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The global economy has become much more energy efficient. But are there further gains to come?

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Dear readers,

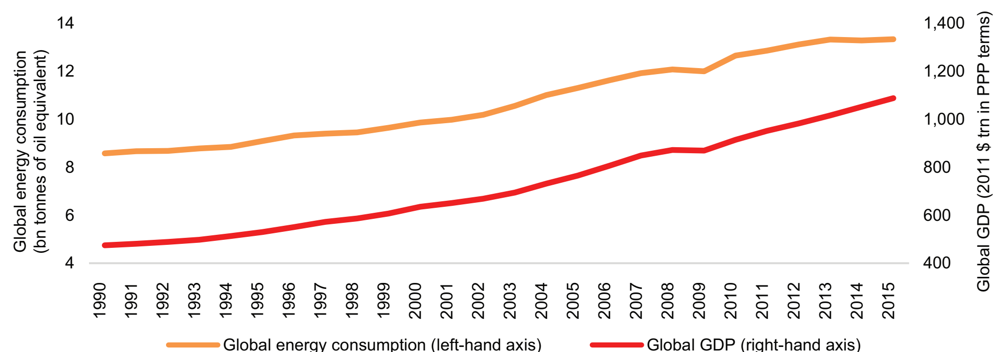
This edition of Global Economy Watch focuses firmly on the outlook for the world economy. At a particularly turbulent political moment, this issue begins with an encouraging economic story: our ability to generate growth from energy is improving rapidly. This is a necessary development. Energy efficiency needs to get better if the world's economies are to meet their climate change abatement targets while continuing to grow. PwC's analysis suggests that the global economy has made significant strides in raising energy efficiency over the past 30 years, and our projections for the next 20 imply that there is still room for improvement. In this analysis, we identify two main drivers of this trend: structural change within large emerging markets and broader technological developments. There are important lessons for business too: energy efficiency will be increasingly insisted upon by consumers and regulators alike.

In our second article consider if recent lacklustre growth in the global economy is likely to deteriorate. Certainly, the outlook for the world's biggest economies is less bright than it was 18 months ago.

In early 2018 we witnessed the fastest and most synchronised growth since before 2008/09 global financial crisis. Since then, the deepening of the trade conflict between the US and China, and challenges in Europe and slow-growing emerging markets have transformed sentiment among businesses and policymakers.

However, we note that slower growth in 2019 in each of the crucial markets of the US, China and the Eurozone is to be expected. The US benefited from a one-off tax cut in 2018. The Chinese government continues to cool its economy very gradually, while the Eurozone is correcting after a couple of years of above-trend growth in 2016-17. That these three economies have cooled simultaneously has been alarming, but fundamentals remain relatively strong. One point of caution: if conditions deteriorated suddenly, central banks would find it difficult to deliver the sort of boost they were able to supply in 2008/09. For businesses, some solid operating conditions are undercut with appreciable downside risk.

Fig 1: Over the past 25 years, global economic growth has grown faster than global energy consumption, as a result of efforts to improve energy efficiency



Source: World Bank

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The global economy has become much more energy efficient. But are there are further gains to come?

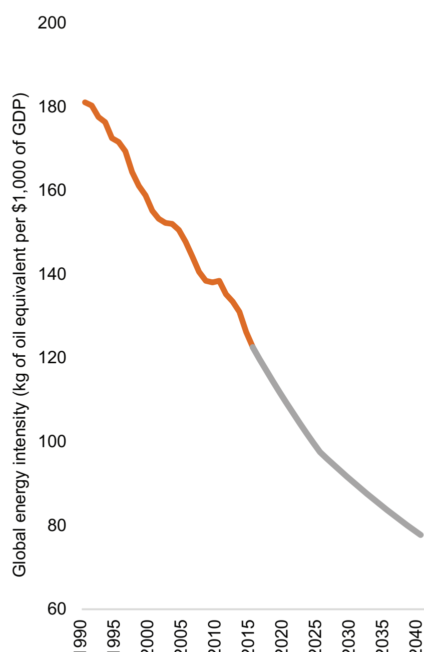
Energy is fundamental to economic growth. It is an essential input into goods and services. It powers offices and fuels transport. Yet there has been a continued divergence of the relationship between energy and economic growth over time as economies mature. With governments and businesses under pressure to promote sustainable development, further energy efficiencies will be crucial to maintaining economic growth while also curtailing climate change. But can this trend of declining energy intensity continue?

