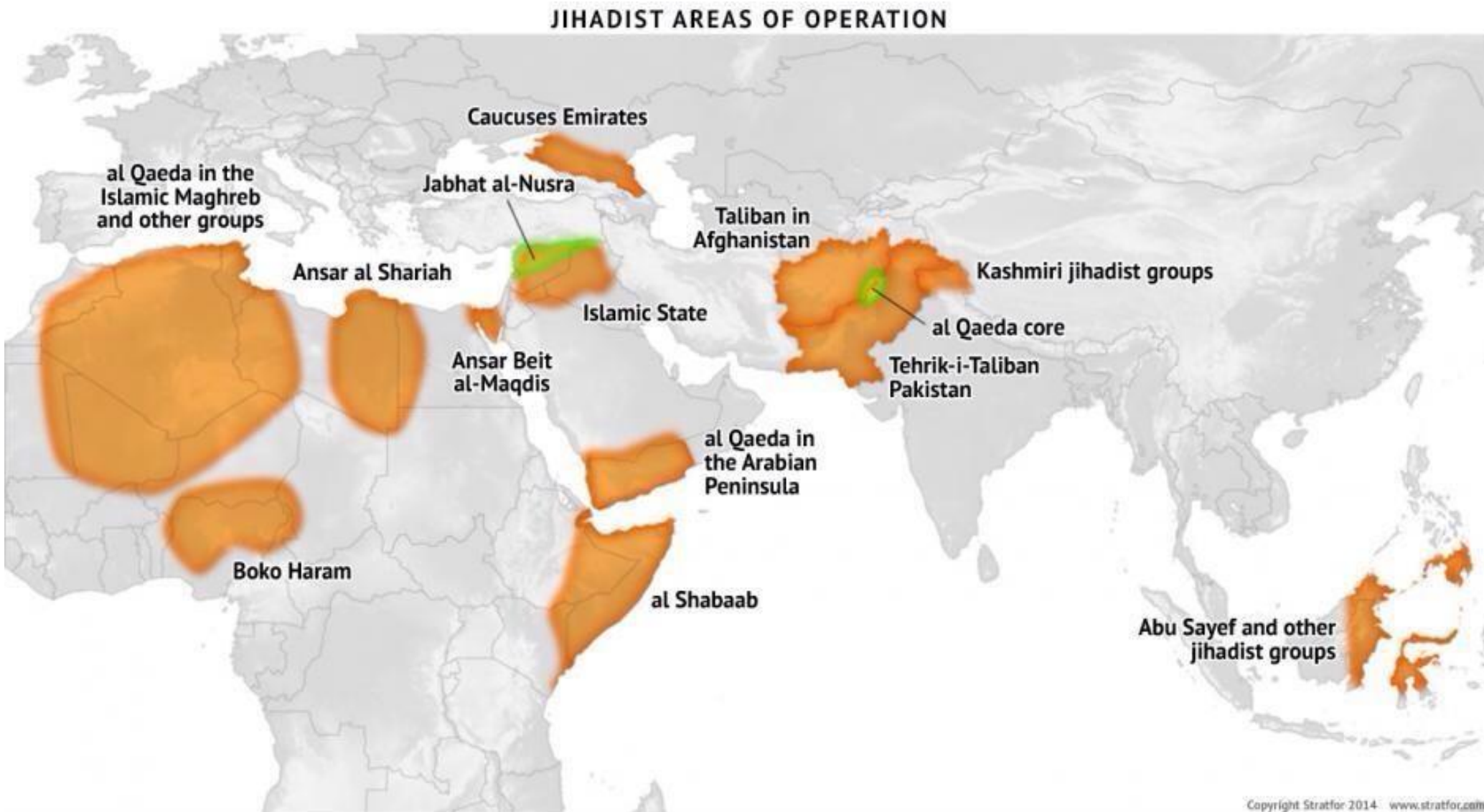
Key Geopolitical Risk Hotspots: May 2016



Elections in 2016: Afghanistan (House, Oct.), Belarus (Parliamentary, Sept.), Bulgaria (Presidential, Oct.), Georgia (Parliamentary, Oct.), Nicaragua (General, Nov.), Philippines (General, May), Russia (Parliamentary, Sept.), Tunisia (Regional, Oct. 16), U.S. (General, Nov.), and Vietnam (National Assembly, May)

