



Global Economy Outlook*: The Backdrop for Semiconductors

Business of Cleans

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**A global outlook based on Consensus Economics, Inc.
CONSENSUS FORECASTS®*



Outline

- **Review last year's economic forecast**
- **Forecast with key themes:**
 - **Slower growth**
 - **Higher uncertainty**
 - **Rising risk of recession**
- **Recession Risk Dashboard**

Summary Overview: 2018

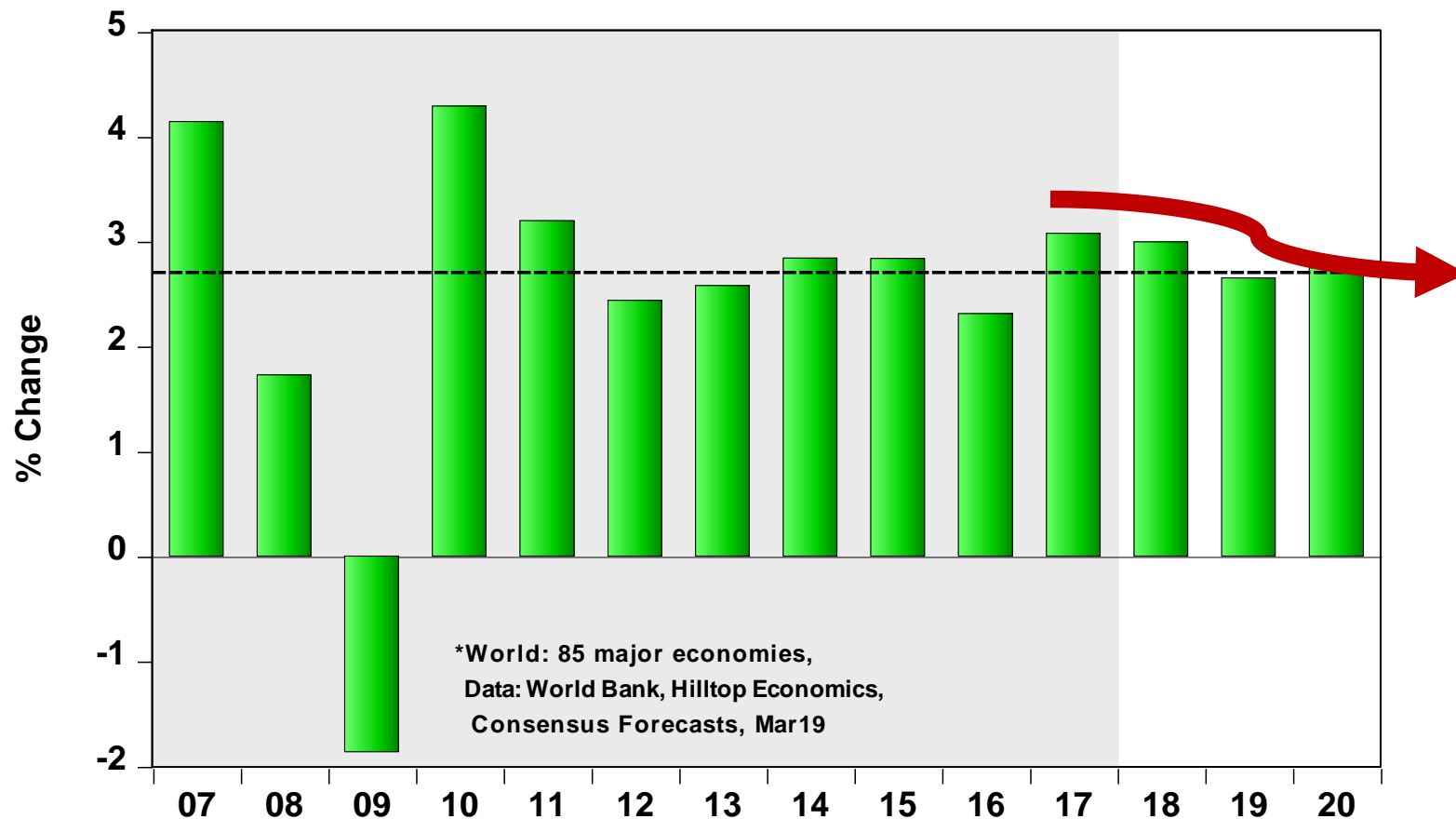
- In the **accelerating phase of the economic cycle** **YES**
 - **Healthy consumer** **YES**
 - **Investment upsurge driving the global economy stronger** **YES**
 - **Slightly higher inflation**, diverging interest rates **YES**
 - **Currency unsettled** **YES**
 - **Potential for much higher economic policy uncertainty: trade, geopolitics the current wild cards** **YES**
- **Healthy backdrop for semiconductor industry:**
 - Demand for semiconductors grows above trend **YES**
 - Wafer Fab Equipment investment strong **Peaked 18M5**
 - Risks: excess capacity expansion, supply chain imbalances (wafers?) and final demand uncertainty (5G, AI, mobile and computing devices)

Summary Overview: 2019-2020

- In the *mature phase of the business cycle with decelerating growth and a rising risk of recession*
 - Investment moderating despite need
 - Healthy but more cautious consumer
 - Low inflation, diverging interest rates, currency unsettled
 - Higher economic policy uncertainty:
 - Domestic fiscal and monetary policy (China, US, EU, Japan)
 - Trade
 - Geopolitics
- **Less-healthy backdrop for semiconductor industry**

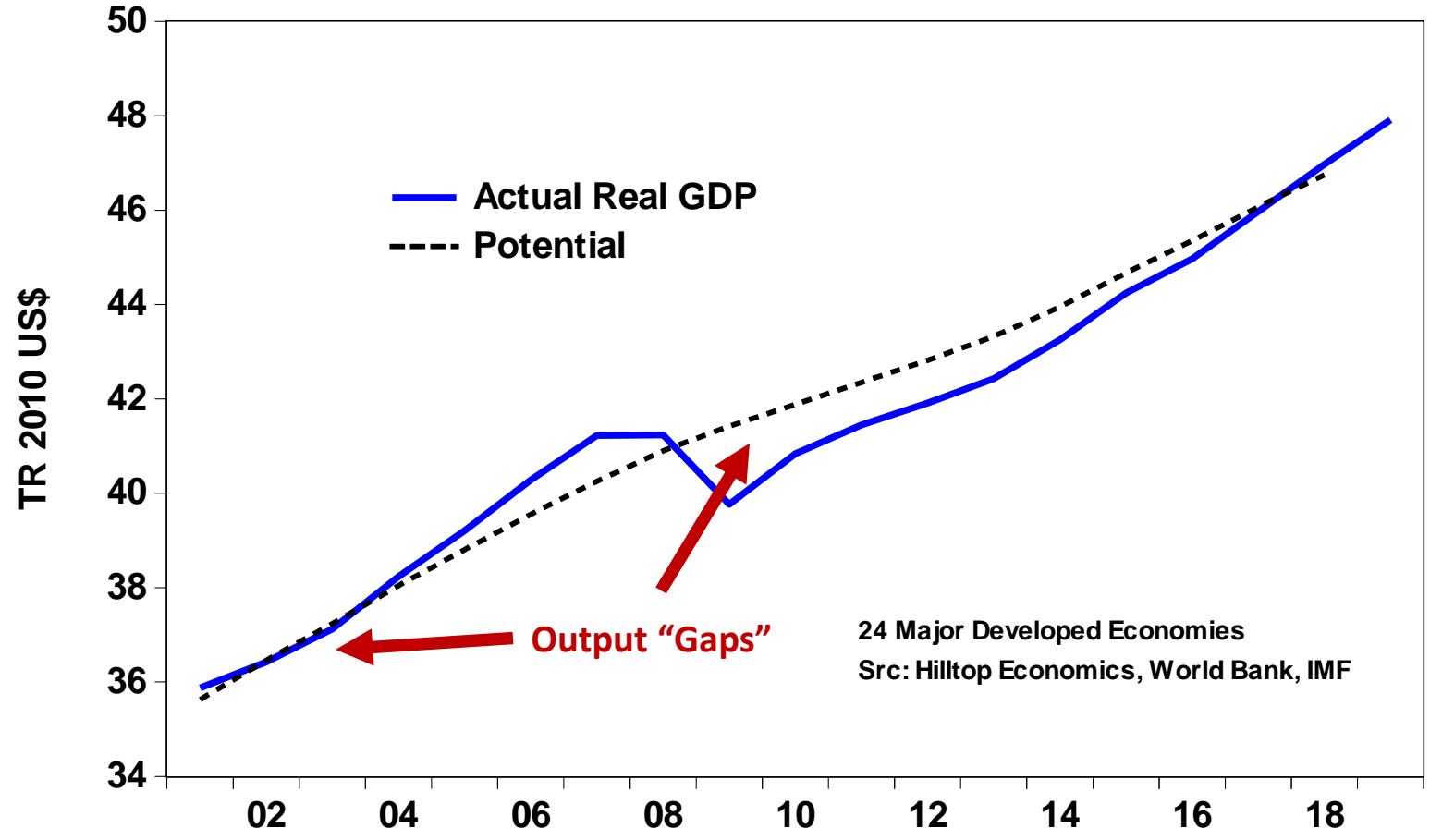
Consensus: Growth Weakens to Trend in 2019-20