Energy intensity is a measure of how much energy is needed to create a unit of GDP. As Figure 1 shows, global energy intensity has been steadily declining. In 1990 it required around 181kg of oil equivalent to produce $1,000 of global GDP in PPP terms. In 2015, it needed 123kg, an improvement in efficiency of more than one-third.

Using projections of global total primary energy demand and PwC's assessments of economic growth, as published in PwC's **The World in 2050** report, we analysed these trends to 2040. We found that global energy demand could increase by almost one-third from 2017 to 2040, driven by greater prosperity and continued population growth in developing countries. But global GDP is expected to increase at a faster rate.

Compared with average annual growth of 1% for global energy demand, global GDP is projected to grow by 2.5% a year on average. Based on this, PwC assesses there is potential for global energy intensity to fall by a further one-third, so that $1,000 of GDP could be generated by 78kg of oil equivalent by 2040. But how can governments and businesses reach, or exceed, this potential?

Fig 2: Structural and technological changes should permit further energy efficiencies



Source: World Bank, IEA, PwC analysis

We identified two key factors:

Structural economic change: As economies mature, they tend to shift away from manufacturing and towards services. For example, according to official data services now account for more than 50% of the Chinese economy, from 40% ten years ago. Typically, services is more energy efficient than manufacturing. In the UK, the services sector accounts for around 80% of GDP but only just over half of its energy consumption, while the industrial sector is responsible for around 15% of each, according to data from the Department for Business, Energy and Industrial Strategy,

Technological progress: Developments such as smart appliances, combined with increased electrification, have helped to limit the rise in energy demand that comes with a growing global middle class by enabling improvements in efficiency. For example, electric vehicles can convert around 60% of energy into movement, compared with only 20% for conventional gas-powered vehicles, according to the US Department of Energy.

PwC discovered that around 85% of economies have improved their energy efficiency since 1990, with an average fall of around 20%. The greatest improvements have occurred in Eastern Europe and Central Asia (see Table 1).

PwC analysed the relationship between the composition of a country's economy and its level of energy intensity to understand if structural economic change was driving these trends. Generally, the countries with a large fall in energy intensity also saw an increase in the importance of services to their economy.

There was little evidence of a strong link between structural economic change and energy intensity at global level. However, when looking at correlations within regions, PwC found that the strength of the relationship varies. There was a relatively strong negative correlation of -0.6 to -0.7 between services as a share of GDP and energy intensity in high-income regions, and around -0.5 in middle-income regions. This means that in richer countries a shift to services is associated with lower energy intensity. By contrast, there was a very weak negative correlation in emerging markets.

This income-contingent relationship suggests that structural economic change only has the potential to lower energy intensity if it is combined with progress in energy efficiency from another source, such as technology. Richer countries have a greater propensity to invest in technology. Education on climate change also tends to be more widespread, meaning consumers are more likely to limit their energy usage.

Table 1: Economies with the largest change in energy intensity, 1990-2015

Rank	Country	Change in energy intensity	Change in services as a share of GDP (percentage points)
1	Bosnia & Herzegovina	(81%)	17.9
2	Myanmar	(79%)	2.1
3	Azerbaijan	(76%)	6.0
4	Belarus	(72%)	19.1
5	China	(68%)	9.1
6	Uzbekistan	(68%)	9.8
7	Lithuania	(66%)	8.7
8	Romania	(65%)	29.6
9	Estonia	(65%)	5.1
10	Ireland	(65%)	(0.8)
11	Poland	(63%)	7.1
12	Slovakia	(62%)	3.8
13	Sudan	(60%)	3.9
14	Cambodia	(60%)	0.4
15	Luxembourg	(56%)	8.6
16	Bulgaria	(56%)	23.0
17	Ethiopia	(55%)	3.2
18	Uganda	(54%)	17.5
19	Ghana	(53%)	1.7
20	Latvia	(51%)	10.6

