**Deutsche Bank Research**

# Public debt in 2020

March 24, 2010

## A sustainability analysis for DM and EM economies

**The global crisis has caused a hitherto unseen fiscal expansion.** In light of surging public debt the issue of debt sustainability has increasingly attracted attention. In this paper we analyse public debt sustainability in both developed and emerging economies. Our country sample consists of 38 countries, 21 emerging markets (EMs) and 17 developed markets (DMs), together accounting for roughly 85% of world GDP.

**Public finances have already become or are at risk of becoming unsustainable in many DMs as well as in a few EMs.** In this context, public debt sustainability goes beyond the absence of sovereign default. We understand debt sustainability as a sovereign's ability to service debt without large adjustments to revenue and/or expenditure as well as the lack of an ever-increasing public debt burden.

**At the moment, public debt sustainability is mainly a problem of DMs.** At least half of the DMs in our country sample will have to implement stringent fiscal consolidation programmes over the next few years in order to prevent already high public-debt-to-GDP ratios from a further significant rise. However, drastic fiscal policy adjustment may be not feasible in the short term and hence public debt is likely to grow further.

**In our baseline scenario the DM public-debt-to-GDP ratio is predicted to soar to 133% in 2020, from just over 100% in 2010.** By contrast, nearly all EM countries in our sample, including major economies, appear to be well positioned to stabilise or even outgrow their current debt ratios without drastic fiscal adjustment.

**Institutional improvements in DMs may help these countries to maintain fiscal credibility.** In light of the future fiscal challenges, many DM governments may introduce new or more effective national debt limits, similar to those put in place in the past with good results by some EMs. Such institutional reforms could help to insulate fiscal policies from political pressure and to anchor financial market expectations.

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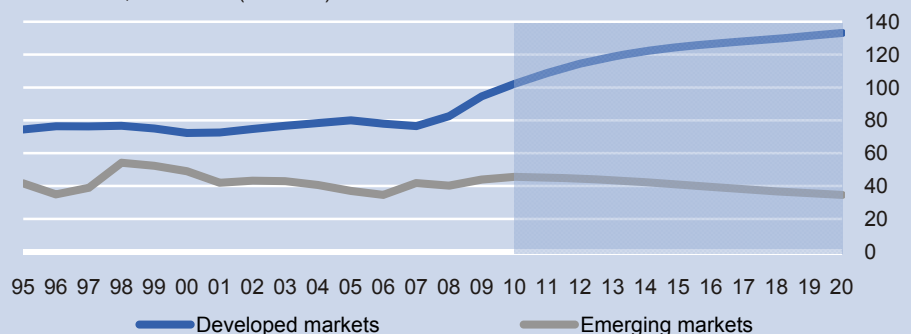**Internet:** www.dbresearch.com
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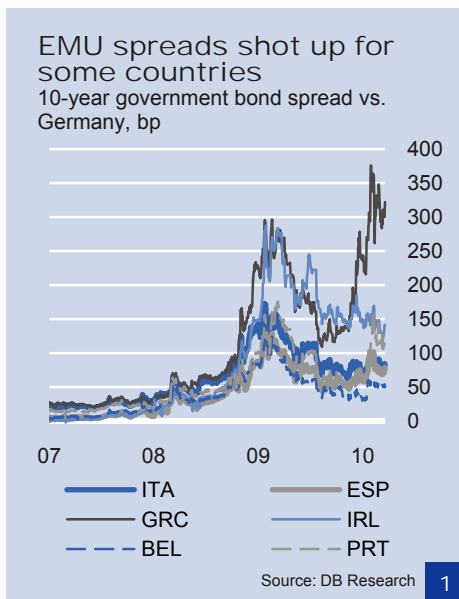**Welcome to a new world!**
Public debt*, % of GDP (baseline)



95 96 97 98 99 00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20

Developed markets          Emerging markets

*GDP-weighted.

Source: DB Research

# Contents

## 1. Introduction

The global crisis has caused a hitherto unseen fiscal deterioration that leaves the world economy with serious challenges. In many developed markets (DMs) as well as in a few emerging markets (EMs) public finances have already become, or are at least at risk of becoming, unsustainable. The common definition of debt sustainability goes beyond the absence of a de jure sovereign default. Consequently, public debt sustainability is defined as a sovereign's ability to service debt without large adjustments to public revenue and/or expenditure and without ever-increasing public-debt-to-GDP ratios. Hence, this definition refers to both a country's ability and willingness to repay its debt.
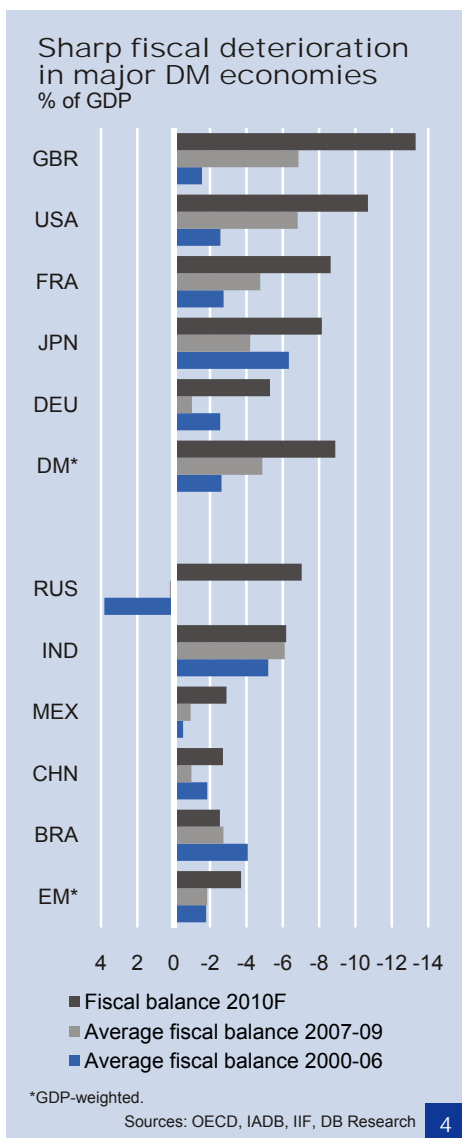
Financial markets have recently started to re-price sovereign risk, especially of those countries with immense fiscal challenges. For example, sovereign bond spreads for some EMU countries like Greece, Portugal, Spain or Ireland have widened sharply since 2008 (see Chart 1). Financial markets have become increasingly concerned about fiscal policies in many advanced economies over the past couple of months, as reflected in the re-widening of DM sovereign CDS spreads (see Chart 2). Interestingly, EM sovereign CDS spreads have mostly returned to their pre-crisis levels, indicating that fiscal policy makers there have weathered the financial storm relatively well (see Chart 3). These antagonistic trends prompt us to take a close look at public debt sustainability, in both DMs and EMs. Our country sample consists of 38 economies (17 DMs and 21 EMs, incl. all G7 and G20 members with Saudi-Arabia as exception), which together account for 85% of world GDP.

Our paper is structured as follows. In Chapter two, we shed some light on the speed and magnitude of the recent deterioration in public finances in DMs and EMs. In Chapter three, we gauge possible future public debt dynamics (from 2010 to 2020) in a baseline scenario as well as in four adverse shock scenarios. In the first three shock scenarios, we consider adverse single-variable shocks in the real GDP growth rate, the real interest rate, and the primary balance, i.e. the fiscal balance before net debt interest payments. The fourth shock scenario is based on a combined or multiple-variable shock in all three variables at the same time. In our baseline scenario, which is subject to relatively conservative assumptions, we assume only gradual fiscal improvements over the next couple of years and rule out imminent bold fiscal policy adjustments. Hence, we are aware that public debt dynamics could eventually turn out to be more favourable than sketched in our central scenario. In Chapter four, we therefore try to measure fiscal consolidation efforts that would be required to (a) prevent public debt from rising from its 2010 level, or alternatively (b) lower public-debt-to-GDP ratios to pre-crisis (2007) levels or benchmarks that could be considered as prudential debt targets. Chapter five provides a conclusion.
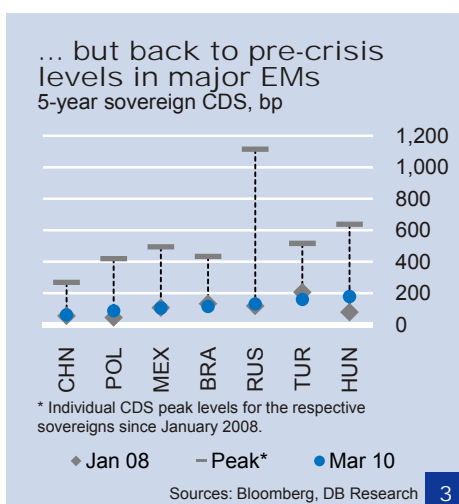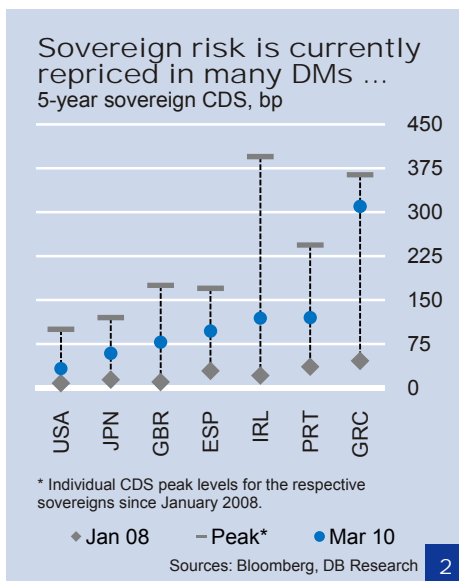
## 2. Fiscal deterioration - an unpleasant result of the global crisis

Most economists, policymakers and international financial institutions called for expansionary monetary and fiscal policies to mitigate the adverse effects of the global crisis. So far, bold and coordinated policy actions have successfully prevented a collapse

**EMU spreads shot up for some countries**
10-year government bond spread vs. Germany, bp



Source: DB Research **1**

**Sovereign risk is currently repriced in many DMs …**
5-year sovereign CDS, bp



* Individual CDS peak levels for the respective sovereigns since January 2008.

◆ Jan 08   — Peak*   ● Mar 10

Sources: Bloomberg, DB Research **2**

**… but back to pre-crisis levels in major EMs**
5-year sovereign CDS, bp



* Individual CDS peak levels for the respective sovereigns since January 2008.

◆ Jan 08   — Peak*   ● Mar 10

Sources: Bloomberg, DB Research **3**

## Sharp fiscal deterioration in major DM economies
% of GDP



GBR
USA
FRA
JPN
DEU
DM*

RUS
IND
MEX
CHN
BRA
EM*

4  2  0  -2  -4  -6  -8  -10 -12 -14

■ Fiscal balance 2010F
■ Average fiscal balance 2007-09
■ Average fiscal balance 2000-06

*GDP-weighted.

Sources: OECD, IADB, IIF, DB Research   **4**

## Public debt increases in (major) DMs
Public debt, % of GDP



120
100
80
60
40
20
0

95  97  99  01  03  05  07  09

—— EM GDP-weighted average
—— EM unweighted average
—— DM GDP-weighted average
—— DM unweighted average

Source: DB Research   **5**

of the world financial system and the global economy. Nearly all major DMs as well as some EMs have run counter-cyclical fiscal policies, either via automatic stabilisers or through discretionary stimuli.[1] As a result, fiscal accounts have worsened significantly since 2007 not only in DMs but also, though to a lesser extent in EMs (see Chart 4). Fiscal accounts were hit particularly hard in DMs with bursting housing market bubbles as well as in countries with already high pre-crisis debt burdens. In the advanced world, fiscal deficits widened to a GDP-weighted average[2] of 5% of GDP between 2007-09 from less than 3% between 2000-06 and are forecast to soar to almost 9% this year. By contrast, the aggregated EM fiscal deficit remained broadly unchanged at around 2% of GDP between 2007-09 compared to the 2000-06 average. However, the deficit looks set to widen to almost 4% of GDP in 2010.

As regards the average GDP-weighted public-debt-to-GDP ratio in DMs and EMs, it is obvious that many DM governments have moved into unexplored territory over the past couple of years. While the GDP-weighted EM public debt stock climbed to around 44% of GDP in 2009 from just 35% in 2006, the DM debt ratio skyrocketed to around 95% of GDP from less than 80%. Today, most EMs still exhibit relatively manageable public debt levels. The current EM public-debt-to-GDP ratio is well below its late 1990s high of 55% of GDP. Contrary to EMs, DM public-debt-to-GDP ratios are now higher than they were in the late 1990s, measured both on an unweighted as well as on a GDP-weighted basis (see Chart 5). Since the turn of the century public finances have worsened in particular in a few major DMs, as underlined by the growing gap between the unweighted (simple) and the GDP-weighted DM public-debt-to-GDP ratio. Meanwhile, the gap between the unweighted and GDP-weighted average debt-to-GDP ratio has narrowed in the EM world, indicating that no major EM has a public debt burden that is significantly above the average level of its peers.
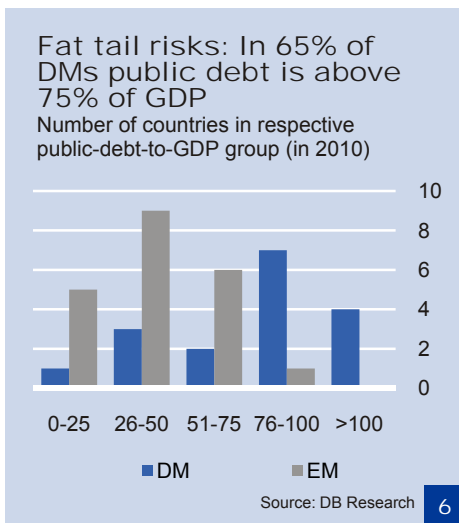
The previous findings indicate that tail risks in public finances, as measured by the relative size of an economy, are nowadays highly concentrated in the advanced world. The nine DMs that face substantial consolidation needs, according to our debt target analysis in Chapter four (Ireland, Germany, the UK, the US, France, Portugal, Greece, Italy and Japan), account for around 85% of our DM sample's total GDP. However, the EMs that are either subject to tangible consolidation needs (the Czech Republic, Hungary, Romania and Poland) or where past efforts to lower high public debt have to continue (e.g Turkey, Brazil, India) account for only 29.8% of our EM sample's total GDP. The statistics of the sample debt distributions (based on 2010 public-debt-to-GDP ratios) speak the same language. While our DM sample has a kurtosis of 4.6, it is only 2.8 in our EM sample. A higher kurtosis indicates more infrequent plus more extreme deviations by some countries from the mean. Furthermore, the debt distribution is much more asymmetric in our DM than in our EM sample. While the DM sample debt distribution has positive skewness of 1, our EM sample is skewed at 0.4, which is much closer to 0. Thus, the right tail of the debt distribution, which represents high debt-to-GDP ratios in both absolute and relative terms, is much longer in our DM than in our EM sample (see Chart 6).
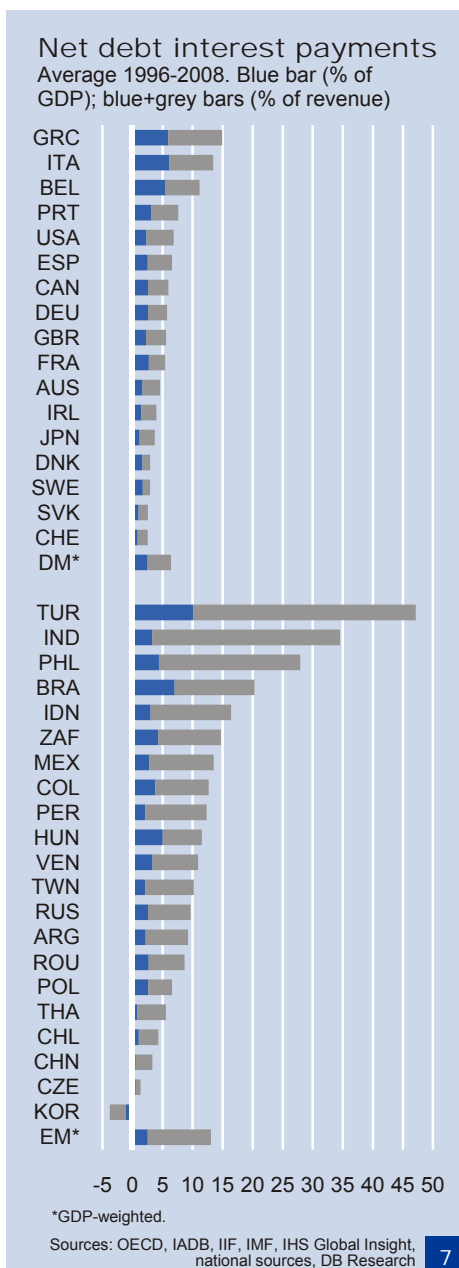
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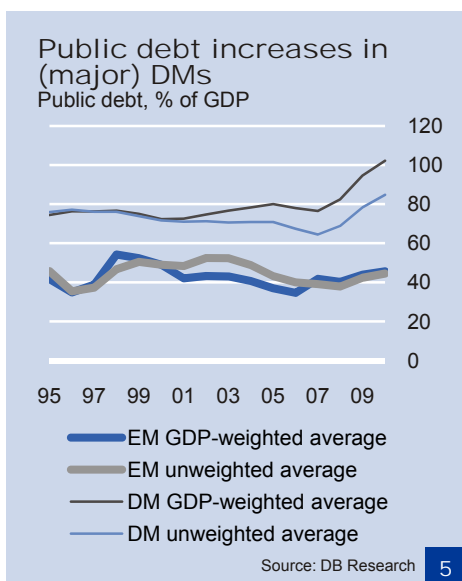
[1]   See Lanzeni, Maria Laura and Veronica Vallés (2009) as well as OECD (2009).
[2]   Using nominal USD GDP based on PPP valuations.