World* Real GDP Growth
2018: 3.0% 2019: 2.7% 2020: 2.7%



Estimating the Global Output Gap

A closed gap is the limiting factor to long-term growth

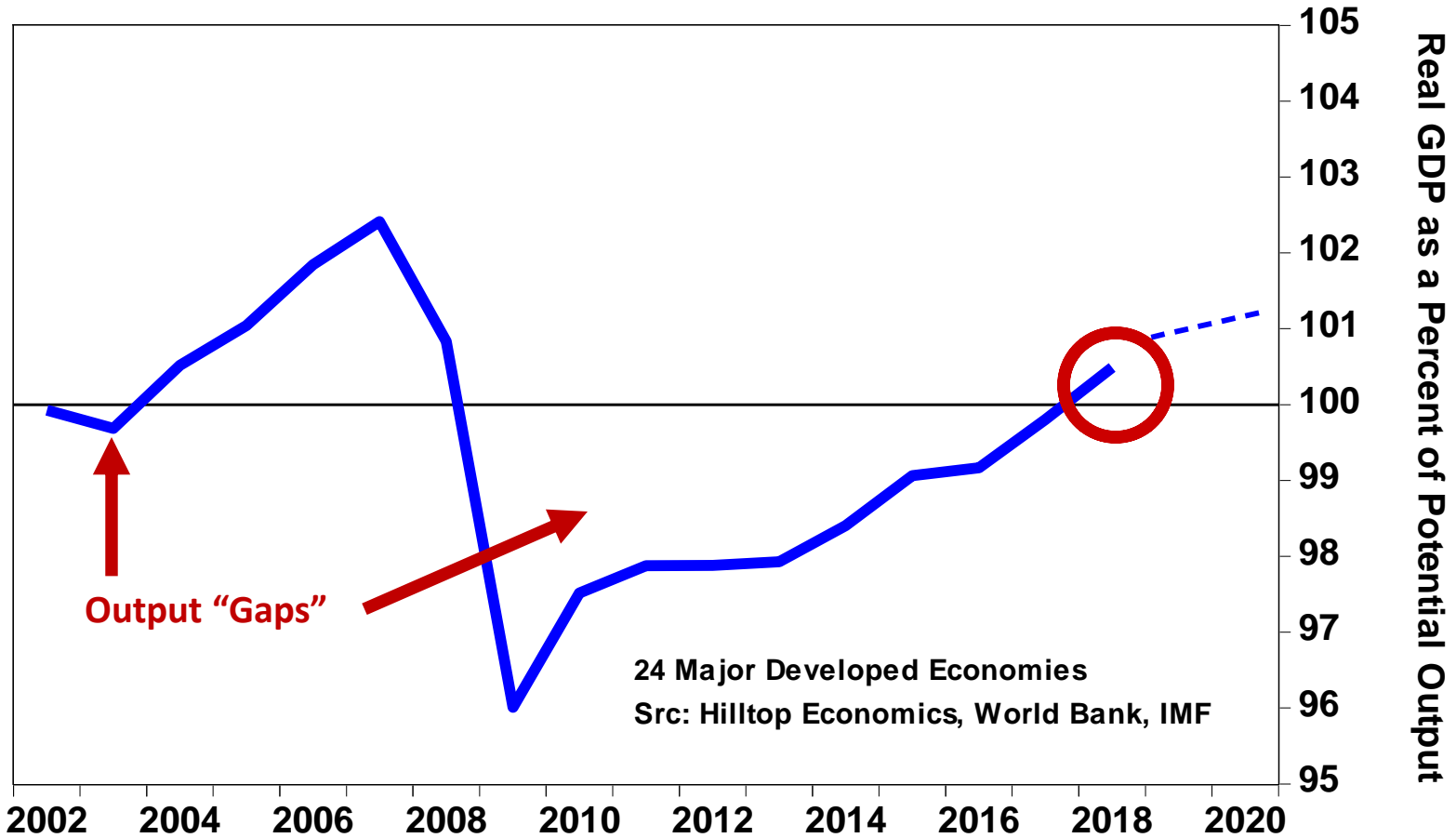


24 Major Developed Economies
Src: Hilltop Economics, World Bank, IMF



Global Output Gap Disappeared in 2018

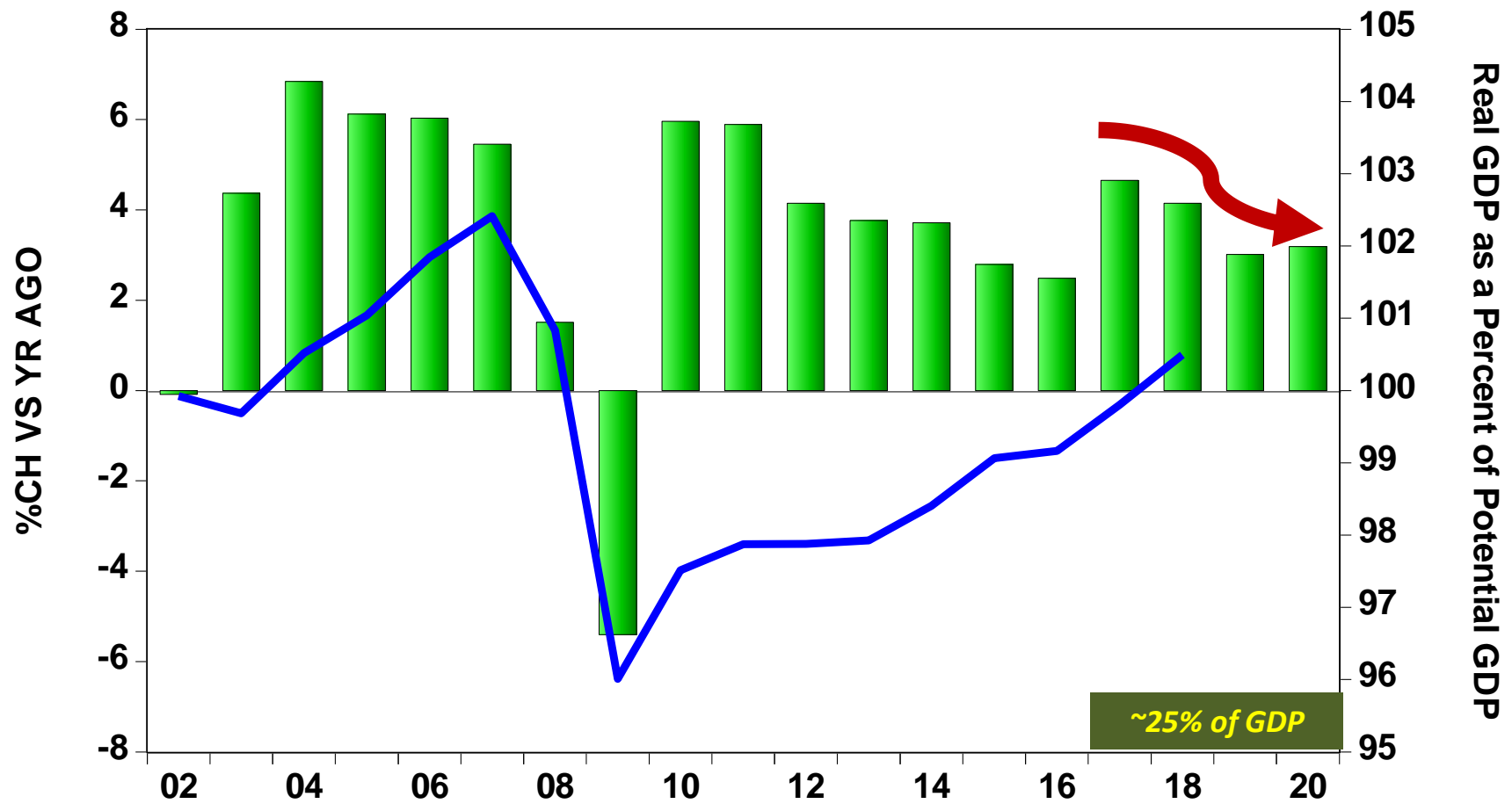
In 2018, Real GDP finally pushed above potential





A Weaker Investment Forecast

(Investment SHOULD be picking up – as it did in 04-07)





Investment Growth: Needed to Drive Cycle Higher But Forecast to Slow

- **Revenue growth OK**
 - Real GDP growth (volume) now at 2.7%
 - Some inflation (price) on average from ~1% - 2%
 - “Revenue” now ~4 ½ %
- **Output gaps closed, need capital to grow**
- **Profitability still positive**
- ***Risk aversion is the problem again***
 - *Forecasts on a downward trajectory*
 - *Economic policy uncertainty volatile and high on a global level*
 - *Interest rates reflecting the uncertainty*

Many Reasons for the Return of Risk Aversion

- **Economic Policy Uncertainty**
 - Trade wars (shifting international institutional arrangement)
 - US (post-stimulus fiscal policy, post-govt shutdown, monetary policy, immigration)
 - Europe (Brexit, Italy, France, EU-wide e.g. immigration)
 - China stimulus impact, international situations
 - Japan tax increases
- **Financial markets**
 - Concern with policy
 - Concern about profits
 - Concern about the strong dollar and rising US interest rates
 - Concern about debt
 - Which explains the weaker real investment forecast & the rising probability of an economic downturn (recession), not just slower growth

Recession Watch Dashboard: Cautious (Yellow)

- Output momentum (Real GDP, Investment, Ind. Production)
- Employment momentum (Unemployment rates)
- Consumer confidence measures (US & majors)
- Equities (recovered & but still a bit volatile)
- Profits & Small Business Earnings (strong, but off peak)
- Oil Prices & Inflation (pressure eased)
- Global Economic Policy Uncertainty (Very high)
- Global Consensus Forecast (weaker trend 11 mo.)
- U.S. Yield Curve (close to inverting)
- Interest Differentials (US vs EU rising)

Recession watch: leading indicators that may help identify turning points that precede a downturn in the next 18 to 24 months

