Capturing the best of both worlds? A balanced approach to Asian investment

The Invesco Sovereign Debt Monitor

Dividends: Sustainability is what counts

Risk & Reward
Research and investment strategies

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The economic and investment prospects for 2013 depend primarily on how quickly the developed economies - especially the US, the eurozone and the UK - can facilitate the repair of balance sheets in the household and financial sectors of their economies, and secondarily on how quickly they can address the problems of the public or government sector indebtedness. Although emerging market economies generally have less indebtedness, their inability to decouple from developed markets has undermined their growth rates in 2012 and should continue to do so in 2013.

The financial crisis of 2008-09 resulted from a crisis in private sector balance sheets - mainly excess borrowing to finance home purchases in the US, the UK and the eurozone periphery. Subsequently, following government measures to expand aggregate spending, to alleviate unemployment and bail out firms and financial institutions, government deficits and debt have surged to levels unprecedented in peacetime, precipitating a second round of the crisis, notably in the eurozone.

Thus throughout the developed world both the private sector (households and financial institutions) and governments are struggling to restore financial health (figure 1). The problem for all is that balance sheet repair takes time, and debt repayment necessarily slows down economic growth. Hence even where recoveries are under way - such as in the United States - growth is sub-par, government revenues from tax collection are weak, budget deficits are adding to debt, and business confidence is low, holding back investment.

This economic outlook will proceed by examining the state of balance sheets in each major area, and the progress made in repairing them. The forecasts for 2013 (table 1) are significantly affected by the comparative health of private and public sector balance sheets, and the prospects in each area for autonomous, self-sustaining recoveries to take hold.

### United States

The US economy was the first to enter recession (in December 2007), and the first to see the effects of the housing crisis seriously impact the banking system (in 2008). However, thanks to strong measures to re-capitalise the banks under the TARP program and other capital-raising measures, together with the imposition of demanding stress-tests as well as generous and sustained liquidity provision via a series of QE programs by the Federal Reserve System, the US banking system is now clearly on the road to recovery. Capital ratios have dramatically increased and the banks are now holding over USD 1.4 trillion in reserve balances or liquidity at the Fed. But by far the most important evidence of the recovery of US banks is the fact that total bank lending (excluding purchases of securities) which had been cut by nearly USD 1 trillion in 2009-11, has been expanding since March 2011 at an annual rate of about 4-5% p.a. - far ahead of the lending growth of eurozone or UK banks.

### Table 1: Forecasts for growth and inflation

<table>
<thead>
<tr>
<th></th>
<th>2012 estimate</th>
<th>Real GDP (Consensus)</th>
<th>CPI inflation (Consensus)</th>
<th>2013 forecast</th>
<th>Real GDP (Invesco)</th>
<th>CPI inflation (Invesco)</th>
</tr>
</thead>
<tbody>
<tr>
<td>US</td>
<td>2.2%</td>
<td>2.1%</td>
<td>1.9%</td>
<td>2.0%</td>
<td>2.0%</td>
<td>1.7%</td>
</tr>
<tr>
<td>Eurozone</td>
<td>-0.5%</td>
<td>2.5%</td>
<td>0.0%</td>
<td>-0.2%</td>
<td>1.9%</td>
<td>1.7%</td>
</tr>
<tr>
<td>UK</td>
<td>-0.1%</td>
<td>2.7%</td>
<td>1.3%</td>
<td>1.0%</td>
<td>2.3%</td>
<td>1.9%</td>
</tr>
<tr>
<td>Japan</td>
<td>1.8%</td>
<td>0.0%</td>
<td>0.8%</td>
<td>1.4%</td>
<td>-0.2%</td>
<td>0.1%</td>
</tr>
<tr>
<td>Australia</td>
<td>3.5%</td>
<td>1.9%</td>
<td>2.8%</td>
<td>3.2%</td>
<td>3.0%</td>
<td>2.7%</td>
</tr>
<tr>
<td>Canada</td>
<td>2.0%</td>
<td>1.8%</td>
<td>2.0%</td>
<td>2.1%</td>
<td>1.9%</td>
<td>1.8%</td>
</tr>
<tr>
<td>China</td>
<td>7.7%</td>
<td>2.7%</td>
<td>8.1%</td>
<td>7.6%</td>
<td>3.3%</td>
<td>1.7%</td>
</tr>
<tr>
<td>India</td>
<td>5.6%</td>
<td>9.3%</td>
<td>6.6%</td>
<td>6.6%</td>
<td>7.6%</td>
<td>7.9%</td>
</tr>
</tbody>
</table>

Source: Consensus Economics, survey date: 12 November 2012.
In contrast to the banks it has to be said that the US “shadow banks” are not in such a strong position. Indeed, their balance sheets are still shrinking: they had declined from USD 14.8 trillion at the peak of the credit boom in 2008 to USD 9.9 trillion in 2012 Q3. In practice this means that many of the markets for structured credit, for asset-backed securities, and for other forms of collateralized financing which characterized the financial bubble have not recovered, and currently do not look likely to do so for perhaps another year or two. As a result, the combined US financial system – the banks and shadow banks together – are not in such robust shape as the banks alone, but progress is definitely being made.

Next, US households are making good progress in repairing their balance sheets. Their debt-to-disposable income ratio has declined from a peak of 134% to 112.7% in 2012 Q3. This 21 percentage point decline in leverage has been achieved by a combination of debt repayment, debt write-offs and income growth. The prospects for 2013 are for continued slow growth of personal incomes (about 3% p.a.) at a rate that exceeds inflation and therefore supports additional savings and debt repayment. Again, the US is further ahead in household balance sheet repair than either the UK or the eurozone.

Finally, the US federal government is potentially facing a severe budgetary tightening in 2013. As background: federal revenues declined from 18.5% to 15.8% of GDP between 2007 and 2012, while federal expenditures have gradually increased from a pre-crisis level of 19.7% of GDP in 2007 to 24.3% in 2012. The result was vastly increased budget deficits. However, since 2009 the budget deficit had already narrowed from 10.1% of GDP to 7.8% in 2012 – a marked tightening. Before the “fiscal cliff” negotiations over the year-end, the Obama administration was planning to reduce the deficit to 6.1% in 2013, and to 2.9% by 2017.

The net outcome of the “fiscal cliff” compromise was to lift income taxes on incomes over USD 400,000, and to eliminate the temporary payroll tax reduction, effectively raising USD 1.2 trillion in revenue against the USD 1.6 trillion that the President had sought. Decisions on spending cuts were largely postponed. This leaves several important hurdles for the Administration to overcome over the next few months if they are to succeed in obtaining agreement on an overall fiscal stance that does not impose too much austerity too rapidly on the US economy. If they fail to reach agreement on any of the three items, the risks of recession are significant.