**Fat tail risks: In 65% of DMs public debt is above 75% of GDP**

Number of countries in respective public-debt-to-GDP group (in 2010)



Source: DB Research    6

**Net debt interest payments**

Average 1996-2008. Blue bar (% of GDP); blue+grey bars (% of revenue)



*GDP-weighted.

Sources: OECD, IADB, IIF, IMF, IHS Global Insight, national sources, DB Research    7
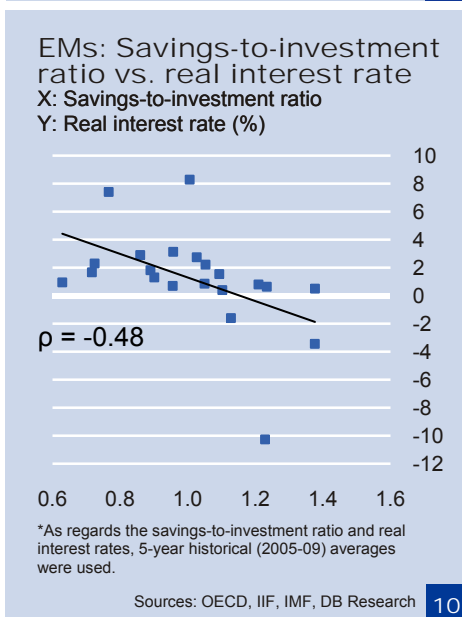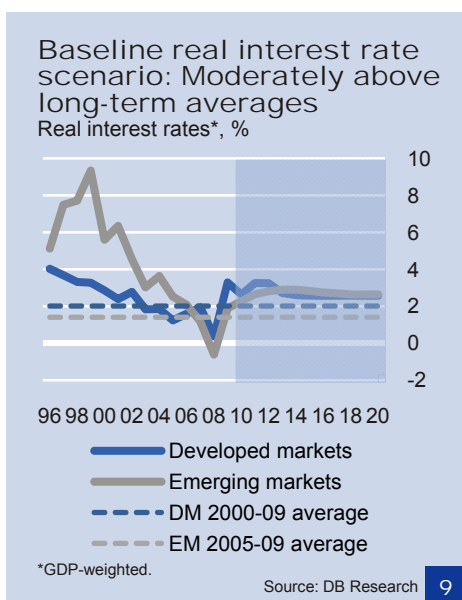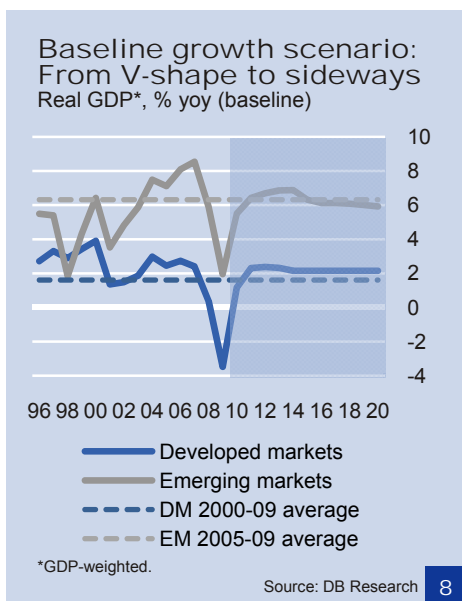
# 3. Public debt scenario analysis

The following scenario analysis is based on gross public-debt-to-GDP figures only.[3] Hence, we take neither a sovereign's net asset/liability position into account, nor do we consider a country's net international creditor or debtor position. Moreover, we focus on public debt ratios as a percentage of GDP which is the conventional method internationally. We use this concept although other denominators that may be a better proxy for the tax base of a given country are also feasible (e.g. Gross National Income or Gross National Disposable Income). Differences between the GDP and other potential denominators are mostly driven by migrants' remittances, the position of an international aid giver or receiver as well as the net creditor/debtor position of a country. As regards the government's debt figures, it is important to bear in mind that debt and fiscal figures are not necessarily 100% comparable across countries because of different classifications. Moreover, we do not consider contingent liabilities that may arise for instance from guarantees to banks or other private companies.

Furthermore, we do not take the public debt structure into account, i.e. we do not differentiate debt by holders (resident vs. non-resident), by currency denomination (domestic vs. foreign currency), by maturity (short, medium, long-term) and/or instruments (e.g. floating vs. fixed interest rate). It goes without saying that the factors listed above are all relevant for the conditions under which governments are able to borrow from capital markets. Moreover, the above factors also determine how vulnerable public balance sheets are to adverse shocks such as higher interest rates, currency fluctuations and/or capital flow reversals. Hence, on the one hand even countries with a relatively low debt burden but an unfavourable debt structure (i.e. short debt maturities, a high share of FX-denominated debt, floating interest payments, high non-resident holdings of public debt) could quickly come under pressure as regards their fiscal solvency if financial market conditions worsened dramatically. On the other hand, highly indebted countries with a favourable debt structure (i.e. long maturities, a low share of FX-denominated debt, fixed interest payments and high resident holdings of public debt securities) have generally more room for fiscal manoeuvre during periods of financial distress and may still be able to borrow at relatively low interest rates for a prolonged period of time. However, despite the importance of the public debt structure for the analysis of debt sustainability, consideration of the individual debt profiles in a large data sample would certainly increase the complexity dramatically. Therefore, we restrict our sustainability analysis to a relatively simple and mechanistic framework (please see Box 1 Appendix for more information). Nevertheless, our framework is able to track the direction and/or the pace of a country's debt dynamics (falling or increasing) under different macro scenarios.

In this chapter we take a look at possible outcomes for public indebtedness in DMs and EMs over the period 2010-20. In our baseline scenario we look at the possible outcome for public-debt-to-GDP ratios over the next ten years in the absence of unexpectedly strong fiscal consolidation and/or major adverse economic shocks.

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[3] Recently the IMF (2009, 2010c) and the OECD (2009) projected public-debt-to-GDP ratios for some selected DM and EM countries for 2014 and 2017, respectively.

**Baseline growth scenario: From V-shape to sideways**
Real GDP*, % yoy (baseline)



Developed markets
Emerging markets
DM 2000-09 average
EM 2005-09 average

*GDP-weighted.

Source: DB Research  8

**Baseline real interest rate scenario: Moderately above long-term averages**
Real interest rates*, %



Developed markets
Emerging markets
DM 2000-09 average
EM 2005-09 average

*GDP-weighted.

Source: DB Research  9

**EMs: Savings-to-investment ratio vs. real interest rate**
X: Savings-to-investment ratio
Y: Real interest rate (%)



ρ = -0.48

*As regards the savings-to-investment ratio and real interest rates, 5-year historical (2005-09) averages were used.

Sources: OECD, IIF, IMF, DB Research  10

As renewed economic and/or financial turmoil may occur,[4] we also assess public debt dynamics under four shock scenarios. Precisely, we consider (a) a real GDP growth shock, (b) a real interest rate shock, (c) a primary balance shock, and finally, (d) a combined shock of adverse movements in all three variables. Scenario (a) can be understood as a low growth scenario in which economic activity is strongly restricted by a wide range of factors, including the impact of private-sector deleveraging, sovereign overborrowing, international trade disputes, high commodity prices, and/or untackled population ageing issues (mainly in DMs). Moreover, scenario (a) captures the risk of a return to recession. Shock scenario (b) describes a world where investors become increasingly worried about surging public debt and the inflation outlook and hence persistently demand higher real interest rates. Rising real interest rates would certainly put pressure on sovereigns with already weak structural fiscal accounts. Especially, those countries with an already large share of net debt interest payments to GDP (or revenue) would suffer the most from higher real interest rates (see Chart 7). Scenario (c) captures a longer-lasting deterioration in public finances, which could arise from further financial-sector support, slumping tax revenue and/or extraordinary expenses on social security. Generally, it is more realistic to assume that any economic shock would affect all three debt flow variables (growth, interest rates, primary balances) at the same time. In order to take account of such a situation we finally show a combined shock scenario (d). Nevertheless, the three single-variable shocks are useful in revealing country-specific weaknesses.

## (1) Baseline scenario

### *Macroeconomic assumptions*

In our scenarios we show potential public debt dynamics within the time horizon of 2010-20. The three variables (1) real GDP growth, (2) real interest rates and (3) primary balances (pb) are used as input factors. Historical time series and short-term forecasts for the relevant variables are taken from a wide range of data sources (please see Box 2 Appendix).
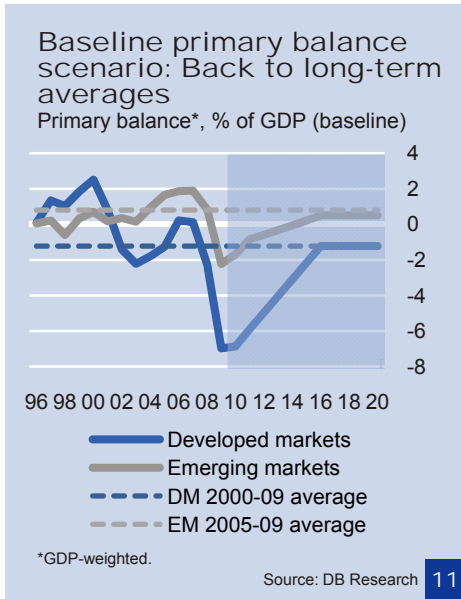
### 1. *Real GDP growth (% p.a.)*

For 2010-14 we take the IMF's real GDP growth forecasts (World Economic Outlook Database, October 2009). For 2015-20 a country's real GDP is assumed to grow at the IMF's 2014 forecast rate. The only exceptions are China, Mexico and Turkey where we expect somewhat lower or higher growth rates than the IMF. Our medium-term real growth assumptions are in line with past averages (2000-09 for DMs, 2005-09 for EMs) (see Chart 8).