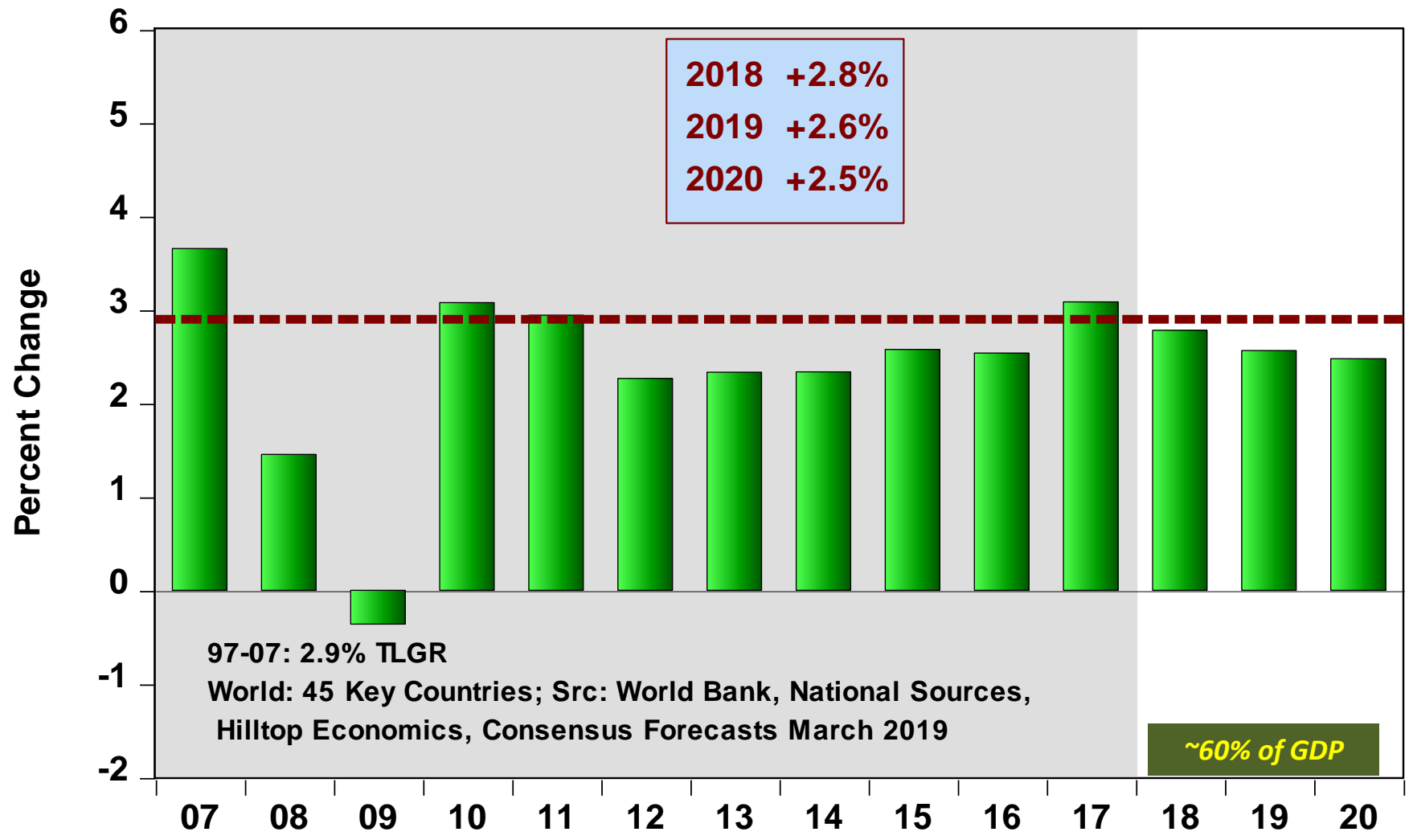


Global Consumer Outlook Healthy

- Unemployment rates are low
- Wages are stable to rising
- Inflation is low
- Oil prices are not a big problem
- Consumer debt is under control
- Confidence is high, but off the peaks or 2018



World* Real Consumption



97-07: 2.9% TLGR

World: 45 Key Countries; Src: World Bank, National Sources, Hilltop Economics, Consensus Forecasts March 2019

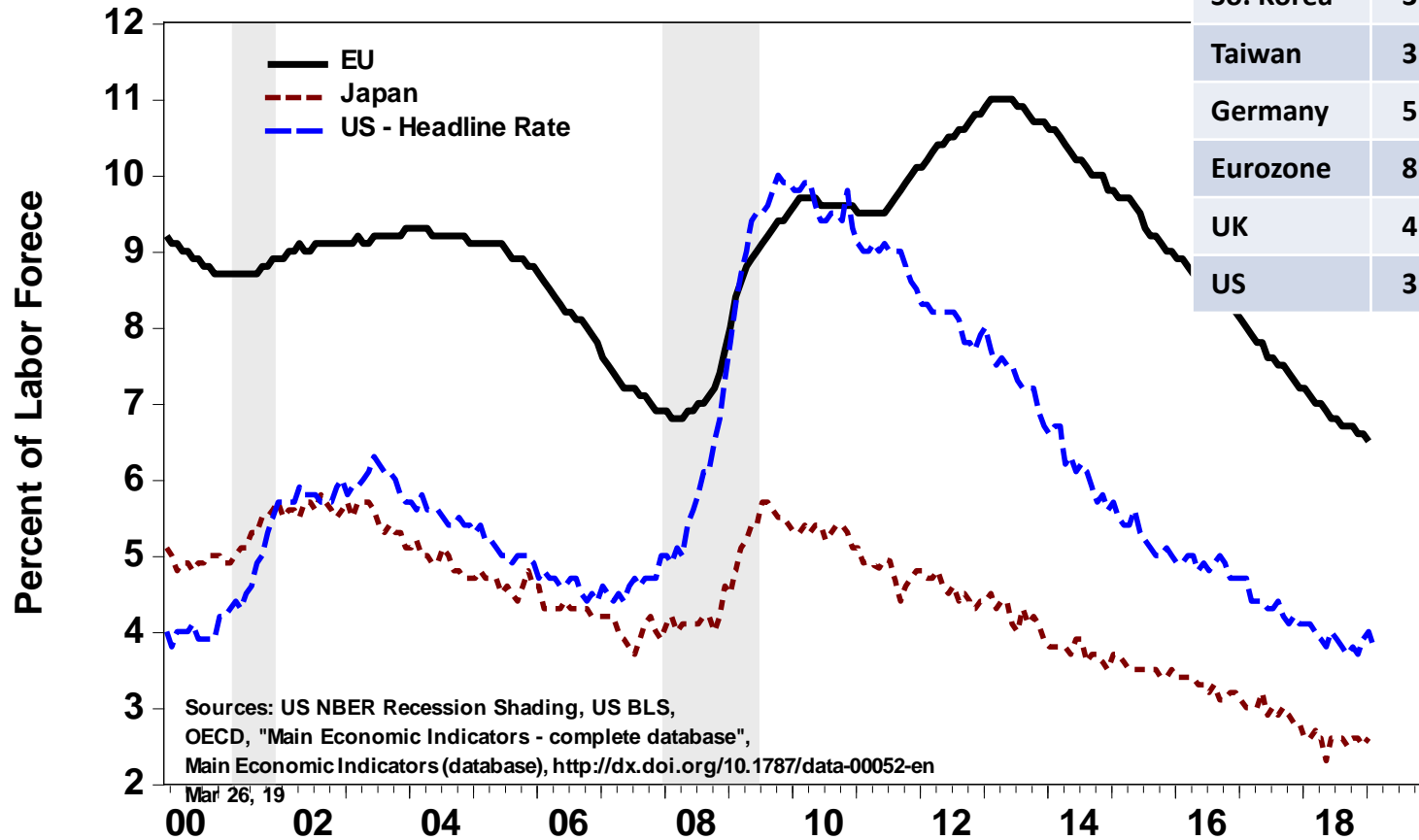
~60% of GDP



Jobs Markets Support Consumption

Unemployment Rates

% Unemp.	2018	2019	2020
Japan	2.4	2.4	2.4
So. Korea	3.8	3.9	3.9
Taiwan	3.7	3.7	3.8
Germany	5.2	4.9	4.8
Eurozone	8.2	7.8	7.6
UK	4.1	4.1	4.2
US	3.9	3.7	3.7





CPI Inflation Weakens in 2019

Despite tightness in labor markets and closed output gaps

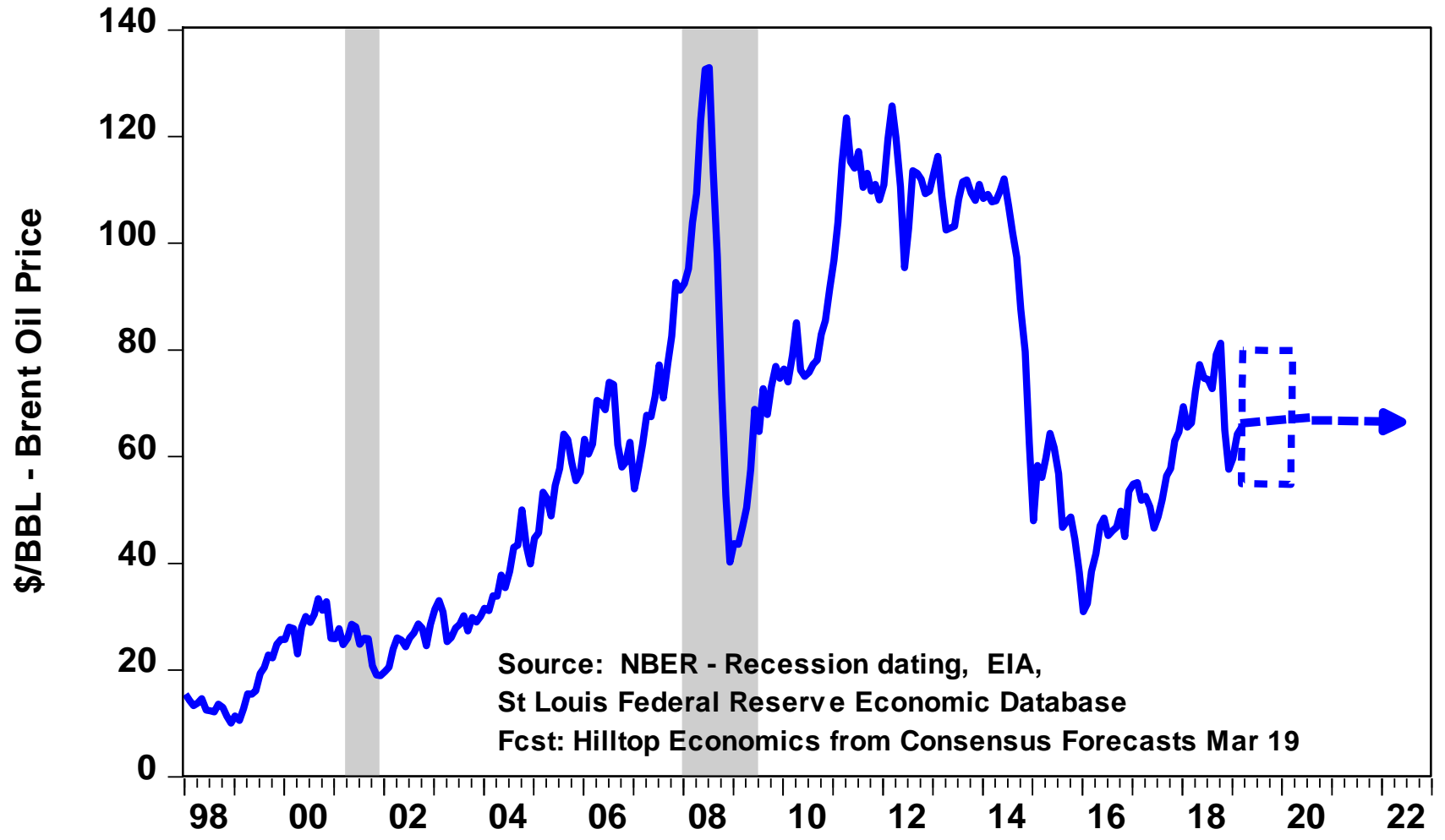
CPI % Change	2016	2017	2018	2019	2020
China	2.0	1.6	2.1	2.1	2.1
Japan	(0.1)	0.5	1.0	0.7	1.0
South Korea	1.0	1.9	1.5	1.3	1.6
Taiwan	1.4	0.6	1.4	0.8	1.1
Germany	0.5	1.8	1.8	1.5	1.6
France	0.2	1.0	1.9	1.3	1.5
Italy	(0.1)	1.2	1.2	0.9	1.2
UK	0.7	2.7	2.6	2.2	2.2
US	1.3	2.1	2.4	1.8	2.2