First, some USD 90 billion of spending cuts, postponed in the fiscal cliff deal, will come into force on 1 March unless some other agreement is reached before then. Second, the debt ceiling will need to be increased to accommodate the federal government’s continuing borrowing requirements. And third, Congress must pass a new budget when the current budget expires on 27 March. These deadlines and the resultant inter-party bickering that will inevitably follow all have the potential to create great uncertainty for business plans across the economy as well as instability in the financial markets.

Assuming some compromise is reached between the President and Congress, I expect another year of roughly 2% GDP growth in the US in 2013, albeit with high volatility in the early months of the year. Meantime on 12 December the Federal Reserve announced an expansion of its QE3 asset purchases to a net USD 85 billion of Treasuries and Mortgage Backed Securities (MBS) per month, a programme which will continue all through 2013. Inflation, which depends ultimately on broad money growth, not the size of the Fed’s balance sheet, should remain subdued at around 1.7%.

**Eurozone**

When the credit crisis began in 2007 the attitude of Euro-area policy-makers and banks was that subprime was an American problem, and that the eurozone did not need to make any adjustments. Sadly, Europeans failed to understand that banks in the eurozone were more leveraged than in the US and had seen their lending grow much more – especially in the periphery of Ireland, Spain and Portugal. As a result, when the crisis hit Ireland and Spain, and the true extent of Greece’s indebtedness became known, the problems of bank, household and sovereign solvency escalated rapidly. It is the legacy of these challenges that the eurozone will face in 2013.

For eurozone banks, the recapitalisation has lagged far behind that of US banks, the stress tests were less rigorous than those conducted in the US, and until Mario Draghi took over the ECB in the autumn of 2011, the ECB had been a reluctant lender of last resort. Consequently Euro-area banks are far behind US banks in repairing their balance sheets. Also, taking the euro-area as a whole, bank lending is still declining, implying that banks as a whole are risk-averse. Even now although the ECB has done two tranches of 3-year LTROs (in December 2011 and February 2012) and Draghi has made strong statements between July and September “to do whatever it takes” to save the euro - for example by means of OMTs (Outright Monetary Transactions, or sterilized purchases of the sovereign debt of troubled economies with up to three years’ maturity) - there is little evidence of a euro-area recovery. In fact no OMTs have been conducted, the ECB’s balance sheet has not expanded, and the amount of broad money (M3) is growing very slowly across the region.

The situation regarding household finances is very mixed across the eurozone, but in general there are high levels of debt, weak house prices and high unemployment in all of the crisis economies, whereas in the core economies household balance sheets are generally in better shape. In Germany for example, household balance sheet repair has been under way ever since the year 2000, enabling Germany to keep its costs under control, and limiting the need for consumers to retrench now. But even in the core, growth and confidence have been weakening in recent months as exports to the periphery and to emerging markets have fallen. In essence, the periphery is contaminating the core.

At the government level the crisis economies of the periphery have seen declines in GDP and sovereign debt-to-GDP ratios have therefore risen rather than fallen (figure 2). This implies that the austerity...
The problem in the household sector is twofold: high leverage and falling real incomes. The British household debt-to-disposable income ratio reached the extraordinary level of 175% in early 2008, and so far has fallen to 146% - a decline of 29 percentage points (figure 3) - compared with a level of 110% in the year 2000 before the credit and housing bubble began. The result has been a big rise in savings and a decline in consumption as consumers attempt to repay debt. The fall in real incomes has occurred partly due to the weakness of sterling (which has raised import and consumer prices, eroding real incomes), and partly because the government has raised numerous taxes such as VAT and passenger and fuel duties, as well as levies for green energy. Thus in the nine months to September 2012 incomes grew 1.4% in nominal terms, but because consumer prices increased 2.9% on average, real incomes fell by 1.5%.

As far as the government is concerned, capital investment and infrastructure projects have been cut steeply, but current expenditure and welfare transfers have continued to rise. Welfare payments increased by as much as 7.7% over the past year, and by nearly 15% over the past three years. In the financial year ending April 2012 the government spent GBP 202 billion or 13% of GDP on welfare benefits and tax credits to lower income earners. Despite much rhetoric (and misdirected criticism) about cutting welfare, the coalition government has done exactly the reverse.

While households’ real earnings may recover to positive territory in 2013 – provided inflation remains low - both the British banks and the British government face a long period of balance sheet repair ahead. This means that while inflation should be slowing further – provided the government resists the urge to raise more revenue through increases in indirect taxes – the GDP growth rate of the economy will inevitably remain low, around 1.0 - 1.5% at best.

**United Kingdom**

In terms of the progress of balance sheet repair, the UK occupies an intermediate position between the US and the eurozone. Although the repair of household and financial sector balance sheets is well under way, the UK faces three major problems. First, the UK entered the crisis with banks that were far larger relative to GDP than either those of the US or most of the eurozone. The subsequent abrupt shrinkage of their international, cross-border business has had the knock-on effect of restricting their willingness to expand at home. Second, during the credit bubble British households became more highly leveraged than households in almost any other economy in Europe except the Netherlands. Third, the UK government had been running deficits for six years before the crisis even started, severely constraining the scale and scope of the stimulus it could apply compared with the United States.

In other words, British banks, households and the government itself were all over-extended in some way at the onset of the crisis. Even so, in contrast to the eurozone which embarked on the work-out process later, the UK is making progress in de-leveraging the balance sheets of both banks and households. All the same, the work-out process is more likely to imply two parliaments of pain rather than just one as the coalition had hoped when they took office in May 2010.

Briefly, using the widest measure of debt, British banks were almost fifteen times larger than the GDP in 2008. In part this is simply the result of London being a major financial centre and the base for banks with worldwide businesses, including the huge offshore euro and US dollar markets that are based in the City. However, because both international trade and cross-border financing were particularly hard-hit in the early stages of the crisis, the knock-on effects on the British economy from its banks switching to attitudes of extreme risk aversion have been substantial. For example, M4 lending by British banks in September 2012 showed a decline of 6% year-on-year. Additionally the government’s Independent Banking Commission has recommended the ring-fencing of retail banks with capital ratios as high as 10% (compared with the Basel III proposal of 4.5% or 7%). Downsizing British banks to meet these new regulatory standards is having the effect of hampering the growth of bank credit across the entire economy.
Japan

The private sector balance sheet problems in Japan have existed since the bursting of the asset bubble in 1989-90, and in the government sector they have become progressively worse over the last two decades. Household debt remains high by comparison with many other economies, and the decline in the household savings rate as a result of the aging of the population means that there is little prospect of rapid debt reduction. In the non-financial corporate sector strong profitability has facilitated a large reduction in indebtedness, but banks remain unwilling to expand their lending to companies, preferring to buy JGBs. On the government side, the most notable development in 2012 was the passage through the Diet of a bill to raise the consumption tax in two steps from 5% to 10% by October 2015. Given that government debt has now reached 220% of GDP, fiscal consolidation was badly needed (figure 4).

