

Is inflation dead? A discussion

Sajjid Chinoy

sajjid.z.chinoy@jpmorgan.com

(91-22) 6157-3386

JPMorgan Chase Bank, N.A., Mumbai Branch

J.P.Morgan

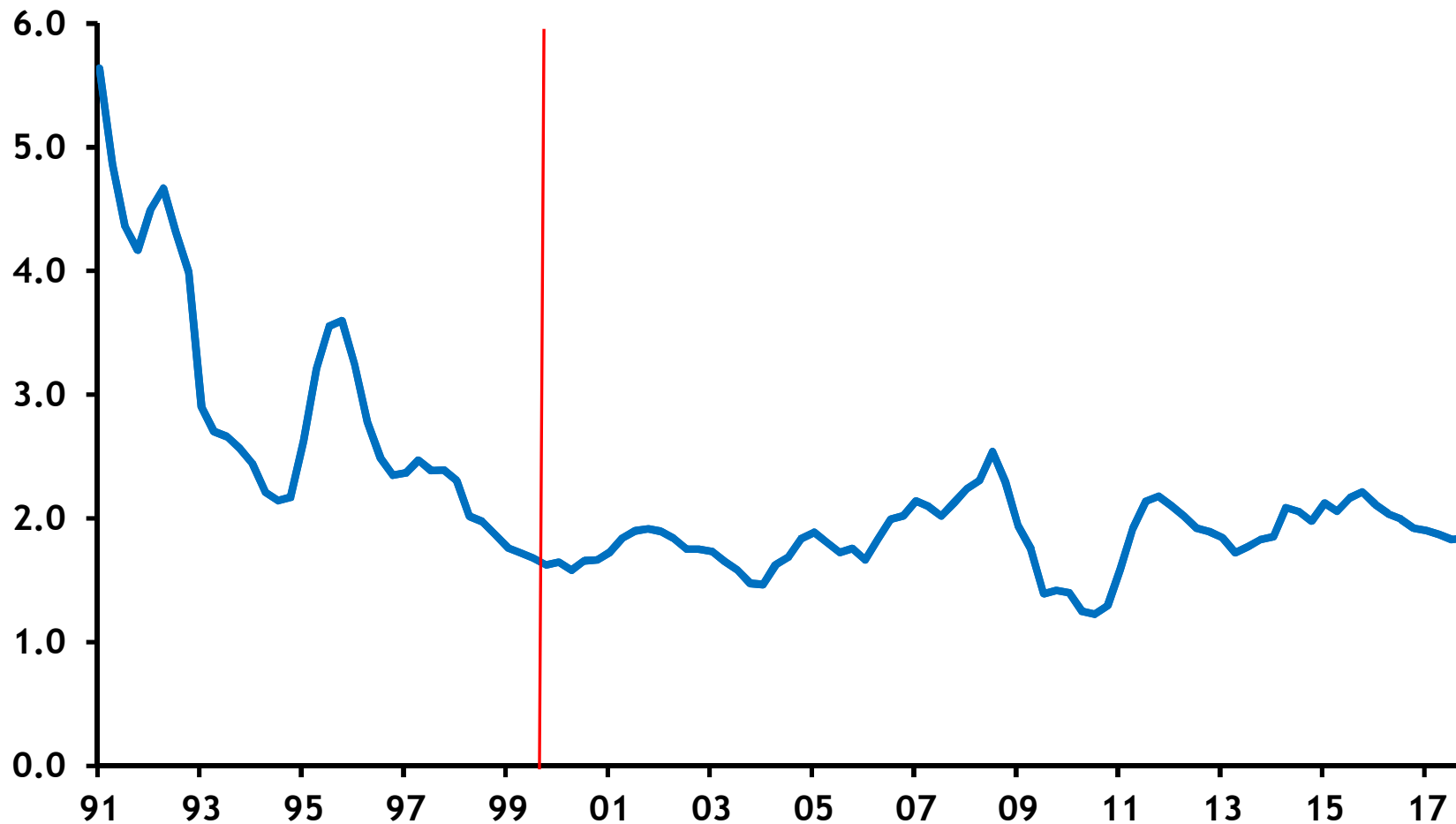
Arthur Lewis meets Gary Becker

- A thought-provoking, and ingenious approach to explaining the inflation slowdown
- Highlights a very different, and heretofore underappreciated, dimension of globalization (injection of high-skill labor, versus the conventional wisdom of low-skill labor, technology, capital)
- Two potentially-interrelated, but analytically separable, questions
 - **The role of USSL in the great inflation decline (GID) – vis-à-vis slack/expectations/oil prices**
 - **Outlook for inflation: is inflation dead?**

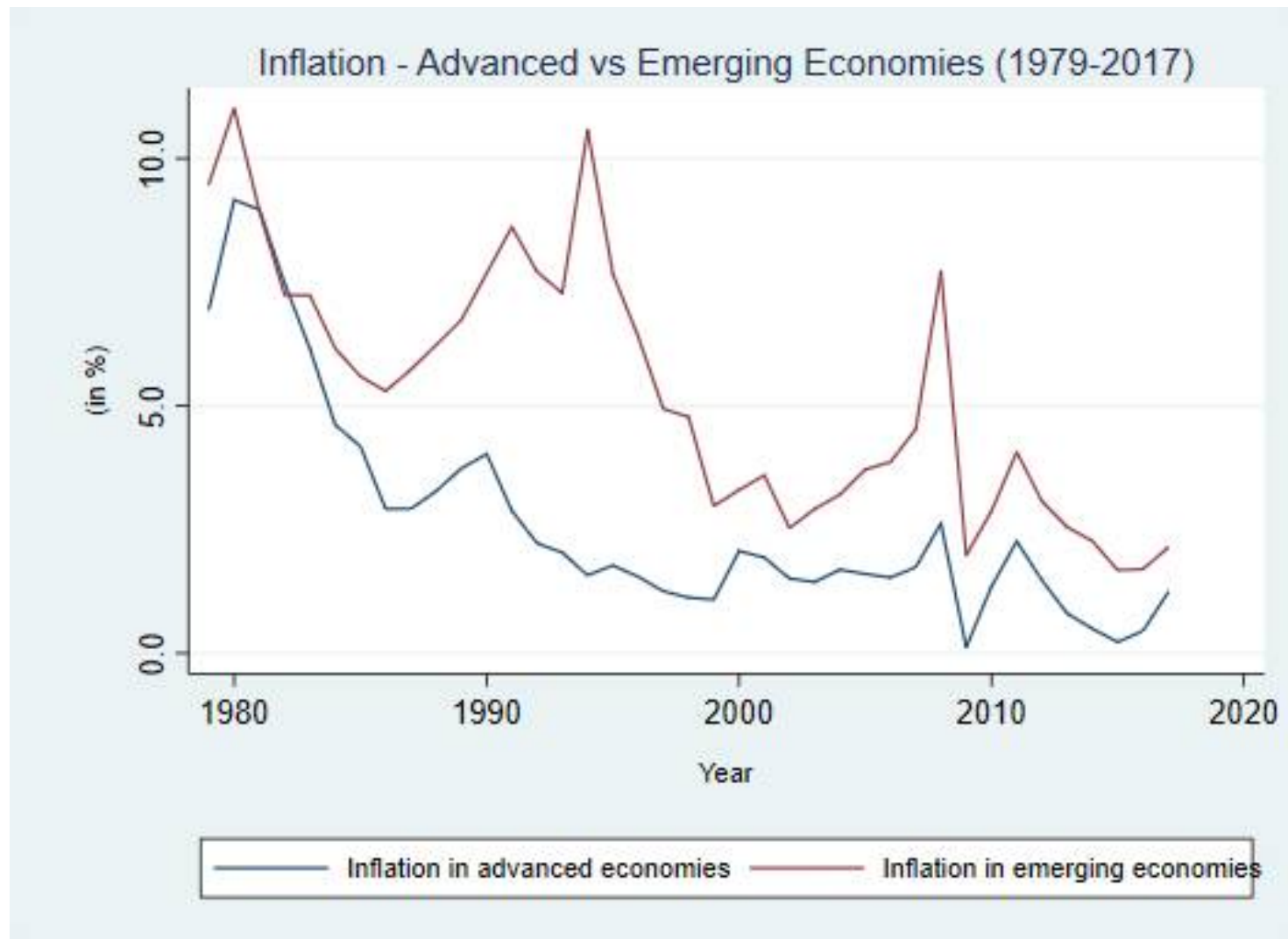
Core inflation: A tale of two halves ?

Core Inflation (Headline adjusted for food and fuel)

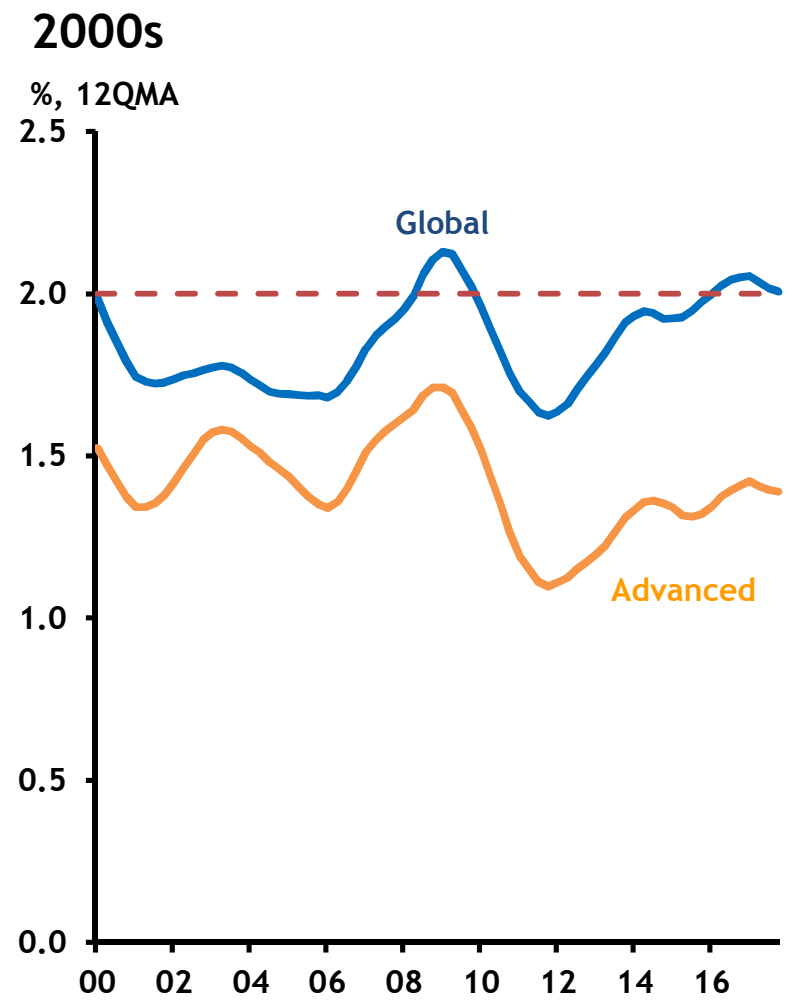
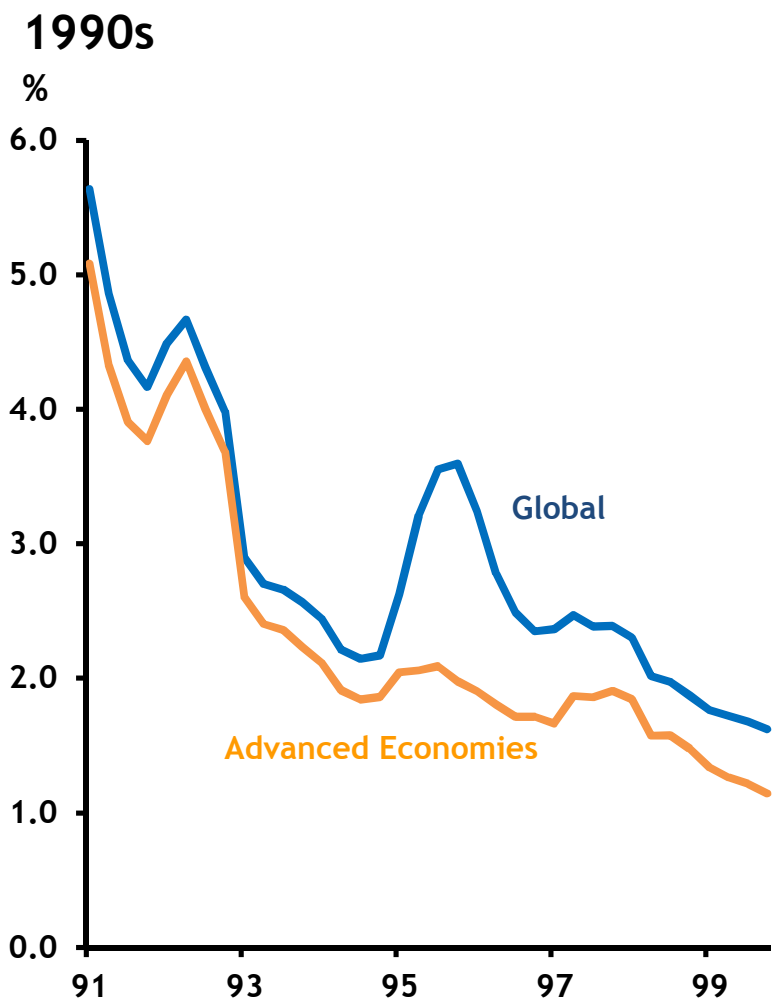
% year-on-year