Hilltop Economics, Based on Consensus Forecasts, March 19

2018 actual vs. forecast: China: -0.2, Germany: +0.1, US & Japan no error

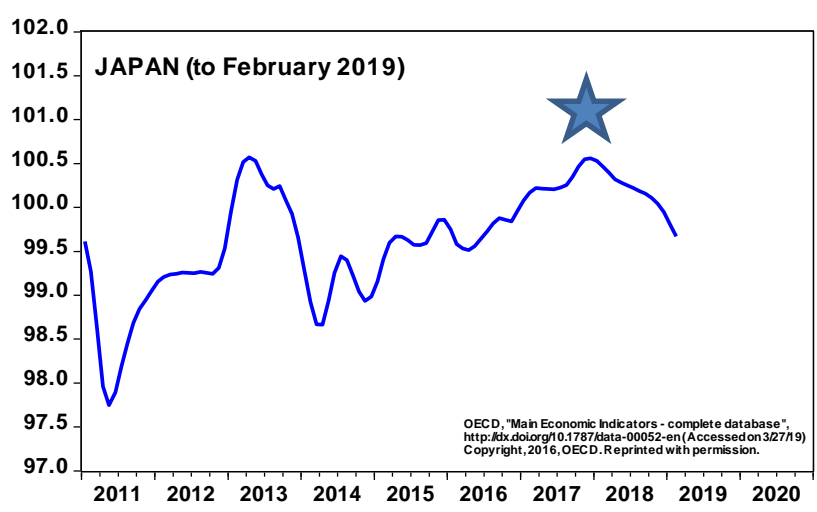
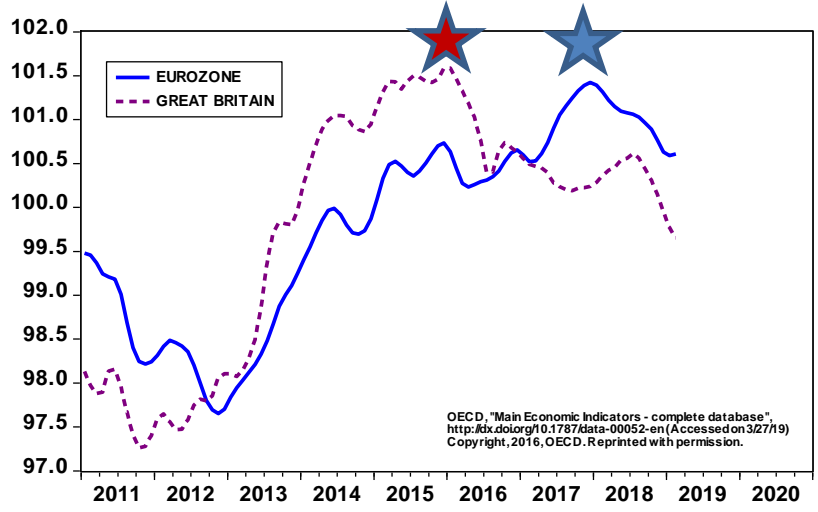
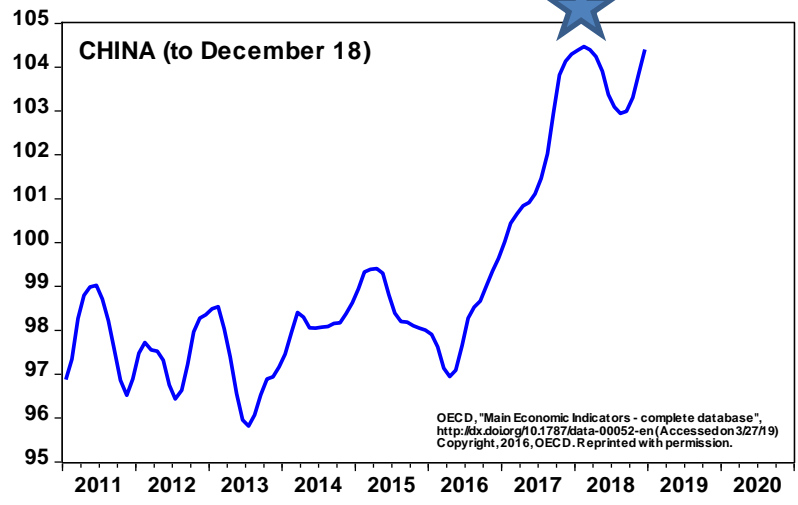
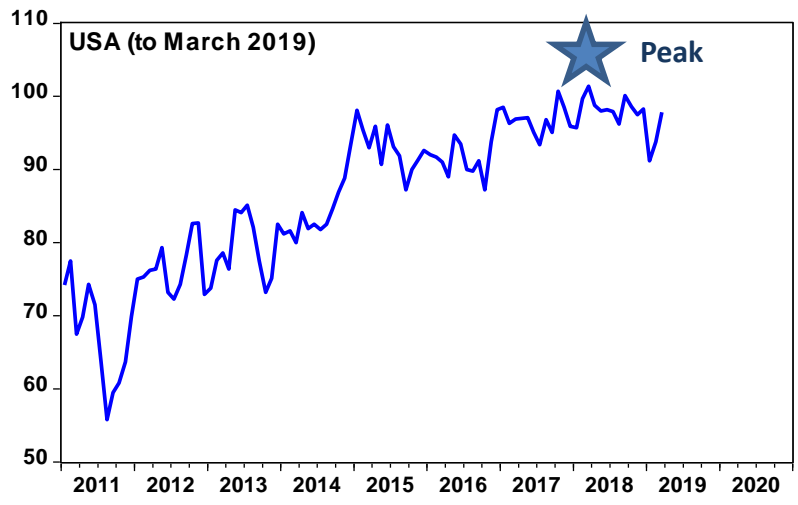


Oil Prices



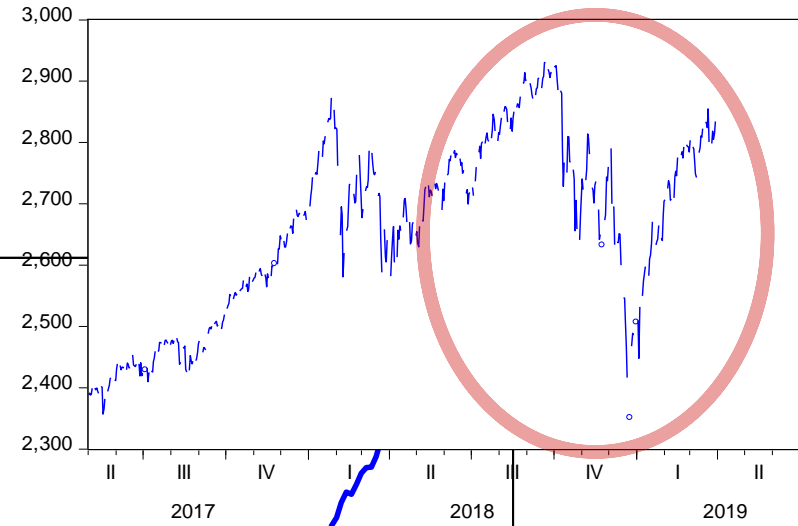
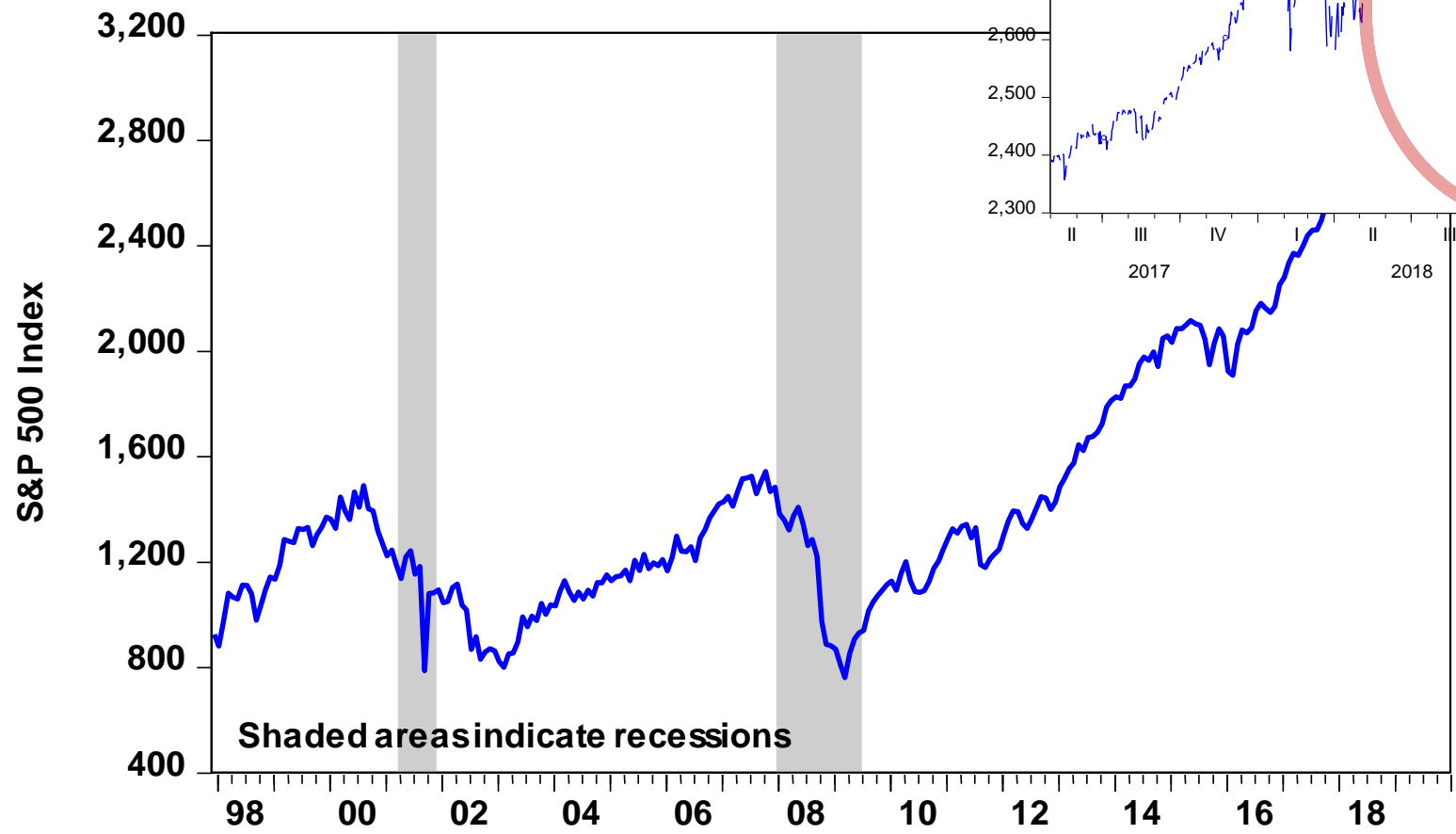