For 2012 I expect real GDP to attain 1.8% (less than previously expected due to the impact of the dispute with China over the Senkaku Islands) but to slow to 1.4% in 2013. Like other Asian economies Japan’s exports have been impacted by the global slowdown, but unlike other East Asian economies domestic demand in Japan cannot be expected to compensate for this. Meantime following the victory of Shinzo Abe and the LDP in the recent election, pressure is being applied on the Bank of Japan to pursue a more expansionary policy, which has started to weaken the yen. Looking ahead, the cheaper yen should contribute to reducing the downward pressure on the prices, but the weakness of domestic demand will make higher inflation a difficult target for the Bank of Japan to achieve. This means that the BOJ is unlikely to meet its target of raising CPI inflation to 1% in 2013 or even 2014. My forecast is for -0.1% in 2012 and a marginally positive CPI increase of 0.1% in 2013.

China and Asia ex-Japan

In contrast to the developed economies, China and most of the Asian economies repaired their balance sheets following the financial crises of the 1990s, and did not participate in the credit and housing bubble of 2002-2008. Therefore they do not face the same need for balance sheet repair as the US, UK and eurozone. Nevertheless, the Chinese economy has been slowing much more than the official figures suggest in response to both domestic and external factors. The recently announced change in political leadership (which will not be fully implemented until March 2013) is delaying a coordinated official response to the slowdown. The policy response so far has therefore been cautious rather than substantial. The slowdown is also aggravated by China’s extreme concentration on exports and fixed capital investment, both areas hard hit by the global weakness.

Growth momentum in China has finally started to stabilize after slowing sharply in the first eight months of 2012. The slowdown was driven by the softening of both domestic and external demand. Based on my estimate of GDP using “hard” numbers such as electricity consumption, rail freight traffic and the real volume of bank loans, momentum in August and September slowed almost as much as it did in the crisis of 2008-09.

Contrary to many other forecasters, I do not believe that a strong turnaround is imminent. It is true that the National Development and Reform Commission has approved several large infrastructure projects in the summer; a number of local governments have announced measures to support industrial activity; and the central authorities have launched a package of measures to boost exports including faster payment of tax rebates and increased loans to exporters. However, the main problem is that China has built a uniquely export-dependent economy in the past two or three decades which also requires very high rates of growth of capital investment to support its exports. With any downturn, such as the present export slowdown, an economy with huge capital investments is prone to decline as capacity is curtailed. This is just the kind of problem which is facing China now.

China can clearly do very little to influence the external slowdown, but it is also severely hampered in its response to the immediate domestic downturn both by the recent transition to a new political leadership and by the memory of the mistakes of the 2008-09 stimulus programme – a property bubble and CPI inflation of 6.5%. Indeed, the leadership is still enforcing the administrative restrictions imposed in an effort to combat that unwelcome spike in property prices. Moreover, even though normal bank lending has largely been brought under control, lending to non-bank financial organisations including property-related trust management products is still rampant, growing at 37.5% year-on-year in the September quarter. It therefore makes no sense for the Chinese authorities to ease monetary conditions at present.

On a longer term basis China is transitioning from real GDP growth rates that averaged almost exactly 10% p.a. in 2001-2010 to something more like 6-8% p.a. (figure 5) As we have learned from Japan, such abrupt adjustments are typically accompanied by significant disruptions. For 2012 as a whole I now expect 7.5% real GDP growth and 2.9% CPI inflation. In 2013, I am forecasting 7.6% real GDP growth and inflation of 1.7%.

The picture for the rest of non-Japan Asia outside China is broadly similar to China’s outlook – constrained by the export slowdown and by their inability or unwillingness to pump-prime too much at home lest their balance of payments deteriorates. Nevertheless, several economies have cut interest rates
and eased credit conditions in order to try to offset the external slowdown, but these measures alone will not be sufficient to reverse the global trend toward slower growth and lower inflation.

**Commodities**

With balance sheet repair being prevalent in the major developed economies, deleveraging, slow money and credit growth, and disinflation will be the order of the day. This means, that in contrast to previous business cycle upswings, it is highly unlikely that any of the major economies will see a surge of liquidity or a sudden upswing in business activity of the kind that would be needed to generate a sustained surge in commodity prices. Having said that, it is nevertheless possible for fears of inflation (e.g. from more QE, or a further cut in interest rates in the eurozone) to drive short-term moves in commodity prices, and supply disruptions in particular markets to drive individual price hikes. The other factor that may contribute to more lasting moves in commodity prices is the larger amount of financial capital committed to commodity investments in modern financial markets. However, none of these is likely to enable price hikes to be long sustained, even though their effects may linger in reported headline prices for up to a year.

**Conclusion**

Even with dramatic policy announcements, such as OMT by the ECB and QE3 by the Fed during the past few months, investors are aware that the underlying problems of over-leveraged households, risk-averse banks, and over-indebted governments in the developed world still remain to be solved. So while risk assets rallied temporarily, the macro-economic data have not improved enough to justify higher asset prices. In addition, it is clear that these problems cannot be solved by waving a fiscal or monetary wand. Fiscal expansion jeopardizes the credit-worthiness of governments, and monetary expansion runs up against the problem that households and companies - by and large - are reluctant to borrow while banks are reluctant to lend. These problems require several years of sustained balance sheet repair. While this process is on-going, consumer spending and business investment in much of the developed world are likely to remain sub-par, and stock markets may disappoint. Moreover, since policy interest rates will remain very low, investors will likely remain in a “search for yield” mode for an extended period.

Meantime, as explained above, in the emerging world balance sheets are in much better shape, but the problem is that many of the emerging economies have built export-oriented economies that are heavily dependent on exports to the developed world. Consequently they, too, are being dragged down by the balance sheet repair problems in the developed world.

*John Greenwood, Chief Economist, Invesco Ltd.*
Crisis resolution: How much progress has been made?

In the aftermath of financial crises, the adjustment process in financial markets, in the real economy and in the balance sheets of companies takes time. We look at the progress which has been made so far in the US, UK and selected crisis-hit eurozone economies. In so doing, we use the average experience of previous major financial crises, as described in Reinhart and Rogoff’s book “This Time is Different”.1

The conclusion is that, compared to the average of previous major crises, there have been some remarkable similarities in the process of adjustment, notably in the US. House prices and equity prices in particular have fallen by a similar amount to that seen in previous crises although, helped by loose monetary policy, the adjustment in the real economy has been less severe. There is now a reasonable basis for thinking that the US is well advanced in its post-crisis adjustment. However, the fact that government debt continues to rise shows that the final resolution is still arguably some years off.