Source: World Bank, PwC analysis

This contingent relationship is evident in Eastern European economies, many of which have been among the world's fastest growing since 1990. This growth has come at the same time as services have risen as a proportion of GDP by an average of around 10-15 percentage points, but also at the same time as the adoption of more energy efficient technology and stronger governance. Seven of the top 20 economies have joined the EU since 1990 and have become subject to the bloc's energy efficiency targets. The performance of these economies in terms of energy intensity is likely explained by a combination of structural change, technological progress and government action.

PwC's analysis also found a positive relationship between manufacturing as a share of GDP and energy intensity.
The strength of the correlation varies by region; it was high in North America and Europe, but non-existent in Asia.
This implies that manufacturing is associated with increased energy intensity in countries that no longer have comparative advantage. Asia, by contrast, has won comparative advantage over time and now uses economies of scale to manufacture in a more energy-efficient manner.

PwC's analysis suggests that economic growth and energy consumption and economic growth could diverge further. This is a positive story for the global economy, as it argues that governments and businesses can continue to pursue climate change policies that limit energy consumption without eliminating economic growth.

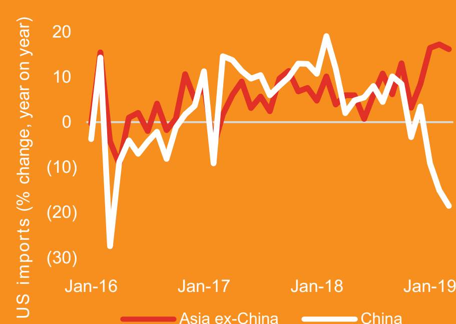
Economic update: Other Asian economies are benefiting from US import substitution

The lag in data means that economics sometimes fails to keep up with politics. For example, the second-round effects of the initial tariffs applied by the US government on Chinese imports are only now becoming known, while the trade conflict grows into a broader economic dispute. US imports from China are in steep decline, a secondary effect of which has benefited China's neighbours. US imports from China fell by around 15% year on year in the first quarter of 2019 according to the Census Bureau, but imports eight other Asian economies–Bangladesh, India, Indonesia, Malaysia, South Korea, Taiwan, Thailand and Vietnam–grew by 16%.

If this trend continues, it is likely contribute to faster economic growth in Vietnam, South Korea and Taiwan, in particular.

Using tariffs to reduce bilateral trade deficits potentially shifts the imbalances elsewhere, assuming demand remains the same. Even if the US succeeds in reducing the size of its trade deficit with China, import substitution with Vietnam will widen the US's deficit with that economy. Indeed, this is already happening. The US's trade deficit with Vietnam stood at $9.3bn in the first three months of 2018, but $13.5bn in Jan-March 2019.

Fig 3: Falling US imports from China are creating opportunities for other Asian economies



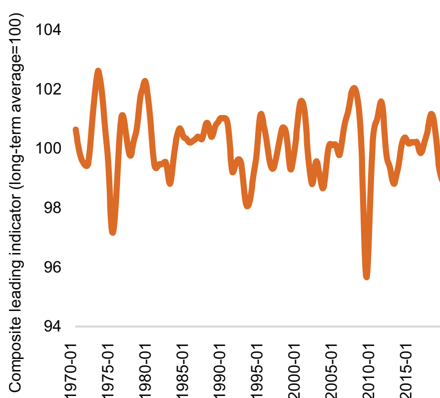
Source: Eikon from Refinitiv

How worried should we be about the global economy?