Consumer Confidence Indexes Are High But off the 2018 peaks, with the exception of China



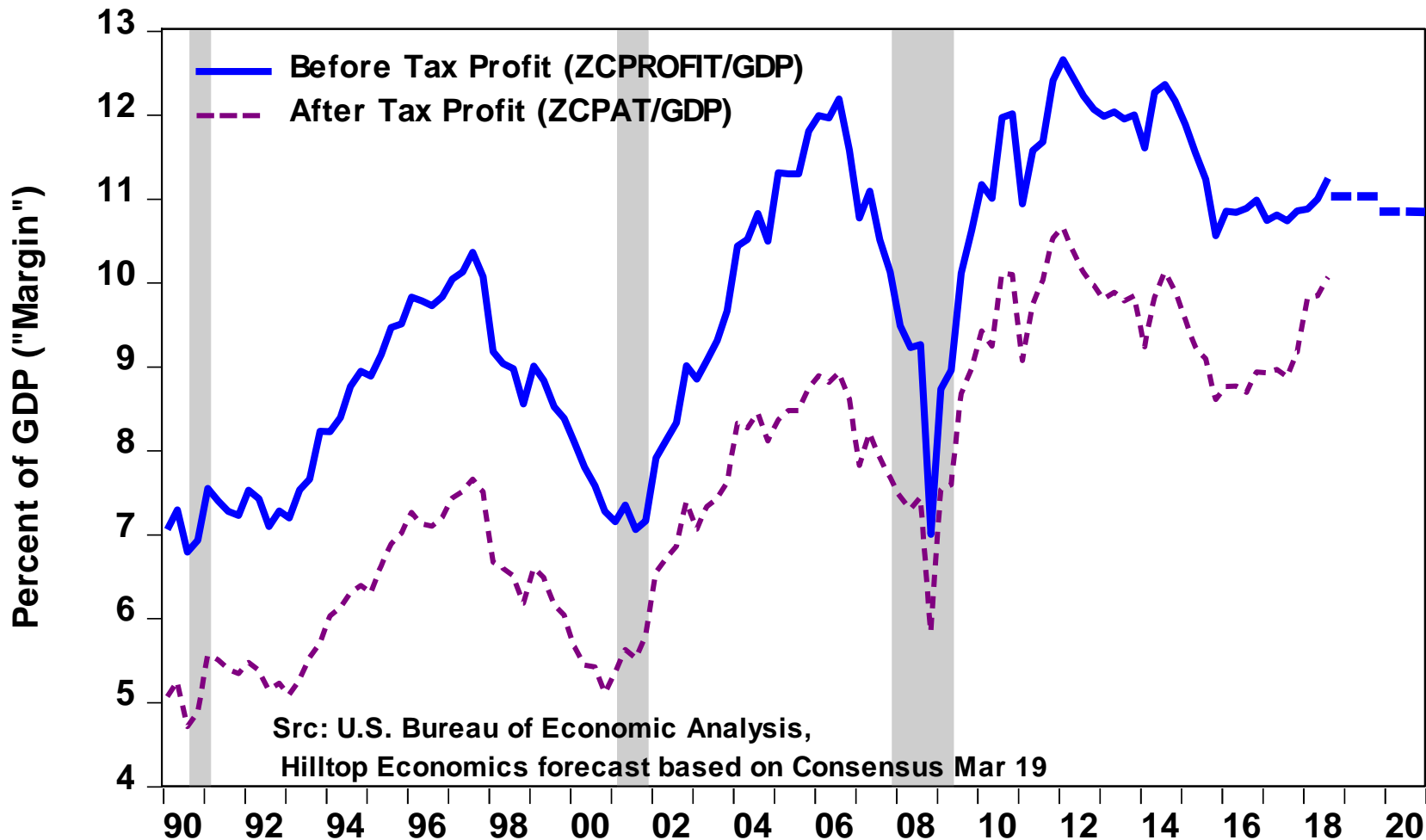


Equity Prices Well Above December Lows as of End-March, but Volatility Unsettling





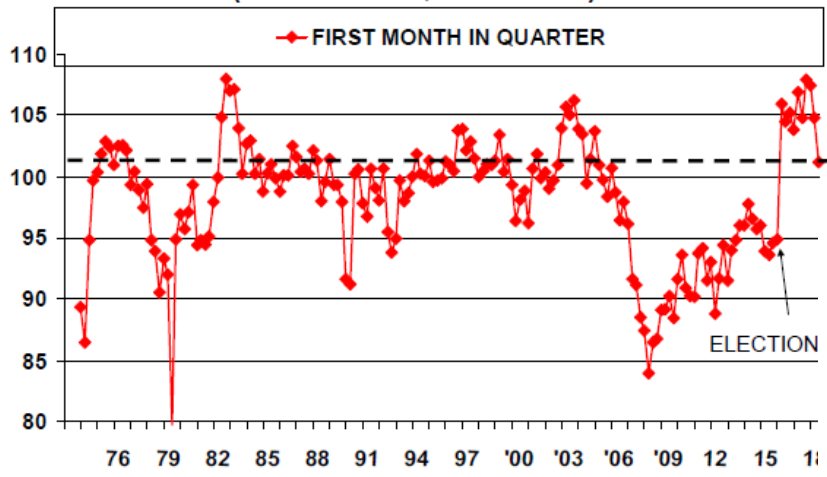
Consensus: Profits Grow in Line with Revenue At Least Through 2020





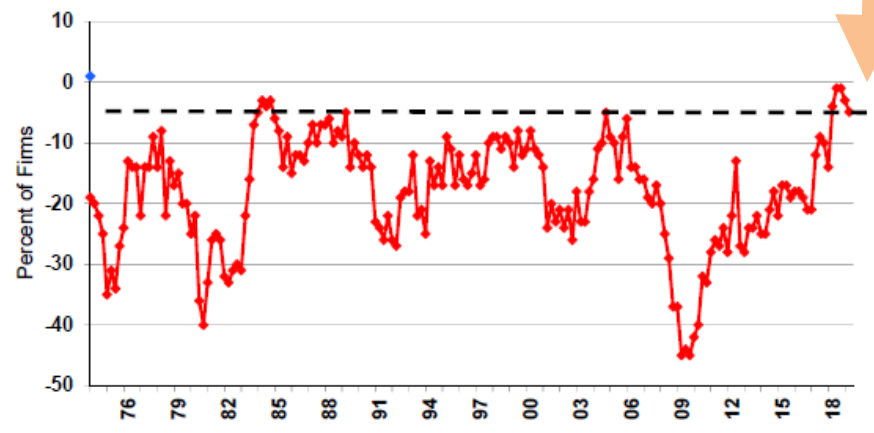
Small Business Optimism: Dropped Sharply in Q1 Earnings Still High, But Off the Peaks

SMALL BUSINESS OPTIMISM INDEX
(QUARTERLY, 1986 = 100)



Actual Earnings Changes

Net Percent ("Higher" minus "Lower") the Last Three Months Compared to the Prior Three Months



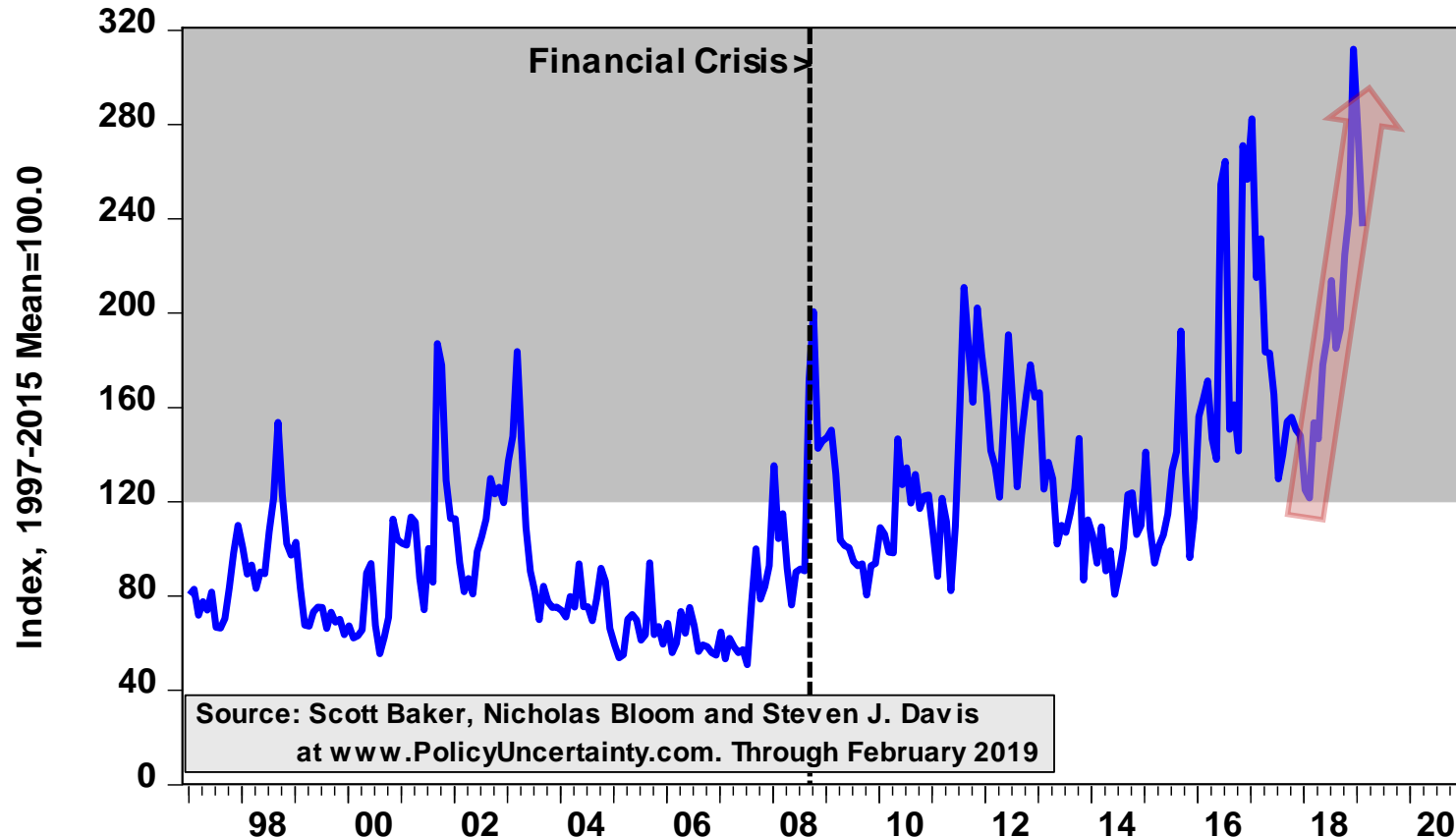
Quarterly data (Jan., April, July, Oct.)