Source: BNY Mellon using data from ElectionGuide and Eurasia Group

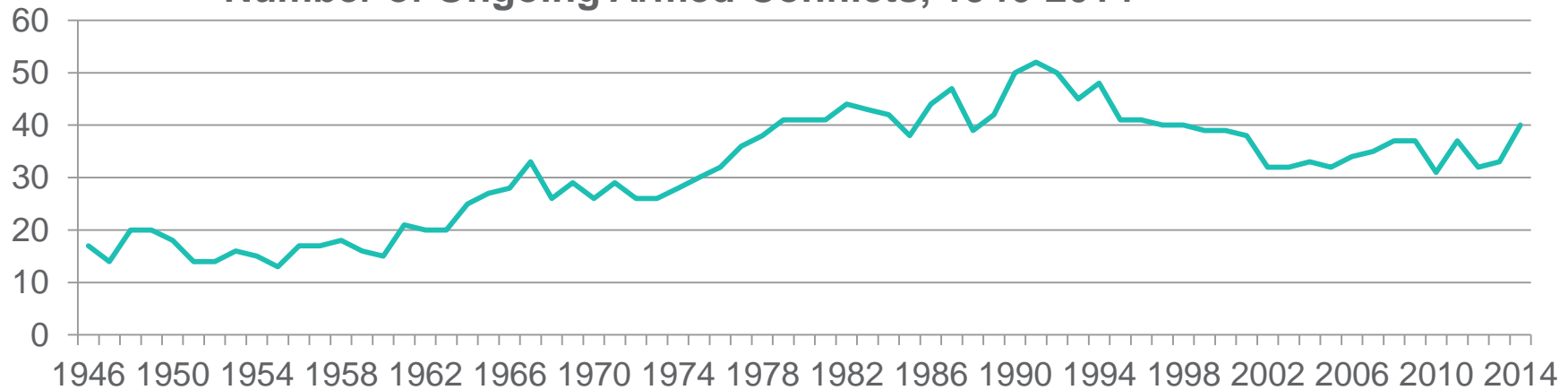
Metastasizing Terrorist Threat



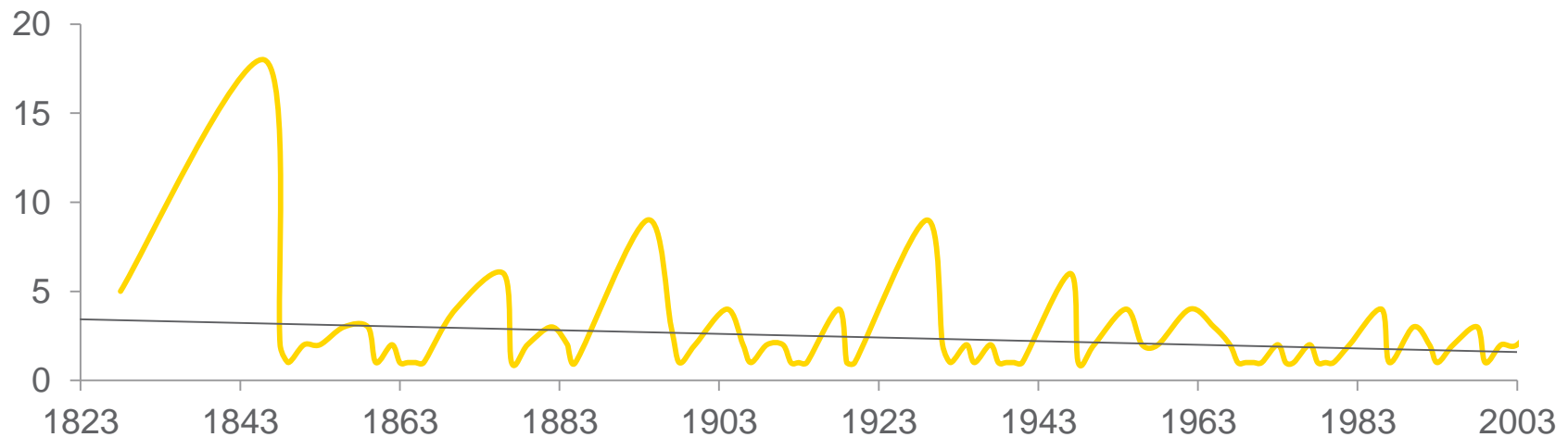
Source: BNY Mellon using data from Stratfor

Patterns of War and Peace

Number of Ongoing Armed Conflicts, 1946-2014



Peace Years Between Major Wars, 1823-2007



Note: Uppsala Conflict Data Program PRIO Armed Conflict Dataset defines armed conflict as intra-, extra-, or inter-state conflict resulting in 25 battle deaths. Correlates of War Project defines major war as an inter-state conflict with at least 1,000 battle deaths within a 12 month period. Source: BNY Mellon using data from Correlates of War Project and Uppsala University Conflict Data Program

Global Financial Markets

Market Structure Evolution

- Expanded information flows make for near-perfect efficiency and render traditional alpha generation more difficult for asset managers
- The ratio of world financial assets to world GDP will remain about 10/1 (Bain Capital). By 2020, this works out to \$900 trillion/\$90 trillion and \$2,184 trillion/\$218 trillion by 2050
- Expansion of virtual markets, prediction markets, and gift economies (such as the open source movement)
- Increased automation in markets where goods will be allocated through “invisible digital hand”
- 3-D printing will alter the market for material goods manufacturing and distribution
- Major equity exchanges may become extinct, replaced by a series of electronic dark pool operators

Grand Convergence

- Economic policymaking, accounting methods, and portfolio management philosophy made globally consistent

Research Provision Shifting

- Rise of third-party independent research
- Decline of broker-dealer research
- Micro, niche, applied, thematic prevails over macro “flow tracking”

Fiscal Policy Revamp

- Triumph of Austerism over Keynesian in many nations
- Entitlement reform, especially with longevity extension
- Distribution fine tuning
- In the U.S., possible end of home mortgage interest reduction, state and local tax deduction, capital gains treatment for hedge funds; lower U.S. corporate taxes
- Emulating Sweden’s failed experiment with a Tobin (Financial Transaction Tax in 1984-1990), the Eurozone will rescind its FTT, if applied, in 2020s

Ethics Upgrade

- Ongoing improvements promoted at schools, firms, CFA and CAIA programs

Regulation/Oversight Rising

- Rooting out inside dealing and cronyism
- Finding the right balance between regulation and innovation encouragement
- Higher capital cushions for financial institutions
- Unintended consequences (liquidity drop)