A year can be a very long time in macroeconomics. Twelve months ago, the Federal Reserve, the US central bank, was raising interest rates regularly; the Eurozone was enjoying a multi-year boom; and the global economy was witnessing its fastest period of growth for a decade. Since then, trade tensions between the US and China have increased, European growth has slipped from above to below trend and recoveries in several major emerging markets have faltered. Given these developments, should we be worried about a global recession?

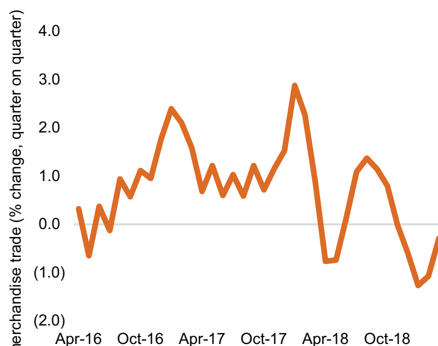
Events of the magnitude of a global recession–defined by the IMF as an annual fall in global GDP per-capita in PPP terms—tend to require a systemic shock. In 2008-09, it was weaknesses in the US financial sector; in the early 1980s it was the consequences of trying to bring down high inflation. There is no immediately apparent trigger in 2019, but there may not need to be, as global growth has remained mediocre during the current expansion. A loss of momentum that would have slowed growth in previous business cycles could be sufficient to stall the economy today.

Fig 4: The OECD's composite leading indicator has the global economy heading towards a level similar to that seen in previous recessions



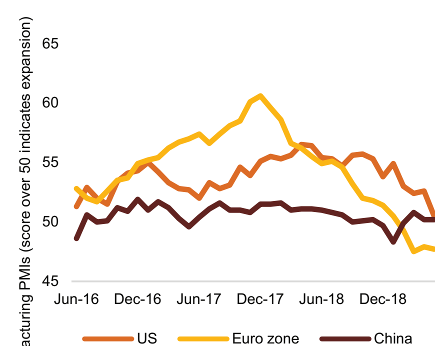
Source: OECD

Fig 5: Global merchandise trade has struggled since the US-China conflict began



Source: Netherlands Bureau for Economic Policy Analysis

Fig 6: Manufacturing has suffered a clear downturn over the past year



Source: Eikon from Refinitiv

Some countries are likely to benefit from the trade conflict owing to import substitution (see Economic update), but the fact that value chains and investments are made across borders means that less global trade would be likely to create more losers than winners, especially if US trade policy hardens towards the EU and Japan.

Two areas give cause for concern: trade and manufacturing. The import tariffs imposed by the US and China since mid-2018 have weakened confidence in financial markets and among businesses, and are likely to have pulled down growth through slower investment. The IMF estimated that existing tariffs will reduce global economic growth by 0.2 percentage points in 2019. If the next round of proposed US tariffs on Chinese imports are implemented, the IMF judges the effect would grow to 0.5 percentage points in 2020.

Manufacturing sectors in the developed world have also struggled over the past year, partly owing to singular country-specific factors, such as new regulations in Germany, but also because of weaker, trade-related demand. So far, there has been little indication that manufacturing woes have spread to the larger services sector.

This might be because services have been supported by demand from strong labour markets and also because governments have acted on the first signs of distress: the Chinese government pushed up investment spending at the beginning of 2019, while the Fed has paused interest rate increases in the US. The European Central Bank has made it clear it could alter its asset-purchasing programme if more support was required.

In the January edition of Global Economy Watch we said we expected 2019 to be the year of the worker, where very low unemployment and subdued inflation push up real wage growth to the benefit of employees. This has shown to be correct so far, as strong consumer spending growth has powered developed markets this year, along with steadily adjustments to policymaking. For as long as this continues, the global economy should avoid recession. However, it is crucial to remember that growth is slower than in previous business cycles and that policymakers' ability to respond is much more constrained. Interest rates remain at record lows in the Eurozone, Australia, Japan and New Zealand. The main lever pulled in response to the global financial crisis would not deliver the same boost in 2019.