Src: NFIB, January 2019 release of Nov – Dec Survey data



Uncertainty Peaked at Crisis Levels in January 2019

Global Economic Policy Uncertainty

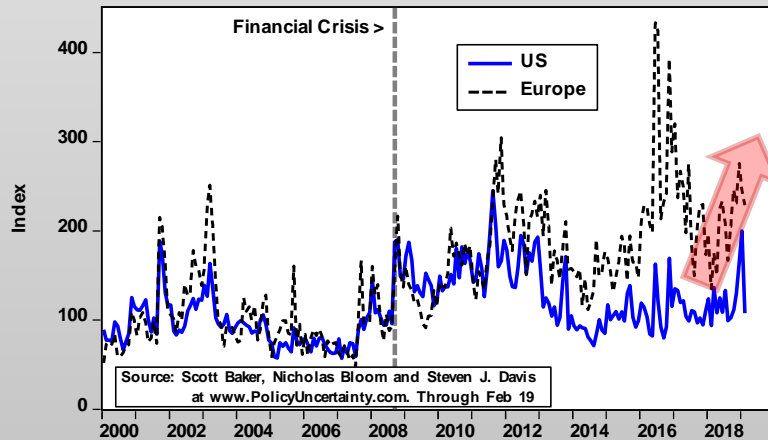


Uncertainty over future economic policy skyrocketed back to levels high enough- in the grey zone on the graph- to dampen investment by the middle of 2018.

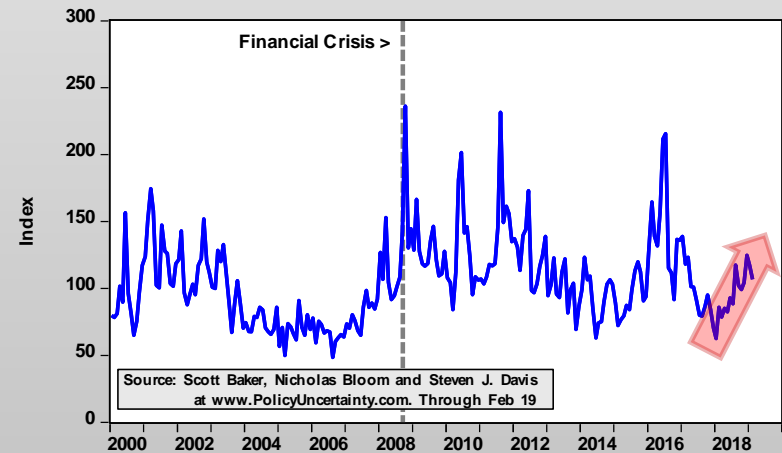


Uncertainty UP Everywhere Except U.S.

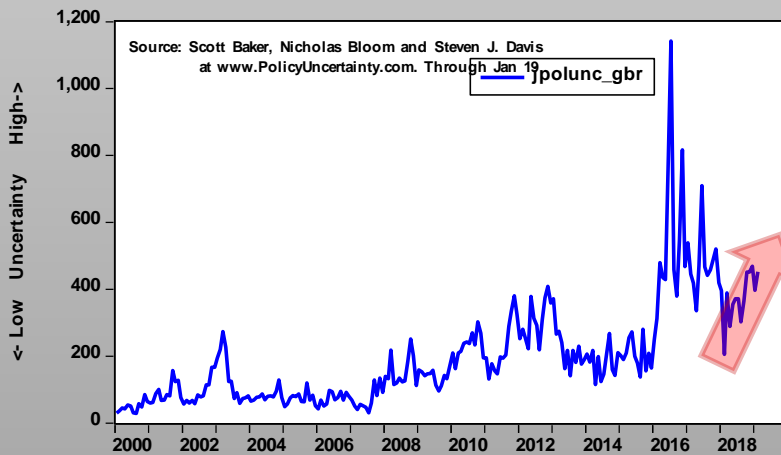
Economic Policy Uncertainty: U.S. & Europe