### 2. *Real interest rate (% p.a.)*

The average real interest rate paid on public debt is difficult to calculate. Because of different maturities, currencies, and interest rate payments, there is no single interest rate that represents a government's borrowing costs. We chose to approximate the relevant real interest rates by CPI-deflated benchmark bond yields, using our own forecasts (more information on our real interest rate
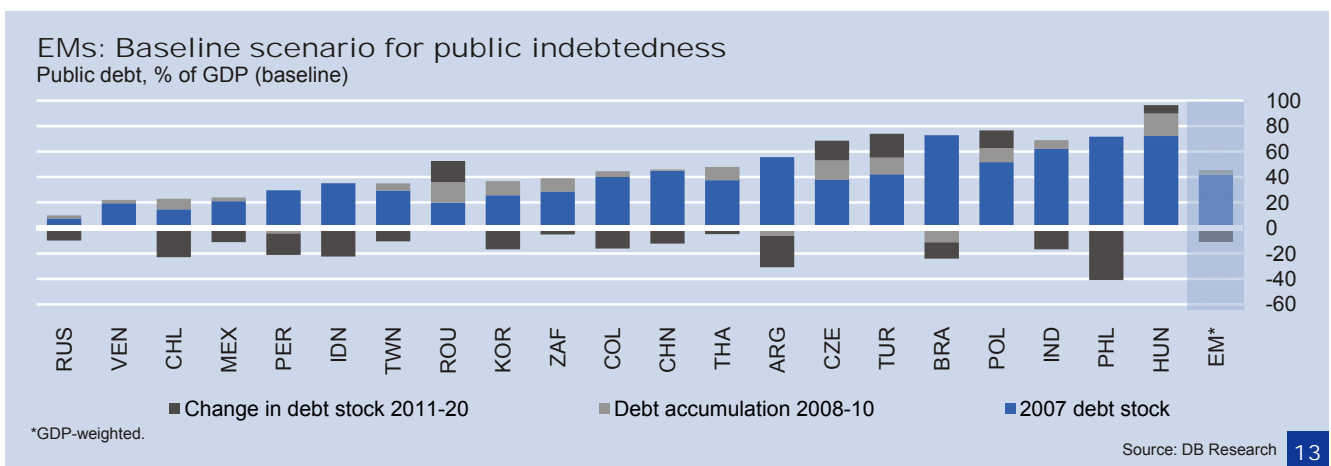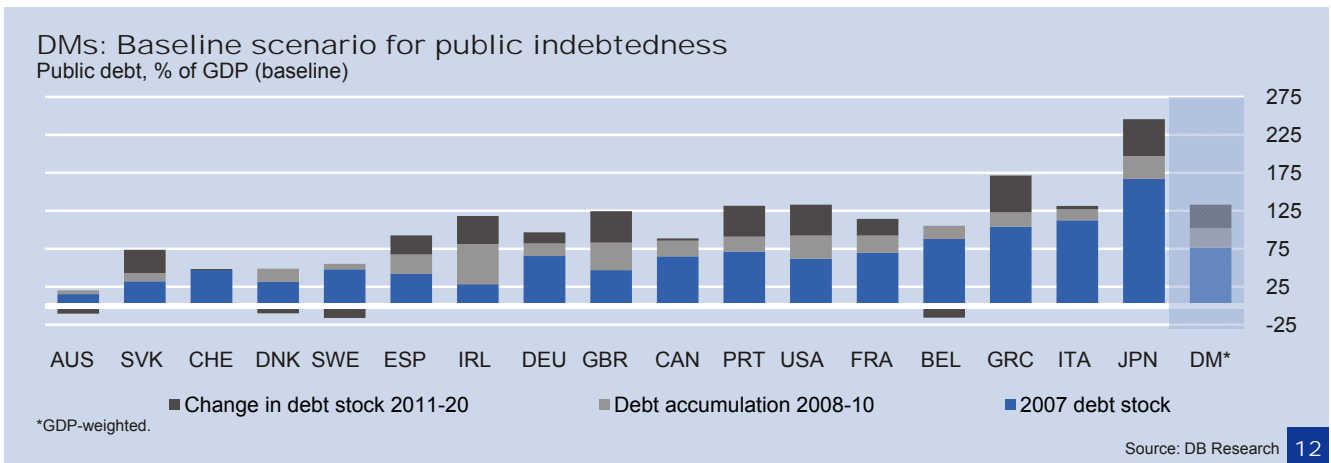
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[4] In January, the IMF raised its economic growth outlook but stressed that risks to financial stability have remained high. Moreover, the IMF warned that the sharp deterioration in fiscal accounts could trigger renewed financial turmoil and might cause borrowing costs to rise. See IMF (2010a) and (2010b).

**Baseline primary balance scenario: Back to long-term averages**
Primary balance*, % of GDP (baseline)



96 98 00 02 04 06 08 10 12 14 16 18 20

— Developed markets
— Emerging markets
- - DM 2000-09 average
- - EM 2005-09 average

*GDP-weighted.

Source: DB Research **11**

calculations are given in Box 2 Appendix).[5] For many years real interest rates have been fairly low because of abundant global liquidity and excess savings in major EMs.[6] Moreover, against the backdrop of the global recession and bold interest rate cuts by central banks, real interest rates temporarily turned negative in many countries in 2008. Furthermore, in a few EM countries real interest rates have been persistently low or even negative for many years, e.g. because of a structural imbalance between domestic investment and savings (see Chart 10).[7] Overall, we assume real interest rates to rise slightly over the next few years and to stay moderately above past averages thereafter (see Chart 9).[8]

### 3. Primary balances (% of GDP)

In our baseline scenario we presume that fiscal consolidation will not take place before 2011 and will be only gradual thereafter (see Chart 11). Hence, we rule out imminent and bold fiscal policy adjustments, which may not be feasible from a social and political point of view.
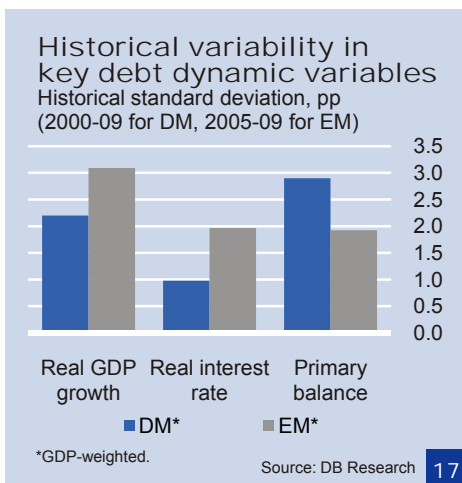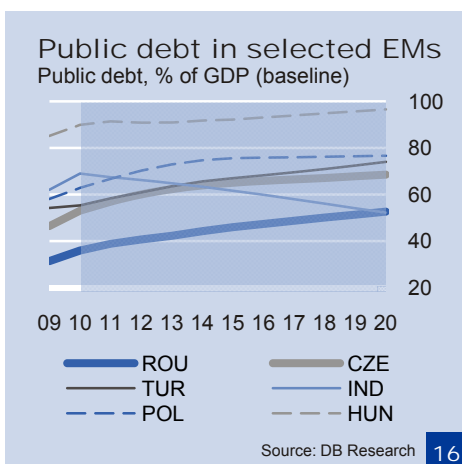
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**DMs: Baseline scenario for public indebtedness**
Public debt, % of GDP (baseline)



AUS  SVK  CHE  DNK  SWE  ESP  IRL  DEU  GBR  CAN  PRT  USA  FRA  BEL  GRC  ITA  JPN  DM*

■ Change in debt stock 2011-20　　■ Debt accumulation 2008-10　　■ 2007 debt stock

*GDP-weighted.

Source: DB Research **12**

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**EMs: Baseline scenario for public indebtedness**
Public debt, % of GDP (baseline)



RUS  VEN  CHL  MEX  PER  IDN  TWN  ROU  KOR  ZAF  COL  CHN  THA  ARG  CZE  TUR  BRA  POL  IND  PHL  HUN  EM*

■ Change in debt stock 2011-20　　■ Debt accumulation 2008-10　　■ 2007 debt stock

*GDP-weighted.

Source: DB Research **13**

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5　In its Article IV reports the IMF uses the ratio of annual net debt interest payments to the previous year's public debt stock. But when deflated, this measure often results in negative real interest rates, which would in our view not be a suitable baseline assumption over the next 10 years.

6　See Becker, Sebastian (2009). Page 6.

7　See Deutsche Bundesbank (2001).

8　For DMs we use ten-year (2000-09) historical averages. For EMs we use five-year (2005-09) historical averages as these economies experienced significant progress over the past couple of years. Hence, taking ten-year averages may not be appropriate to describe structural macroeconomic conditions in these countries.

**Baseline debt scenario: Welcome to a new world!**
Public debt*, % of GDP (baseline)



*GDP-weighted.

Source: DB Research  **14**

**Public debt in selected DMs**
Public debt, % of GDP (baseline)



Source: DB Research  **15**

**Public debt in selected EMs**
Public debt, % of GDP (baseline)



Source: DB Research  **16**

**Historical variability in key debt dynamic variables**
Historical standard deviation, pp (2000-09 for DM, 2005-09 for EM)



*GDP-weighted.

Source: DB Research  **17**

*Baseline public-debt-to-GDP projections*

On a GDP-weighted basis public indebtedness in DMs will continue to rise substantially to 133% of GDP on average by 2020 (from 102% in 2010), according to our baseline projections. In EMs, the debt-to-GDP ratio will fall to 35%, from around 46% in 2010 (see Chart 14). Looking at specific countries in the DM world, Japan, Greece, the US, Portugal, Italy, the UK, Ireland and France will probably have debt-to-GDP ratios of over 100% in 2020. Noticeably, Italy is the only country in this group whose debt-to-GDP ratio looks set to remain more or less at the same level as today. In Australia, Denmark, Sweden and Belgium, debt-to-GDP ratios are forecast to decline (see Chart 12).

In EMs, 16 out of 21 countries will probably see public debt decline over the period 2011-20 (see Chart 13). This indicates that most EM countries will not be forced to cut spending and/or hike taxes significantly. Only in five countries (Romania, the Czech Republic, Turkey, Poland and Hungary) will fiscal adjustment be necessary in order to avoid increases in the public debt burden between 2010 and 2020. Overall, our baseline scenario projections suggest that unsustainable debt dynamics, which have traditionally been perceived as an EM problem,[9] are now increasingly becoming an issue for many DMs and not only for some smaller countries (Greece, Portugal, Ireland) but also for major economies such as Japan, the US and the UK (see Chart 15). Debt projections for single countries can be found in Table 1 in the Appendix.
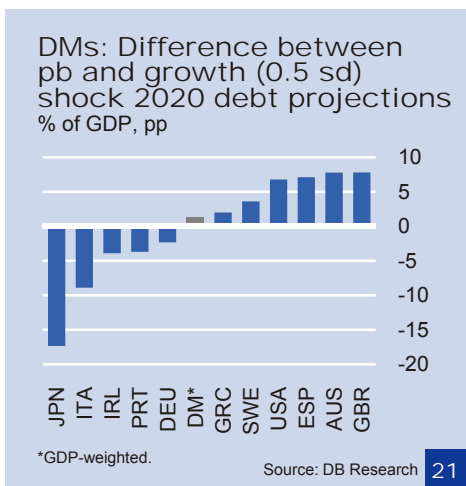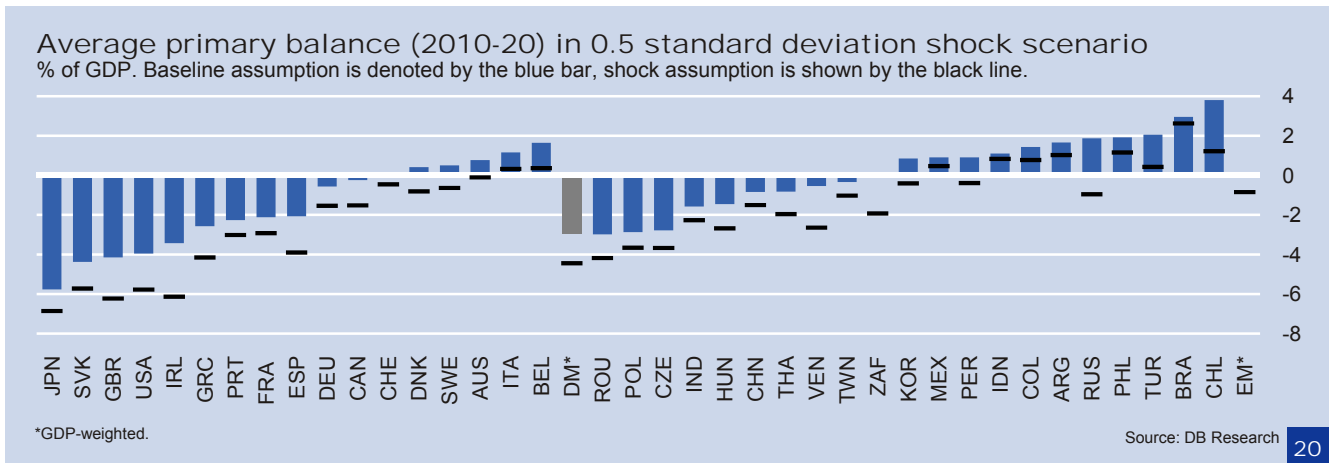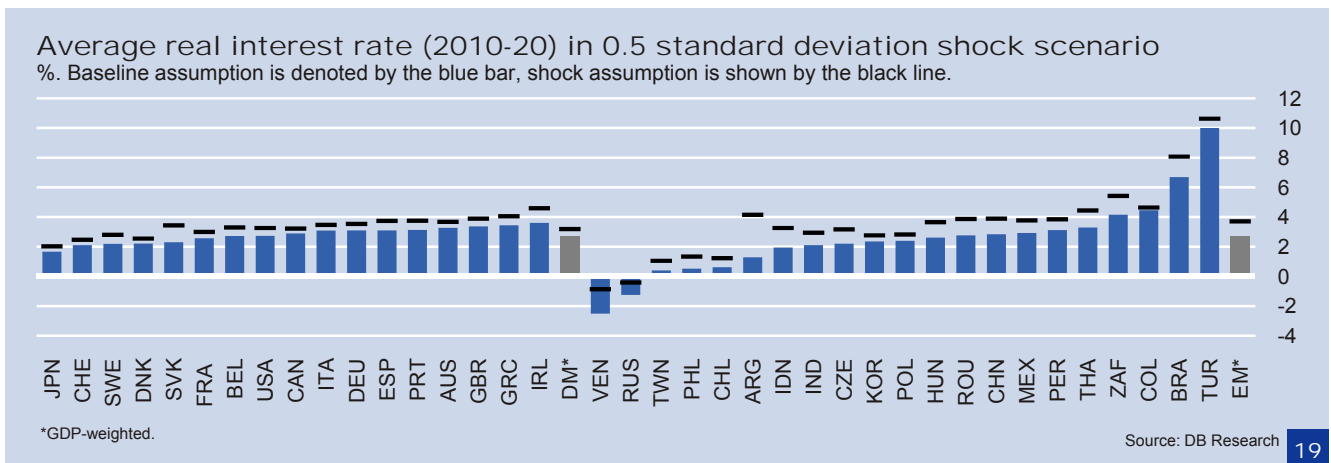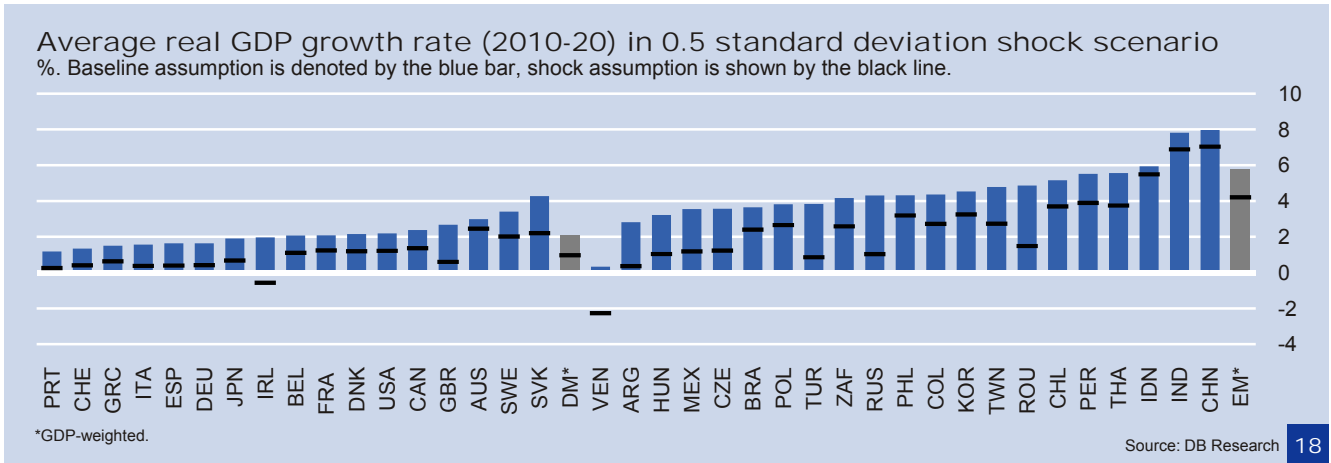
## (2) Shock scenarios