In the UK, Ireland and several southern European economies (which have been worse hit in these respects than other previous crisis economies), the adjustment process has many similarities with that in the US but has not progressed as far: in particular it is not yet clear whether real house prices have reached a trough. Despite the particularly adverse effects on output and employment, the adjustment in house prices and in government debt levels has, so far, been less pronounced in typical historic crises.

As always, however, the issue is the extent to which further adjustment is discounted in financial markets. The good progress made by the US in post-crisis adjustment should, we believe, help all equity markets in 2013 but, more importantly, there are many examples of good quality companies that have managed to survive in a tough environment with limited top line growth whilst retaining strong balance sheets and generating good cash flows.

**Major financial crises: historic experience**

Reinhart and Rogoff’s survey identified the key characteristics of fifteen major financial crises throughout history. The average experience of these (figure 1) is that: real house prices fell by 35% over 6 years; equity prices fell by 55% over 3.5 years; the unemployment rate rose 7 percentage points over 4 years and output (measured by GDP) fell by 9% over 2 years; and government debt to GDP ratio rose by 86 percentage points over 5 years.

The fifteen major crises include some which are very familiar: those following the Great Crash in the US stock market in October 1929 and the Asian financial crisis of 1997 (encompassing six countries, Indonesia, Hong Kong, Malaysia, Philippines, South Korea and Thailand). Others have received perhaps less public attention: the Spanish financial crisis after 1977, for example. But they all share the same characteristics: a rapid build-up in lending (by banks and other financial entities) and a surge in asset prices – most notably housing and equity prices – producing bubble conditions. This is then followed by a period of debt repayment, deleveraging and asset price falls, accompanied by adverse effects on the real economy and unemployment.

How does the crisis which erupted in mid-2007, intensified in 2008, and engulfed the US and UK economies and, more recently, several eurozone economies, compare to those previous major crises? And what does this indicate about the position in which these economies find themselves now?

**Post 2007/8 crisis experience compared**

**House prices**

In previous major crises house prices have fallen in real terms by 35%, with the decline taking an average of six years. The US pattern corresponds pretty closely with that average experience. The peak (in the second quarter of 2006) to trough (in the first quarter of 2012) decline in house prices amounted to 43% in real terms (figure 2) and took just one quarter less than the major crisis average. We can be reasonably confident that the first quarter of 2012 was a trough in US real house prices as we have seen two quarters of rising real prices since then.

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**Figure 1: Average experience of 15 major financial crises**

- Real house prices fall by 35% over 6 years
- Equity prices fall by 55% over 3.5 years
- Unemployment rate rises 7 percentage points over 4 years
- Output falls by 9% over 2 years
- Government debt to GDP ratio rises by 86 percentage points over 5 years

*The 15 financial crises are: Norway (1899); US (1929); Spain (1977); Norway (1987); Finland (1991); Sweden (1991); Japan (1992); Indonesia, Hong Kong, Malaysia, Philippines, South Korea, Thailand (all 1997); Colombia (1998); and Argentina (2001). Source: Reinhart and Rogoff “This Time is Different: Eight Centuries of Financial Folly” (Princeton University Press, October 2009).*

**Figure 2: Real house prices**

<table>
<thead>
<tr>
<th>Country</th>
<th>Real house prices</th>
<th>Average of previous crises</th>
</tr>
</thead>
<tbody>
<tr>
<td>Portugal</td>
<td></td>
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<td>Italy</td>
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<td>UK</td>
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<td>Spain</td>
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<tr>
<td>Greece</td>
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<td></td>
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<tr>
<td>Average</td>
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</tr>
<tr>
<td>US</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ireland</td>
<td></td>
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</tr>
</tbody>
</table>

Source: Thomson Reuters Datastream. Data as at 12 December 2012. Source for average: Reinhart and Rogoff (see figure 1).
and that rise has been accompanied by a recovery in other housing market indicators (notably new home building).

Ireland’s real house price fall has been larger than the historic crisis average; the declines in Greece and Spain were marginally smaller than average. However, for all the eurozone ‘crisis’ economies (Greece, Portugal and Ireland, which have received bailouts and Italy and Spain, which have witnessed intermittent and extreme pressures but no bailout), there is no firm evidence that a trough in real house prices has yet been reached. In Spain, for example, the decline in house prices accelerated in the third quarter of 2012 even though measures to transfer bank assets to Spain’s ‘bad bank’ were intensified. Furthermore, the decline in Portuguese and Italian house prices has, so far, been much smaller than the average crisis experience.

In the UK, although many have pointed to signs of a house price recovery, in real terms national average house prices continued to decline in the third quarter of 2012, five years after the peak was reached. Moreover, the real decline in prices from that peak (24%) is somewhat less than the average crisis experience.

As far as house prices are concerned, therefore, there are reasonable grounds for seeing the US adjustment as having run its course and the basis for a recovery now being built. In all European markets, however, including the UK as well as the peripheral eurozone economies, there must still be some doubt about whether the full adjustment has yet taken place.

**Equity prices**

Equity prices typically adjust faster than house prices in a crisis environment. According to Reinhart and Rogoff’s analysis of ‘15 major financial crises’ the fall typically amounts to 55% over three and a half years. In the current crisis, the low point in the UK and US equity markets (as well as in Ireland) occurred as long ago as March 2009. Moreover, the extent of the falls in the US and UK - 57% and 48%, respectively (figure 3) - were pretty close to the average major crisis experience. The adjustment took only half the ‘major crisis’ average time, however, a fact which might not be all that surprising given that stock market reactions are arguably faster now than in the past.

Equity markets in Greece, Italy, Portugal and Spain declined for longer and by more than the average major crisis experience. In those four markets the low points were not reached until June/July 2012 and there has been a recovery since then. The peak to trough decline in Greece amounted to as much as 91%, which may sound extreme but is not unknown: the decline in the Thai stock market after the 1997 crisis was of a similar magnitude.

As far as equity prices are concerned, therefore, the crisis correction in the US, the UK and Ireland was completed quite swiftly - by early 2009, but the process has been much more protracted in other eurozone economies, with a low point seemingly formed in mid-2012, around five years after the pre-crisis peaks. One note of potential optimism is that the recovery in the US and UK markets after the March 2009 lows was substantial. The S&P 500 index, which hit an intra-day low of 666 on 6 March 2009, was trading at over twice that level in late December 2012. In equity markets it is so often the case that the darkest hour is just before dawn.

**Output**

The drop in the overall output of the economy, as measured by GDP, was smaller in the US and the UK than in previous major crises. Of the countries considered in Figure 4 only in Ireland was the drop in output comparable to that seen in other major crises. In those three economies - US, UK and Ireland - the duration of the downturn was between one and two years, a rapid downward adjustment comparable to that of the average of previous major financial crises.