Headline and core reveal different dynamics



Different decades, different dynamics

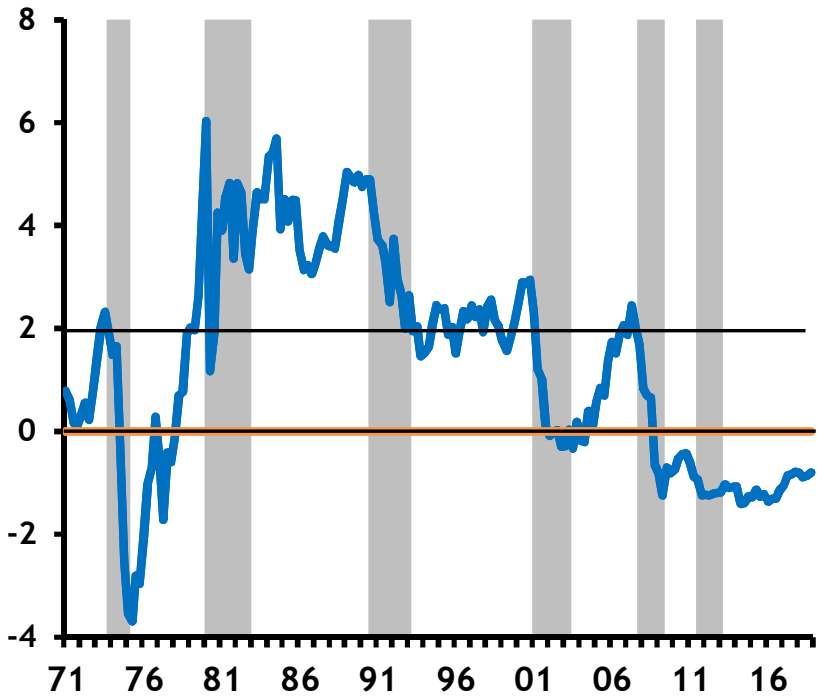


Advanced economy core inflation consistently below 2% but has not secularly fallen over since 2000

Why did inflation fall in the 1990s? The “great moderation”...

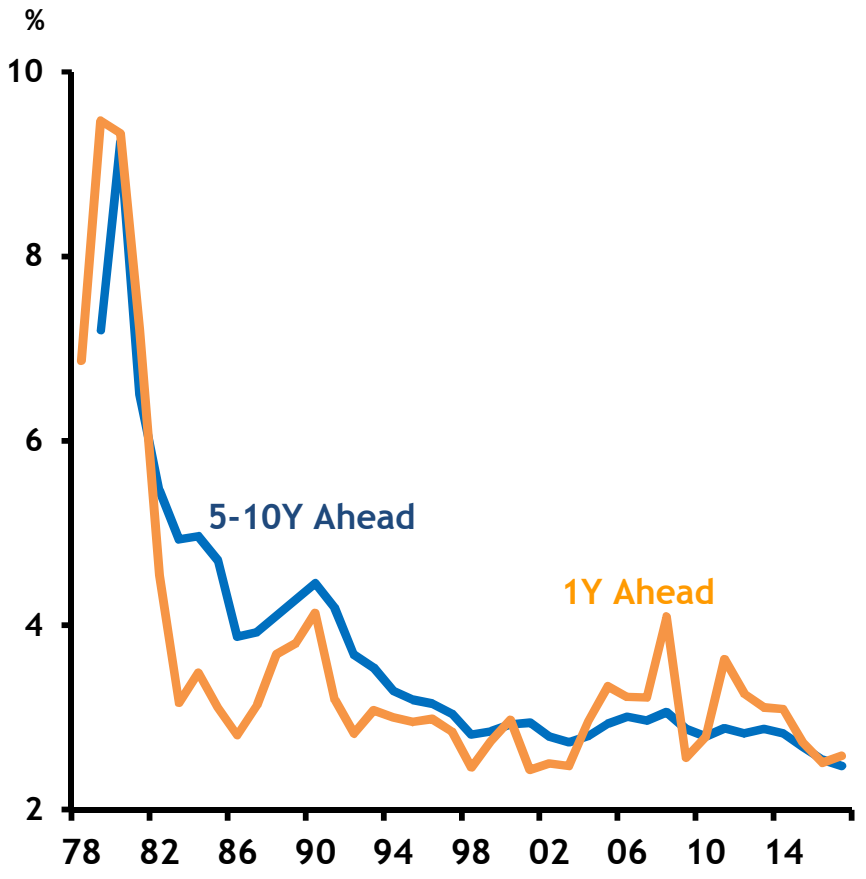
Real Policy Rates, Advanced Economies

%pa; Policy rate less core inflation



Source: J.P. Morgan; Recession bars are for DM

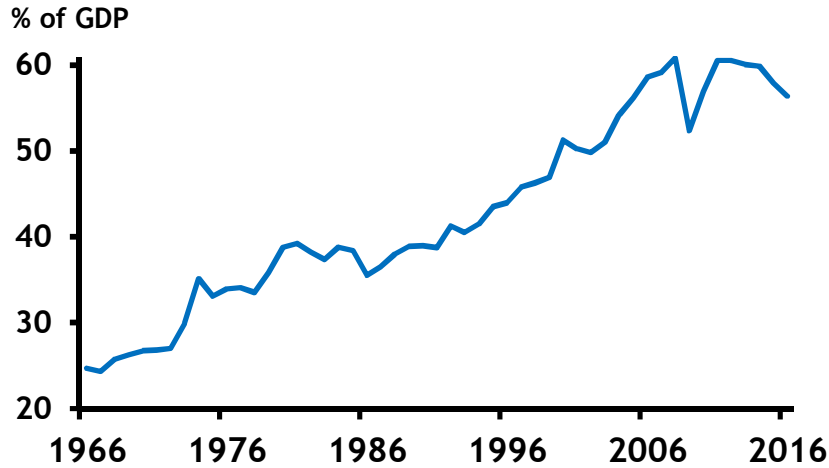
Inflation expectations (median)



Source: University of Michigan

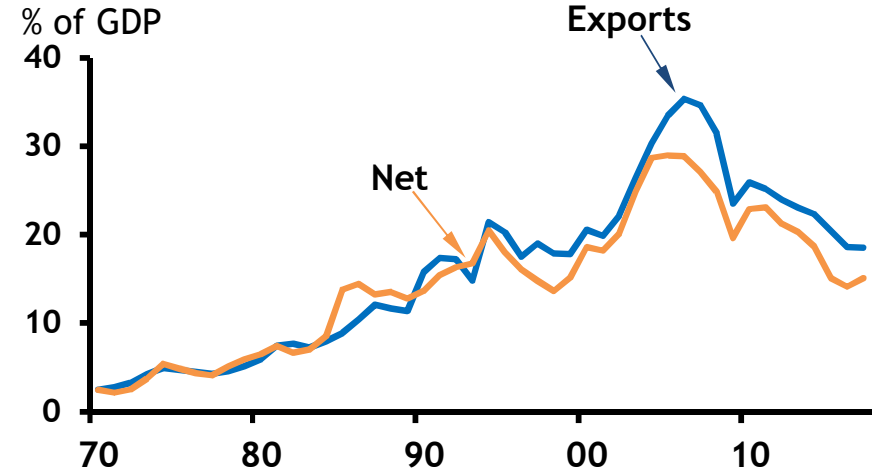
...meets the positive supply shock from globalization

Global trade*



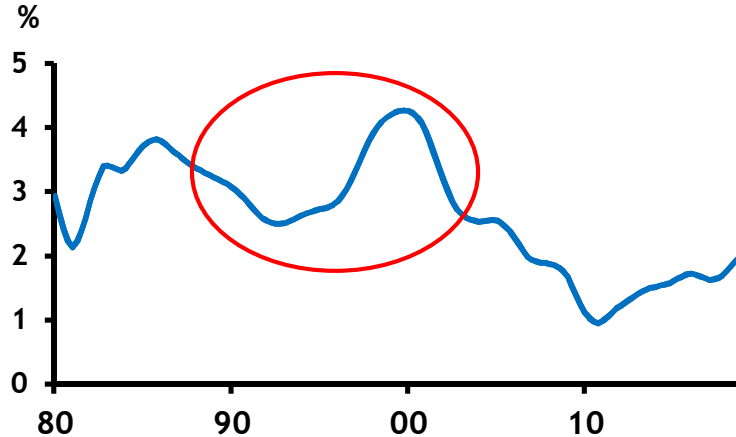
*imports + exports goods and services
Source: World Bank