The world economy still faces serious downside risks. One should not forget that the current rebound has been mainly driven by extraordinary monetary and fiscal policy stimuli. We therefore show the likely path of public debt stocks in four alternative shock scenarios: a real GDP growth shock (a), a real interest rate shock (b), a primary balance shock (c) and a combined shock or multiple-variable shock scenario (d). The real GDP growth shock rate is calculated as our baseline forecast minus 0.5 historical standard deviation(s).[10] The same shock scenario assumptions are applied for the primary balances (with a negative sign) as well as real interest rates (with a positive sign). The combined shock is calculated as our baseline forecast minus (for real GDP growth and the primary balance) and plus (for real interest rates) 0.25 standard deviation(s). All shocks are assumed to persist throughout the whole period 2010-20. The underlying single-variable shock assumptions on real GDP growth, real interest rates and primary balances are shown in the charts 18, 19, and 20. Overall, our shock scenario methodology is broadly in line with the IMF's Article IV public debt sustainability framework.[11] For completeness, we also calculate the 2020 debt stock projections in a more severe 1 standard deviation (single variable) and 0.5 standard deviation (multiple variable) shock scenario. All shock scenario assumptions (i.e. the country-specific standard deviations of real GDP growth, real interest rates and primary balances) as well as all scenario debt-to-GDP outcomes are shown in Table 1 in the Appendix.
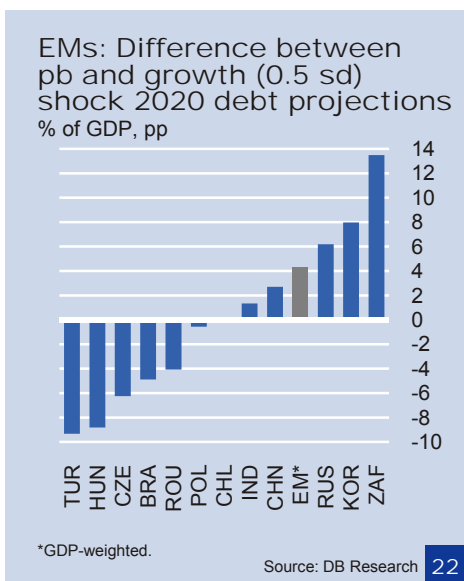
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9  See IMF (2003).

10  For DMs we use ten-year (2000-09) historical standard deviations. For EMs we use five-year (2005-09) historical standard deviations.

11  The IMF also assumes variables to persistently deviate from their baseline forecasts by half of a standard deviation in a single-variable shock and by one-quarter of a standard deviation in a multiple-variable shock scenario.

## Average real GDP growth rate (2010-20) in 0.5 standard deviation shock scenario

%. Baseline assumption is denoted by the blue bar, shock assumption is shown by the black line.



*GDP-weighted.

Source: DB Research    **18**

## Average real interest rate (2010-20) in 0.5 standard deviation shock scenario

%. Baseline assumption is denoted by the blue bar, shock assumption is shown by the black line.



*GDP-weighted.

Source: DB Research    **19**

## Average primary balance (2010-20) in 0.5 standard deviation shock scenario

% of GDP. Baseline assumption is denoted by the blue bar, shock assumption is shown by the black line.



*GDP-weighted.

Source: DB Research    **20**

### DMs: Difference between pb and growth (0.5 sd) shock 2020 debt projections

% of GDP, pp



*GDP-weighted.

Source: DB Research    **21**

**a) Real GDP growth shock scenario.** Here we assume growth to be permanently weaker than in our baseline scenario. Growth could turn out to be much weaker than currently anticipated for many reasons. First of all, the exit from monetary and fiscal stimuli could eventually lead to a return to recession as private-sector demand will not be able to fill the gap because of ongoing develeraging. Moreover, sovereign overborrowing, international trade disputes, high commodity prices, and/or untackled population ageing issues could turn out to weigh much more-than-expected on medium-term growth. As a result, EM public debt would on a GDP-weighted average reach 40% of GDP in 2020 (vs. 35% in the baseline and 46% currently), while DM debt would soar to almost 150% of GDP (vs. 133% in the baseline and 102% currently).

**EMs: Difference between
pb and growth (0.5 sd)
shock 2020 debt projections**
% of GDP, pp



*GDP-weighted.

Source: DB Research  **22**

**DM governments are facing
enormous fiscal challenges**
Public debt, % of GDP, GDP-weighted



09 10 11 12 13 14 15 16 17 18 19 20

— Baseline
— GDP shock
— Interest rate shock
— Primary balance shock
-- Combined shock

Shocks are of 0.5 sd (single variable shock) and
0.25 sd (combined shock).

Source: DB Research  **23**

**Public debt trends appear
much more benign in EMs**
Public debt, % of GDP, GDP-weighted



09 10 11 12 13 14 15 16 17 18 19 20

— Baseline
— GDP shock
— Interest rate shock
— Primary balance shock
-- Combined shock

Shocks are of 0.5 sd (single variable shock) and
0.25 sd (combined shock).

Source: DB Research  **24**

*b) Real interest rate shock scenario.* As we assume that governments will be only able to gradually improve their public finances over time, sovereigns will have to continue issuing large amounts of debt. Fortunately, record issuance volumes have not yet led to significantly higher real interest rates. However, record-high sovereign borrowing could eventually swamp financial markets and thus drive real interest rates up. In such a real interest rate shock scenario EM debt in 2020 would still be much lower than today (approx. 38% vs. 35% in the baseline and 46% currently). Although the picture would be not as dramatic as in a growth shock scenario, the DM (GDP-weighted) debt-to-GDP ratio would be still six percentage points higher compared to the baseline (approximately 139% vs. 133% in the baseline). Generally, our applied real interest rate shocks lead to lower public debt-to-GDP outcomes than our real GDP growth shocks. The reason for this is that historical standard deviations are much lower for real interest rates than for real GDP growth rates (see Chart 17). It goes without saying that real interest rates could of course rise much more significantly than captured in our interest rate shock scenario, which is based on relatively low historical variation in real interest rates. However, one key factor that could prevent too drastic an increase in global real interest rates is the existence of global excess money supply.
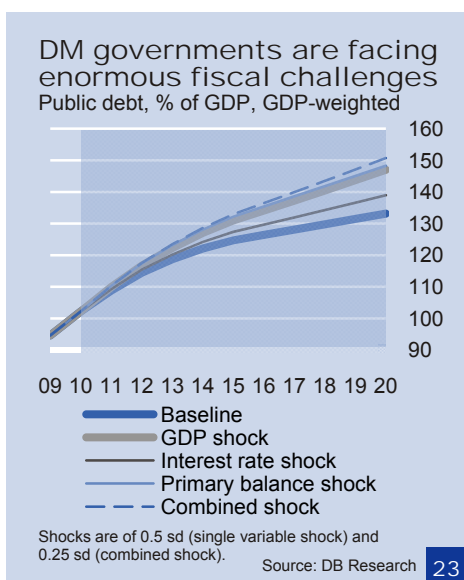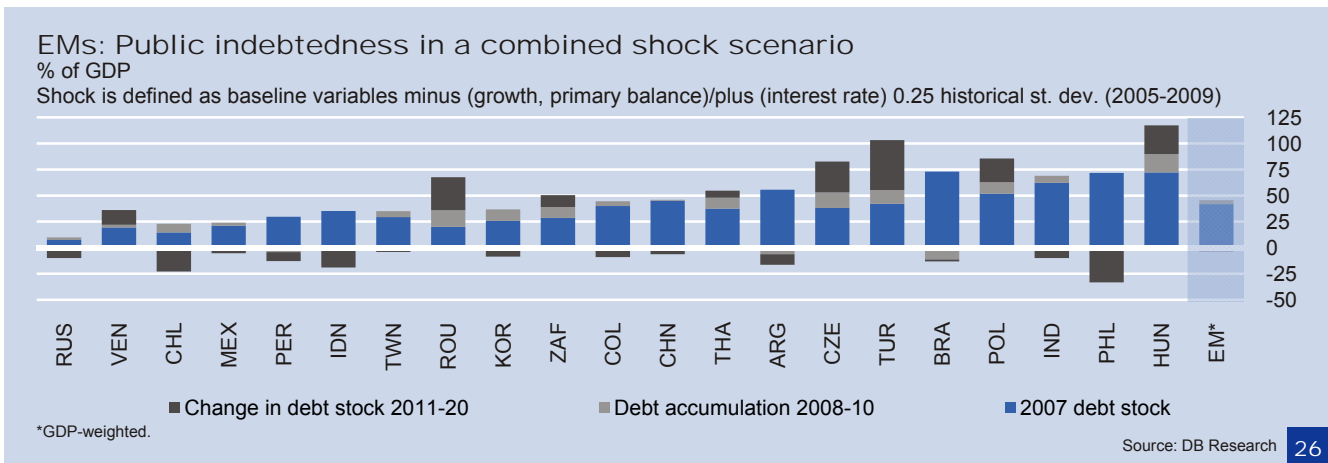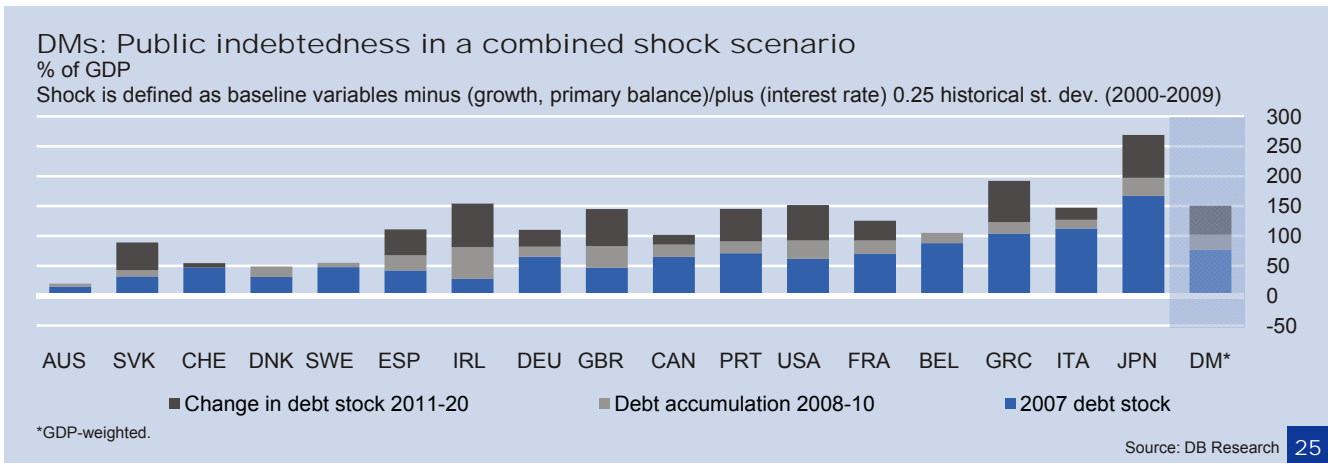
*c) Primary balance shock scenario.* A change in governments in some EM and DM countries and/or the need for further public support for the banking system are factors that could lead to a renewed deterioration in public finances and hence effectively prevent any fiscal consolidation over the next couple of years. In this scenario, EM public debt would reach 44% of GDP in 2020, compared with 35% in the baseline scenario and 46% today. For DMs, public debt levels would rise to similar levels as in the GDP growth shock scenario (i.e. 148% vs. 147% in the growth shock scenario). However, the difference between both shock scenarios can be wide for individual countries (see charts 21 and 22). For example, the UK and the US seem to be more susceptible to a primary balance shock than to a growth shock (8 and 7 pp), while the reverse is true for Japan (17 pp) and Italy (9 pp).
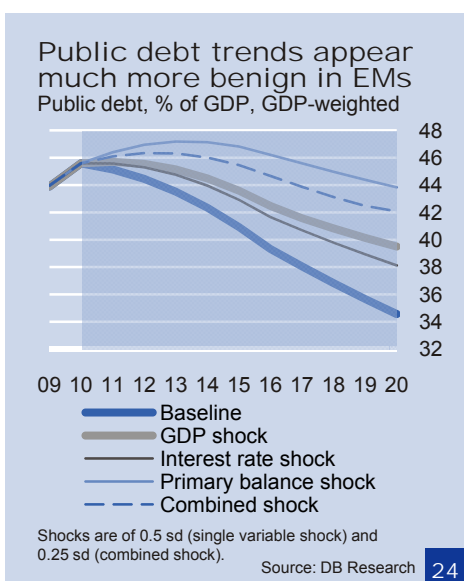
*d) Combined shock scenario.* Taking into account a situation in which different shocks occur at the same time, we finally describe a combined shock scenario. As our combined shock scenario permanently affects real GDP growth, real interest rates, and primary balances at the same time, all three variables are assumed to deviate by 0.25 standard deviations from their baseline projections. Under this shock, aggregate EM debt would end up at 42% of GDP in 2020, still lower than today's 46%. In DMs, public indebtedness would rise to 151% of GDP by 2020 vs. 133% in the baseline and 102% today. A look at individual countries shows that only Australia and Sweden would be still able to keep their 2020 combined shock debt level significantly below their 2010 debt stock.

To sum up, advanced economies perform much worse than EMs in terms of debt sustainability, in both our baseline and shock scenarios (see charts 23 and 24). Moreover, public debt sustainability has not only become an issue for a tiny group of smaller crisis-struck countries but in particular for major DMs such as Japan, the US and the UK (see Chart 12). A caveat, however, should be noted. Given that calculations for EMs are to a large extent based on 2005-09 averages and for DMs on 2000-09 averages, we implicitly extrapolate recent structural improvements in many EM countries (such as central bank independence or more

transparent and responsible fiscal policies). This assumption might eventually turn out to be too optimistic in a scenario of persistently high risk aversion on the part of investors, persistently stagnating domestic demand in major DM economies, bursting bubbles in some EM countries, or other home-grown EM crises. Moreover, it remains to be seen whether subdued domestic demand in major DMs can be substituted for by rising domestic demand in major EMs. Additionally, many EM countries may choose to increase the relative size of government spending/revenue at a higher stage of economic development.