Structured Products Resurrection

- CLO boom in 2014/2015
- Rise of ABS, second half of Teens

Derivatives Growing

- Next generation (career, housing)
- All trades through clearing house

Volatility: Void then Structural Increase

- Erratic pace of innovation
- More noise trading on higher information flow

Liquidity Limited

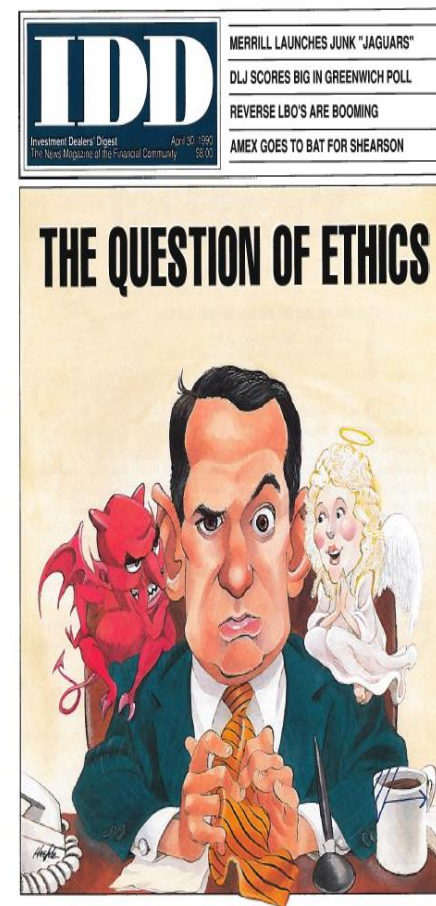
- Challenged by broker-dealer retreat
- Incomplete “electronic” bond markets

Risk: Shift in Preference to Lower Tolerance

- New measures
- Scenario analysis emphasis
- Globally holistic

Sovereign Wealth Funds: Continued Investment Demand Growth

- Slower but still positive accumulation rates as modern mercantilism persists
- Further expansion of the investment choice set



Financial Market Instruments

Fx: General U.S. Dollar Strength over Mid-Teens; Toward Multi-Reserve Currency World

- U.S. dollar still main reserve currency given unparalleled deep financial markets and institutions enforcing laws
- U.S. dollar, Euro, Sterling, Yen, Indian Rupee, Chinese Renminbi currency majors; China will become a principal reserve currency by 2030
- Awaiting full convertibility of Indian and Chinese currencies by 2020s
- Discussions on how to divide the world into 2-5 optimal currency areas
- Information flows reduce home bias and capital flows receive a boost
- Trade flows may slow down on the margin as robots reduce comparative advantages and if national economic policies induce some form of trade wars
- Commercial banks still dominant in trade financing
- Euro sovereign debt has different values across Eurozone

Commodities: Selectivity as Always; Highly-Cyclical Asset Class Dominated by Energy

- Battery technology advanced enough to reduce demand for petroleum; fleet autos shift to electric
- Renewable energy production grows, dealing another blow to fossil fuels (related infrastructure)
- Water becomes a very important commodity given population growth and climate change in some areas
- EM shift in food consumption to more protein

Equities: Asset Class of Choice in Teens

- Possibility of higher-sustained equity risk premia due to lower equity enthusiasm by new investors from EM
- Continued escalation of algorithmic trading based on quantitative models
- Faster EM economic expansion and growing capital markets projected to increase the share of world equity capitalization of emerging markets to 55% from 31% by 2030 (Goldman Sachs)
- China's market cap projected to overtake U.S. by 2030 (Goldman Sachs)
- The demographic changes in countries such as India and China will alter the capital ownership patterns by 2050. Two-thirds of the world capital may be owned by India and China
- As life expectancy increases in developed countries, older population in developed countries will sell their financial assets in exchange for imported goods from emerging economies (Jeremy Siegel); target fund assumptions must adjust
- Rise of EM IPOs, especially from Asia
- Corporate sector equity-focused, but aging investors demand bonds
- Aging demographic favors high-dividend value over no dividend growth
- Small stocks with little coverage become more attractive



Source: BNY Mellon Center for Global Investment and Market Intelligence

Financial Market Instruments

Equities continued...

- In 1952, U.S. households held 89.6% of U.S. stocks; only 37.3% by 2015; private and public retirement fund share (14.6%); mutual funds (20.2%)
- Global turnover 39% in 1990 to 116% in 2014
- Increased corporate short-termism to maximize earnings
- Structural liquidity impediments in certain markets: Half the value of the Israel equity market controlled by 20 families; similar concentration in South Korea

Bonds: Reset to High Rates in Late Teens/Twenties

- Classic broker-dealer principal trading model and bond ratings head toward near extinction
- Big data reduces information, and trading search costs significantly
- Disintermediation to shadow banking system encouraged, particularly in Asia and Europe
- Private markets → direct lending
- Diminished importance of classic bond ratings
- Corporate capital structures more equity-focused as global shift to services reduces hard assets to serve as collateral
- Covered mortgage bonds origination rise given demand for housing and principal-agent problem with passthrough securities

Corporations: Era of “Business Model Disruption”; Governance Gains

- Deep disruption of business models in many industries
- Toward mitigation of corporate tax arbitrage among nations
- Public monthly financial statements may be considered
- Board of director selection will become much more scientific
- Corporate governance enhancement: director certification may be required
- Globally standardized accounting
- Daily info blogs and Twitter continue sharp growth
- High-frequency guidance versus mandatory filings only; some firms will seek to avoid high information trend
- End of defined benefit plans and reduction of financial statement risk of underfunded pension fund status
- Inexorable trend to larger multinational enterprises, offset to some degree by entrepreneurial start-ups (the main path to new wealth)
- M&A boosted by quest for size and global scale, more rapid turnover of underperforming businesses
- Managerial capitalism to financial market capitalism in late 20th century
- Dismantling of vertically-integrated, oligopolistic industrial behemoths of late 20th century
- 30-40 year institutional lag to deal with technological change (e.g., persistence of multiple market regulatory agencies in U.S.)

Source: BNY Mellon Center for Global Investment and Market Intelligence

Financial Markets

Corporations continued...