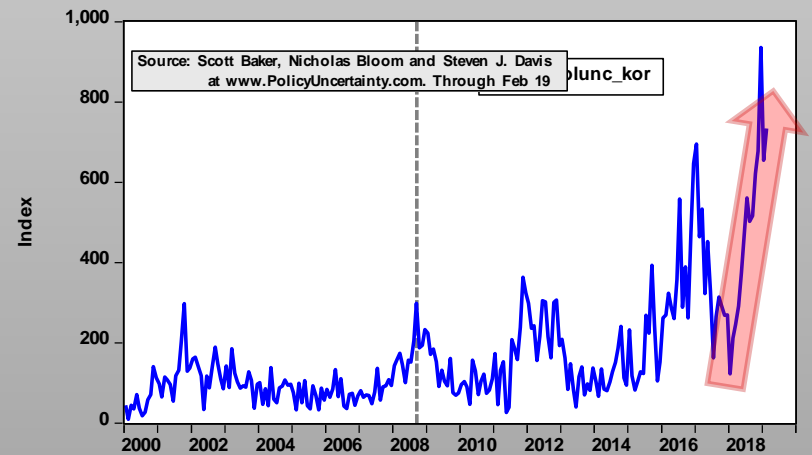
Economic Policy Uncertainty: Japan



UK Economic Policy Uncertainty

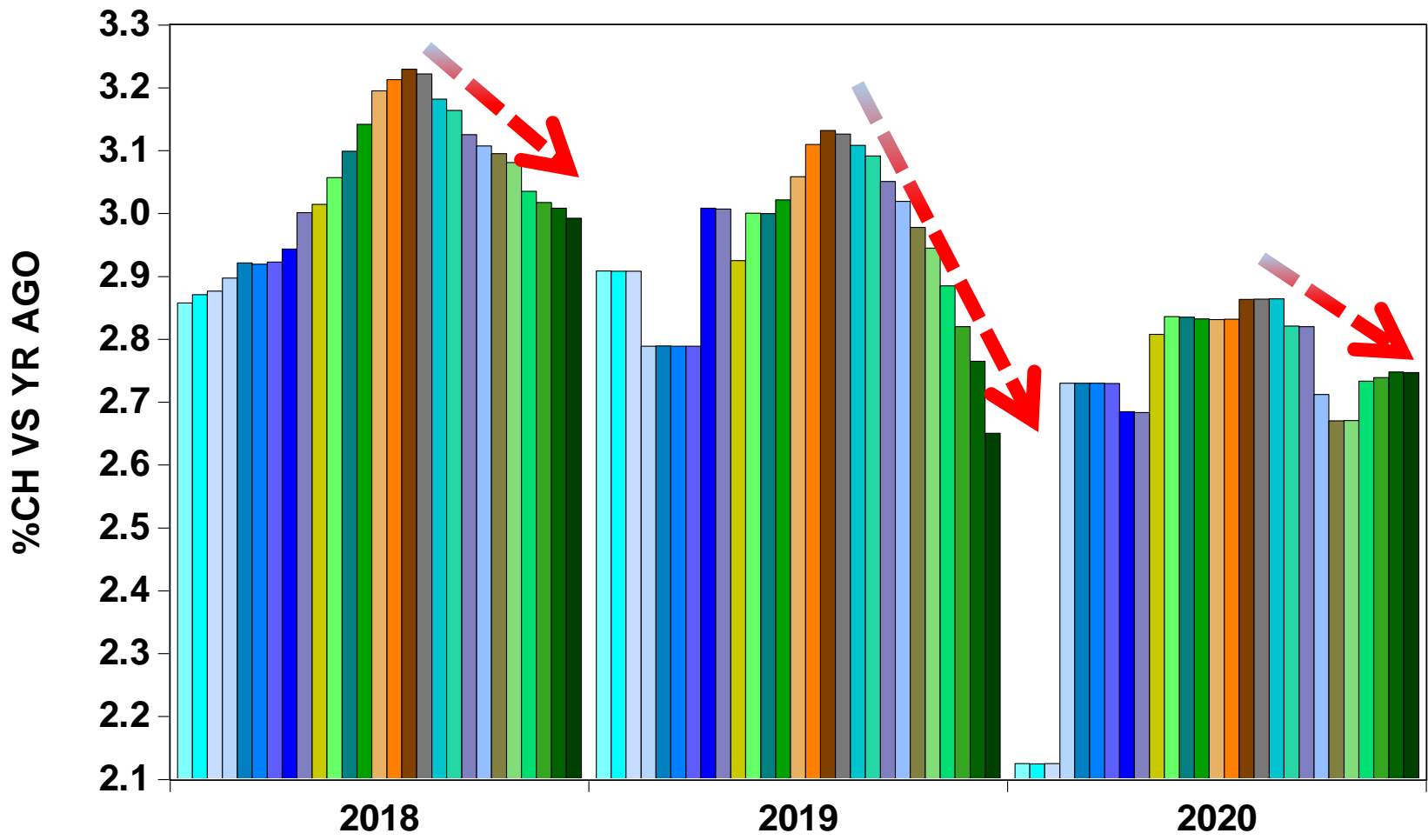


Economic Policy Uncertainty: China





Global Real GDP Forecasts for 2019 Lowered – Eleven Months in a Row

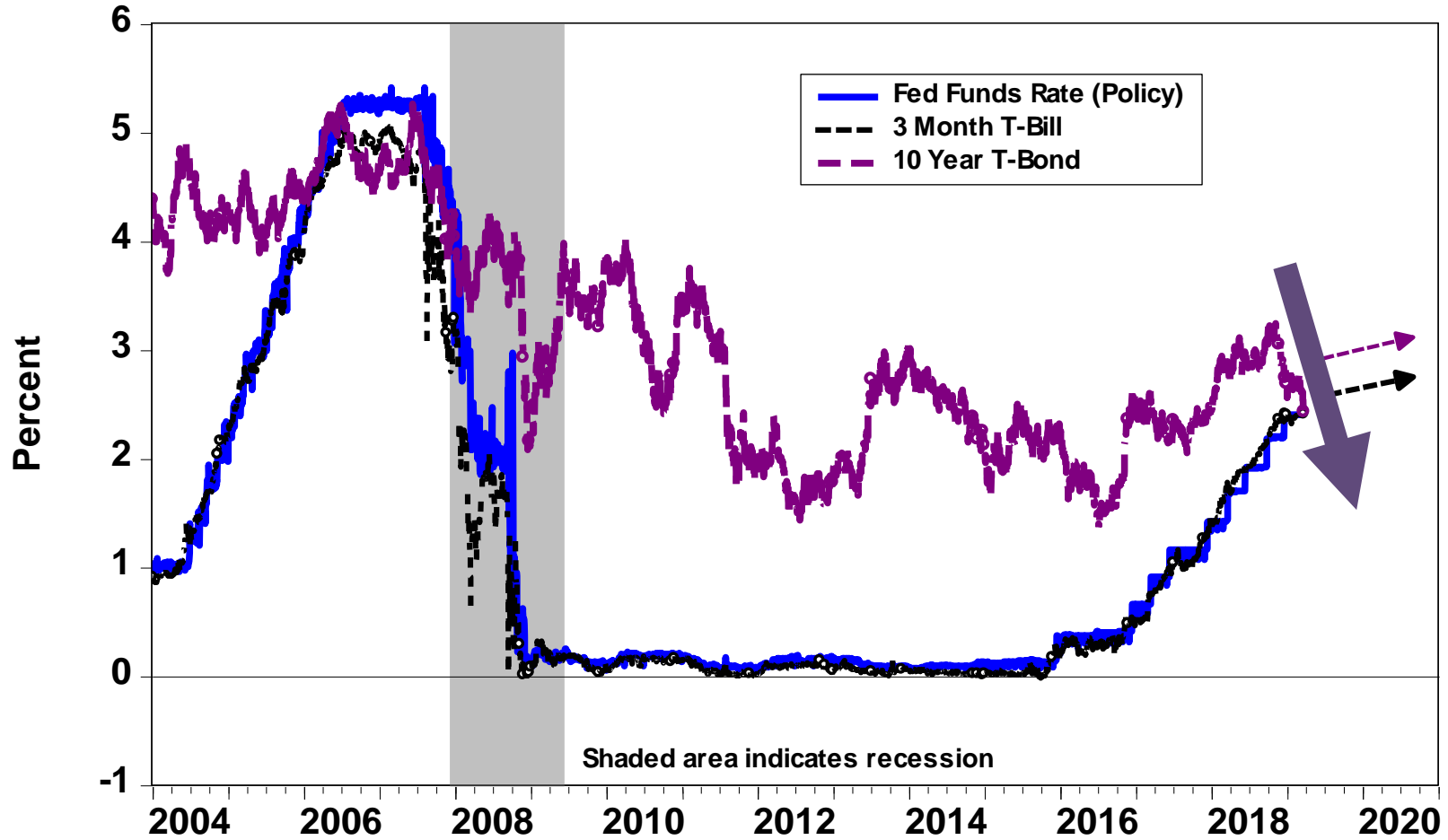


Jan 17-Mar 19 Forecasts



Yield Curve on Verge of Signaling Recession

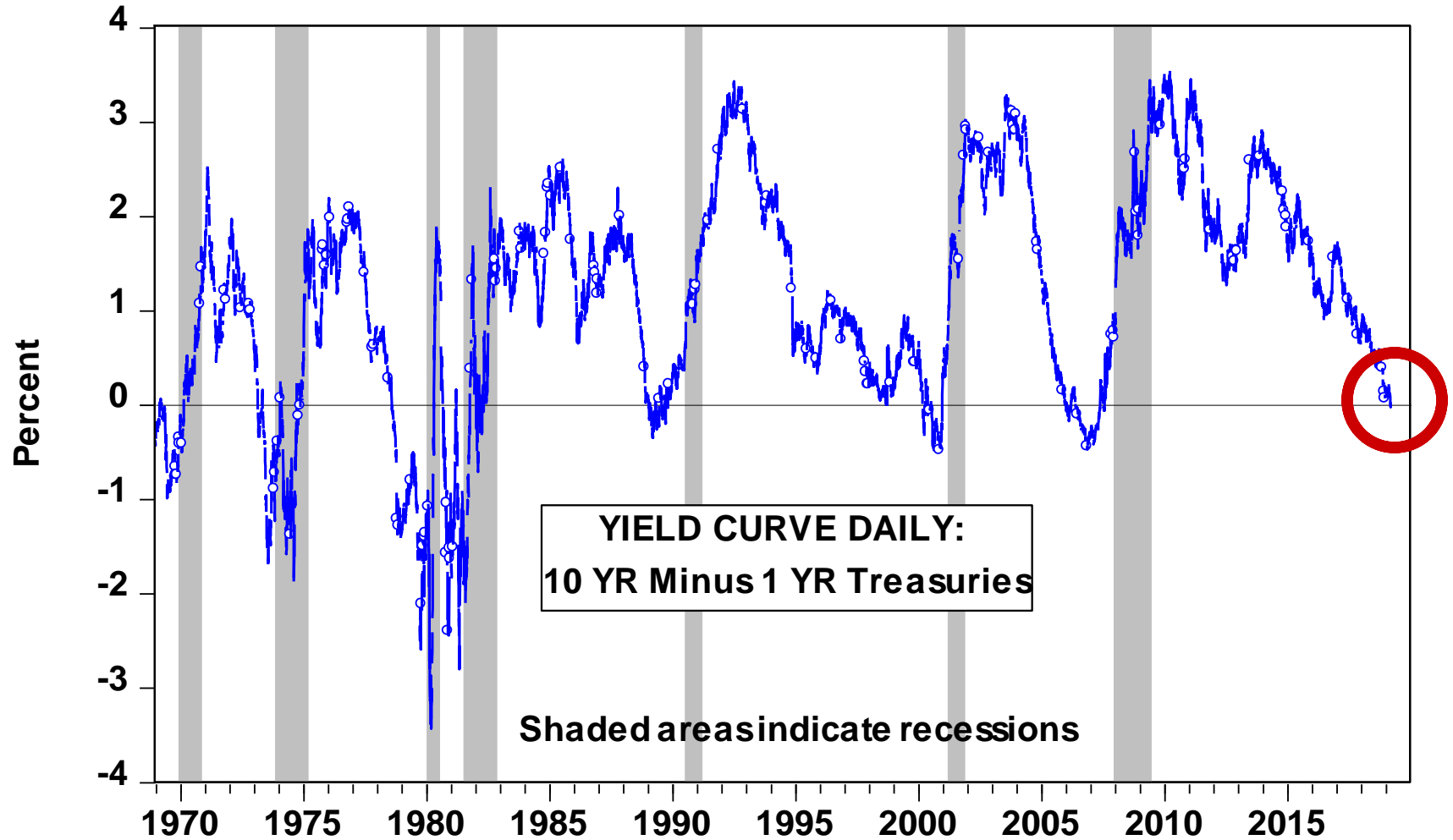
*Uncertainty & fear of recession driving U.S. longer-term rates lower;
 Consensus (the arrows) too optimistic as of the end of March*





U.S. Yield Curve Foreshadows Recession

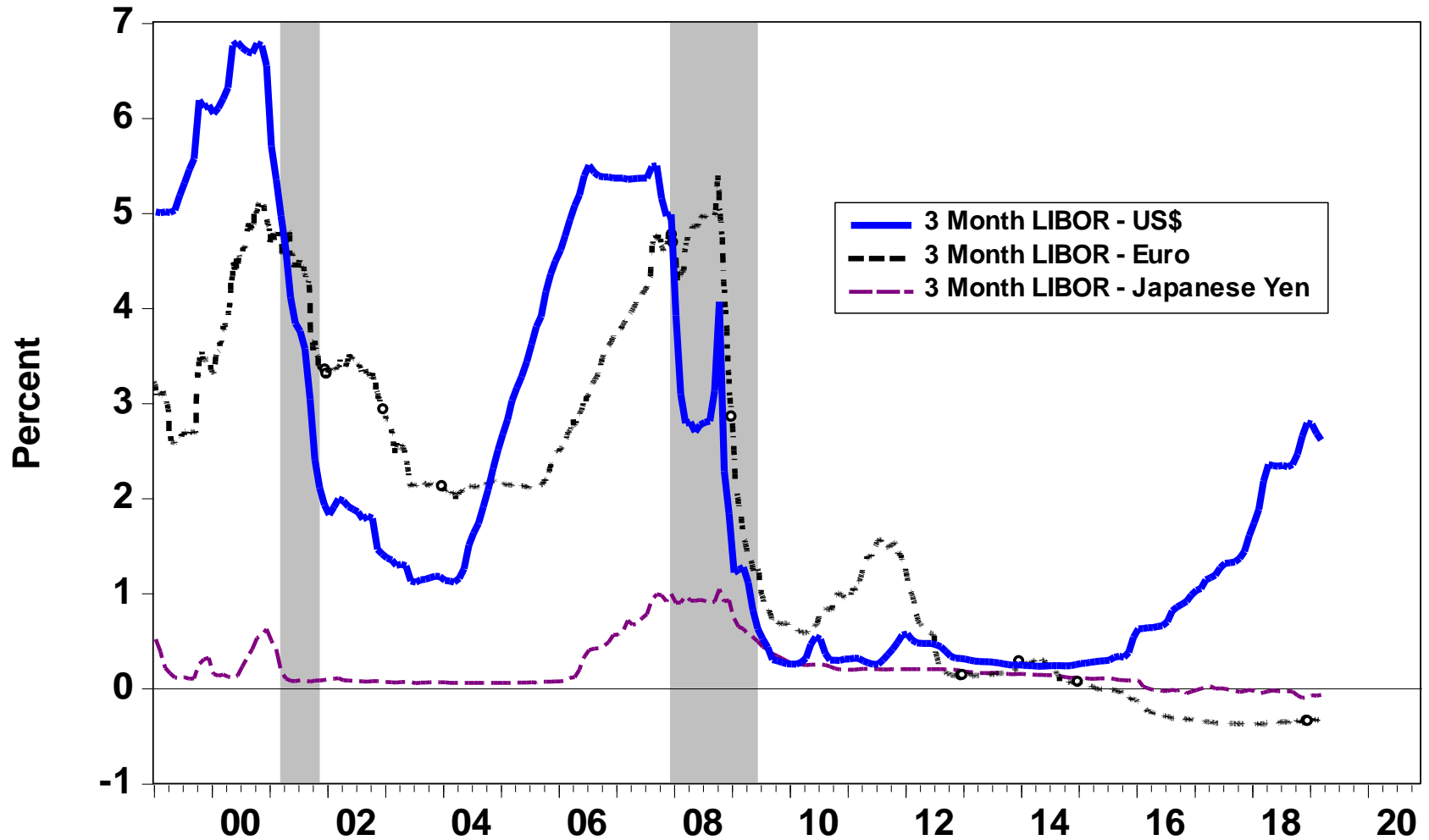
Seven (*eight?*) inversions, seven recessions in the past 50 years