China goods exports



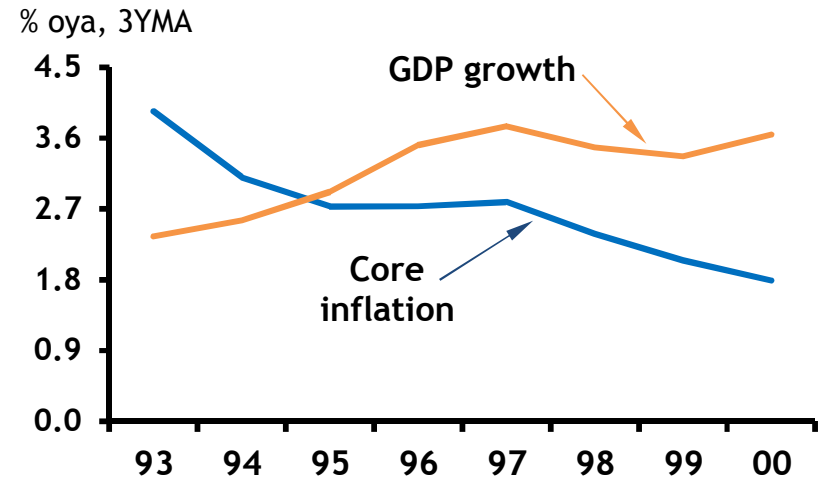
Source: NBS, GAS

US Potential growth



Source: CBO

Global GDP Growth and Core Inflation

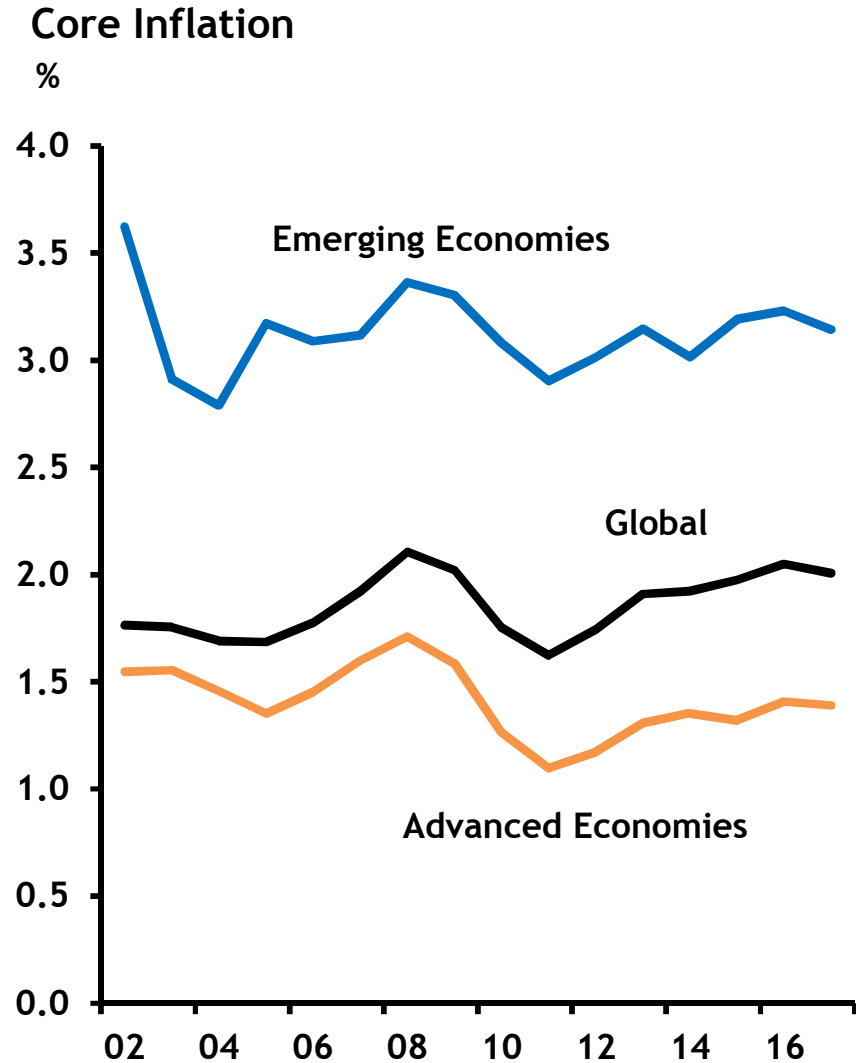


Source: IMF, JPM research

Discriminating among hypotheses

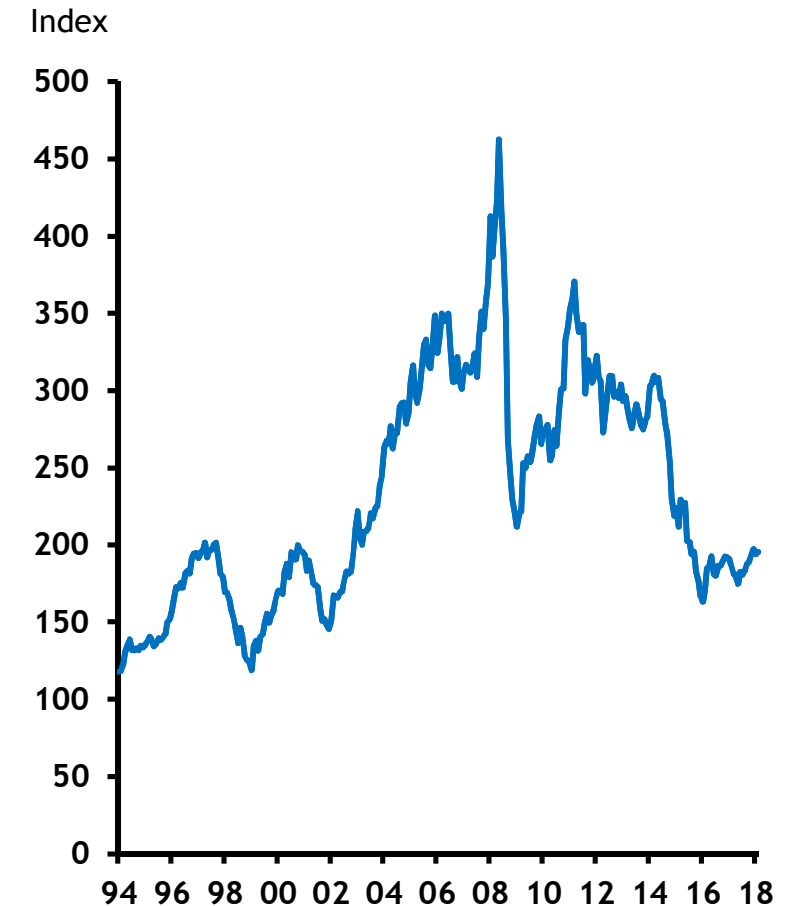
- Undisputed slowdown of headline and core in the 1990s
- Indicative of a positive supply shock
- But many potential factors that may have underpinned it:
 - Injection of capital and low-skilled labor from globalization
 - Disinflation forces from technologically-induced productivity boom in the U.S.
 - Anchored inflation expectations
 - **USSL – embodied disproportionately in goods or services?**

But no secular decline in core inflation since then



Source: J.P. Morgan calculations, Bloomberg

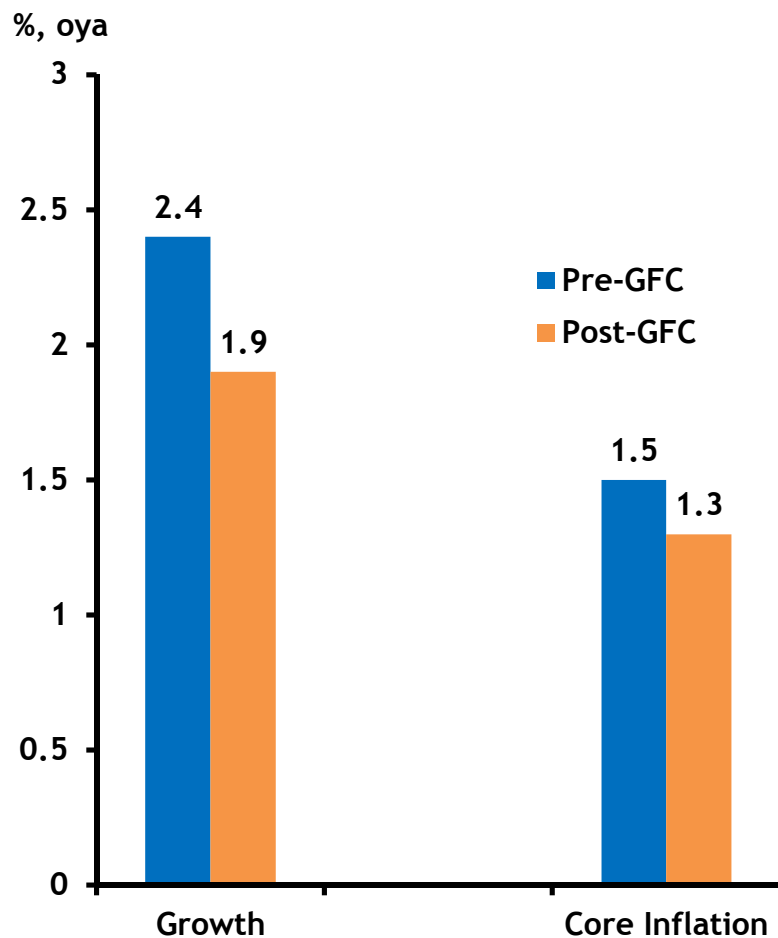
Commodity prices (CRY Index)



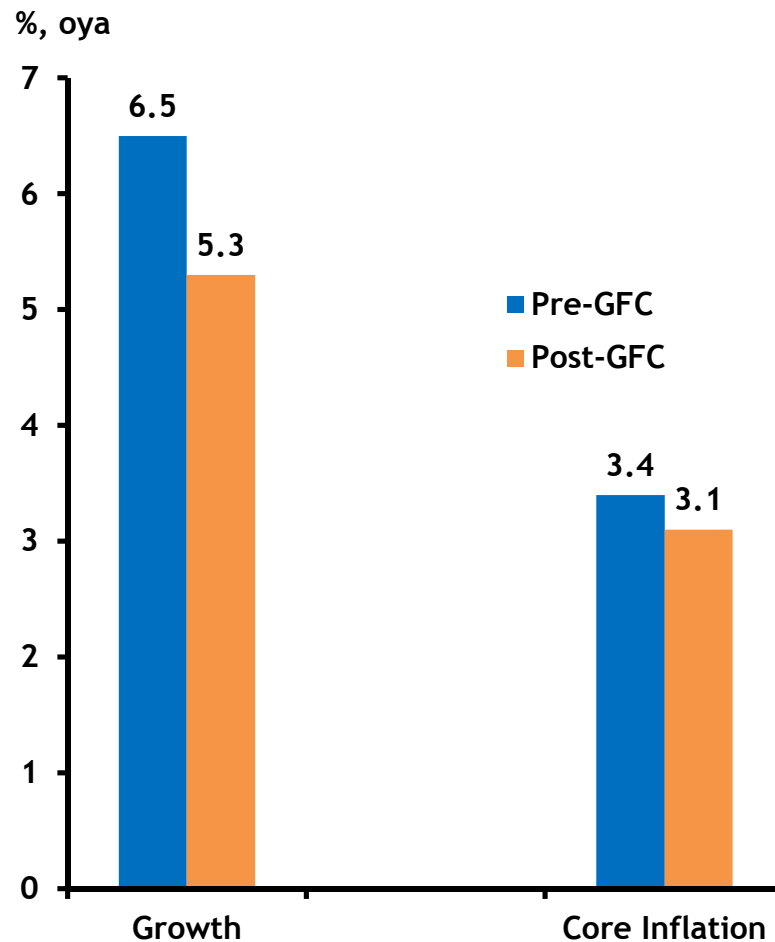
Source:

Modest declines post-GFC accompanied by meaningful growth slowdowns

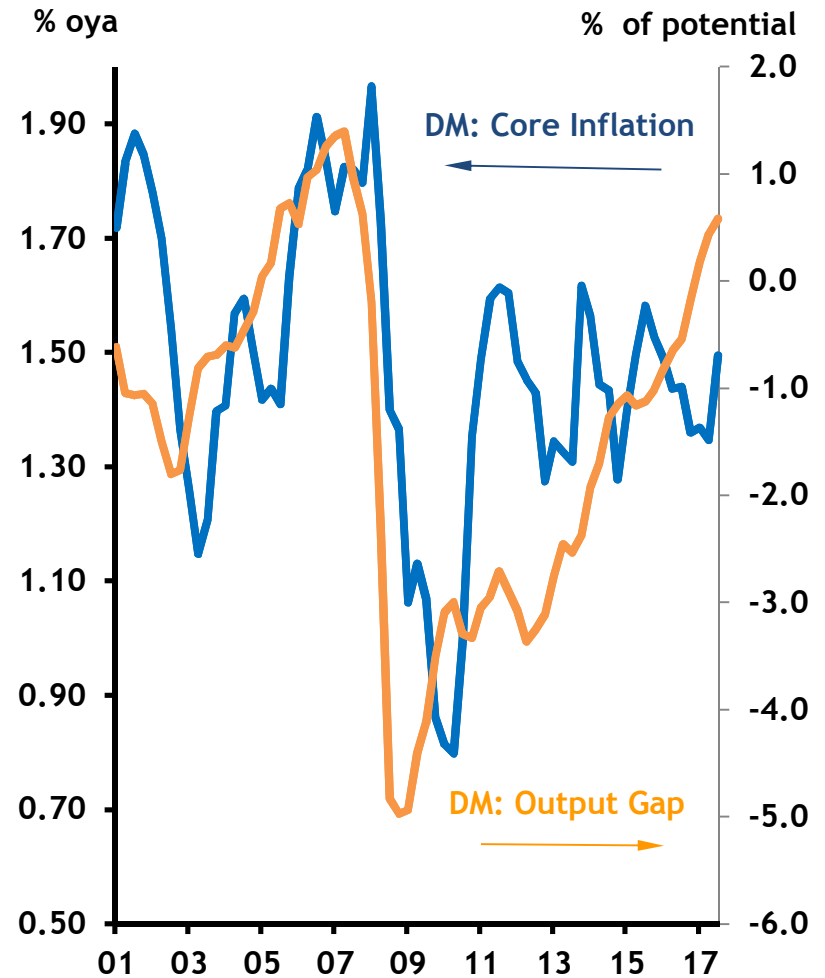
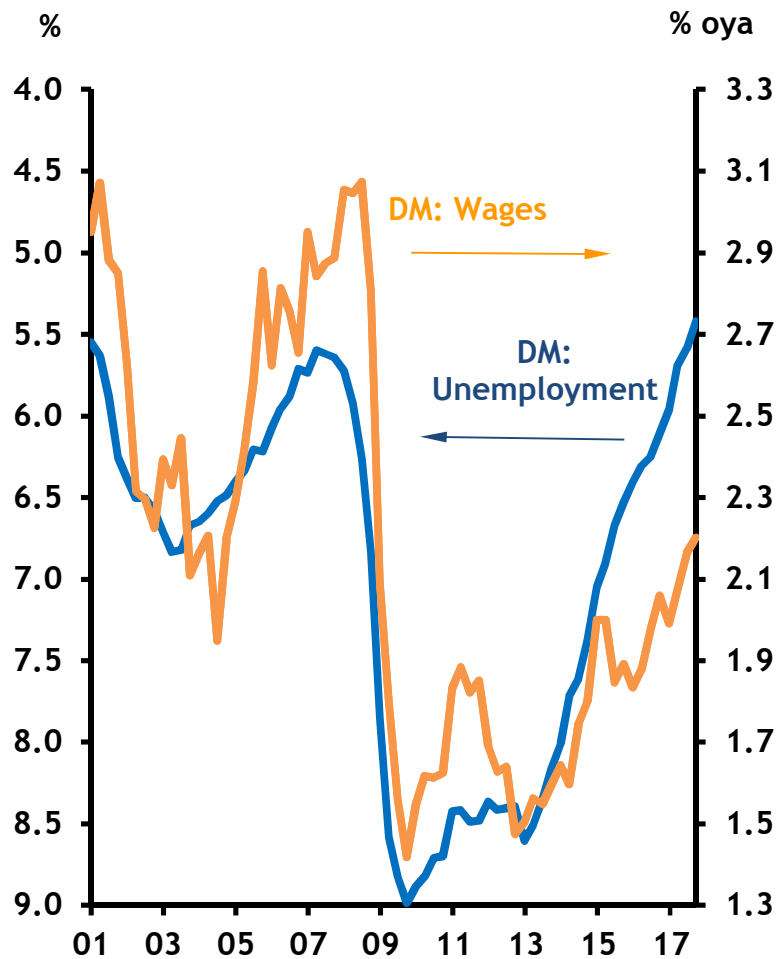
Advanced Economies



Emerging Economies



Philips Curve: Rumors of my death are grossly exaggerated

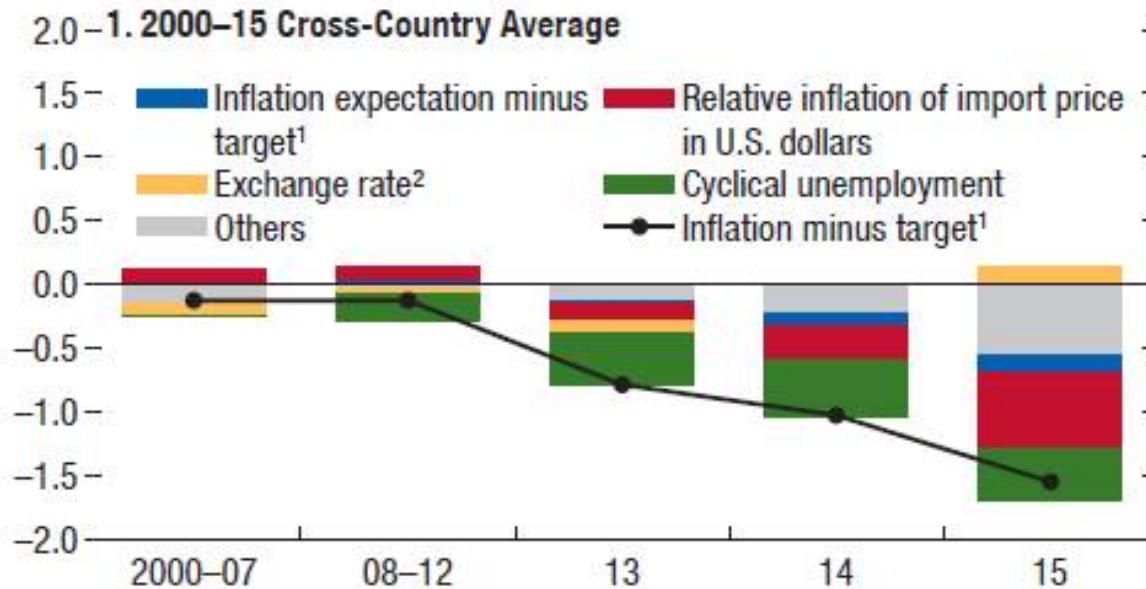


WEO finds slack player a key role in inflation misses

**Figure 3.12. Contribution to Inflation Deviations from Targets:
Advanced Economies**

(Percent)

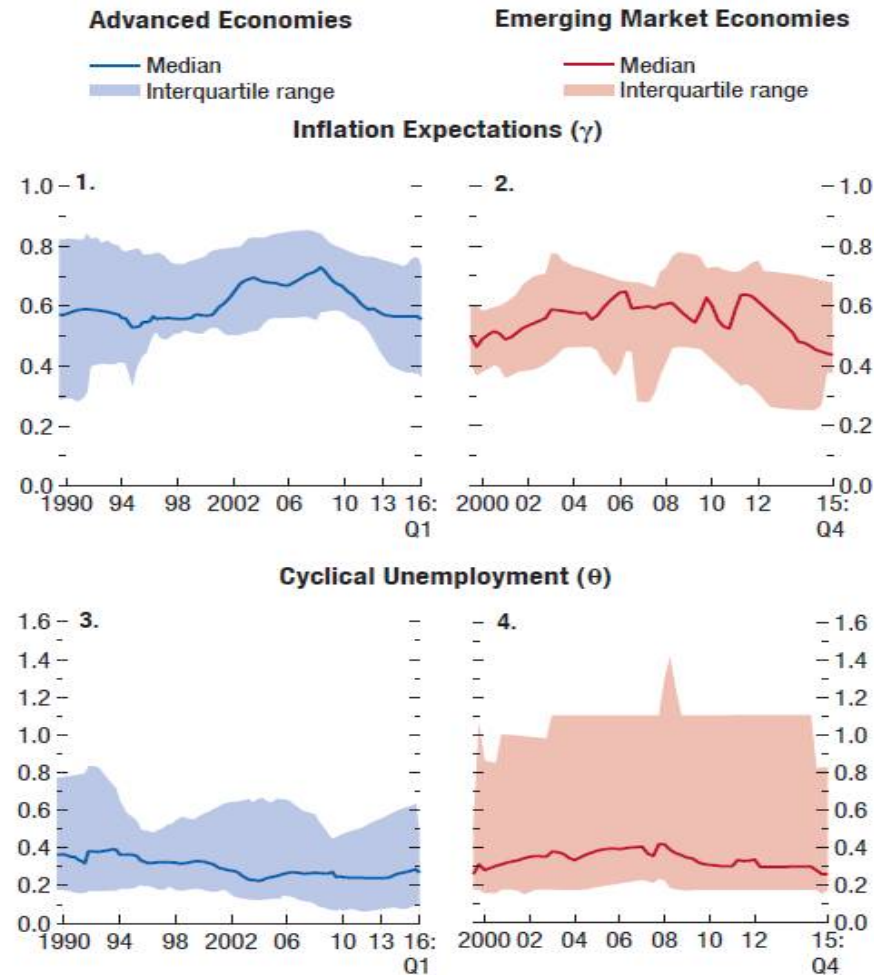
Cyclical unemployment and weaker import prices can account for the bulk of the deviation of inflation from targets in advanced economies since the global financial crisis, but other unexplained factors have been playing an increasingly larger role more recently.