**DMs: Public indebtedness in a combined shock scenario**
% of GDP
Shock is defined as baseline variables minus (growth, primary balance)/plus (interest rate) 0.25 historical st. dev. (2000-2009)



■ Change in debt stock 2011-20    ■ Debt accumulation 2008-10    ■ 2007 debt stock
*GDP-weighted.                                                                            Source: DB Research  **25**

**EMs: Public indebtedness in a combined shock scenario**
% of GDP
Shock is defined as baseline variables minus (growth, primary balance)/plus (interest rate) 0.25 historical st. dev. (2005-2009)



■ Change in debt stock 2011-20    ■ Debt accumulation 2008-10    ■ 2007 debt stock
*GDP-weighted.                                                                            Source: DB Research  **26**

***Looking beyond 2020: DM/EM sample debt matrices***

Because of our central assumption of a gradual exit from expansionary fiscal policies the bulk of public debt increases will occur between 2010 and 2015. Over this period our baseline forecasts show rising debt-to-GDP ratios for almost all countries. However, when real GDP growth rates, real interest rates and primary balances are assumed to return to their medium-term paths, public-debt-to-GDP ratios will likely start to fall in many EM and some DM countries. In the following, we seek to shed some light on likely public debt trends beyond 2020. To single out countries with structural fiscal strengths/weaknesses we group our EM and DM samples according to (a) the 2020 baseline debt-to-GDP ratio (low, medium, high) and to (b) the baseline long-term debt trend (falling, stable, increasing). The thresholds are set as follows: (I) debt below the first quartile of the empirical 2020 debt distribution is classified as low, (II) debt between the first and the third quartile is considered medium and (III) debt levels above the sample distribution's third quartile are considered to be high.

## Public debt 2020 matrix 1: Developed markets

| Level, % of GDP/Tendency | Low (debt ratio<73.7) | Medium (73.7<debt ratio<131.4) | High (debt ratio>131.4) |
|---|---|---|---|
| Falling | Australia, Denmark, Sweden, Switzerland | Belgium, Canada | Italy |
| Stable | | Germany, Ireland, Spain | |
| Increasing | | France, Slovakia, UK | Greece, Japan, Portugal, USA |

Source: DB Research **27**

## Public debt 2020 matrix 2: Emerging markets

| Level, % of GDP/Tendency | Low (debt ratio<20) | Medium (20<debt ratio<52.2) | High (debt ratio>52.2) |
|---|---|---|---|
| Falling | Chile, Indonesia, Mexico, Peru, Russia | Argentina, Brazil, China, Colombia, Philippines, South Africa, South Korea, Taiwan, Thailand, Venezuela | India |
| Stable | | | Poland |
| Increasing | | | Czech Republic, Hungary, Romania, Turkey |

Source: DB Research **28**

### Real GDP growth - real interest rate differential*
Percentage points
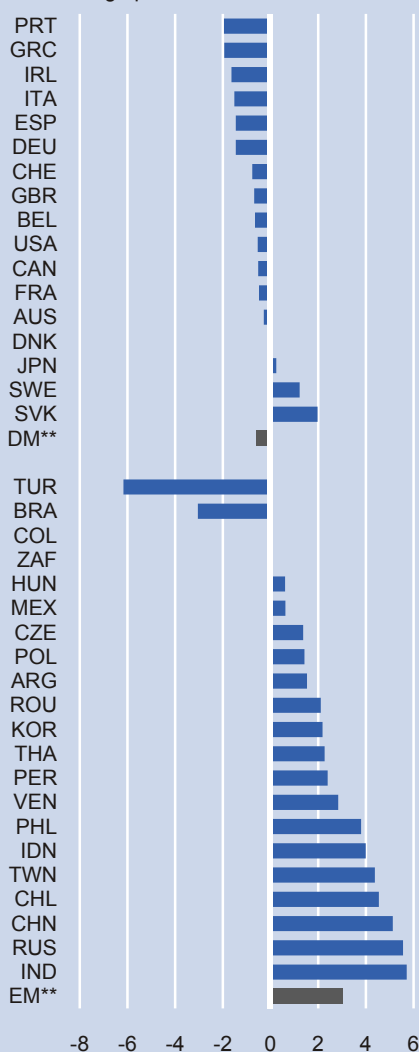


*Based on average 2010-20 forecasts.
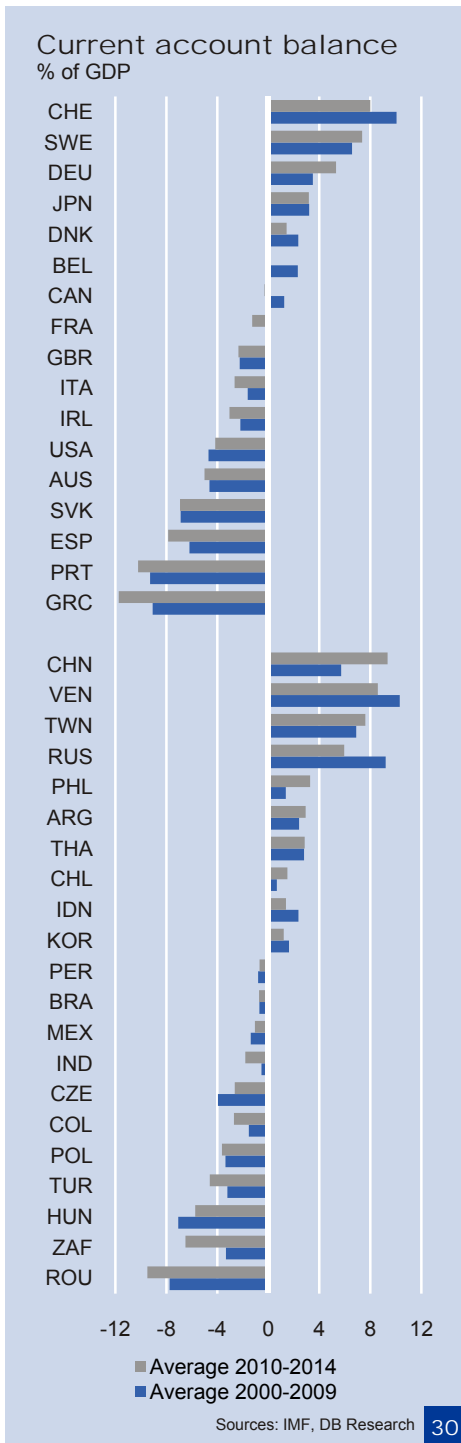**GDP-weighted.

Source: DB Research **29**

As regards these thresholds, it is important to bear in mind that this classification is based on our 2020 public-debt-to-GDP baseline projections and not on current debt stocks. Moreover, the debt classification of a country is to be seen relative to other peer economies and not in absolute terms. Hence, a DM country's 2020 baseline debt stock of close to (but below) 131.4% of GDP is only relatively medium compared to other DMs but of course very high in absolute terms and historically (see matrices 1 and 2 above). We differentiate between our DM and EM samples because of the still very different debt structures.
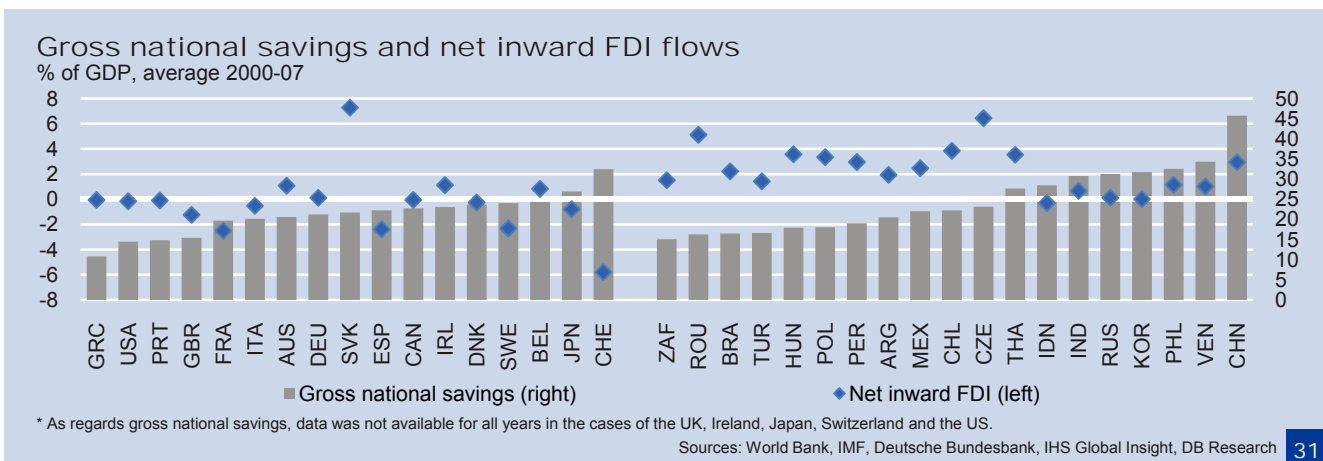
The DM countries that are in the most unfavourable group of countries with high (2020 baseline) and increasing public-debt-to-GDP ratios are Greece, Japan, Portugal and the US. The fourth DM with a relatively high 2020 debt burden is Italy. However, in Italy the public-debt-to-GDP ratio shows to a (slightly) falling trend beyond 2020. Although it is important to keep in mind that a rising debt-to-GDP ratio (which is already significantly above prudent thresholds) does not necessarily imply that a country will become unable to meet its debt obligations, high debt can negatively affect a country's growth performance.[12] In turn, lower growth may then cause further fiscal difficulties and hence the debt-to-GDP ratio to rise further. Among the DMs with medium and increasing (stable) debt-to-GDP ratios are France, Slovakia and the UK (Germany, Ireland and Spain). Although their debt levels are classified as medium, it should be kept in mind that the public-debt-to-GDP ratios for all those countries (except for Slovakia) are forecast to exceed 90% in 2020, which is far above the 60% Maastricht debt threshold. In the EM world, the Czech Republic, Hungary, Romania, and Turkey are in the most unfavourable group (high/rising), while Poland and India will have high but stable and falling 2020 debt stocks, respectively. Although India's baseline 2020 debt-to-GDP ratio of slightly above 50% will be much lower than today, it will be still high compared to other EM peers. Finally, the outperformers among the DMs and EMs with low and falling debt-to-GDP ratios are Australia, Denmark, Sweden and Switzerland as well as Chile, Indonesia, Mexico, Peru and Russia (see matrices 1 and 2 above).
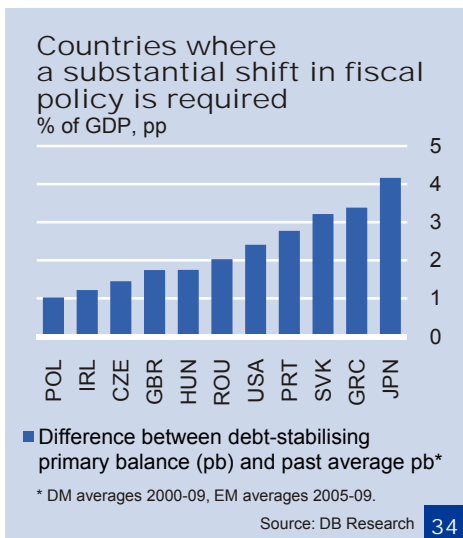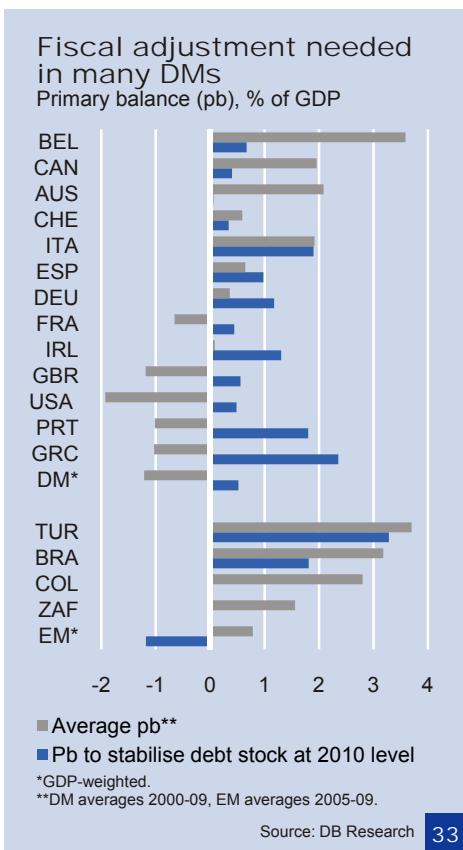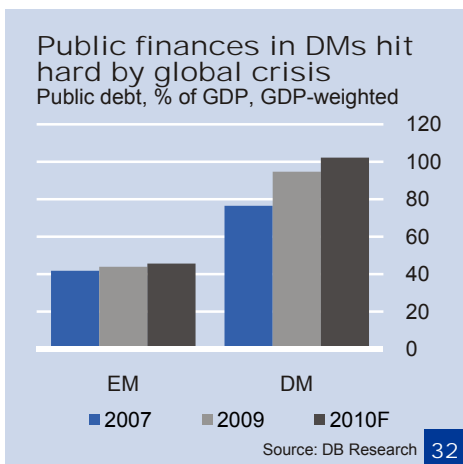
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[12] See Reinhart, Carmen M. and Kenneth S. Rogoff (2009).

## Current account balance
% of GDP



■ Average 2010-2014
■ Average 2000-2009

Sources: IMF, DB Research   **30**

As regards the DMs and EMs with the highest 2020 baseline debt levels, it is important to bear in mind that our country groupings are solely based on the public-debt-to-GDP ratio (low/medium/high) and its underlying trend (falling/stable/high). This means that we do not take other crucial debt characteristics into account (i.e. domestic vs. foreign currency, internal vs. external as well as the maturity and interest payment profile). It goes without saying that a country's fiscal vulnerability to financial and/or economic shocks hinges crucially on such aspects. For instance, a country with an independent monetary policy and the ability to issue in domestic currency and at long maturities (as e.g. the US and Japan) is in a much better position to cope with possible shocks than a country without monetary independence but heavily reliant on external and/or short to medium-term funding (such as Greece or Portugal).

Additionally, the national savings rate as well as the intertemporal current account dynamics of an economy are of great importance to fiscal sustainability. Governments of countries that run large current account deficits (mainly funded by external debt-creating inflows because of low domestic savings and/or low net FDI) are worse off than governments that are able to finance the bulk of their deficits domestically. As regards the five DMs with high debt-to-GDP ratios (Italy, Greece, Portugal, Japan and the US), Greece and Portugal are again the weakest link. While Italy and especially Japan are currently able to finance public deficits mainly internally thanks to still relatively high gross national savings rates (though savings are set to decline due to population ageing), Greece and Portugal cannot rely on large domestic savings (see Chart 31). Moreover, the Greek economy faces difficulties in reducing its heavy reliance on external funding over the short to medium term. Past external deficits were mainly the result of surging private consumption, high public deficits and only to a lesser extent of investment activity. As consumption spending is not generating future cash flow (i.e. trade surpluses) to pay back external debt, the Greek and Portuguese current accounts are likely to remain in deficit. Unlike Greece and Portugal, most EMs with high public-debt-to-GDP ratios and relatively low savings rates and/or sizeable external deficits are characterised by ongoing capital accumulation thanks to substantial inward FDI flows (as e.g. Poland, the Czech Republic, Romania, Hungary and Turkey). Significant inward FDI inflows and the related knowledge transfer create the potential to generate sufficient future trade surpluses to pay back external debt and to gradually increase domestic savings. This will in turn contribute to a broadening of the tax base and hence is likely to boost public revenue (see Chart 31).