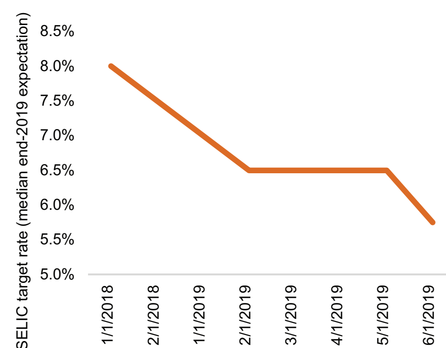
Global economic projections commentary: July 2019

The Americas

In the US, the Federal Reserve is increasingly likely to cut, rather than increase, interest rates. The shift may be driven by two factors: the current US trade policy towards China, which we believe is slowing business investment growth, and the possibility of slower economic growth and inflation as a result of the fading residual effects of the 2018 tax cuts. The labour market remains strong, with unemployment now at its lowest point in almost 50 years. Together with signs of strengthening productivity growth, this supports our existing projection for GDP growth in 2019 of 2.3%.

The Brazilian economy shrank unexpectedly in the first quarter and industry output in the second quarter appears weak. In addition, the continued effects of austerity measures to narrow the budget deficit are likely to pull down growth. The central bank may cut interest rates substantially, with forecasts for the end-2019 rate now the lowest on record. We have therefore revised down our projection for Brazil's growth in 2019 to 1.2%, from 1.3% previously. The Mexican economy also shrank in January-March, causing us to downgrade growth to 1.8% for 2019, from 2.1% in 2018.

Brazil: Investors expect the central bank to cut interest rates in the remainder of 2019



Source: Eikon from Refinitiv

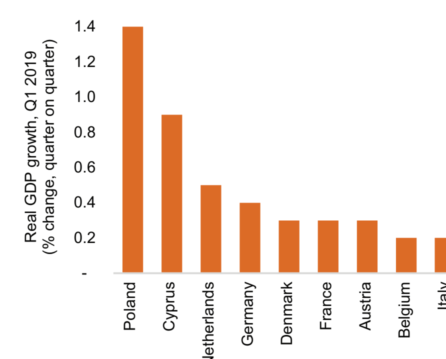
Europe

The latest national accounts data showed that the Eurozone grew by 0.4% quarter on quarter in the first quarter of 2019, broadly in line with its potential growth rate. In the core, Germany's weaker than expected performance in the second half of 2018 proved temporary. In the periphery, Portugal, Ireland, Greece and Spain continue to grow at rates much faster than the regional average.

The attention, however, is now shifting to dwindling inflation expectations. The European Central Bank made it clear at its last meeting that additional stimulus will be deployed unless inflation accelerates. September is likely to be the earliest opportunity for such a decision, to coincide with the publication of the next set of economic projections.

The other risk we are monitoring is the possibility of US tariffs being imposed on European goods. If this goes ahead, the impact will be limited to specific sectors of the European economy.

Eurozone: After a rocky 2018, the regional economy is returning to trend growth



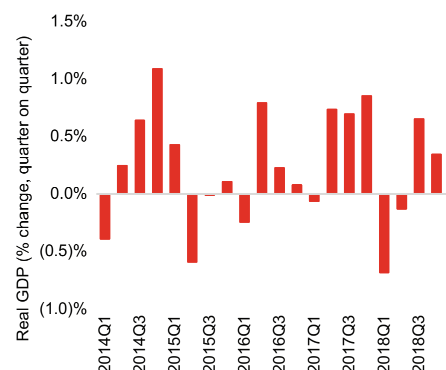
Source: Eurostat

Eastern Europe, Middle East and Africa

South Africa's economy suffered its largest decline in a decade in the first quarter of 2019, falling by 0.9% quarter on quarter, according to official data. Manufacturing experienced a particular hit, as the state electricity provider, Eskom, suffered severe power shortages in February and March which caused the sector's output to fall by 8.8% relative to the fourth quarter of 2018. We expect the economy to face will continue to face pressure throughout the year as industrial action, weak investment and a widening budget deficit all pose challenges to President Cyril Ramaphosa's proposed 'New Dawn' of economic reform.