- Three industrial revolutions: steam and telegraphy; electricity and oil; computers
- Sugary soft drinks largely eliminated
- Fading of high-calorie, fast food restaurants
- Online shopping reduces the number of malls
- Movie theatres largely displaced by holographic, home entertainment systems
- Only rare and specialty hard copy book stores survive
- Service, leisure, personal electronic, sporting goods, airline industries will fare well during most periods
- Coal industry displaced by shale gas; uranium industry helped by conversion to conventional nuclear power, hurt by fusion

Financial Institutions Resculpted; Conventional Business Model Threat From “FinTech”

- 1948-1980 pay in finance equivalent to other professions; higher by 1980 on; by 2007, 2X; mean reversions in Teens and Twenties
- 1990-2006 U.K. finance compensation up 10%; Germany & France no more than 6%
- Branch banking sharply curtailed, displaced by e-banking
- Conventional money-lending banks on endangered species list; broker-dealers spun out of some banks
- Bank capital rises to 20%-25%
- Regulatory clamps in Teens, followed by mitigation in the 2020s and 2030s
- More consolidation among major institutions, especially inter-regional
- Still “too-big-to-fail” and “too-small-to-save”
- Advanced decentralization and customization of some financial institutions with one-to-one and many-to-many relationships between individuals and institutions (e.g., peer-to-peer lending, crowd-sourcing)
- Policymakers will need to take more rigorous measures against market manipulation due to high-frequency trading
- Global shadow banking system enlargement
- Fannie Mae and Freddie Mac will be stand-alone housing-finance enterprises in the Twenties, possibly merged
- Banking sector grows faster than GDP in emerging economies (PwC)
- Total domestic credit in the E7 economies is likely to overtake total domestic credit in the G7 economies by 2050 (PwC)
- The rapid expected rise in “fintech” will threaten some classic banking business models

“The markets of the future will be determined by the tempestuous seas of the future, not by the past.”

Peter L. Bernstein, New York Times, March 2008

Financial Service Industry Change by 2030

- ◆ Global grand convergence of economic, accounting, corporate management, asset management techniques, reduction in trade and capital flow barriers (assumes no politically-motivated trade wars)
- ◆ Inevitable fine-tunings of accounting, risk (Basel III), central bank, fiscal policy doctrines, and Supranational/GSE methodologies
- ◆ Continued mainstreaming China, India, and other EM sovereigns into global economy/capital markets
- ◆ Need to convert to alternative energy sources and reckon with environmental problems
- ◆ Segmented electronic global bond exchanges largely replace broker-dealers
- ◆ Gigantic demographic shift to older populations in developed nations, placing huge stresses on public and private “safety nets” legislated from the late 19th through early/mid-20th century
- ◆ Potential for more frequent GPR jolts than during the last quarter of the 20th century
- ◆ Further marvelous technological innovations will lead to greater capital market efficiency
- ◆ Introduction of new quantitative tools for risk management and financial institution operations (beyond VAR)
- ◆ New financial products: e.g., career risk insurance, derivative miniaturization: alpha via derivatives only; cash buy-and-hold; consumerization of unconventional capital choices (e.g., EM, real estate, medical costs)
- ◆ Increased emphasis on alpha/beta separation and management fee reductions through expanded use of ETFs and index products (including smart beta)
- ◆ Inclusion of economic/capital market history in the mandatory MBA, PhD, CFA curriculums
- ◆ More data (new indices, more history), improved analytical techniques; already in development in the physics and math departments?
- ◆ Possible deprivatization (i.e., Russia, portions of Latin America)

Biggest Strategic Concerns

- ◆ Full global economic recovery from Great Recession and end of “secular stagnation” takes much longer, a function of business model adjustment frictions, very rapid/very deep deleveraging, Eurozone rationalization, as well as structural cooling of Asian (China) growth
 - ◆ Alternately, clumsy withdrawal of monetary stimulus leads to a recession in late Teens/early Twenties
 - ◆ Sustainability of “Modern Mercantilism/Western Consumer Imbalances” and consequences of abrupt shift in trade and capital flows: possible swing to mild protectionism in late Teens
 - ◆ Disorderly currency valuation shifts
 - ◆ Negative adjustment effects of enormous fiscal deficits in Japan
 - ◆ Proliferation of new institutional participants, especially alternatives managers, across global capital markets, their experience, their risk/reward calculus
 - ◆ Rapid innovation in global capital market architecture alters expected economic/capital market relationships in new and perhaps disadvantageous ways
 - ◆ “Unraveling of Mammoth-Herd Effect”: global convergence to similar philosophies (i.e., use of Alternatives) implies lower financial asset returns on average; successful asset manager performance differentiation may become more challenging
 - ◆ Uncertain climate change effects for capital markets
 - ◆ GPR/terrorism: the 21st century Teens hopefully will not resemble the 20th century
-