## Gross national savings and net inward FDI flows
% of GDP, average 2000-07



■ Gross national savings (right)          ◆ Net inward FDI (left)

* As regards gross national savings, data was not available for all years in the cases of the UK, Ireland, Japan, Switzerland and the US.

Sources: World Bank, IMF, Deutsche Bundesbank, IHS Global Insight, DB Research   **31**

## 4. How much fiscal action is required?

In many countries rising public-debt-to-GDP ratios imply the risk of increasing pressure on sovereign financing capacity, creditworthiness and hence ratings. A "positive" shock, which we have not yet discussed, would be triggered by unexpectedly strong but well-balanced fiscal consolidation. Should economies show signs of a more durable recovery, or – more gloomily – should market and rating agencies' pressure itensify, such a scenario would not look that far-fetched. But how much adjustment is needed? This depends on the current and desired debt level. As "desired" debt targets we use three different benchmarks:

*(1) Stabilising current (2010) debt levels,* as preventing further increases could send a positive signal about fiscal prudency.

*(2) Pre-crisis (2007) debt levels,* to be attained in 5-10 years' time.

*(3) Prudential public-debt-to-GDP benchmarks* (of 60% for DMs and 40% for EMs), to be attained over a 10-year period.
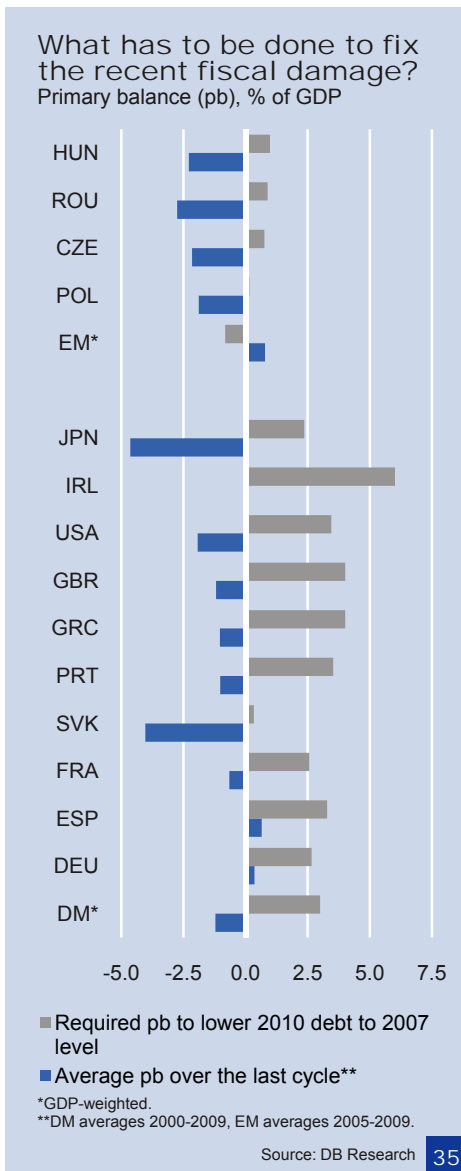
All country-specific consolidation requirements to lower debt to the three debt targets are shown in Table 2 in the Appendix. For arithmetic details see Box 1 section (b) and (c) in the Appendix.

### (1) Restoring fiscal credibility: Stabilising debt levels

To stabilise debt at 2010 levels, EM countries – on aggregate – could run a primary fiscal deficit of 1.2% of GDP each year. For the past five years, these countries have run a primary surplus of 0.8%, so the stabilisation of debt appears to be easily manageable. Of course, there are country-by-country differences. Turkey and Brazil, for instance, would need to deliver a substantial permanent primary surplus to stabilise their debt. However, in both EMs the required primary surpluses are largely in line with what was achieved over the last cycle. With respect to our DM sample, 13 of the 17 countries need to run constant primary surpluses in order to stabilise their 2010 public-debt-to-GDP ratios. For the aggregate DM sample, governments have to run a surplus of 0.5%. This looks ambitious in a historical comparison: in the past decade, DMs ran an average primary deficit of 1.2%. Again, the country-by-country analysis shows significant differences and some silver lining. For example, crisis-struck countries like Spain, the UK and the US could stabilise their 2010 public-debt-to-GDP ratio by running only moderate permanent primary surpluses. Nevertheless, the gap between the primary balance achieved over the last cycle and the debt-stabilising primary balance indicates that many DM and a few EM governments have to significantly alter their fiscal policy stance. This is also true for countries that could continue to run primary deficits to stabilise debt levels. In Japan, Greece, Slovakia, Portugal, the US, Romania, Hungary, the UK, the Czech Republic, Ireland and Poland (consolidation needs by decreasing size) the debt-stabilising permanent primary balance is at least one percentage point above the average figure of the last cycle (see charts 33 and 34).

### (2) Lowering debt to pre-crisis levels

Here we discuss the permanent primary fiscal balances required to bring current (2010) public-debt-to-GDP ratios back to pre-crisis levels (2007) within five or ten years' time. Nearly all DMs (16 out of 17, with Switzerland as exception) have to achieve constant primary surpluses of 1-12% of GDP in order to lower public-debt-to-GDP ratios to pre-crisis levels over the next five years. If spread over ten

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**Public finances in DMs hit hard by global crisis**
Public debt, % of GDP, GDP-weighted



■ 2007  ■ 2009  ■ 2010F

Source: DB Research **32**

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**Fiscal adjustment needed in many DMs**
Primary balance (pb), % of GDP



■ Average pb**
■ Pb to stabilise debt stock at 2010 level
*GDP-weighted.
**DM averages 2000-09, EM averages 2005-09.

Source: DB Research **33**

---

**Countries where a substantial shift in fiscal policy is required**
% of GDP, pp



■ Difference between debt-stabilising primary balance (pb) and past average pb*

* DM averages 2000-09, EM averages 2005-09.

Source: DB Research **34**

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**What has to be done to fix the recent fiscal damage?**
Primary balance (pb), % of GDP



- Required pb to lower 2010 debt to 2007 level
- Average pb over the last cycle**

*GDP-weighted.
**DM averages 2000-2009, EM averages 2005-2009.

Source: DB Research **35**

**Debt reduction is the name of the game in most DMs**
Primary balance (pb), % of GDP



- Pb to reach 60% debt limit in 10 years
- Pb to reach pre-crisis debt level in 10 years
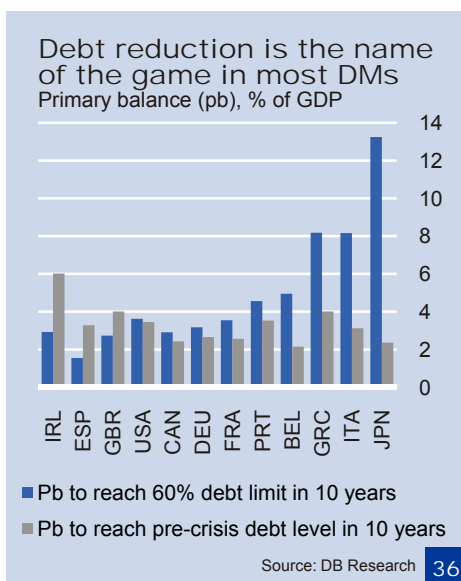
Source: DB Research **36**

years, the required adjustment ranges from 1-6% of GDP for 13 out of 17 DMs. The consolidation needs are largest in Japan, Ireland, the US, the UK, Greece, Portugal, Slovakia, France, Spain and Germany. This holds true in absolute terms and/or relative to what has been achieved over the past years. Contrary to most DMs and in line with the scenario results of Chapter 3, debt reduction to 2007 levels does not appear challenging for most EMs, according to the average primary balance achieved over the last cycle. The only exceptions are Poland, the Czech Republic, Hungary and Romania. These countries need a tangible improvement on their primary balances to reach their pre-crisis indebtedness (see Chart 35).

However, pre-crisis indebtedness is not necessarily a meaningful benchmark for the analysis of debt sustainability. Especially for those countries where the difference between the public debt levels in 2010 and 2007 is small and/or where the pre-crisis debt stock was already elevated, the focus on pre-crisis levels may not show the true sacrifice required to cut public-debt-to-GDP ratios back to more sustainable levels. Thus, we also calculate the permanent adjustment needed on the primary balance to lower public debt to benchmarks considered prudent.
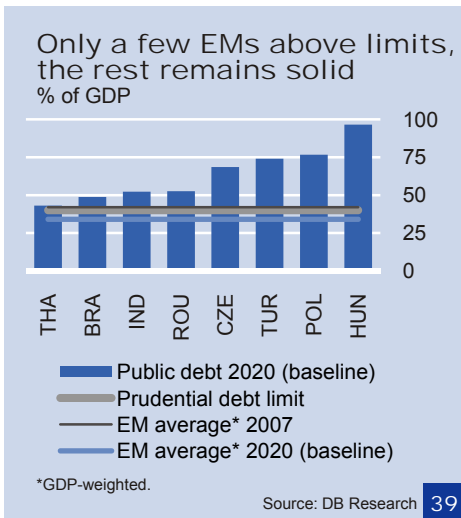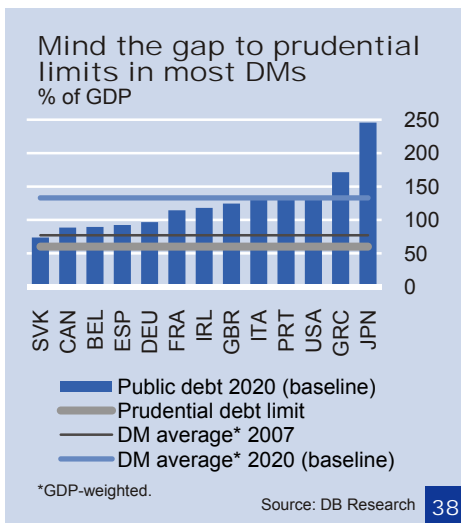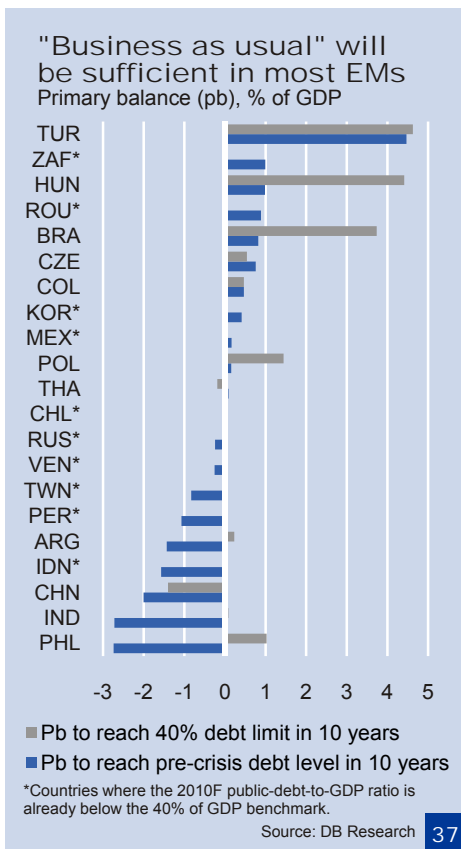
### (3) Lowering debt to prudential benchmark levels

As benchmarks and in line with the IMF's calculations we use public-debt-to-GDP ratios of 60% and 40% for DMs and EMs, respectively. Other benchmarks are also perceivable and economic theory offers no widely accepted public-debt-to-GDP limits. Although the 60% limit for DMs (also part of the Maastricht treaty) has some theoretical justification, it could be considered arbitrary. For EMs we use a limit of 40% of GDP, which is often suggested as a critical external debt limit.[13] At least up to now there are several reasons that support this discount for EMs (e.g. more unfavourable debt structure, higher exchange rate and market access risks).

In our sample only 5 of 17 DMs (Australia, Slovakia, Switzerland, Denmark and Sweden) have public-debt-to-GDP ratios of below 60%. In fact most DM countries, including major economies and most major EMU and EU countries, have debt stocks well above this benchmark. Germany, the UK, the US, France, Portugal, Belgium, Greece and Italy would have to achieve constant annual primary surpluses of 2.5-8% of GDP over the next ten years to reach a public-debt-to-GDP ratio of 60% (see Chart 36). Moreover, the debt-reducing primary balances are extremely demanding (with the exception of Belgium and Canada) in relation to past averages. Compared to the last decade these countries will have to improve their primary balances by 2-7 percentage points. By contrast, in the EM world there seems no widespread need for sharp fiscal consolidation. Nevertheless, fiscal challenges in the EMs should not be underestimated. Within our sample only ten out of 21 EMs have public-debt-to-GDP ratios below our 40% benchmark. However, compared to DMs the efforts required to reach prudential levels look much more manageable (see Chart 37). Only Romania, Hungary, Poland and the Czech Republic would have to alter their fiscal policy stance substantially. However, these EMs enjoy the prospect of joining EMU and hence of migrating to the DM segment. As EMU members they would be able to issue public debt in a global reserve currency. Thus, the 60% debt limit, well within reach except for Hungary, appears to be a more appropriate benchmark to them.

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[13]  See IMF (2009) and Reinhart, Carmen M. et al. (1999).

## "Business as usual" will be sufficient in most EMs
Primary balance (pb), % of GDP



■ Pb to reach 40% debt limit in 10 years
■ Pb to reach pre-crisis debt level in 10 years

*Countries where the 2010F public-debt-to-GDP ratio is already below the 40% of GDP benchmark.

Source: DB Research **37**

## Mind the gap to prudential limits in most DMs
% of GDP



■ Public debt 2020 (baseline)
━ Prudential debt limit
━ DM average* 2007
━ DM average* 2020 (baseline)

*GDP-weighted.

Source: DB Research **38**

## Only a few EMs above limits, the rest remains solid
% of GDP



■ Public debt 2020 (baseline)
━ Prudential debt limit
━ EM average* 2007
━ EM average* 2020 (baseline)

*GDP-weighted.

Source: DB Research **39**

## Policy implications: Why our debt target analysis matters!

At this juncture we want to stress that public debt ratios above 60% (40%) of GDP do not necessarily imply a crisis. Many DMs and EMs have not (de jure) defaulted despite having borne relatively high debt. However, debt ratios well above these limits and/or on a rising trend certainly increase the risk of market repercussions. At the moment, this applies in particular to DMs. Moreover, the outlook for public debt levels above the 60% benchmark, on the rise and substantially above past levels in a lot of DMs has several implications (see chart 38).