Of course, in both the US and the UK there are concerns about a renewed weakening of GDP: in the US as a result of fiscal consolidation and in the UK of a ‘triple dip’ recession. However, in both of those economies GDP is some way above the trough level reached in the second quarter of 2009 (3.3% higher in the UK, 7.4% higher in the US) so in our view a ‘lower trough’ than that currently seen would seem relatively unlikely.

The same cannot be said of Portugal, Spain and Greece, where GDP continued to contract in the third quarter of 2013 and where it is far from clear as to whether a trough in activity has been reached.
Unemployment rate
The one big puzzle with regard to the UK economy in the post-crisis period is that the rise in the unemployment rate has been relatively modest, when judged in relation to the drop in output and to other countries’ average crisis experience.

The rise in the unemployment rate from its 5.2% low point in November 2007 to the peak of 8.4% in October 2011 - a rise of 3.2 percentage points - was less than half the amount typical of post-financial crisis economies.

Explanations generally centre on increased flexibility in the labour forces compared to the past, manifested in more part-time jobs and shorter working hours.

Whatever the explanation, the rise was smaller than in the US where the unemployment rate rose 5.6 percentage points from its March 2007 low point (of 4.4%) to its 10% peak in October 2009. That was marginally below the typical post-financial crisis experience.

In both the US and the UK, the smaller than average drop in output and more restrained increase in the unemployment rate undoubtedly owe something to those two countries’ policies of aggressive easing of monetary policy, with very low interest rates and Quantitative Easing policies.

The comparably more restrained monetary easing by the European Central bank may, in that context, help explain the substantial rise in the unemployment rates seen in Portugal, Ireland, Spain and Greece. In Spain and Greece the increases have been far larger than the typical post-financial crisis experience. That has been perhaps the most disturbing aspect of post-crisis developments in the eurozone, particularly as youth unemployment in both of those countries exceeds 50%.

Government debt
Some cite inappropriately tight fiscal policies in the eurozone crisis economies as an explanation for this sharp rise in unemployment and argue that fiscal austerity measures need to be tempered. Paul Krugman is a leading advocate of such a view.2 The high levels of government debt in the eurozone crisis economies is, however, a primary concern of the ‘troika’ (the IMF, ECB and European Commission). Bringing down government debt as a share of GDP is at the centre of their ‘bail out’ programmes.

The typical post-crisis experience shows, however, that such objectives face large obstacles. The typical post-crisis experience is a substantial increase in the government debt to GDP ratio - by 86 percentage points over the course of five years. Using that as a benchmark, Italy, Portugal and (albeit as a result of debt restructuring) Greece have actually seen, so far, a smaller rise in debt than is typical of the average financial crisis.

The rise in the government debt/GDP ratio in Spain, the UK and Ireland is larger than average post-crisis experience. In all of the economies shown in figure 6, however, government debt is generally forecast to continue rising for some years yet.3

Conclusions
Assessing the behaviour of the US, UK and the ‘crisis’ eurozone economies relative to the experience of previous major financial crises suggests the following:

The US is well advanced in its process of post-crisis adjustment, with the decline in asset (house and equity) prices corresponding quite closely to that of previous economic crises. Although the rise in government debt is a cause of much current concern, the increase in the US has not yet been as large as that typical of other crisis episodes.

The UK and Ireland have several elements in common with the adjustment seen in the US, although in both economies there is no convincing evidence yet that real house prices have reached a trough and turned higher.

Finally, in the southern European economies, although the loss of output and the rise in unemployment has been severe, there is no clear evidence yet that the decline in house prices has reached its trough. Post crisis adjustment, which has been painful so far, may have further to go still in parts of the eurozone.

However, the more encouraging news is that there are some indications that southern eurozone equity markets may now have seen their post-crisis troughs.

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Figure 5: Unemployment - increase from trough

Figure 6: Government debt - increase during the crisis

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reached. The experience of the economies that made a quicker post-crisis adjustment was that their equity markets gained strongly. No one should expect full post-crisis resolution to be completed in the eurozone in one or even two years. However, there is now good reason to believe that a corner has been turned and, in our view, there may be some good company-specific equity market opportunities.

Paul Temperton
Chief Economist of TIER Company Limited

Notes:
3 See, for example, OECD Economic Outlook November 2012.
In the developed markets, dividend yield strategies have become very popular over the past few years, as they promise income in times when bond yields are at historic lows. Dividend investing is also becoming an increasingly attractive investment theme in Asia, which for years has been associated with growth stocks rather than equities that generate income or a well-developed corporate bond market.

Most Asian companies pay dividends - finally

The dividend theme in Asia reflects the expansion of the investment universe which is in part a by-product of corporate restructuring in the post-Asian crisis period. Immediately after the crisis of 1997-1998, most Asian corporates were highly geared and, in the absence of significant financing opportunities due to the systemic collapse in many regional banking systems and capital markets, had no choice but to focus on debt repayment and balance sheet repair. Over the past five years, Asian corporates generally have rebuilt better balance sheets and many more companies generate relatively steady cash flows to offer regular dividend payments, expanding the opportunity set for dividend-paying stocks considerably. In 1998, only 57% of corporates in Asia ex-Japan paid dividends; by 2011, a full 81% of the investment universe provided regular distributions to shareholders across a broad array of sectors, according to CLSA Asia-Pacific Markets. Moreover, more and more companies are moving to regular quarterly distributions, not just the more developed markets of Singapore and Hong Kong.

As a result, dividends are an increasingly important part of total return in Asia ex-Japan. Over the past five years, when stock prices declined due to the international financial crisis, this loss was almost entirely compensated for by dividends; and over the past three years, dividends accounted for more than a third of total return, according to UBS (table 1).

This process was accompanied by a steady re-rating of dividend stocks. The MSCI Asia ex-Japan high dividend yield index (which contains securities with above-average dividend yields, a track record of consistent dividend payments and the capacity to sustain future dividend payments) showed significant outperformance compared to its parent index, the MSCI Asia ex-Japan (figure 1).

The appeal of Asian bonds

The expansion of the Asian bond market has also been significant in the past five years and, like the growth in the number of dividend-paying stocks, also had its genesis in the aftermath of the Asian crisis. As a response to the crisis, many Asian policymakers viewed the promotion of local and regional bond markets as an off-set to what had been a significant reliance of Asian corporates on the banking system for financing, often in the form of short-term foreign currency denominated debt. The volatility of such capital flows exacerbated the currency and financial sector crises. Given the high rates of savings in the region, in retrospect the need for bank financing might have been mitigated had there been more developed local debt markets to channel domestic savings into domestic investment.