With both inflation expectations and slack playing a role

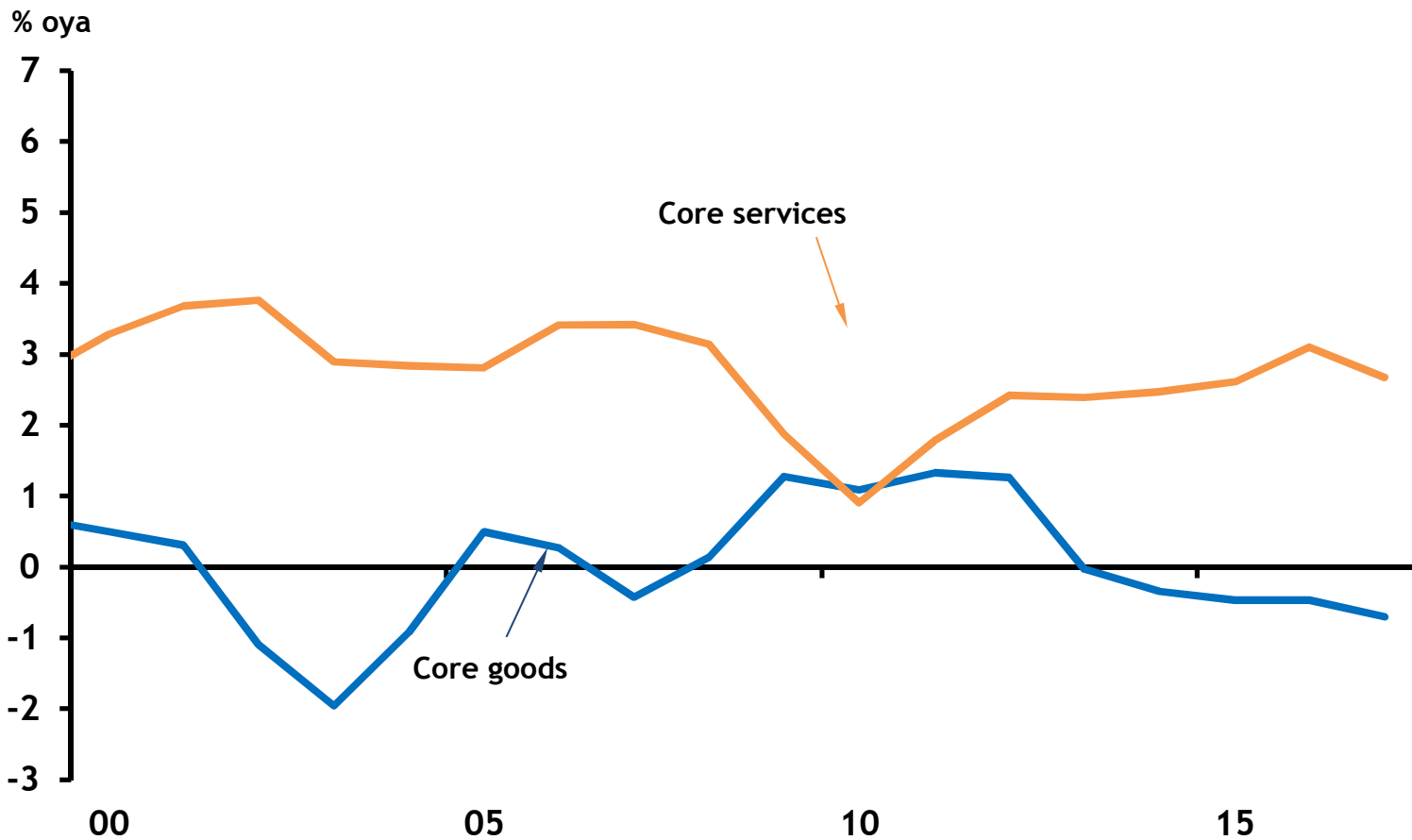
Figure 3.11. Estimated Phillips Curve Parameters

Estimation results suggest that the degree of anchoring of inflation to long-term expectations increased in the 1990s and early 2000s but declined more recently toward the level attained in the early 1990s. Other parameters, including the slope of the Phillips curve, have been broadly stable.



Where should USSL show up? Goods or services? Service inflation much stickier

US Consumer Price Inflation: Services much more sticky

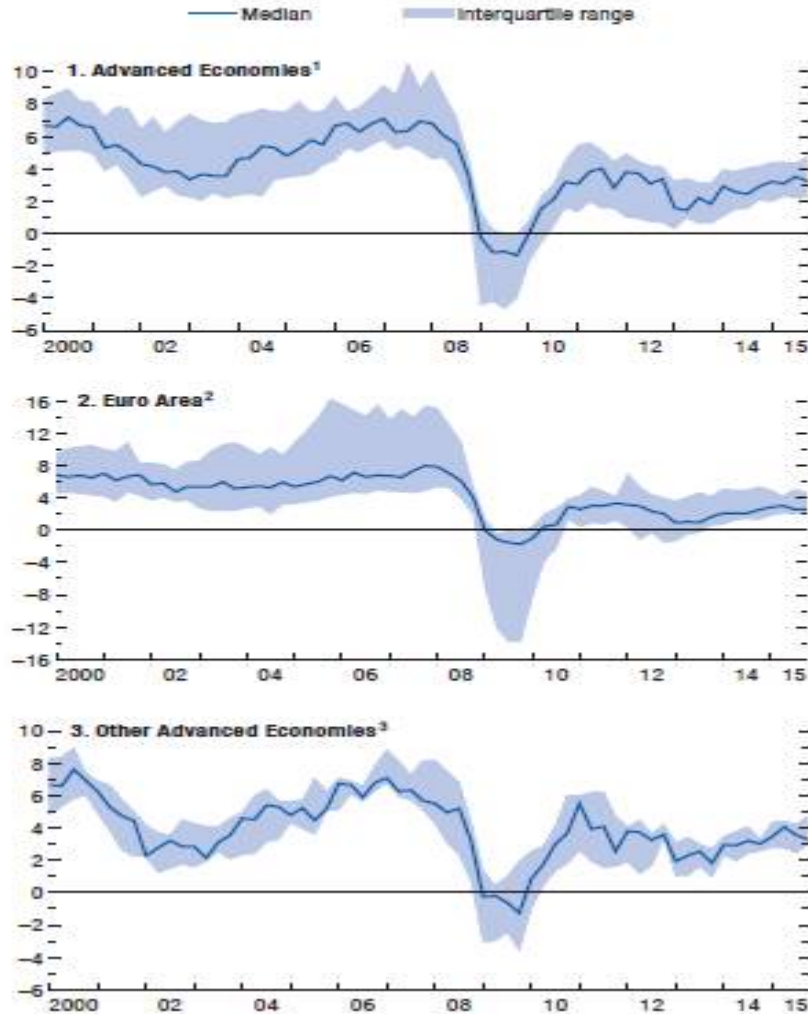


Source: BLS

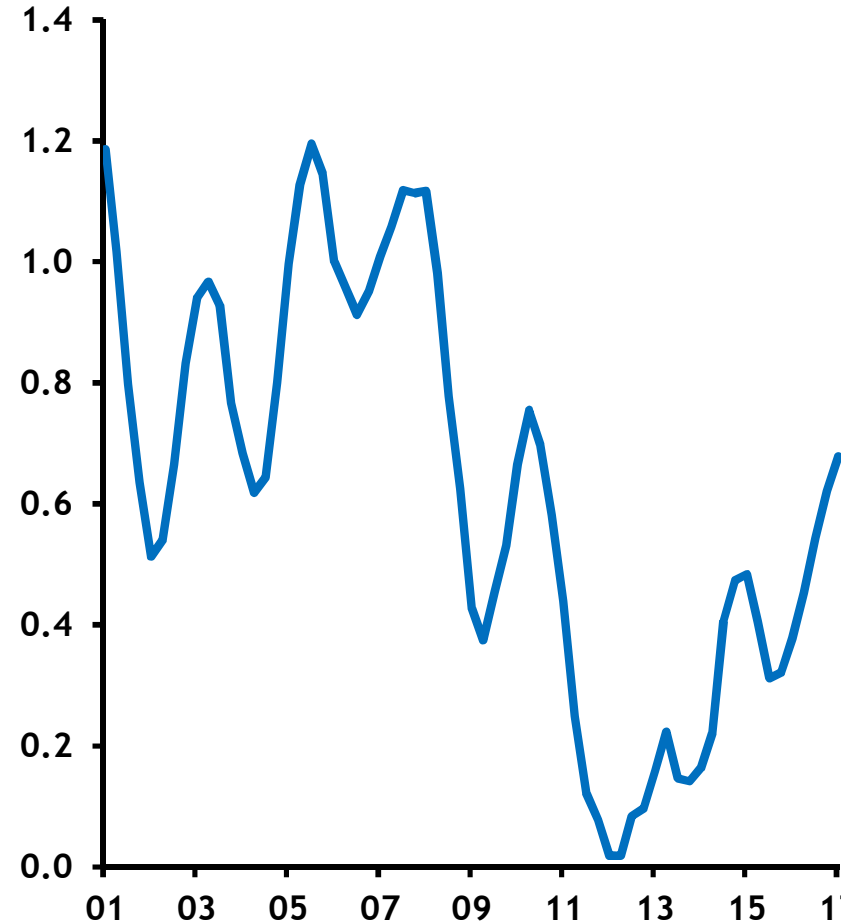
Wage growth has slowed in AEs since the GFC

Figure 3.8. Wage Inflation in Advanced Economies
(Year-over-year percent change of nominal wages)

Despite improvements in labor markets, wage growth remains subdued in many advanced economies.