Different International Interest Rate Trends

A risk to financial flows, currencies, and a contributor to uncertainty



Summary: 2019-20

- The world economy has moved into a decelerating phase of the business cycle.
- Consensus expects slightly below-trend growth in key output measures (investment, consumption) that drive semiconductor demand.
- Recession risks  rising from economic policy uncertainty (globally).
- Growth Rates:

Annual % Change	2017	2018	2019	2020
World Real GDP	3.1	3.0	2.7	2.7
Investment	4.7	4.1	3.0	3.2
Consumption	3.1	2.8	2.6	2.5
<i>SEMI MSI</i>	10.0	7.9	(1.5)	2.9



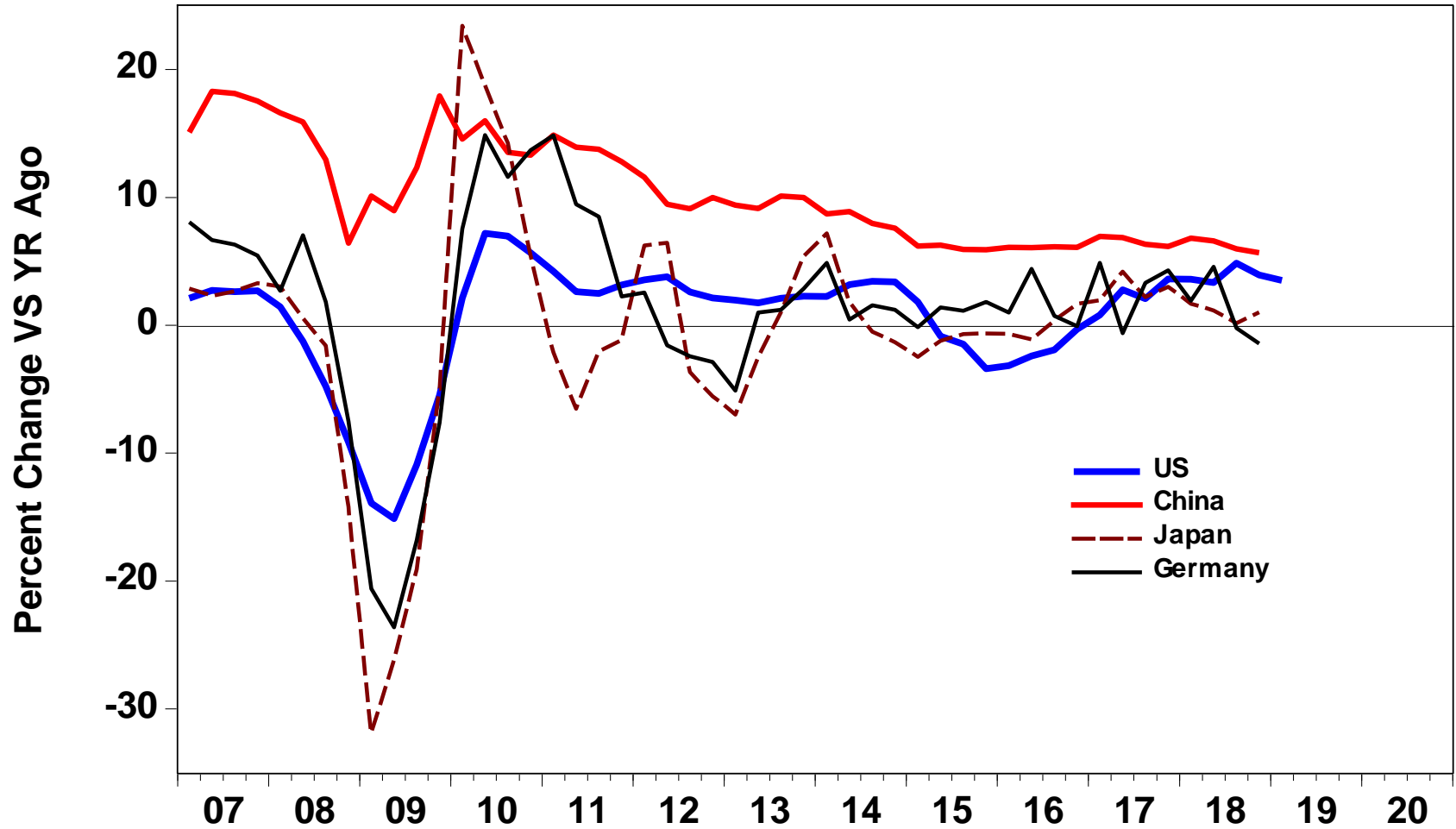
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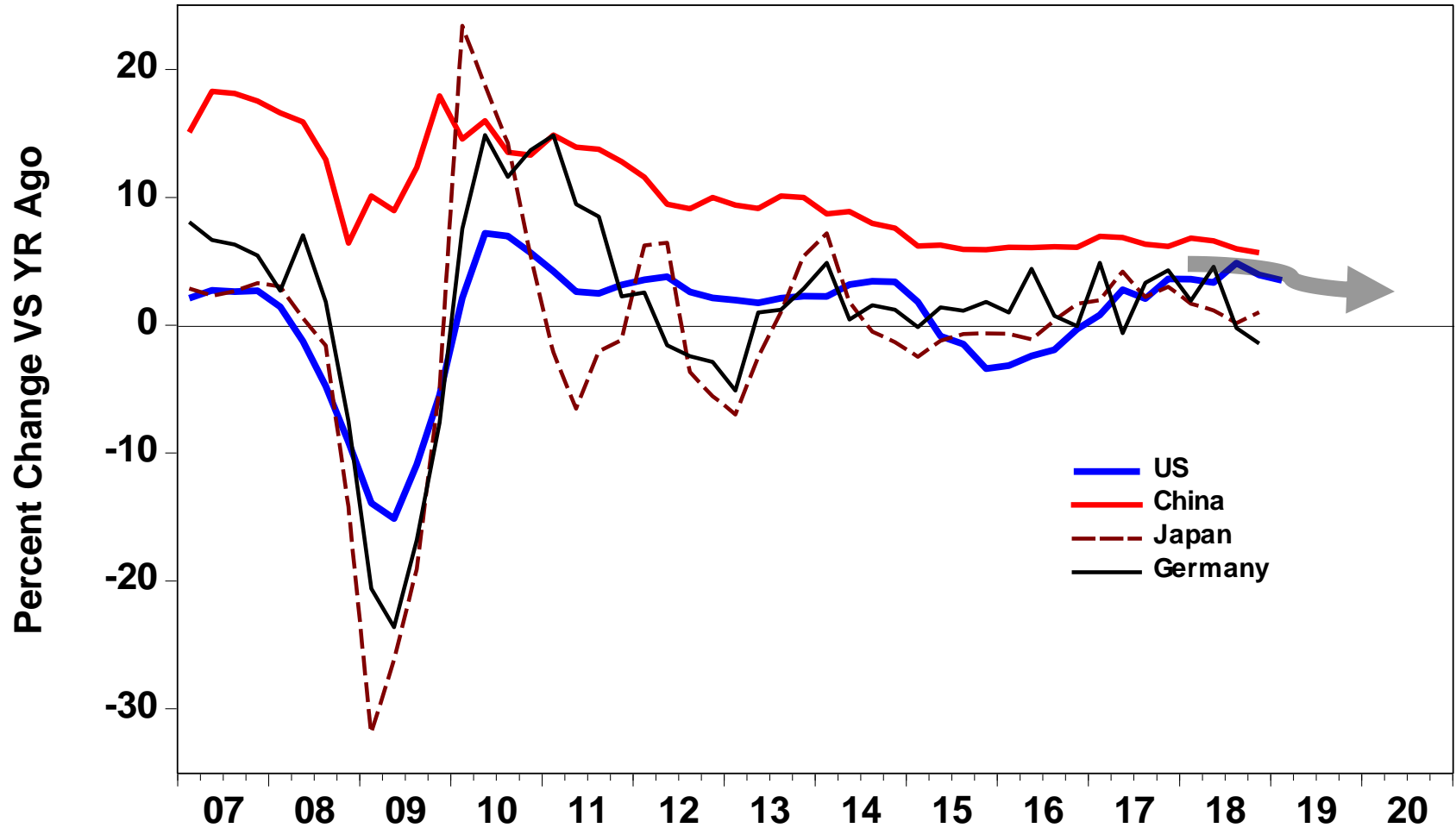


Industrial Production Moderating





Industrial Production Moderating



Economy Risks

One positive, many negative

- Forecasters under-anticipate business investment and consumer spending: actual data is better than the expectation
- Global trade protectionism
- Differential global monetary policy
 - Interest rates (U.S. tightens as others still easing/loose)
 - Currency & financial asset turmoil
 - U.S. yield curve flattening
- China post 19th Party Congress (geopolitical, debt, property market bubble, etc.)
- Political extremism (US & EU)
- Geopolitical
 - N. Korea, Middle East
 - Global terrorism
- Oil