Snapshot of Key Asset Management Strategies in 2016; Richer Choice Set Coming

Technical	Convergence Trading	Lifecycle Value	Portable Alpha	Low, Medium, Large Risk Tolerance	Large Cap Growth	LDI	Transportation Strategy
Buy-And-Hold (Linear)		High Coupon/Low Coupon	Bottom Up	Merger Arb	Market Timing	Passive (Index or ETF)	Currency Overlay
Short, Medium, Long Horizon				Top Down	Statistical Arb	Corporate Restructuring	Cyclical/Defensive
Rolls	Absolute Return	Liquidity Risk Mitigation	Short Duration	Long/Short	Mean Semi-Variance Optimization		
Upgrade/Downgrade	New Issue Flipping	Long Only	Fundamental	Non-Momentum (Oscillating)			
	Cash Futures Basis Trading	Central Bank Arb	Systematic Short Vol		Global Macro	Covariance, Stress Test, Short Fall Risk Minimization	Convertible Arbitrage
Positive Carry (Forward Bias Across Assets)	Active	Sufficient Diversification		Upgrade/Downgrade Trade			
Secular Theme Driven	Bond Yield Maximization	Spread Sector Overweight	Cash-CDs Interventionist Fund of Funds	Constant Mix (Concave)	Maximum Concentration		
Butterfly	Short Only	Stable Value	Cheapest-to-Deliver	Treasury Futures Vol vs. Swaption Vol	Large Cap/Small Cap	Contrarian	
		Algorithm	Closet Indexing	Seasonality	CAPM	Dialectical Idiosyncratic vs. Systemic	
Momentum	130/30 Growth	Tick Trading	Activist Investor	Barbell	Auctions	GPR-Driven	
Storage Strategy		Managed Futures	Constant Maturity			Real Asset Outperformance - Inflation Linkers, Commodities, Natural Resources, Infrastructure	
Ratings Arb	Long Duration	Calendar Spreads	Long Vol	Gamma	Strategic Allocation		
High Liquidity/Low Liquidity	Too-Interconnected-To-Fail			Option-based Portfolio Insurance (Convex)			
Intermediate Duration	Structural Selection				Efficient Frontier	Tail Risk Mitigation	
	Quantitative	Straddles	Substitution Spread Strategy	Mezzanine	Demographic Differentiation	Capital Structure Arb	
Market Neutral		On-the-Run/Off-the-Run		Portable Alpha			
Geography Arbitrage				Arbitrages - Accounting, Tax, Regulation, Rating, Monetary, Political Policies		Constant-Proportion Portfolio Insurance (Convex)	
Relative Value Arbitrage	Dynamic Conditional Correlation	Event Driven					

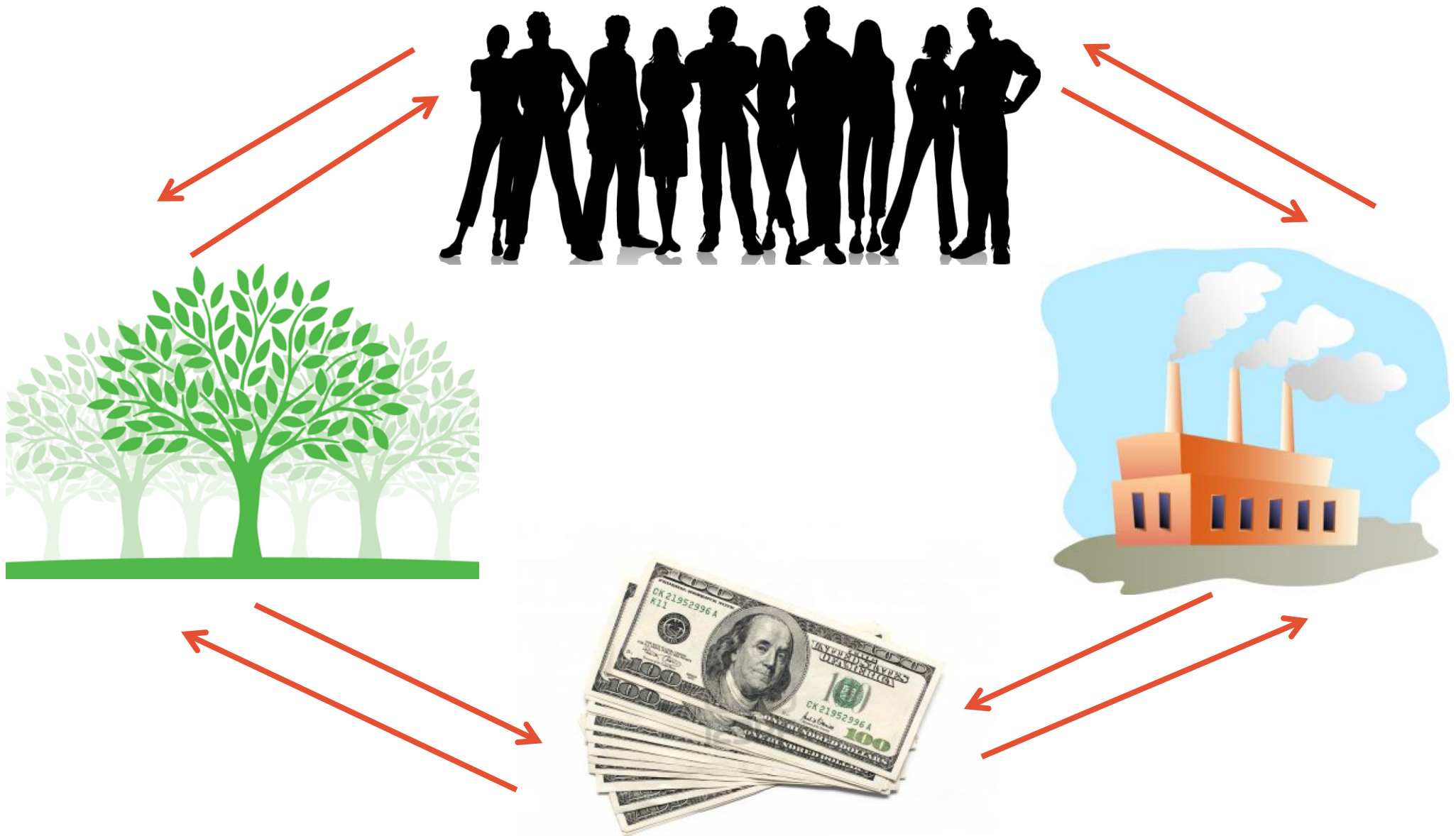
The Future of Global Portfolio Management