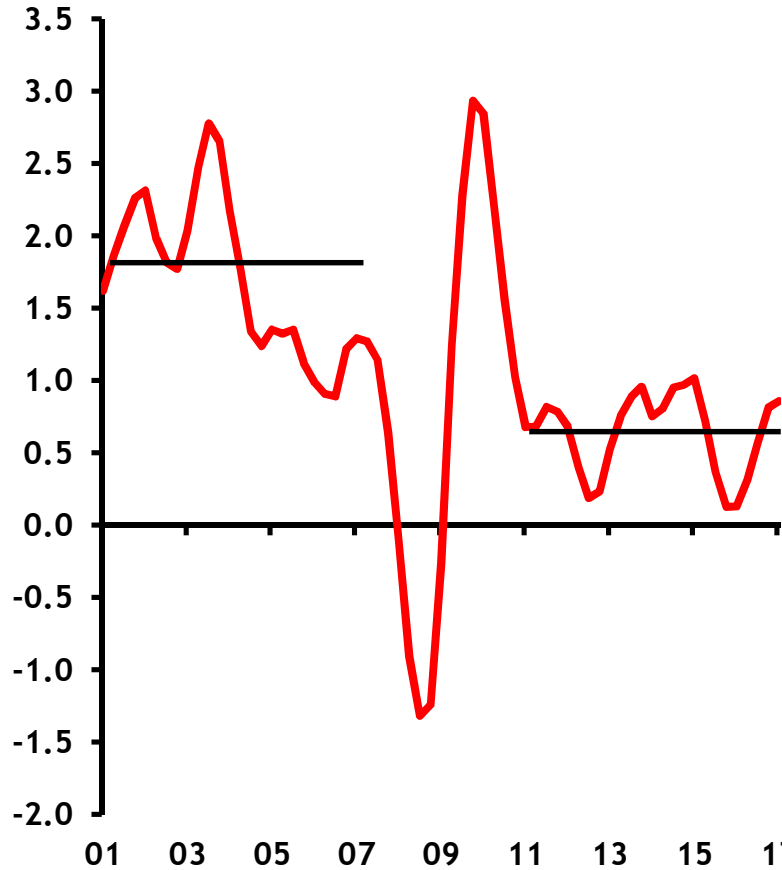
Real Wages, DM
% oya, 4qmq



But so has productivity growth

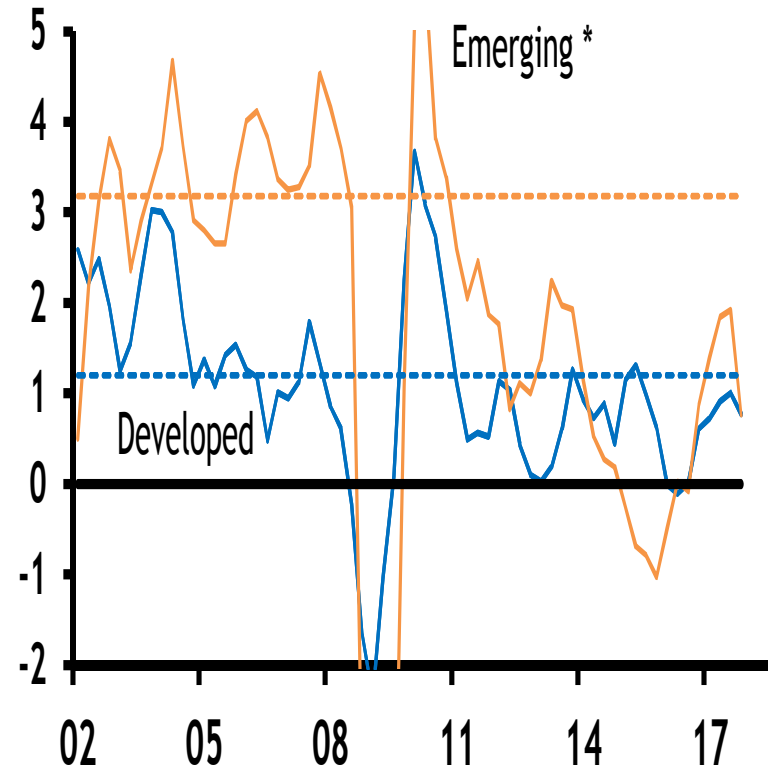
Productivity Growth, DM

% oya, 4qma



Global labor productivity

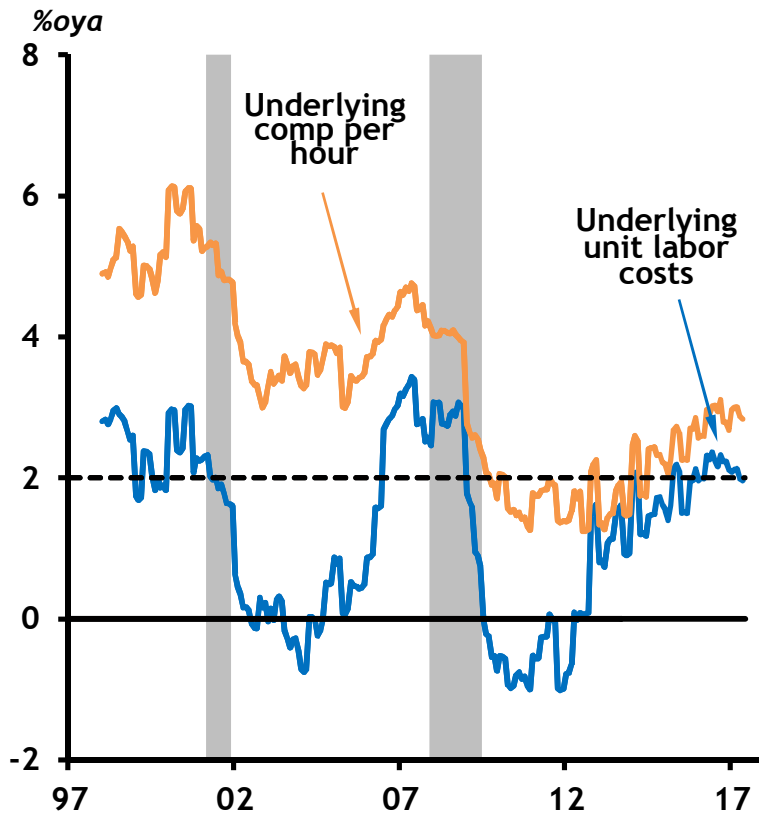
%oya (dashed show 2002-06 avg)



Source: J.P. Morgan; * Productivity is GDP/Employment (excludes China, India)

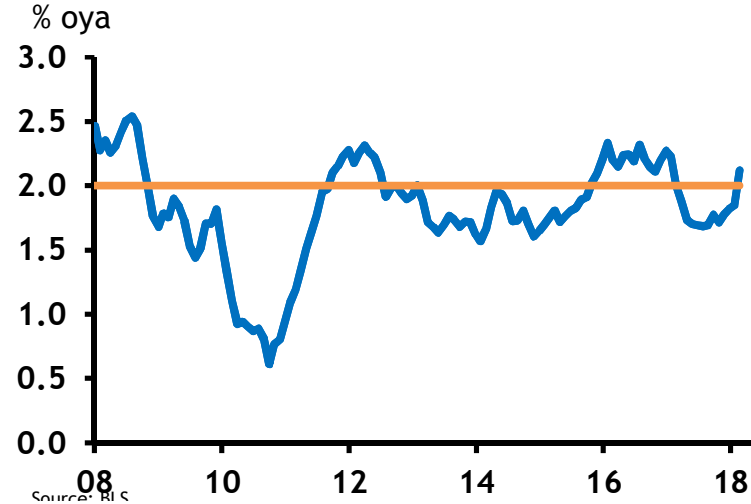
Pushing up unit labor costs

Underlying compensation per hour and ULC



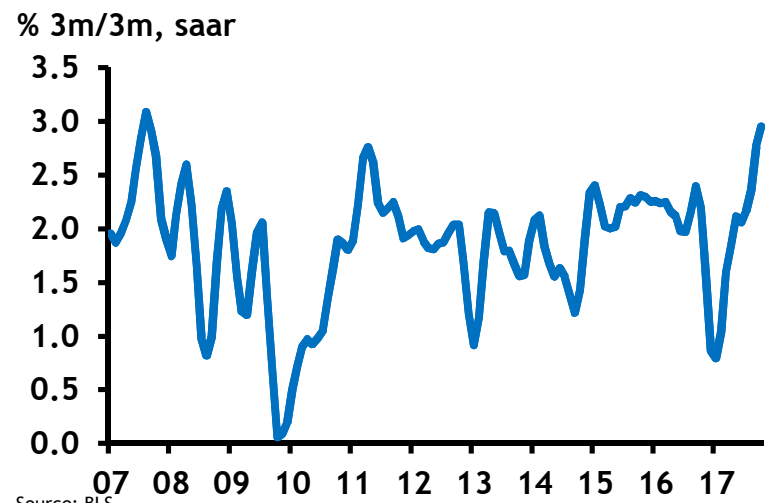
Source: J.P. Morgan

US: Core inflation



Source: BLS

US: Core inflation momentum

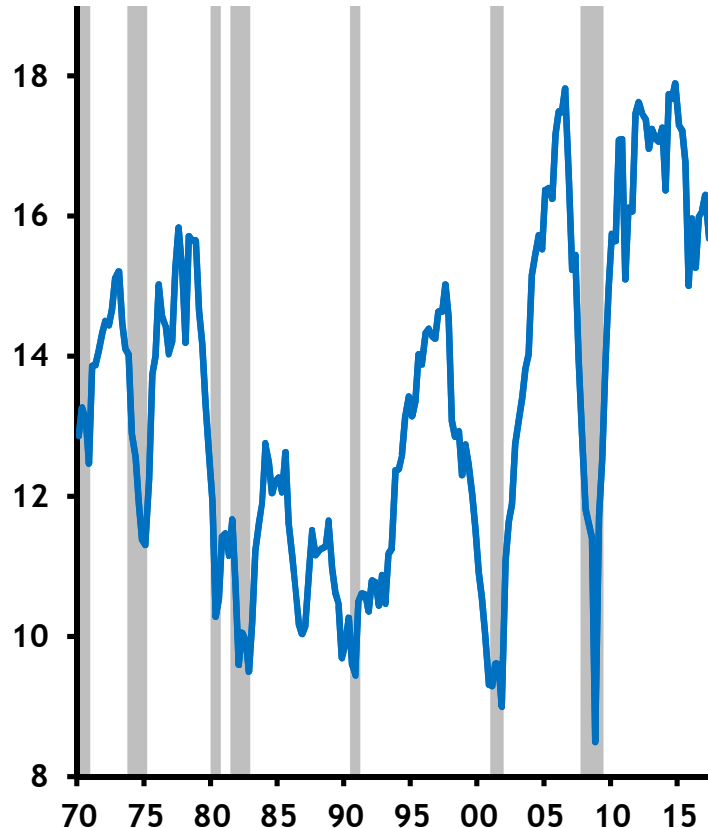


Source: BLS

Source: J.P. Morgan calculations, BLS

The wages conundrum

US domestic corporate profit margin
% of corporate value added (1Q17 excludes settlements)



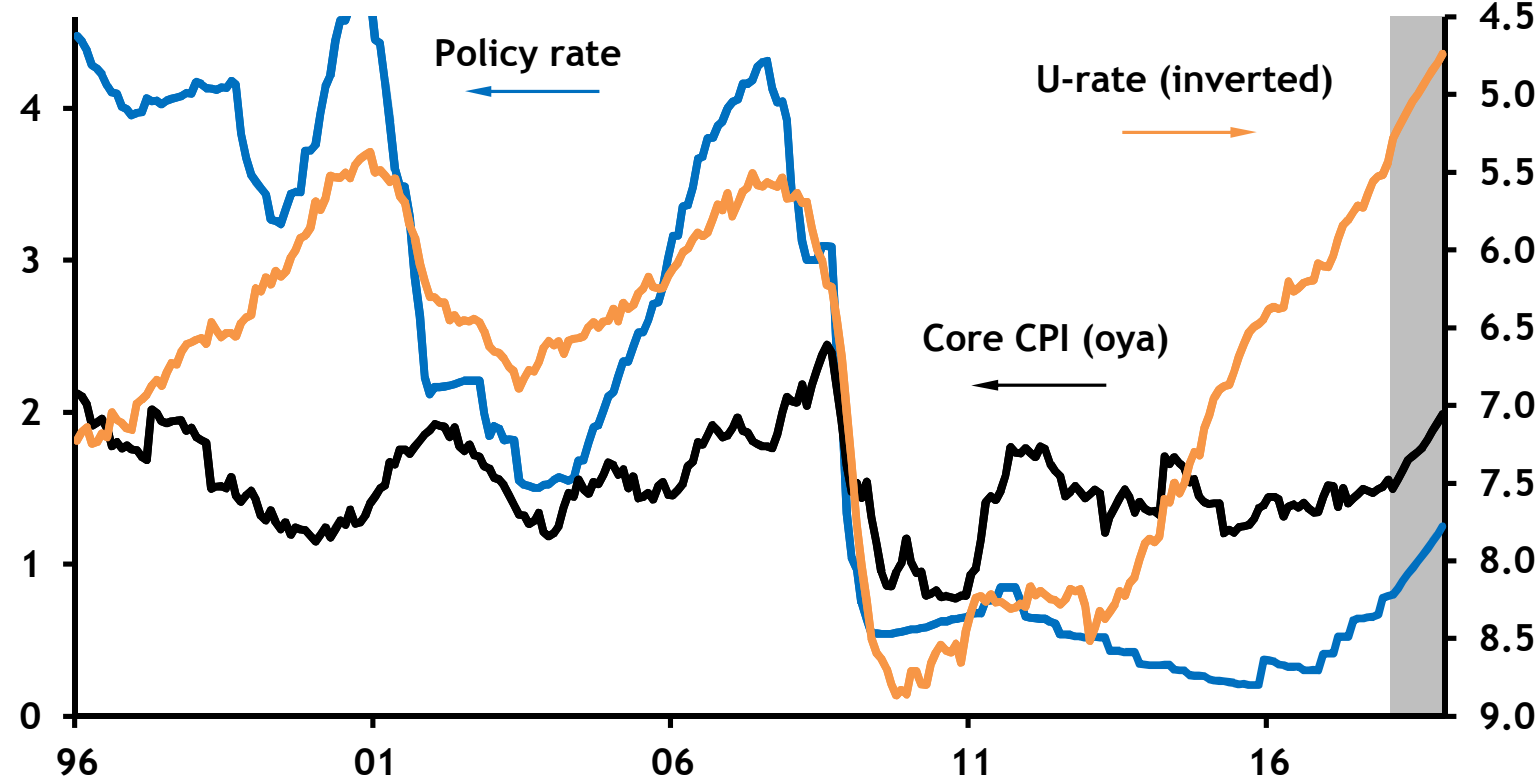
Source: BEA, FRB

- **Slowdown in wages can be partially explained by slowdown in productivity**
- **But corporate profits unusually high for this stage of business cycle**
- **Wage slowdown greater than productivity? Abnormally low cost of capital?**
- **USSL can be an explanation here**
- **But (1) wage slowdown only after GFC; (2) shouldn't USSL push labor productivity up?**