We expect growth in Nigeria to accelerate for a second consecutive year in 2019, to around 2.5%. However, this pace remains considerably below the targets set out by the country's Economic Recovery and Growth Plan, which aimed for 4.5%. Lower oil production and higher unemployment are likely to be behind this underperformance, with the unemployment rate around 5 percentage points higher in 2018 than expected in the plan.

South Africa: The economy shrank at the fastest rate in a decade in Q1 2019



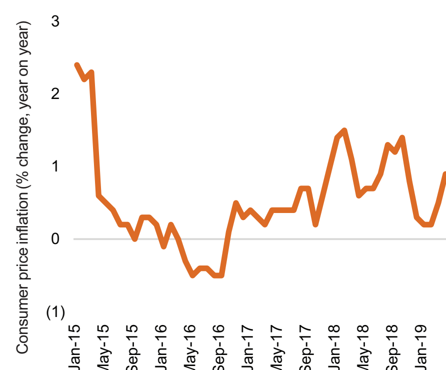
Source: Eikon from Refinitiv

Asia

China's long-term economic slowdown is set to continue in 2019-20. The government will support the economy to the extent it needs to in order to meet its target of economic growth of between 6 and 6.5% in 2019. We project growth of 6.3%, slowing to 6.2% in 2020. Short-term stimulus may come at the expense of tackling longer-term issues, such as local government finances and debt reduction.

India is likely to remain the fastest-growing large economy in the world over the next two years. Its low GDP per head and catch-up potential means growth in excess of 7% a year should be attainable. In Japan the government is likely to raising the rate of consumption tax in October, which should boost the economy's performance in mid-2019, but possibly lead to weakness afterwards. The Bank of Japan will keep monetary policy extremely loose and look for any indication of stronger inflation. We expect overall economic growth of 1% this year, a similar pace to that of 2018.

Japan: Consumer price inflation remains well below the BoJ's 2% target



Source: Eikon from Refinitiv

Projections: July 2019

	Share of 2017 world GDP		Real GDP growth				Inflation			
	PPP	MER	2018e	2019p	2020	2021-2025p	2018e	2019p	2020p	2021-2025p
Global (Market Exchange Rate ('MER'))		100.0%	3.2	2.8	2.8	2.8	3.0	2.3	2.4	2.6
Global (Purchasing Power Parity ('PPP') rates)	100.0%		3.7	3.4	3.5	3.4	3.4	2.8	3.0	3.0
G7	30.6%	46.0%	2.1	1.7	1.5	1.5	2.0	1.6	1.7	2.0
E7	37.6%	26.6%	5.3	5.0	5.3	5.1	3.5	3.7	3.8	3.7
United States	15.3%	24.3%	2.9	2.3	1.8	1.8	2.3	1.8	1.7	2.2
China	18.2%	15.0%	6.6	6.3	6.2	5.9	2.1	2.4	2.7	2.9
Japan	4.3%	6.1%	0.6	1.0	0.3	0.6	1.0	0.9	1.5	1.2
United Kingdom	2.3%	3.3%	1.4	1.4	1.3	1.8	2.5	2.0	2.0	2.0
Eurozone	10.2%	13.9%	1.8	1.1	1.6	1.5	1.6	1.3	1.6	2.0
France	2.2%	3.2%	1.6	1.2	1.5	1.8	1.9	1.4	1.6	1.9
Germany	3.3%	4.6%	1.4	0.7	1.6	1.4	1.7	1.4	1.7	2.3
Greece	0.2%	0.3%	1.9	2.0	2.2	1.5	0.6	0.7	1.2	1.8
Ireland	0.3%	0.4%	6.8	3.4	3.7	3.0	0.5	1.0	1.2	1.9
Italy	1.8%	2.4%	0.8	0.1	0.9	0.8	1.1	0.9	1.3	1.7
Netherlands	0.7%	1.0%	2.5	1.6	2.3	1.9	1.7	2.3	1.5	2.0
Spain	1.4%	1.6%	2.6	2.3	1.8	2.0	1.7	1.0	1.6	1.9
Poland	0.9%	0.7%	5.2	3.8	3.0	3.0	1.9	2.0	2.5	2.5
Russia	3.2%	1.9%	1.7	1.5	1.8	1.5	4.0	4.5	4.5	4.7
Turkey	1.7%	1.1%	0.4	(1.5)	2.6	2.4	16.3	17.1	13.9	13.0
Australia	1.0%	1.7%	2.8	2.2	2.7	2.8	1.9	2.1	2.3	2.5
India	7.4%	3.3%	7.1	7.3	7.5	7.7	4.0	4.2	4.8	5.0
Indonesia	2.6%	1.3%	5.2	5.2	5.1	5.2	3.2	3.4	3.9	3.0
South Korea	1.6%	1.9%	2.7	2.5	2.8	2.8	1.6	1.4	1.6	2.0
Brazil	2.6%	2.6%	1.3	1.3	2.2	2.1	3.7	4.3	3.9	4.0
Canada	1.4%	2.1%	1.8	1.6	1.8	1.7	2.2	1.7	1.9	1.9
Mexico	1.9%	1.4%	2.1	1.8	2.7	2.7	4.8	3.2	2.7	3.0
South Africa	0.6%	0.4%	0.8	1.3	1.7	1.8	5.3	4.6	4.8	5.5
Nigeria	0.9%	0.5%	2.0	2.1	2.5	2.5	16.3	12.4	11.7	14.0
Saudi Arabia	1.4%	0.9%	2.1	1.8	1.9	2.1	3.4	2.8	3.0	3.0