- Next generation capitalism
- Increased importance of market timing as high correlations reduce importance of security selection, etc.
- Real-time, virtual global capital market for all instruments
- Concentrated portfolios as leverage not available to enhance returns
- Heavily harvesting “big data”
- 10 bp outperformance in a 200 bp total return world may not be worth paying for
- Integrated, multi-asset class approach, leading to near-extinction of siloization
- Toward model standardization, especially attribution and risk
- Increased importance of real return products and strategies as governments focus on repression
- Greater emphasis on asset allocation
- Vast institutional changes, particularly at broker dealers
- Electronic-led global financial system
- Increase in growth investing as value diminishes

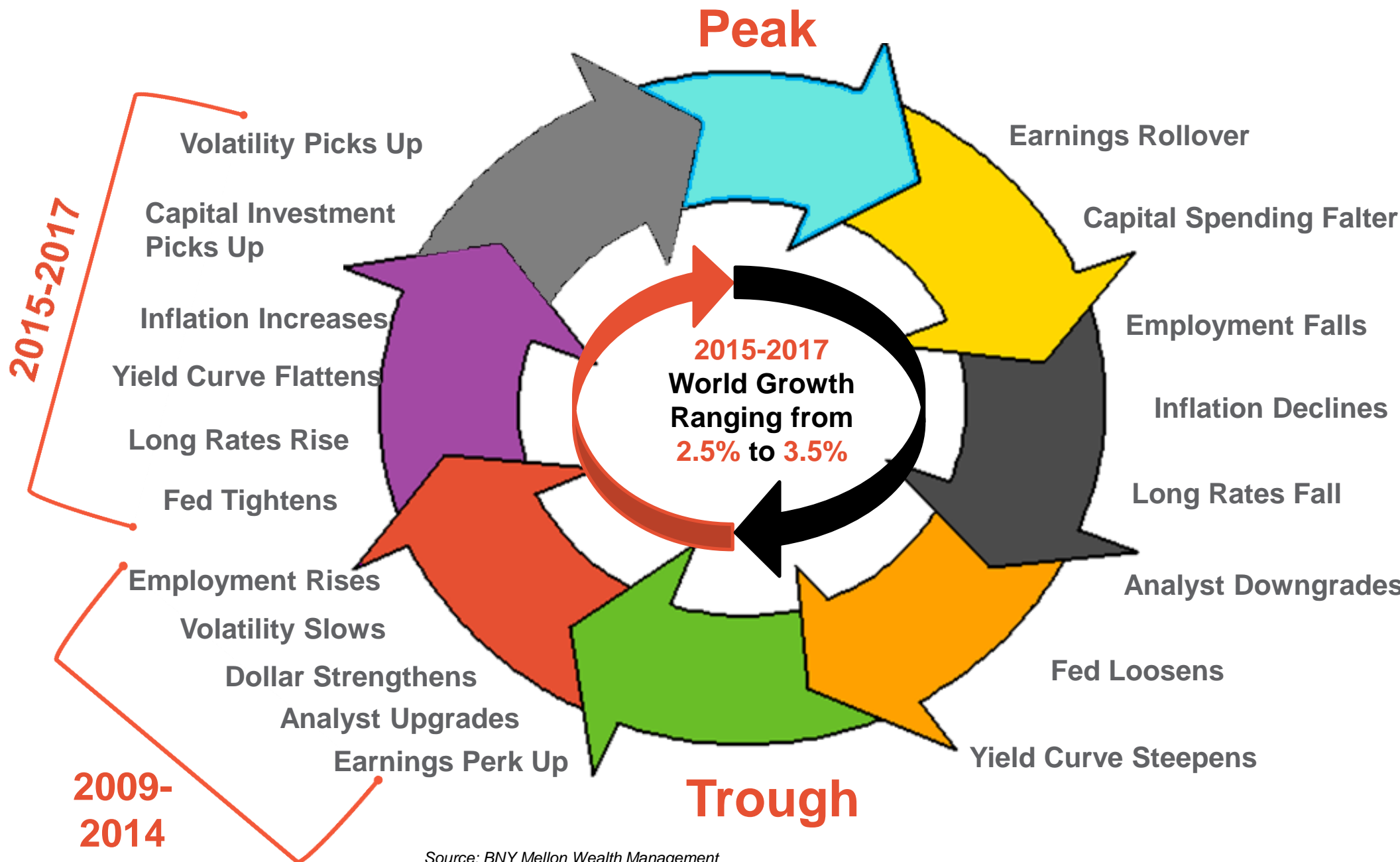
The Future of Global Asset Management

- Less constraints
- More precise portfolio targets
- Greater range of securities
- Bespoke > generic solutions/asset classes
- Cost controls
- Consolidation
- Alternatives
- Social investing
- Uneven liquidity
- Inadequate market structures
- Increased regulatory oversight
- HFT controls
- Lighting up dark pools
- Infrastructure
- Innovation
- Full conversion from defined benefits (DB) to defined contributions
- Rise of ETFs