Rephrasing the problem

DM policy, u-rates and core CPI

%, both scales



Source: J.P. Morgan

Putting it all together

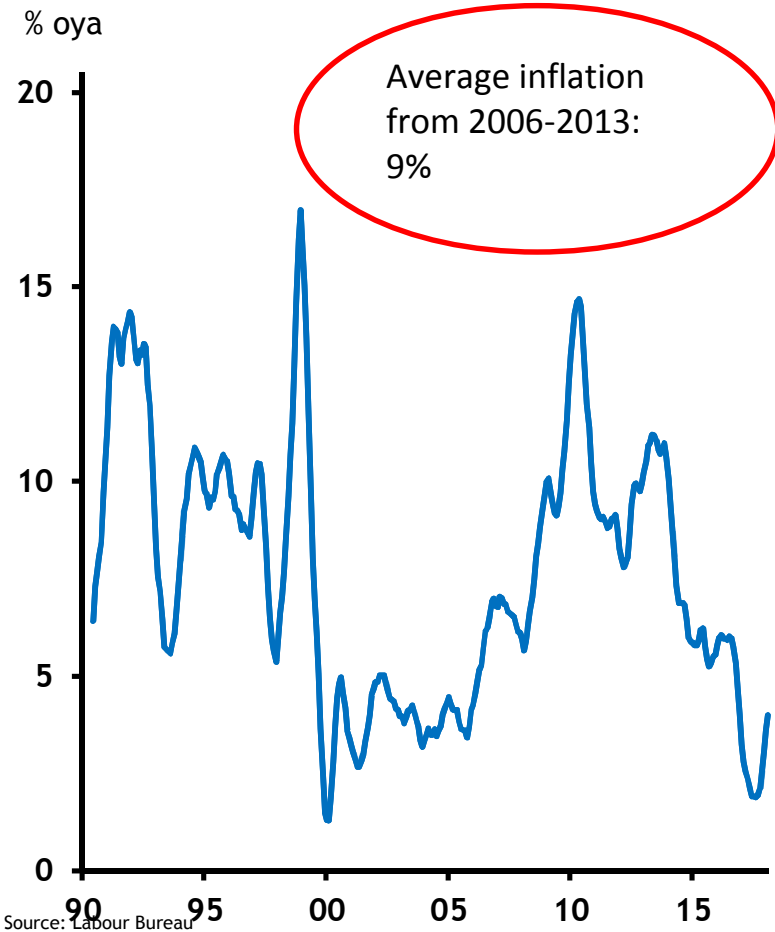
- Core inflation slowed sharply in the 1990s but remained sticky after that
- Core inflation not immune to output gaps and slack, even though Phillips curve may have flattened
- No secular decline in wage growth or unit labor costs over three decades, as USSL would imply?
- Wage growth has slowed, but since GFC, and partly explained by lower labor productivity
- **Implications**
- **As protectionism rises and USSL is interrupted, does inflation climb back up?**
- **As slack continues to reduce, does inflation go back up, despite a flatter Phillips Curve?**

Suggestions

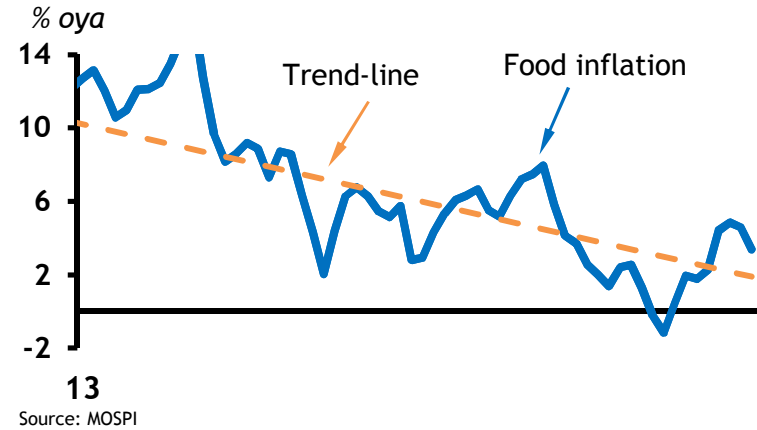
- **Use core rather than headline inflation**
- **Use an “Augmented Phillips Curve” approach controlling for inflations expectations and slack and testing USSL explanatory power after controlling for traditional variables**
- **See if there are structural breaks – since experience of 2000s very different from 1990s**
- **Why not run wage growth on USSL but after adjusting for labour productivity?**
- **Split core inflation into core goods and core services to test for differential impacts?**

What has driven India's sharp disinflation?

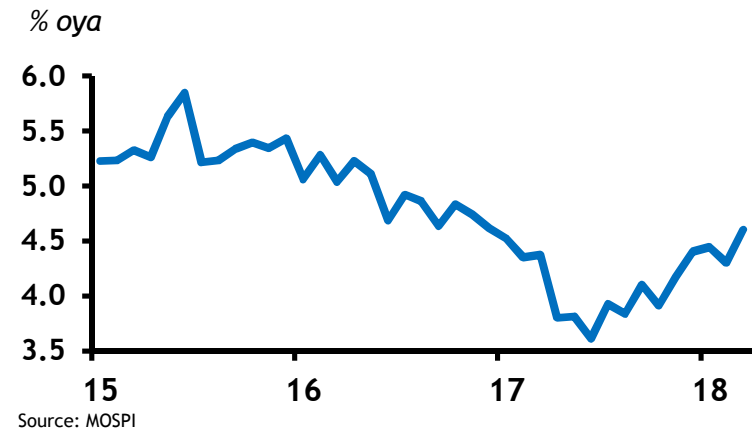
India: CPI (IW)



India: Food inflation



Core-Core inflation



What has driven India's sharp disinflation?

Table 2: Determinants of Inflation in India

Dependent variable: Year-on-Year CPI Inflation Rate

Output gap - HP filter - 1Q lag	0.52**
Annual growth in wages - 1Q lag	-0.04
Annual growth in MSP - 1Q lag	0.06^
Dummy for below normal monsoon	0.67*
Annual growth in \$/Re. exchange rate - 1Q lag	-0.08**
Annual growth in world food price index - 1Q lag	0.02
Annual growth in world food price index - 2Q lag	-0.03^
Annual growth in world food price index - 3Q lag	0.01
Annual growth in world food price index - 4Q lag	0.00
Annual growth in world food price index - 5Q lag	0.01
Annual growth in world food price index - 6Q lag	-0.02
Annual growth in world food price index - 7Q lag	0.04*
Annual growth in world food price index - 8Q lag	0.00
Annual growth in world crude price - 1Q lag	0.01^
Dummy for new monetary policy regime#	-1.43**
CPI inflation - 1Q lag	0.41**
CPI inflation - 2Q lag	0.23
CPI inflation - 3Q lag	0.18
CPI inflation - 4Q lag	-0.30**
CPI inflation - 5Q lag	0.47**
CPI inflation - 6Q lag	0.01
CPI inflation - 7Q lag	0.01
CPI inflation - 8Q lag	-0.21**
Observations	60
R-squared	0.96
D-W-statistic	1.96
B-G serial correlation test (LM test)	0.16
AIC	2.50
SBC	3.33

** indicates significant at 5% level, * indicates significant at 10% level, ^ indicates significant at 15% level. #: NEWREGIME is a binary 1 for 2014Q1-2015Q1, a substantially low yoy inflation period.

Disclosures

Analysts' Compensation: The research analysts responsible for the preparation of this report receive compensation based upon various factors, including the quality and accuracy of research, client feedback, competitive factors, and overall firm revenues.

Other Disclosures

J.P. Morgan ("JPM") is the global brand name for J.P. Morgan Securities LLC ("JPMS") and its affiliates worldwide. J.P. Morgan Cazenove is a marketing name for the U.K. investment banking businesses and EMEA cash equities and equity research businesses of JPMorgan Chase & Co. and its subsidiaries.

Principal Trading: J.P. Morgan and/or its affiliates normally make a market and trade as principal in fixed income securities discussed in this report.