Sources: PwC UK analysis, National statistical authorities, Eikon from Refinitiv and IMF. All inflation indicators relate to the Consumer Price Index (CPI). Note that the tables above form our main scenario projections and are therefore subject to considerable uncertainties. PwC recommends that our clients look at a range of alternative scenarios. UK and Ireland numbers are contingent on a reasonably smooth Brexit.

Interest rate outlook of major economies

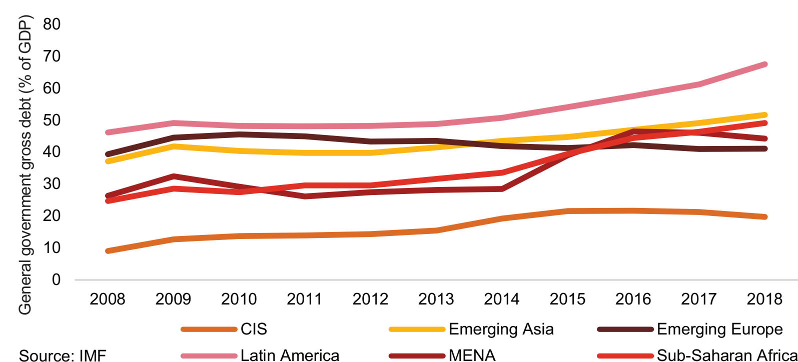
	Current rate (Last change)	Expectation	Next meeting
Federal Reserve	2.25-2.5% (December 2018)	A single rate cut in the second half of 2019	July 30-31
European Central Bank	0.00% (March 2016)	No rate change in 2019	July 25
Bank of England	0.75% (August 2018)	No rate change in 2019	August 1

Chart of the month

Since the financial crisis a decade ago, public debt held by emerging markets has grown faster than GDP in every region of the world, according to World Bank data. This rise is only marginal in the case of Europe, but is much clearer in Asian, African and Latin American economies.

A decade of low interest rates has led to greater borrowing, especially for long-term infrastructure projects. However, the IMF suggests spending has risen on social programmes among middle-income countries and on interest payments among low-income economies. Both groups have seen public investment fall as a proportion of GDP.

Governments of emerging market economies across the world have become more indebted in the past decade



Source: IMF

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