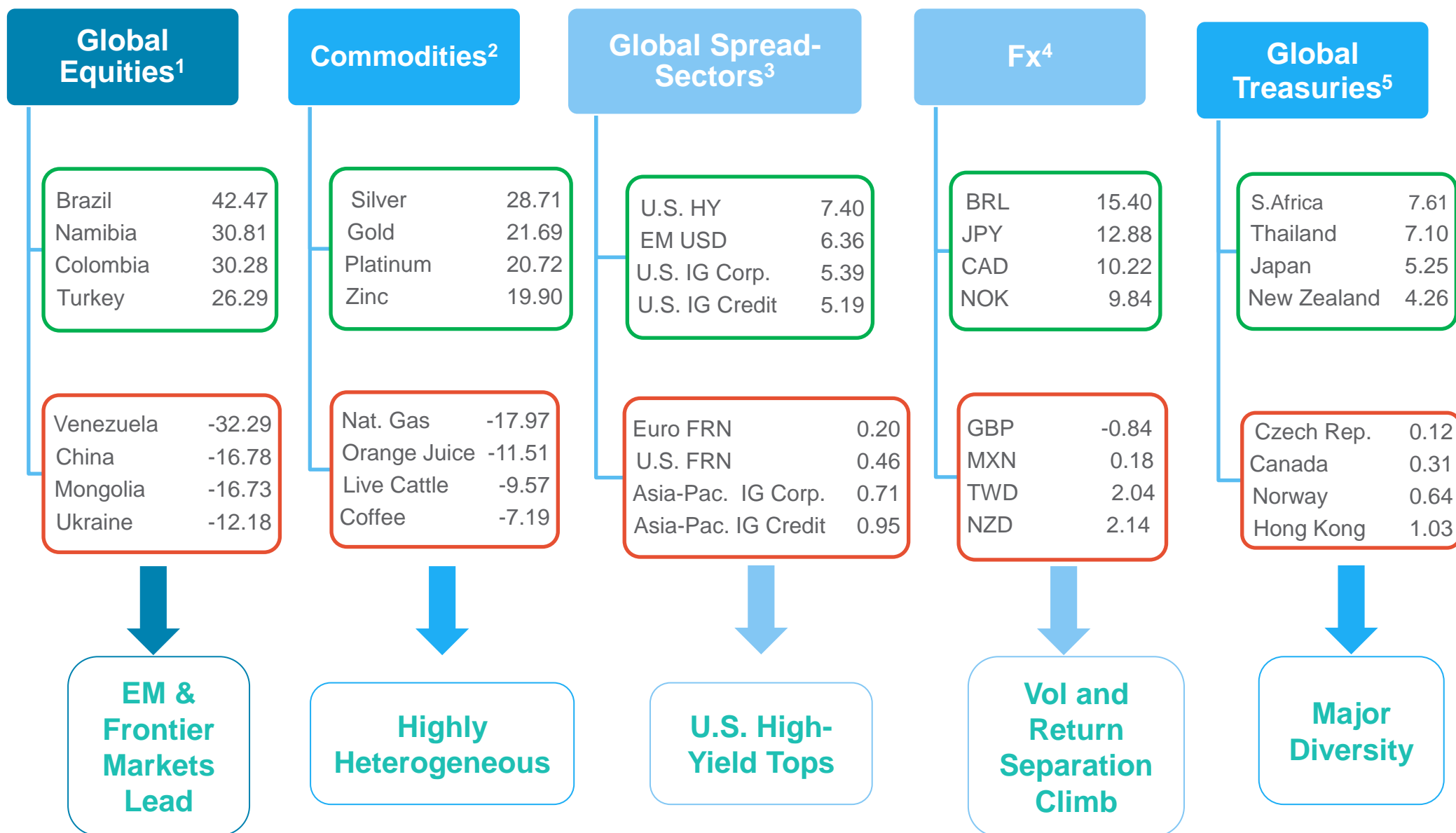
Environmentally Sustainable Growth Key to Intergenerational Equity