Firstly, record volumes of sovereign issuance will have to be absorbed. This holds true even if some consolidation will be achieved. Thus, regulatory pressure on FIs to absorb this issuance might increase. Moreover, countries with public debt well above benchmarks might suffer from crowding-out effects or may have to accept substantially higher risk premia. Although for some DMs (including EMU members) such risk repricing may be desirable from an economic point of view (i.e. to enforce fiscal discipline), it will complicate the task of preserving public debt sustainability in the short run. Secondly, the credibility of institutional arrangements like national debt limits in DMs or the EU's Maastricht treaty as well as the Stability and Growth Pact will be under pressure for years. Thirdly, the fiscal challenges in many DMs may revitalise the long-standing debate on the establishment of ex-ante instruments to deal with sovereign debt problems. Concepts to enforce an insolvency law for sovereign debtors or to establish the IMF as a sovereign bankruptcy trustee (traditionally developed in times of EM crisis) could gain more acceptance. Some country groups like the Asian countries or the EU/EMU may also opt for similar ex-ante safeguards, i.e. the creation of an Asian or European Monetary Fund (EMF). Such institutional improvements may help to mitigate cross-border externalities and moral hazard problems that are inherent to ex-post bail-outs. As the design of a potential EMF will have to be part of the current European institutional framework, its design and funding are likely to be partially based on the Maastricht framework. Thus, countries with a public-debt-to-GDP ratio higher than 60% and/or fiscal deficits above 3% of GDP would have to contribute to its funding.[14] Our debt target analysis clearly shows that all major EU/EMU members would be contributors for many years. This would help to equip such an institution with adequate capital. Fourthly, our debt target analysis gives some tentative insight on potential pressures on DM sovereign creditworthiness in the absence of credible consolidation plans along the lines of the sketched requirements. Failure to consolidate could have serious implications for rated quasi-sovereign and private sector entities.

The ulimate bearer of the sketched adjustment costs (e.g. through higher income taxation) is the population, i.e. the electorate of a country. Thus, the quality of policymaking will be crucial in the years ahead. Being aware of this, governments may want to "ringfence" fiscal consolidation from political pressure using (more) effective institutional arrangements such as limits on public indebtedness. This may also help to anchor financial market expectations. Ironically, DMs could capitalise on past EM experience in this field.[15]

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[14]  A concept for the design of a Euro(pean) Monetary Fund is presented in Gros, Daniel and Thomas Mayer (2010).

[15]  See Gleich (2003), Koen and van den Noord (2005) as well as Schick (2003).

# 5. Conclusion

Although there is a strong need for medium-term fiscal consolidation in many DMs and a few EMs, one should not forget that expansionary policies mitigated the adverse effects of the global crisis and very likely prevented a collapse of the global financial system and the world economy. At the moment, it appears that a fiscal exit can take place only gradually. Our 2020 scenarios as well as our debt target analysis highlight that public debt has become, or is at least at the risk of becoming, unsustainable in many DMs but only in a few EMs. At least in theory, most EMs could afford to run looser fiscal policies, for instance by extending counter-cyclical fiscal policies in order to smooth the fall-out from the global crisis. Moreover, moderate initial debt levels put them in a relatively comfortable position to stabilise or even outgrow their debt-to-GDP ratios.
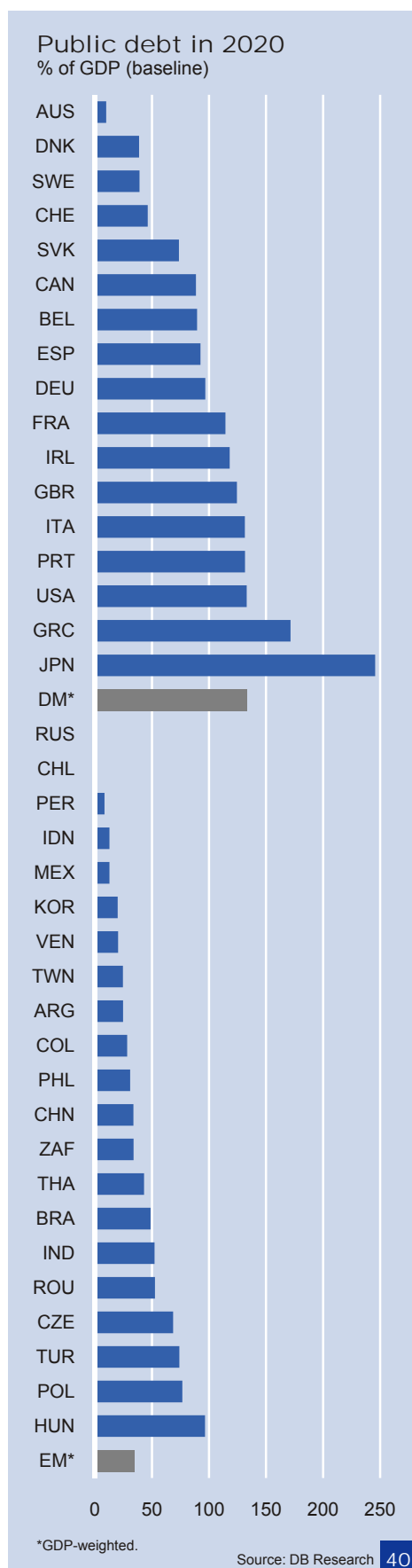
As regards our scenario analysis in Chapter three, only austere and bold fiscal policy adjustments after the worst of the crisis is over, which may lay the foundations for higher potential real GDP growth, lower real interest rates and improved fiscal accounts, would significantly alter the presented public debt dynamics. Chapter four indicates the potential scope of austere fiscal policies. For some countries the permanent primary balances required to stabilise or even reduce public-debt-to-GDP ratios look very ambitious. However, the feasibility of achieving better outcomes than those presented in our baseline scenario should not be neglected, at least for some economies. For example, Germany was able to run a primary surplus of 1.3% of GDP on average in nine years during the last two decades. Between 1984 and 1990, Germany was even able to run a primary surplus for seven consecutive years. Thus, the ability to stabilise public debt ratios or to bring them closer to our prudential benchmarks should not generally be underestimated. This holds true for both DM and EM countries. Nevertheless, the required economic and political efforts to consolidate public finances might be much greater than in the past. Overall, medium-term fiscal consolidation is more likely to occur in a supportive macroeconomic environment. During an economic downturn or recession, rising tax rates may not suffice to substantially increase the tax-to-GDP ratio.

Should consolidation fail, policymakers in DMs and some EMs may be tempted to look for other ways to fix the fiscal damage. Either they could tolerate a substantial acceleration in CPI inflation to inflate public debt and/or they risk severe adjustments in the real effective exchange rate. Such adverse scenarios should not be disregarded. The assumption that major macro issues cannot go wrong in the DM world (including EMU) has to be scrapped in the aftermath of the global crisis while this time EM, not DM, economies are the ones in the lead to keep public indebtedness sustainable. Welcome to a new world!

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Sandra Stankiewicz

**Public debt in 2020**
% of GDP (baseline)

Countries (top to bottom): AUS, DNK, SWE, CHE, SVK, CAN, BEL, ESP, DEU, FRA, IRL, GBR, ITA, PRT, USA, GRC, JPN, DM*, RUS, CHL, PER, IDN, MEX, KOR, VEN, TWN, ARG, COL, PHL, CHN, ZAF, THA, BRA, IND, ROU, CZE, TUR, POL, HUN, EM*

Axis: 0 50 100 150 200 250

*GDP-weighted.

Source: DB Research  40

# Appendix

| | Table 1: Public debt sustainability analysis | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Permanent real GDP growth shock | | | | Permanent real interest rate shock | | | | Permanent primary balance shock | | | | Permanent shock in all three variables (combined shock) | |
| | Baseline Scenario | 1/2 st. dev. | 1 st. dev. | 1/2 st. dev. | 1 st. dev. | 1/2 st. dev. | 1 st. dev. | 1/2 st. dev. | 1 st. dev. | 1/2 st. dev. | 1 st. dev. | 1/2 st. dev. | 1 st. dev. | 1/4 st. dev. | 1/2 st. dev. |
| | 2020 debt (% of GDP) | Real GDP growth, pp | | 2020 debt (% of GDP) | | Real interest rate, pp | | 2020 debt (% of GDP) | | Primary balance, pp | | 2020 debt (% of GDP) | | 2020 debt (% of GDP) | |
| AUS | 10 | 0.5 | 1.1 | 11 | 12 | 0.4 | 0.8 | 11 | 11 | 0.9 | 1.7 | 19 | 27 | 15 | 21 |
| DNK | 39 | 1.0 | 1.9 | 44 | 49 | 0.3 | 0.7 | 40 | 42 | 1.2 | 2.4 | 51 | 63 | 48 | 59 |
| SWE | 39 | 1.4 | 2.8 | 46 | 54 | 0.6 | 1.2 | 42 | 45 | 1.1 | 2.3 | 50 | 60 | 50 | 61 |
| CHE | 46 | 0.9 | 1.9 | 51 | 56 | 0.4 | 0.7 | 48 | 50 | 0.6 | 1.1 | 52 | 58 | 52 | 59 |
| SVK | 74 | 2.1 | 4.1 | 85 | 99 | 1.1 | 2.3 | 80 | 86 | 1.3 | 2.7 | 86 | 98 | 89 | 107 |
| CAN | 89 | 1.0 | 2.0 | 99 | 110 | 0.3 | 0.6 | 92 | 95 | 1.3 | 2.6 | 102 | 115 | 102 | 116 |
| BEL | 90 | 1.0 | 1.9 | 100 | 112 | 0.6 | 1.1 | 96 | 102 | 1.3 | 2.6 | 102 | 115 | 105 | 121 |
| ESP | 93 | 1.2 | 2.5 | 104 | 118 | 0.6 | 1.3 | 98 | 104 | 1.8 | 3.7 | 111 | 130 | 111 | 131 |
| DEU | 97 | 1.2 | 2.4 | 109 | 123 | 0.4 | 0.9 | 101 | 105 | 1.0 | 2.0 | 107 | 117 | 110 | 125 |
| FRA | 114 | 0.8 | 1.7 | 124 | 134 | 0.4 | 0.8 | 119 | 124 | 0.8 | 1.6 | 123 | 131 | 125 | 137 |
| IRL | 118 | 2.5 | 5.1 | 150 | 191 | 1.0 | 2.0 | 129 | 141 | 2.7 | 5.4 | 146 | 174 | 154 | 197 |
| GBR | 124 | 2.1 | 4.2 | 138 | 153 | 0.5 | 1.1 | 130 | 136 | 2.1 | 4.2 | 146 | 167 | 145 | 167 |
| ITA | 131 | 1.2 | 2.4 | 149 | 169 | 0.4 | 0.8 | 137 | 142 | 0.8 | 1.7 | 140 | 149 | 147 | 164 |
| PRT | 132 | 0.9 | 1.9 | 143 | 156 | 0.6 | 1.2 | 139 | 147 | 0.8 | 1.5 | 140 | 148 | 145 | 160 |
| USA | 133 | 1.0 | 2.0 | 145 | 158 | 0.5 | 1.1 | 139 | 146 | 1.8 | 3.6 | 152 | 171 | 152 | 172 |
| GRC | 171 | 0.9 | 1.8 | 186 | 202 | 0.6 | 1.2 | 181 | 191 | 1.6 | 3.2 | 188 | 205 | 192 | 215 |
| JPN | 246 | 1.2 | 2.5 | 274 | 306 | 0.4 | 0.7 | 253 | 262 | 1.1 | 2.2 | 256 | 267 | 269 | 294 |
| RUS[1] | 0 | 3.3 | 6.6 | 0 | 0 | 0.8 | 1.7 | 0 | 0 | 2.8 | 5.7 | 6 | 28 | 0 | 11 |
| CHL[3] | 0 | 1.5 | 2.9 | 0 | 0 | 0.6 | 1.2 | 0 | 0 | 2.6 | 5.2 | 0 | 21 | 0 | 2 |
| PER[5] | 8 | 1.6 | 3.3 | 12 | 15 | 0.7 | 1.4 | 10 | 11 | 1.3 | 2.6 | 20 | 32 | 17 | 26 |
| IDN[3] | 13 | 0.4 | 0.9 | 14 | 14 | 1.3 | 2.6 | 15 | 18 | 0.3 | 0.5 | 15 | 17 | 16 | 19 |
| MEX[4] | 13 | 2.4 | 4.7 | 18 | 25 | 0.8 | 1.7 | 15 | 16 | 0.4 | 0.9 | 17 | 21 | 19 | 25 |
| KOR | 20 | 1.3 | 2.6 | 23 | 28 | 0.4 | 0.8 | 21 | 22 | 1.3 | 2.5 | 31 | 43 | 28 | 37 |
| VEN[2] | 20 | 2.6 | 5.2 | 26 | 34 | 1.6 | 3.3 | 24 | 28 | 2.1 | 4.2 | 40 | 60 | 36 | 55 |
| TWN[6] | 25 | 2.1 | 4.1 | 30 | 36 | 0.6 | 1.3 | 26 | 28 | 0.7 | 1.4 | 30 | 36 | 31 | 38 |
| ARG[9] | 25 | 2.5 | 4.9 | 35 | 49 | 2.9 | 5.7 | 37 | 53 | 0.6 | 1.3 | 31 | 37 | 39 | 58 |
| COL[7] | 28 | 1.6 | 3.3 | 35 | 44 | 0.2 | 0.4 | 29 | 30 | 0.7 | 1.3 | 35 | 42 | 36 | 43 |
| PHL[11] | 31 | 1.1 | 2.3 | 36 | 41 | 0.8 | 1.6 | 34 | 38 | 0.8 | 1.5 | 37 | 44 | 38 | 47 |
| CHN[12] | 34 | 0.9 | 1.9 | 37 | 40 | 1.1 | 2.1 | 37 | 41 | 0.7 | 1.3 | 39 | 45 | 40 | 46 |
| ZAF[6] | 34 | 1.6 | 3.2 | 40 | 48 | 1.3 | 2.5 | 39 | 45 | 2.0 | 4.0 | 54 | 74 | 50 | 69 |
| THA[8] | 43 | 1.8 | 3.6 | 51 | 60 | 1.1 | 2.3 | 48 | 53 | 1.1 | 2.3 | 53 | 64 | 55 | 68 |
| BRA[10] | 49 | 1.2 | 2.5 | 57 | 67 | 1.4 | 2.8 | 58 | 69 | 0.3 | 0.7 | 53 | 56 | 60 | 72 |
| IND[3] | 52 | 0.9 | 1.9 | 56 | 61 | 0.8 | 1.7 | 56 | 60 | 0.7 | 1.4 | 58 | 63 | 59 | 66 |
| ROU | 53 | 3.4 | 6.8 | 67 | 88 | 1.1 | 2.2 | 57 | 62 | 1.2 | 2.4 | 63 | 74 | 68 | 86 |
| CZE | 69 | 2.3 | 4.7 | 83 | 101 | 1.0 | 1.9 | 74 | 80 | 0.9 | 1.8 | 77 | 85 | 83 | 99 |
| TUR | 74 | 3.0 | 6.0 | 105 | 149 | 0.6 | 1.3 | 79 | 85 | 1.6 | 3.3 | 96 | 118 | 103 | 139 |
| POL | 77 | 1.2 | 2.3 | 84 | 93 | 0.4 | 0.9 | 79 | 82 | 0.8 | 1.6 | 84 | 91 | 86 | 95 |
| HUN | 97 | 2.2 | 4.4 | 117 | 143 | 1.0 | 2.1 | 106 | 116 | 1.2 | 2.5 | 108 | 120 | 117 | 141 |
| DM* | 133 | 1.1 | 2.2 | 147 | 163 | 0.5 | 1.0 | 139 | 145 | 1.5 | 2.9 | 148 | 163 | 151 | 170 |
| EM* | 35 | 1.5 | 3.1 | 40 | 46 | 1.0 | 2.0 | 38 | 42 | 1.0 | 1.9 | 44 | 49 | 42 | 51 |

For OECD countries public debt and fiscal data are taken from the Economic Outlook database. For non-OECD countries data are taken from the IADB, IIF, IMF, Eurostat databases, national sources or DB Research. Public debt and fiscal statistics refer to general government if not specified otherwise by footnotes (for detailed information please see Box 2).
* GDP-weighted.