Legal Entities Disclosures

U.S.: JPMS is a member of NYSE, FINRA, SIPC and the NFA. JPMorgan Chase Bank, N.A. is a member of FDIC. **U.K.:** JPMorgan Chase N.A., London Branch, is authorised by the Prudential Regulation Authority and is subject to regulation by the Financial Conduct Authority and to limited regulation by the Prudential Regulation Authority. Details about the extent of our regulation by the Prudential Regulation Authority are available from J.P. Morgan on request. J.P. Morgan Securities plc (JPMS plc) is a member of the London Stock Exchange and is authorised by the Prudential Regulation Authority and regulated by the Financial Conduct Authority and the Prudential Regulation Authority. Registered in England & Wales No. 2711006. Registered Office 25 Bank Street, London, E14 5JP. **South Africa:** J.P. Morgan Equities South Africa Proprietary Limited is a member of the Johannesburg Securities Exchange and is regulated by the Financial Services Board. **Hong Kong:** J.P. Morgan Securities (Asia Pacific) Limited (CE number AAJ321) is regulated by the Hong Kong Monetary Authority and the Securities and Futures Commission in Hong Kong and/or J.P. Morgan Broking (Hong Kong) Limited (CE number AAB027) is regulated by the Securities and Futures Commission in Hong Kong. **Korea:** This material is issued and distributed in Korea by or through J.P. Morgan Securities (Far East) Limited, Seoul Branch, which is a member of the Korea Exchange(KRX) and is regulated by the Financial Services Commission (FSC) and the Financial Supervisory Service (FSS). **Australia:** J.P. Morgan Australia Limited (JPMAL) (ABN 52 002 888 011/AFS Licence No: 238188) is regulated by ASIC and J.P. Morgan Securities Australia Limited (JPMSAL) (ABN 61 003 245 234/AFS Licence No: 238066) is regulated by ASIC and is a Market, Clearing and Settlement Participant of ASX Limited and CHI-X. **Taiwan:** J.P. Morgan Securities (Taiwan) Limited is a participant of the Taiwan Stock Exchange (company-type) and regulated by the Taiwan Securities and Futures Bureau. **India:** J.P. Morgan India Private Limited (Corporate Identity Number - U67120MH1992FTC068724), having its registered office at J.P. Morgan Tower, Off. C.S.T. Road, Kalina, Santacruz - East, Mumbai – 400098, is registered with Securities and Exchange Board of India (SEBI) as a 'Research Analyst' having registration number INH000001873. J.P. Morgan India Private Limited is also registered with SEBI as a member of the National Stock Exchange of India Limited (SEBI Registration Number - INB 230675231/INF 230675231/INE 230675231), the Bombay Stock Exchange Limited (SEBI Registration Number - INB 010675237/INF 010675237) and as a Merchant Banker (SEBI Registration Number - MB/INM000002970). Telephone: 91-22-6157 3000, Facsimile: 91-22-6157 3990 and Website: www.jpmpi.com. For non local research reports, this material is not distributed in India by J.P. Morgan India Private Limited. **Thailand:** This material is issued and distributed in Thailand by JPMorgan Securities (Thailand) Ltd., which is a member of the Stock Exchange of Thailand and is regulated by the Ministry of Finance and the Securities and Exchange Commission and its registered address is 3rd Floor, 20 North Sathorn Road, Silom, Bangrak, Bangkok 10500. **Indonesia:** PT J.P. Morgan Securities Indonesia is a member of the Indonesia Stock Exchange and is regulated by the OJK a.k.a. BAPEPAM LK. **Philippines:** J.P. Morgan Securities Philippines Inc. is a Trading Participant of the Philippine Stock Exchange and a member of the Securities Clearing Corporation of the Philippines and the Securities Investor Protection Fund. It is regulated by the Securities and Exchange Commission. **Brazil:** Banco J.P. Morgan S.A. is regulated by the Comissao de Valores Mobiliarios (CVM) and by the Central Bank of Brazil. **Mexico:** J.P. Morgan Casa de Bolsa, S.A. de C.V., J.P. Morgan Grupo Financiero is a member of the Mexican Stock Exchange and authorized to act as a broker dealer by the National Banking and Securities Exchange Commission. **Singapore:** This material is issued and distributed in Singapore by or through J.P. Morgan Securities Singapore Private Limited (JPMS) [MCI (P) 202/03/2017 and Co. Reg. No.: 199405335R], which is a member of the Singapore Exchange Securities Trading Limited and/or JPMorgan Chase Bank, N.A., Singapore branch (JPMCB Singapore) [MCI (P) 059/09/2017], both of which are regulated by the Monetary Authority of Singapore. This material is issued and distributed in Singapore only to accredited investors, expert investors and institutional investors, as defined in Section 4A of the Securities and Futures Act, Cap. 289 (SFA). This material is not intended to be issued or distributed to any retail investors or any other investors that do not fall into the classes of "accredited investors," "expert investors" or "institutional investors," as defined under Section 4A of the SFA. Recipients of this document are to contact JPMS or JPMCB Singapore in respect of any matters arising from, or in connection with, the document. **Japan:** JPMorgan Securities Japan Co., Ltd. and JPMorgan Chase Bank, N.A., Tokyo Branch are regulated by the Financial Services Agency in Japan. **Malaysia:** This material is issued and distributed in Malaysia by JPMorgan Securities (Malaysia) Sdn Bhd (18146-X) which is a Participating Organization of Bursa Malaysia Berhad and a holder of Capital Markets Services License issued by the Securities Commission in Malaysia. **Pakistan:** J. P. Morgan Pakistan Broking (Pvt.) Ltd is a member of the Karachi Stock Exchange and regulated by the Securities and Exchange Commission of Pakistan. **Saudi Arabia:** J.P. Morgan Saudi Arabia Ltd. is authorized by the Capital Market Authority of the Kingdom of Saudi Arabia (CMA) to carry out dealing as an agent, arranging, advising and custody, with respect to securities business under licence number 35-07079 and its registered address is at 8th Floor, Al-Faisaliyah Tower, King Fahad Road, P.O. Box 51907, Riyadh 11553, Kingdom of Saudi Arabia. **Dubai:** JPMorgan Chase Bank, N.A., Dubai Branch is regulated by the Dubai Financial Services Authority (DFSA) and its registered address is Dubai International Financial Centre - Building 3, Level 7, PO Box 506551, Dubai, UAE.

Disclosures

Country and Region Specific Disclosures

U.K. and European Economic Area (EEA): Unless specified to the contrary, issued and approved for distribution in the U.K. and the EEA by JPMS plc. Investment research issued by JPMS plc has been prepared in accordance with JPMS plc's policies for managing conflicts of interest arising as a result of publication and distribution of investment research. Many European regulators require a firm to establish, implement and maintain such a policy. Further information about J.P. Morgan's conflict of interest policy and a description of the effective internal organisations and administrative arrangements set up for the prevention and avoidance of conflicts of interest is set out at the following link <https://www.jpmorgan.com/jpmpdf/1320742677360.pdf>. This report has been issued in the U.K. only to persons of a kind described in Article 19 (5), 38, 47 and 49 of the Financial Services and Markets Act 2000 (Financial Promotion) Order 2005 (all such persons being referred to as "relevant persons"). This document must not be acted on or relied on by persons who are not relevant persons. Any investment or investment activity to which this document relates is only available to relevant persons and will be engaged in only with relevant persons. In other EEA countries, the report has been issued to persons regarded as professional investors (or equivalent) in their home jurisdiction.

Australia: This material is issued and distributed by JPMSAL in Australia to "wholesale clients" only. This material does not take into account the specific investment objectives, financial situation or particular needs of the recipient. The recipient of this material must not distribute it to any third party or outside Australia without the prior written consent of JPMSAL. For the purposes of this paragraph the term "wholesale client" has the meaning given in section 761G of the Corporations Act 2001.

Germany: This material is distributed in Germany by J.P. Morgan Securities plc, Frankfurt Branch which is regulated by the Bundesanstalt für Finanzdienstleistungsaufsicht.

Hong Kong: The 1% ownership disclosure as of the previous month end satisfies the requirements under Paragraph 16.5(a) of the Hong Kong Code of Conduct for Persons Licensed by or Registered with the Securities and Futures Commission. (For research published within the first ten days of the month, the disclosure may be based on the month end data from two months prior.) J.P. Morgan Broking (Hong Kong) Limited is the liquidity provider/market maker for derivative warrants, callable bull bear contracts and stock options listed on the Stock Exchange of Hong Kong Limited. An updated list can be found on HKEx website: <http://www.hkex.com.hk>.

Korea: This report may have been edited or contributed to from time to time by affiliates of J.P. Morgan Securities (Far East) Limited, Seoul Branch.

Singapore: As at the date of this report, JPMSS is a designated market maker for certain structured warrants listed on the Singapore Exchange where the underlying securities may be the securities discussed in this report. Arising from its role as designated market maker for such structured warrants, JPMSS may conduct hedging activities in respect of such underlying securities and hold or have an interest in such underlying securities as a result. The updated list of structured warrants for which JPMSS acts as designated market maker may be found on the website of the Singapore Exchange Limited: <http://www.sgx.com>. In addition, JPMSS and/or its affiliates may also have an interest or holding in any of the securities discussed in this report – please see the Important Disclosures section above. For securities where the holding is 1% or greater, the holding may be found in the Important Disclosures section above. For all other securities mentioned in this report, JPMSS and/or its affiliates may have a holding of less than 1% in such securities and may trade them in ways different from those discussed in this report. Employees of JPMSS and/or its affiliates not involved in the preparation of this report may have investments in the securities (or derivatives of such securities) mentioned in this report and may trade them in ways different from those discussed in this report.

Taiwan: This material is issued and distributed in Taiwan by J.P. Morgan Securities (Taiwan) Limited. According to Paragraph 2, Article 7-1 of Operational Regulations Governing Securities Firms Recommending Trades in Securities to Customers (as amended or supplemented) and/or other applicable laws or regulations, please note that the recipient of this material is not permitted to engage in any activities in connection with the material which may give rise to conflicts of interests, unless otherwise disclosed in the "Important Disclosures" in this material.

India: For private circulation only, not for sale.

Pakistan: For private circulation only, not for sale.

New Zealand: This material is issued and distributed by JPMSAL in New Zealand only to persons whose principal business is the investment of money or who, in the course of and for the purposes of their business, habitually invest money. JPMSAL does not issue or distribute this material to members of "the public" as determined in accordance with section 3 of the Securities Act 1978. The recipient of this material must not distribute it to any third party or outside New Zealand without the prior written consent of JPMSAL.

Canada: The information contained herein is not, and under no circumstances is to be construed as, a prospectus, an advertisement, a public offering, an offer to sell securities described herein, or solicitation of an offer to buy securities described herein, in Canada or any province or territory thereof. Any offer or sale of the securities described herein in Canada will be made only under an exemption from the requirements to file a prospectus with the relevant Canadian securities regulators and only by a dealer properly registered under applicable securities laws or, alternatively, pursuant to an exemption from the dealer registration requirement in the relevant province or territory of Canada in which such offer or sale is made. The information contained herein is under no circumstances to be construed as investment advice in any province or territory of Canada and is not tailored to the needs of the recipient. To the extent that the information contained herein references securities of an issuer incorporated, formed or created under the laws of Canada or a province or territory of Canada, any trades in such securities must be conducted through a dealer registered in Canada. No securities commission or similar regulatory authority in Canada has reviewed or in any way passed judgment upon these materials, the information contained herein or the merits of the securities described herein, and any representation to the contrary is an offence.

Dubai: This report has been issued to persons regarded as professional clients as defined under the DFSA rules.

Brazil: Ombudsman J.P. Morgan: 0800-7700847 / ouvidoria.jp.morgan@jpmorgan.com.

General: Additional information is available upon request. Information has been obtained from sources believed to be reliable but JPMorgan Chase & Co. or its affiliates and/or subsidiaries (collectively J.P. Morgan) do not warrant its completeness or accuracy except with respect to any disclosures relative to JPMS and/or its affiliates and the analyst's involvement with the issuer that is the subject of the research. All pricing is indicative as of the close of market for the securities discussed, unless otherwise stated. Opinions and estimates constitute our judgment as of the date of this material and are subject to change without notice. Past performance is not indicative of future results. This material is not intended as an offer or solicitation for the purchase or sale of any financial instrument. The opinions and recommendations herein do not take into account individual client circumstances, objectives, or needs and are not intended as recommendations of particular securities, financial instruments or strategies to particular clients. The recipient of this report must make its own independent decisions regarding any securities or financial instruments mentioned herein. JPMS distributes in the U.S. research published by non-U.S. affiliates and accepts responsibility for its contents. Periodic updates may be provided on companies/industries based on company specific developments or announcements, market conditions or any other publicly available information. Clients should contact analysts and execute transactions through a J.P. Morgan subsidiary or affiliate in their home jurisdiction unless governing law permits otherwise.

"Other Disclosures" last revised January 01, 2018.

Copyright 2018 JPMorgan Chase & Co. All rights reserved. This report or any portion hereof may not be reprinted, sold or redistributed without the written consent of J.P. Morgan.

J.P.Morgan