<table>
<thead>
<tr>
<th>Table 1: Return structure of Asian stocks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital return</td>
</tr>
<tr>
<td>2012 (1 year)</td>
</tr>
<tr>
<td>2010 - 2012 (3 years)</td>
</tr>
<tr>
<td>2008 - 2012 (5 years)</td>
</tr>
</tbody>
</table>

Total return refers to the Datastream Asia ex-Japan Equity Total Return Index, Gross Dividends Reinvested; capital return refers to the Datastream Asia ex-Japan Equity Price Index, dividend return is the performance differential between the two. The figures for capital return and dividend return may not add up to total return due to rounding. Source: UBS, Datastream. Data as at 31 December 2012.

Figure 1: Outperformance of high dividend stocks

December 2008 = 100

Source: Bloomberg, Invesco. Data as at 31 December 2012.

Figure 2: Asian local bond market volume has surged

Source: Invesco, ADB. Quarterly data as at Q3/2012.
In the years to follow, the expansion of the local bond market was strongly encouraged. Initially, this took place in the form of increased issuance of local currency government bonds to build out yield curves, but gradually expanded to corporate bond issuance. Issuance of both accelerated significantly following the most recent global financial crisis with the flood of cash that entered the region in search of higher returns (figure 2). As a result, there was a significant expansion of the Asian bond markets - from USD 175 bn in December of 1997 to over USD 6 trn as of the end of September 2012.¹

Continuous credit upgrades since the Asian crisis have also helped to support bond prices. Since 1998, all major Asian economies have seen an improvement in their sovereign credit profile, while four economies (India, Indonesia, Thailand and South Korea) moved to investment-grade status from sub-investment grade. The appeal of Asian bonds became even more apparent in the post-2008 period, as the collapse of benchmark interest rates and deterioration in debt fundamentals in developed markets contrasted with the higher yields offered in Asia alongside better debt dynamics and fundamentals (figures 3 and 4). The lower historic volatility of Asian bonds relative to bonds from other countries as well as stocks makes them a potentially attractive risk-adjusted play on Asian growth and structural improvement.

Where are the opportunities?
Bond yields have declined considerably, not only in developed countries but also in Asia as inflows to fixed income assets have increased significantly. The average yield on the HSBC Asian USD Bond Index came down from 8.3% at the end of 2008 and 4.8% at the end of 2011 to 3.4% as at 31 December 2012. While we believe there are still attractive bond opportunities which can reduce overall volatility and enhance risk-adjusted returns in a mixed portfolio, a balanced approach would, in our opinion, favour greater exposure to dividend-yielding equities at this point, given the compression in spreads. Furthermore, equities have become more attractive versus bonds on a yield gap analysis basis (figure 5).

Globally, the rush into high-yield stocks after the worst of the global financial crisis was over resulted in these stocks being considerably re-rated (figure 6). In Asia ex-Japan, the PE of the top two quintiles of high-dividend yield stocks relative to the overall index has moved from 0.6x in 1999 to current levels of 0.9x. The number of fund launches in the income space might normally be a signal opposing a sell, but in a low-yield environment fund flows into global dividend yield strategies have continued to expand (figure 7), suggesting the dividend-yield theme could still have some way to go and that these stocks could even trade at a premium to the underlying index.

Not all dividend stocks are alike, however. Focusing exclusively on the highest-yielding stocks carries potential risks. Absolute yield levels can be misleading, particularly in times of economic distress when share prices might fall well below historic averages, resulting in artificially inflated dividend yields. Therefore, we believe it is important to focus on dividend sustainability rather than on absolute yield levels. Asia’s relatively robust corporate cash flows and strong balance sheets on aggregate suggest corporates have the ability to deliver on dividend commitments, but we believe dividends must be considered in the context of sustainable business models and steady cash income streams on an

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¹ Official public debt to GDP is 108%, figure shown is net of official foreign reserves. Source: UBS; US Treasury; Eurostat; Bloomberg. Data for 2011.
individual corporate level. We consider it important to look for companies with solid balance sheets and above average dividend yields for a sustained period relative to the relevant benchmark, as well as successful records of sustained profitability and steady cash income streams.

In our view, a strategy that seeks to combine stocks with sustainable high dividend yields and quality coupon paying bonds may be able to provide investors with the best of both worlds, potentially delivering stable income and capital growth on a risk-adjusted basis.

Annabel Betz, Client Portfolio Director
Invesco Asia-Pacific

Notes:
1 Source: Asian Development Bank, 30 November 2012.
The more evenly risk is distributed across individual portfolio components, the better diversified the portfolio. This is the main idea behind the diversification concepts introduced in this article.

In the two previous parts of this series, we dealt with the topic portfolio diversification and introduced concepts like the most diversified portfolio (MDP) and the minimum tail-dependent portfolio (MTD). Here, we will cover another diversification concept, the equal risk contribution portfolio (ERC) – also known as a risk parity strategy – as formalized by Qian. His starting point are the contributions of individual financial instruments to the standard deviation risk of the portfolio. According to Qian, a portfolio’s diversification increases as the differences between these individual risk contributions diminish – to put it differently: a portfolio is more diversified the more evenly the load (risk) is distributed across all risk-bearing components (the individual securities).

A similar concept is put forward by Boudt, who in place of the contributions to the standard deviation measure the contributions to a one-sided (i.e. focussed only on expected loss) risk measure like CVaR. Below, we present two variations of this: the minimum CVaR concentration portfolio (MCC) and the budgeted CVaR contribution portfolio (BCC).

**Portfolios with restrictions on risk contributions**

Our examination starts with the risk contribution of the i-th financial instrument to the total risk of a portfolio, where $i = 1, \ldots, N$:

$$ C_i M_{\omega \in \Omega} = \omega_i \frac{\partial M_{\omega \in \Omega}}{\partial \omega_i} $$

In this formula, $M_{\omega \in \Omega}$ represents a linearly homogeneous risk measure and $\omega$ stands for the portfolio weighting of the i-th financial instrument. $M_{\omega \in \Omega}$ can be used for either the standard deviation of the portfolio or as a one-sided risk measure such as VaR or CVaR, since all three measures constitute linearly homogeneous functions of the portfolio weighting.

According to Euler’s homogeneous function theorem, total risk is equal to the sum of the risk contributions from equation (1). The risk contributions can also be expressed as proportions of overall risk, by dividing the total by $M_{\omega \in \Omega}$:

$$ \% C_i M_{\omega \in \Omega} = \frac{C_i M_{\omega \in \Omega}}{M_{\omega \in \Omega}} \times 100 $$

We employ this relative expression in our empirical analysis.