Classic Global Economic/Market Cycle in Early 21st Century

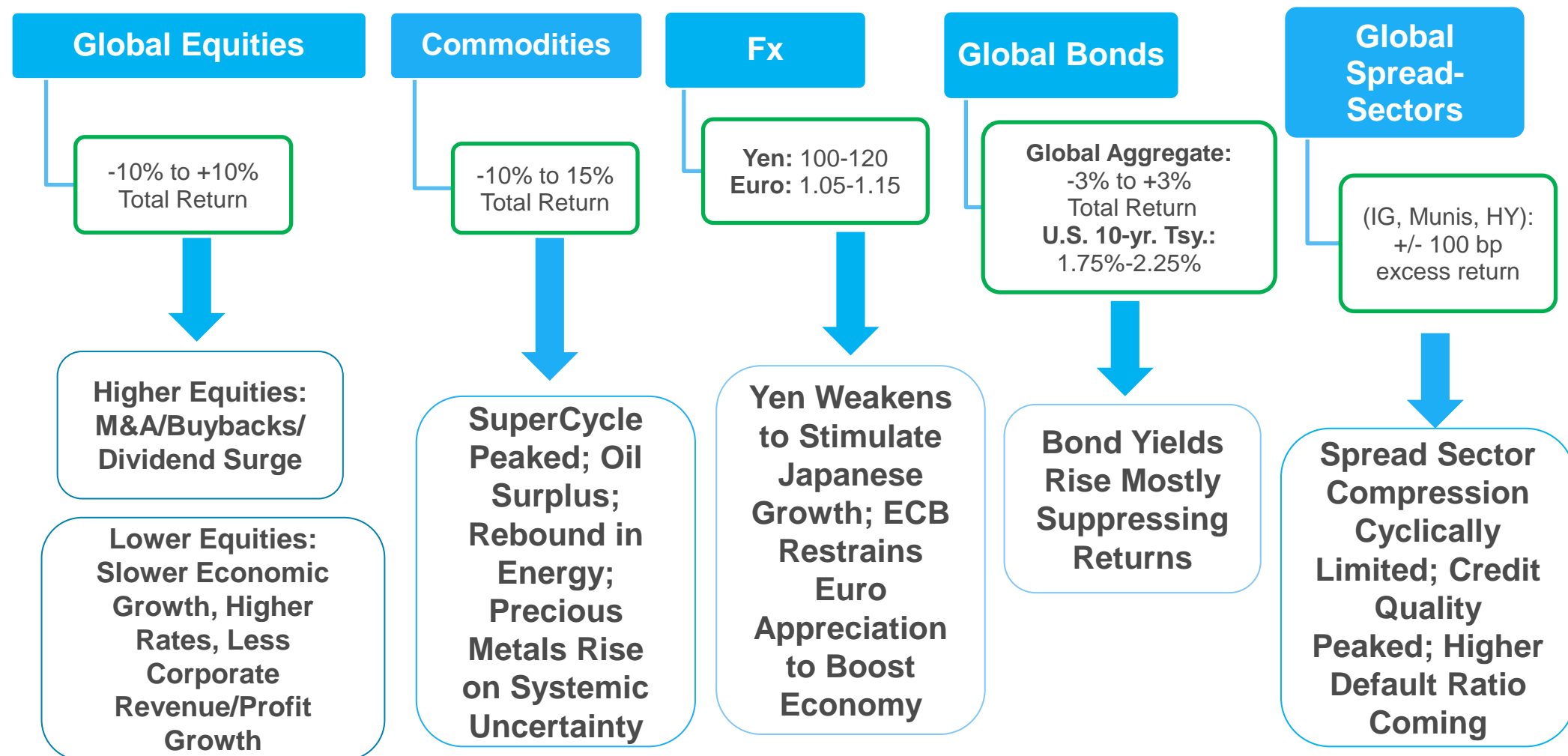


2016 Global YTD Leaders and Laggards (total return, %): Top and Bottom 4 Across Multiple Asset Classes as of April 30



1) Total returns in U.S.\$; 2) S&P GSCI total return indices; 3) Barclays total return indices; Asia-Pacific IG Credit and Asia-Pacific IG Corp.: yen-hedged; 4) Spot return vs. U.S.-dollar and includes major currencies as defined by Bloomberg; 5) Barclays Global Treasury total return index local currency; Source: BNY Mellon using data from Barclays Live, FactSet, and Bloomberg

2016 Market Views



- **Key Risks:** Economic, Geopolitical, Regulatory, Gains Trading

Getting the “Big Picture Call” Right:

Ten Defining Issues for the Late Teens/Early Twenties Decade

When and how does the next global recession rise?

- Late business cycle rotation from risky to less risky asset classes should prove beneficial

Monetary and Fiscal Policy Normalization

- High chance of a zig-zag trail rather than a liner path

Regulatory Revamp of Global Financial System

- May bring unintended negative consequences

Chinese Growth: ? Landing

- Deceleration from 7%-10% to below 7%

EM → AE Status

- Convergence in the long run, but expect challenges

Shale Revolution

- Once a “Twilight Thesis,” now soaring due to fracking

Demographics

- Effects of advanced economies “Boomers” retirement

Geopolitical Risk

- The “Wildcard”

Technological Change Quickening and Big Data

- Markets have never been as richly informed

Evolution of AM Philosophy and Methods

- “Only thing that is constant is change”

Source: BNY Mellon Center for Global Investment and Market Intelligence

“The Great Reformation Age: 2009 – 2030”



Self-Driven Google Cars **National, State, & Local Government Consolidation** **Atlantic → Pacific** **New Economic Statistics** **Economic and Finance Theory Redefined**

Rise of Consilience: **Books as Rare as Vinyl Records** **Nanotechnology** **Shift to Longer Horizons** **HIV, Malaria Wiped Out**

Interdisciplinary Approach To **Water Resource Constraints** **Taming Leverage Cycle** **Globalization** **Fusion Power Finally Arrives**

Social, Economic, Political, Science **Genetic Engineering** **Electronic Currency Supplants Conventional Currency** **High Government Oversight** **Smart Beta**

Robotics **Baby-Boom Generation Struggles Financially in Retirement** **Mars Visited** **Quantum Computing** **Battery Revolution Exponential Technology Change**

Holographic Clothes **Bitcoin** **EM Middle Class Explosion**

Social, Cultural Unrest Driven by Computers, TV **Carbon Capture** **LATAM & Asia Mainly Advanced Economies** **Periodic Trade Wars**

Heightened Uncertainty **Fiscal Policy Resolution** **Complex Order** **U.S. and European Economies Left Behind** **End of Asset Class Siloization**

Regular Cyber-War Disruption **Artificial Intelligence** **Singularity** **Conservative Finance** **Terrorism Escalates**

Cellular Regeneration **Global Financial System** **Contagion Frequency Escalation** **Unintended Consequences of Possible Resource Wars** **Solar Panel Efficient**

Public Post-Office Ends **Tech Change** **Dark Matter Discovered** **Behavioral Dynamics** **Quant Security Ranking Service**

Commodity Scarcity **String Theory Proved** **Physics of Complexity** **Grand Methodological Convergence in AM** **WMD Proliferation, Especially BIO-Weapons** **Alternatives Dominance**

Big Data **Broker-Dealers** **Multiverse Confirmed** **Career Insurance** **Urbanization Domination** **Extra-Terrestrial Life Discovered in Solar System Materials**

New Commuting Patterns **World Financial Authority** **Global Oil Production Accelerates** **3D Printers** **Technology/Neural Implants**

Climate Change & Cost to Control Soars

Career Lessons and Recommendations

1. Know your capital market history
2. Travel internationally as much as possible
3. Beware of false forecasts, especially very long-term forecasts
4. Antiquated economic and financial market data assembled under anachronistic methods can produce false guidance
5. Try not to become overly beholden to capricious “flow data” like monthly production, labor, confidence, and central bank reports
6. Maintain a flexible, unbiased mindset; the outlook is neither perpetually positive or negative
7. Technological innovation especially difficult to project
8. Financial markets are an information and knowledge-based industry
9. Encourage entrepreneurship in pursuit of start up nation
10. Wildcard risks will rise
11. Increased financial market complexity boosts need for expert guidance
12. Enhance human capital: education never stops (TED, Coursera)
13. Create a legacy

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