Sources: OECD, IADB, IIF, IMF, Eurostat, national sources, DB Research

## Table 2: Public debt sustainability analysis

| | Average real GDP growth rate (2010-2020 fore-cast), % | Average real interest rate (2010-2020 fore-cast), % | Average primary balance (2010-2020 fore-cast), % of GDP | Pre-crisis debt, % of GDP | Current debt, % of GDP | Baseline Scenario, % of GDP | Required primary balance to stabilise 2010 debt stock, % of GDP | to lower 2010 debt stock to 2007 level — Achievement of debt reduction (% of GDP) in: | | to lower 2010 debt stock to target level of 40% of GDP (EM) and 60% of GDP (DM) — Achievement of debt reduction (% of GDP) in: | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 2007 | 2010 | 2020 | | 5 years | 10 years | 5 years | 10 years |
| AUS | 3.0 | 3.3 | 0.8 | 15 | 20 | 10 | 0.1 | 1.0 | 0.5 | debt < target | debt < target |
| SVK | 4.3 | 2.3 | -4.4 | 32 | 43 | 74 | -0.8 | 1.4 | 0.3 | debt < target | debt < target |
| CHE | 1.3 | 2.1 | 0.1 | 47 | 45 | 46 | 0.3 | 0.0 | 0.1 | debt < target | debt < target |
| DNK | 2.2 | 2.2 | 0.4 | 32 | 49 | 39 | 0.0 | 3.5 | 1.7 | debt < target | debt < target |
| SWE | 3.4 | 2.2 | 0.5 | 48 | 55 | 39 | -0.7 | 0.9 | 0.0 | debt < target | debt < target |
| ESP | 1.6 | 3.1 | -2.1 | 42 | 68 | 93 | 1.0 | 6.2 | 3.3 | 2.7 | 1.6 |
| IRL | 2.0 | 3.6 | -3.4 | 28 | 81 | 118 | 1.3 | 11.7 | 6.0 | 5.5 | 2.9 |
| DEU | 1.6 | 3.1 | -0.6 | 65 | 82 | 97 | 1.2 | 4.8 | 2.7 | 5.8 | 3.2 |
| GBR | 2.7 | 3.4 | -4.2 | 47 | 83 | 124 | 0.6 | 7.7 | 4.0 | 5.1 | 2.7 |
| CAN | 2.4 | 2.9 | -0.2 | 65 | 86 | 89 | 0.4 | 4.3 | 2.4 | 5.2 | 2.9 |
| PRT | 1.2 | 3.1 | -2.3 | 71 | 91 | 132 | 1.8 | 5.7 | 3.5 | 7.9 | 4.6 |
| USA | 2.2 | 2.7 | -4.0 | 62 | 92 | 133 | 0.5 | 6.4 | 3.5 | 6.8 | 3.6 |
| FRA | 2.1 | 2.6 | -2.1 | 70 | 92 | 114 | 0.4 | 5.1 | 2.6 | 7.0 | 3.5 |
| BEL | 2.1 | 2.7 | 1.6 | 88 | 105 | 90 | 0.7 | 4.3 | 2.2 | 9.9 | 5.0 |
| GRC | 1.5 | 3.4 | -2.6 | 104 | 123 | 171 | 2.4 | 6.8 | 4.0 | 15.3 | 8.2 |
| ITA | 1.6 | 3.1 | 1.2 | 112 | 127 | 131 | 1.9 | 5.2 | 3.1 | 15.4 | 8.2 |
| JPN | 1.9 | 1.7 | -5.8 | 167 | 197 | 246 | -0.5 | 5.3 | 2.4 | 26.9 | 13.2 |
| RUS[1] | 4.3 | -1.2 | 1.9 | 7 | 10 | 0 | -0.5 | 0.0 | -0.2 | debt < target | debt < target |
| VEN[2] | 0.3 | -2.5 | -0.5 | 19 | 22 | 20 | -0.6 | -0.4 | -0.3 | debt < target | debt < target |
| CHL[3] | 5.2 | 0.6 | 3.8 | 15 | 23 | 0 | -1.0 | 0.8 | 0.0 | debt < target | debt < target |
| MEX[4] | 3.6 | 2.9 | 0.9 | 21 | 24 | 13 | -0.1 | 0.5 | 0.2 | debt < target | debt < target |
| PER[5] | 5.5 | 3.1 | 0.9 | 30 | 25 | 8 | -0.6 | -1.5 | -1.1 | debt < target | debt < target |
| IDN[3] | 5.9 | 1.9 | 1.1 | 35 | 33 | 13 | -1.2 | -1.6 | -1.6 | debt < target | debt < target |
| TWN[6] | 4.8 | 0.4 | -0.3 | 29 | 35 | 25 | -1.5 | -0.2 | -0.8 | debt < target | debt < target |
| ROU | 4.9 | 2.8 | -3.0 | 20 | 36 | 53 | -0.7 | 2.6 | 0.9 | debt < target | debt < target |
| KOR | 4.5 | 2.4 | 0.9 | 26 | 37 | 20 | -0.8 | 1.5 | 0.4 | debt < target | debt < target |
| ZAF[6] | 4.2 | 4.2 | 0.1 | 29 | 39 | 34 | 0.0 | 2.0 | 1.0 | debt < target | debt < target |
| COL[7] | 4.4 | 4.5 | 1.4 | 40 | 45 | 28 | 0.0 | 0.9 | 0.5 | 0.9 | 0.5 |
| CHN[12] | 8.0 | 2.8 | -0.8 | 45 | 46 | 34 | -2.2 | -2.2 | -2.0 | -1.1 | -1.4 |
| THA[8] | 5.6 | 3.3 | -0.8 | 38 | 48 | 43 | -1.0 | 1.2 | 0.1 | 0.7 | -0.2 |
| ARG[9] | 2.8 | 1.3 | 1.7 | 56 | 49 | 25 | -0.7 | -2.0 | -1.4 | 1.2 | 0.2 |
| CZE | 3.6 | 2.2 | -2.8 | 38 | 53 | 69 | -0.7 | 2.5 | 0.8 | 2.1 | 0.5 |
| TUR | 3.8 | 10.0 | 2.1 | 42 | 55 | 74 | 3.3 | 5.8 | 4.5 | 6.2 | 4.6 |
| BRA[10] | 3.6 | 6.7 | 3.0 | 73 | 62 | 49 | 1.8 | 0.0 | 0.8 | 6.1 | 3.7 |
| POL | 3.8 | 2.4 | -2.9 | 52 | 63 | 77 | -0.9 | 1.6 | 0.2 | 4.0 | 1.4 |
| IND[3] | 7.8 | 2.1 | -1.6 | 62 | 69 | 52 | -3.7 | -1.8 | -2.7 | 3.1 | 0.1 |
| PHL[11] | 4.3 | 0.5 | 1.9 | 72 | 71 | 31 | -2.6 | -2.7 | -2.7 | 4.1 | 1.0 |
| HUN | 3.2 | 2.6 | -1.5 | 72 | 90 | 97 | -0.5 | 3.2 | 1.0 | 9.8 | 4.4 |
| DM* | 2.1 | 2.7 | -3.0 | 76 | 102 | 133 | 0.5 | 5.7 | 3.0 | na | na |
| EM* | 5.8 | 2.7 | 0.1 | 42 | 46 | 35 | -1.2 | -0.5 | -0.8 | na | na |

For OECD countries public debt and fiscal data are taken from the Economic Outlook database. For non-OECD countries data are taken from the IADB, IIF, IMF, Eurostat databases, national sources or DB Research. Public debt and fiscal statistics refer to general government if not specified otherwise by footnotes (for detailed information please see Box 2).
*GDP-weighted.

Sources: OECD, IADB, IIF, IMF, Eurostat, national sources, DB Research

## Box 1: The basic debt arithmetics

When analysing public debt sustainability in DMs and EMs, it is useful to recall the basic concept of public debt arithmetics. For more details please see Eduardo (2005) and Sturzenegger (2002).

### (a) Debt scenario analysis

To begin with, the dynamics of debt accumulation can be described in absolute terms as:

$$D_{t+1} - D_t = r_{t+1} \cdot D_t - PB_{t+1} \quad (1)$$

where $D$ denotes a country's gross public debt stock, $r$ captures the real interest rate paid on public debt outstanding, and $PB$ represents the government's primary balance, i.e. the government's fiscal balance before net debt interest payments. The above identity can also be expressed in percent of GDP, which puts the public debt stock in relation to the size of the economy (government's underlying potential tax base):

$$\frac{D_{t+1}}{GDP_{t+1}} = (1 + r_{t+1}) \cdot \frac{D_t}{GDP_t} \cdot \frac{GDP_t}{GDP_{t+1}} - \frac{PB_{t+1}}{GDP_{t+1}} \quad (2)$$

After rearranging we obtain:

$$d_{t+1} = \left(\frac{1 + r_{t+1}}{1 + g_{t+1}}\right) \cdot d_t - pb_{t+1} \quad (3)$$

where $d$ denotes the public debt stock and $pb$ the primary budget balance (both in percent of GDP). Finally, $g$ represents the annual real GDP growth rate (% p.a.).

As shown in equation (3), the current public debt stock depends on the past year's debt stock as well as on today's real interest rate, real GDP growth rate and primary balance. The higher the real interest rates, the lower real GDP growth and the lower the primary balance, the more the public-debt-to-GDP ratio rises. In other words, strong real GDP growth, low real interest rates and sound fiscal policies (as reflected by primary surpluses) are necessary to avoid ever-rising public debt stocks or to lower public debt to more sustainable levels.

In our scenario analysis in Chapter three we use equation (3) to consider medium/long-term debt dynamics for a baseline as well as different adverse shock scenarios. In our scenarios all three input variables (real GDP growth, the real interest rate, and the primary balance) are forecast for the whole period of the study (2010-20).

### (b) Stabilising the current debt-to-GDP ratio

Often it is important to know what primary balances governments have to achieve in order to stabilise their current public-debt-to-GDP stocks under given macroeconomic and financial conditions, i.e. under the prevailing economic growth and interest rates.

It can be shown from (3) that the required primary balance to stabilise the debt-to-GDP ratio, denoted as $pb^*$, depends on the differential between the real interest rate $r$ and the real GDP growth rate $g$ as well as on the prevailing debt level in year t=0:

$$pb^* = \left(\frac{r - g}{1 + g}\right) \cdot d_0 \quad (4)$$

### (c) Lowering the current debt-to-GDP ratio to target levels (debt target analysis)

Highly indebted sovereigns may have to achieve more than stabilisation of their current public-debt-to-GDP ratios. Instead, more ambitious fiscal improvements are needed to put public debt dynamics on a sounder footing.

In order to lower the current debt-to-GDP ratio to a target level $d^*$ over the next $T$ years, the required permanent primary balance $pb^{**}$ is given by:

$$pb^{**} = \frac{d_0 \cdot \left(\dfrac{1 + r}{1 + g}\right)^T - d^*}{\displaystyle\sum_{j=0}^{T-1} \left(\dfrac{1 + r}{1 + g}\right)^j} \quad (5)$$

## Box 2: Country sample, macroeconomic data and data sources

Our country sample consists of 38 economies, 21 of which are considered as being EMs and 17 as being DMs, according to DB Research's classification. In 2009, the full sample accounted for around 85% of world GDP (based on PPP valuations). The macroeconomic data comes from the OECD's Economic Outlook Database, the Inter-American Development Bank's (IADB) Latin American and Caribbean Macro Watch Data Tool, the Institute of International Finance (IIF), the International Monetary Fund's (IMF) World Economic Outlook Database, Eurostat, national sources, Deutsche Bank Global Markets Research and DB Research.

### I. Public debt and fiscal figures

Generally, we rely on fiscal and public debt data that refers to the general government in order to capture all obligations stemming from central and local governments as well as from the social security system or from public entities. However, in some EMs public debt figures refer to other aggregates (i.e. central government or public sector). If this is the case, detailed information on the data used in the analysis can be found in the footnotes to the result tables. As regards the OECD countries within our sample, primary balance forecasts for 2010 and 2011 were taken from the OECD's Economic Outlook Database (No 86). Thereafter, we used own forecasts. For the remaining countries we used own estimates over the whole forecasting period.

*Footnotes on fiscal accounts and public debt series in the result tables:*

1. Debt refers to general government, fiscal statistics to federal government.
2. Non-financial public sector debt; fiscal statistics include central government, non-financial public enterprises, Venezuelan Social Security Institute and Deposit and Guarantee Fund.
3. Debt and fiscal statistics refer to central government.
4. Debt refers to general government; fiscal statistics include federal government, public entities and public enterprises.
5. Debt and fiscal statistics include general government and non-financial public enterprises.
6. Debt refers to public sector, fiscal statistics to central government.
7. Non-financial public sector debt; fiscal statistics include central government and non-financial public entities.
8. Total public debt; fiscal statistics refer to general government.
9. Debt and fiscal statistics include national administration, public enterprises and other public entities.
10. Debt refers to general government; fiscal statistics include central government, federal governments, regional governments and social security.
11. Total public debt; fiscal statistics refer to national government.
12. Public debt is based on the IMF's 2006 Article IV Consultation (October 2006) estimates. Fiscal statistics refer to general government.

### II. Real GDP growth rate

Data on real GDP growth rates for the years 2010-2014 for all countries were taken from the IMF World Economic Outlook. We based our forecast for 2015-2020 on the IMF's 2014 forecast (with the exception of China, Mexico and Turkey, for which we used our own estimates).

### III. Interest rate

As regards sovereign borrowing costs, we took historical bond yields from the OECD's Economic Outlook Database (No. 86) for the OECD member countries. For Latin America (with the exceptions of Mexico and Brazil) real interest rates were calculated as the weighted average of the interbank rates and the EMBI yield (CPI-deflated). For Mexico bond yields were taken from the OECD, for Brazil we took our own estimates. For the remaining countries, bond yields were taken from national central banks. The only exceptions were Romania (for which Eurostat data is used), China, Indonesia, the Philippines, Taiwan (DB Research) as well as South Africa and Thailand (where IMF data is used). The CPI-deflator used to calculate real interest rates was taken from the IMF's World Economic Outlook Database (October 2009). For 2010-20 we used our own forecasts.

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