**Equal contributions to standard deviation risk...**

The formula for the ERC portfolio is arrived at through the application of portfolio standard deviation

$$ \sigma(\omega) = \sqrt{\omega^T \Sigma \omega} \quad \text{for } M_{\omega \in \Omega}, $$

where $\omega$ represents the $(N \times 1)$ weighting factor and $\Sigma$ the variance-covariance matrix of returns. The minor diagonal elements of this matrix are $\sigma_i$ (covariance of returns from the i-th and j-th financial instruments), the main diagonal elements are $\sigma_i^2$ (variance of returns from the i-th financial instruments). This results in the following partial derivatives:

$$ \frac{\partial \sigma(\omega)}{\partial \omega_i} = \frac{\omega_i \sigma_i^2 + \sum_{j \neq i} \omega_j \sigma_{ij}}{\sigma(\omega)} $$

These N partial derivatives are proportional to the i-th line of $(\Sigma \omega)$. Accordingly, the optimisation problem in an ERC portfolio with additional long-only and budget restrictions can be formulated as follows:

$$ P_{\text{ERC}} : \omega_i (\Sigma \omega) = \omega_j (\Sigma \omega), \forall i, j \quad 0 \leq \omega_i \leq 1, \text{for } i = 1, \ldots, N \quad \omega^T 1 = 1 $$

where $i$ is the $(N \times 1)$ unit vector. The solution is arrived at using numerical optimisation (sequential quadratic programming).

One closed-form solution presupposes identical correlation of all conceivable pairs of portfolio values. Then, the weighting of the i-th financial instrument is determined as the inverse of relative volatility. More volatile financial instruments receive a lower portfolio weighting, more stable ones are weighted higher. In this case, the ERC solution is identical with the Maximum Sharpe Ratio Portfolio (MSR).

By definition, the standard deviation risk of the ERC portfolio is greater than that of a minimum-variance solution like the Global Minimum Variance Portfolio (GMV). But, it is lower than that of a naive solution like the Equal Weighted Portfolio (EQW).

**...and CVaR risk**

Below, we determine the risk contributions of individual financial instruments using CVaR as risk measure in place of standard deviation. By applying the CVaR function for $M_{\omega \in \Omega}$ in equation (1), the CVaR contribution of the i-th financial instrument becomes:

$$ C_i \text{CVaR}_{\omega \in \Omega, \alpha} = \frac{\partial \text{CVaR}_{\omega \in \Omega, \alpha}}{\partial \omega_i} $$

Now, confidence level $\alpha$ is added as a further parameter to the formula. It must be either specified a priori for all quantile-based risk measures or determined in the context of the optimisation.

Calculation of partial derivatives for these risk contributions is dependent on the assumed joint distribution function of returns. Under the assumption of normal distribution (or generally under the assumption of elliptical joint distribution), the partial derivatives can be computed quite easily. Consequently, either normal distribution or the one-
sided risk measure derived from the Cornish-Fisher expansion are used for practical application.

Under the normal distribution assumption, portfolio CVaR is:

\[
C \text{Var}_{\omega, \alpha} = -\alpha \mu + \sqrt{\omega \Sigma \omega} \frac{\phi(z_{\alpha})}{\alpha}
\]

where the \((N \times 1)\) vector \(\mu\) represents expected returns, \(\phi\) the density function of the standard normal distribution and \(z_{\alpha}\) the \(\alpha\)-quantile of the standard normal distribution. The marginal contribution of the \(i\)-th financial instrument to portfolio CVaR is thus:

\[
C_i \text{Var}_{\omega, \alpha} = \omega_i \left[ \mu_i + \left( \frac{\Sigma_{\alpha}}{\sqrt{\alpha \Sigma \omega}} \right) \phi(z_{\alpha}) \right]
\]

Scaillet (2002) demonstrated that the contribution to CVaR is equivalent to the contribution to portfolio loss if the loss contributions are higher than the VaR at a given confidence level \(\alpha\).

Note also that the portfolio allocation - under the assumption \(\mu = 0\) with equal CVaR contributions - is always equivalent to that of an ERC portfolio. The assumption of zero expected returns is founded in the random walk hypothesis. Under this premise, the first term in equation (7) is zero and the target function deviates from that of an ERC optimisation only through inclusion of the constant term \(\phi(z_{\alpha})/\alpha\), one which has no effect on the solution.

Compared to the ERC optimisation, this approach offers two advantages: for one, a coherent risk measure is applied, and secondly, restrictions can be set with respect to portfolio CVaR contributions. The optimisation can even be centered around the restrictions, for instance, by using a MinMax formula as found in Boudt et al. (2011a):

\[
C_{\omega, \alpha} = \min \left\{ \max_i C \text{Var}_{\omega, \alpha} \right\}
\]

The authors refer to this approach - which minimises the maximum CVaR contribution - as a Minimum CVaR Concentration (MCC) optimisation. It results in uniform CVaR contributions as a solution with interval budgets (Budgeted CVaR Contribution or BCC optimisation).

**Empirical application**

We will now apply the three optimisation approaches (ERC, MCC and BCC) to a global mixed portfolio.

The financial instruments will comprise equities and fixed income paper from the US, UK, Japan and the eurozone, as well as a commodities index. The equity markets will be covered via the S&P 500, FTSE 100, TOPIX and EuroStoxx4, the bond markets via US, UK, Japanese and German 10yr government bonds and the commodity markets via the GSCI performance index.

The optimisations are based on monthly returns from February 1991 to October 2012. No short positions are included and currency risks have been abstracted out. For the BCC optimisation, the maximum CVaR contribution was set to 20% at a confidence level of 95%, which was also applied for the MCC optimisation.

As in the previous parts of this series, we have separated the overall sample into two phases. Using the returns from February 1991 to October 2007, we optimized the portfolios; on this basis, we then determined their performance in the period November 2007 to October 2012. By way of comparison, we will also look at the performance of the evenly weighted EQW portfolio (which starts with all financial instruments constituting 1/9 or roughly 11%) as well as that of the MDP portfolio.

Table 1 shows the portfolio shares of the nine financial instruments; figure 1 shows the relative weightings compared to an EQW portfolio.

As can be seen, the MDP portfolio does not contain UK equities or German bonds, and the share of US equities is small, at about 1.55%. Instead, there is a markedly larger weighting of US, UK and Japanese bonds, eurozone equities and commodities than in

**Table 1: Portfolio allocations**

<table>
<thead>
<tr>
<th>Markets</th>
<th>MDP</th>
<th>ERC</th>
<th>BCC</th>
<th>MCC</th>
</tr>
</thead>
<tbody>
<tr>
<td>US equities</td>
<td>1.55</td>
<td>6.13</td>
<td>6.91</td>
<td>6.22</td>
</tr>
<tr>
<td>US bonds</td>
<td>18.23</td>
<td>14.25</td>
<td>13.87</td>
<td>4.27</td>
</tr>
<tr>
<td>UK equities</td>
<td>0.00</td>
<td>5.83</td>
<td>5.65</td>
<td>4.87</td>
</tr>
<tr>
<td>JP equities</td>
<td>15.93</td>
<td>13.70</td>
<td>11.54</td>
<td>13.81</td>
</tr>
<tr>
<td>JP bonds</td>
<td>9.29</td>
<td>6.48</td>
<td>0.77</td>
<td>5.96</td>
</tr>
<tr>
<td>EZ equities</td>
<td>37.17</td>
<td>24.12</td>
<td>27.84</td>
<td>35.29</td>
</tr>
<tr>
<td>EZ bonds</td>
<td>9.41</td>
<td>5.33</td>
<td>7.18</td>
<td>2.70</td>
</tr>
<tr>
<td>EZ bonds</td>
<td>0.00</td>
<td>17.31</td>
<td>22.49</td>
<td>22.94</td>
</tr>
<tr>
<td>Commodities</td>
<td>8.41</td>
<td>6.85</td>
<td>3.76</td>
<td>3.92</td>
</tr>
</tbody>
</table>

Source: Invesco. For illustrative purposes only.

**Figure 1: Portfolio allocations compared**

<table>
<thead>
<tr>
<th>MDP vs EQW</th>
<th>ERC vs EQW</th>
<th>BCC vs EQW</th>
<th>MCC vs EQW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commodity</td>
<td>EQW</td>
<td>MDP</td>
<td>ERC</td>
</tr>
<tr>
<td>Commodity</td>
<td>EQW</td>
<td>MDP</td>
<td>ERC</td>
</tr>
<tr>
<td>Commodity</td>
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<td>MDP</td>
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<tr>
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<td>EQW</td>
<td>MDP</td>
<td>ERC</td>
</tr>
<tr>
<td>Commodity</td>
<td>EQW</td>
<td>MDP</td>
<td>ERC</td>
</tr>
</tbody>
</table>

EQW: Equal-weighted portfolio; MDP: Most diversified portfolio; ERC: Equal risk contribution portfolio; BCC: Budgeted CVaR contribution portfolio; MCC: Minimum CVaR concentration portfolio.

The charts show the active positions of the other portfolios relative to the EQW.

Source: Invesco. For illustrative purposes only.
the ERC, BCC and MCC portfolios. Except for the weighting of Japanese equities, the ERC and BCC portfolios are similar. There are virtually no Japanese equities in the BCC portfolio, but in the ERC approach they have a meaningful weighting.

We also calculated risk - measured as standard deviation risk and modified Expected shortfall (ES) at 95% confidence - as well as the diversification and concentration ratios (table 2).6

Standard deviation risk and ES are highest in the case of the EQW approach; MDP and ERC are in the middle; the BCC and MCC portfolios carry the least risk ex post.

By definition, the MDP portfolio has the highest diversification ratio, followed closely by the ERC solution, while the BCC (and EQW) exhibits the lowest degree of diversification.

When it comes to the concentration ratio, on the other hand, that is lowest in the ERC portfolio and highest for the MDP approach - presumably because it leaves out a number of financial instruments.

Table 3 shows the percentage contributions to modified ES at a confidence level of 95%.

Note the negative ES contributions from bonds of all countries in the evenly weighted EQW portfolio, by which they serve a hedging purpose. It can also be seen that more than 90% of portfolio ES comes from the equity portion. There is also risk bundling evident under MDP: as much as two-thirds of portfolio ES derives from Japanese and eurozone equities and commodities. For the ERC, BCC and MCC solutions, the ES contributions are more evenly distributed; the maximum ES contribution was lowest under the ERC allocation, at just over 16% (Japanese equities), followed a close second by the MCC solution (slightly above 16% for eurozone bonds).

Figures 2, 3 and 4 show absolute and relative performance second phase based on the original allocation in table 1.

The terminal values of the three new approaches are higher than those of the EQW and MDP portfolios (figure 2). At the outset of the subprime crisis, the EQW portfolio sees a dramatic decline - like all other allocations, which also saw (albeit smaller) declines. At the start of 2009, all five portfolios then begin a major comeback.

Looking at the differences in returns of the ERC, BCC and MCC vs. EQW and MDP (figures 3 and 4), the following is evident: First, the ERC, BCC and MCC returns are higher in roughly half of the months and lower in the other half than under the EQW allocation. Second, ERC, BCC and MCC have a markedly larger advantage over EQW than over...

### Table 2: Portfolio metrics

<table>
<thead>
<tr>
<th>Statistic</th>
<th>EQW</th>
<th>MDP</th>
<th>ERC</th>
<th>BCC</th>
<th>MCC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard deviation</td>
<td>1.802</td>
<td>1.227</td>
<td>1.228</td>
<td>1.199</td>
<td>1.118</td>
</tr>
<tr>
<td>ES (modified, 95%)</td>
<td>3.415</td>
<td>1.941</td>
<td>1.913</td>
<td>1.759</td>
<td>1.580</td>
</tr>
<tr>
<td>Diversification</td>
<td>1.849</td>
<td>2.180</td>
<td>2.094</td>
<td>1.926</td>
<td>2.040</td>
</tr>
<tr>
<td>Concentration</td>
<td>0.136</td>
<td>0.167</td>
<td>0.115</td>
<td>0.129</td>
<td>0.138</td>
</tr>
</tbody>
</table>

Source: Invesco. For illustrative purposes only.

### Table 3: Contributions to the ES (at 95% confidence)

<table>
<thead>
<tr>
<th>Markets</th>
<th>EQW contributions</th>
<th>MDP contributions</th>
<th>ERC contributions</th>
<th>BCC contributions</th>
<th>MCC contributions</th>
</tr>
</thead>
<tbody>
<tr>
<td>UK equities</td>
<td>20.503</td>
<td>0.000</td>
<td>12.969</td>
<td>12.616</td>
<td>10.965</td>
</tr>
<tr>
<td>UK bonds</td>
<td>-1.555</td>
<td>6.493</td>
<td>9.924</td>
<td>11.952</td>
<td>13.455</td>
</tr>
<tr>
<td>JP bonds</td>
<td>-1.640</td>
<td>11.475</td>
<td>1.006</td>
<td>5.646</td>
<td>15.644</td>
</tr>
<tr>
<td>EZ bonds</td>
<td>-1.967</td>
<td>0.000</td>
<td>8.009</td>
<td>16.298</td>
<td>16.150</td>
</tr>
</tbody>
</table>

Source: Invesco. For illustrative purposes only.
methodology

MDP. Third, returns under the three new concepts are higher in around two-thirds of all months than under the MDP portfolio.

Summary and outlook

In this article, we interpreted diversification as the most uniform possible distribution of portfolio risks across individual financial instruments. We defined portfolio risk as both standard deviation of portfolio returns (ERC) and CVaR (BCC and MCC). As a rule, none of the three approaches permits analytical solutions, so that numerical optimisation methods are required. The empirical simulation, however, supports the hypothesis that approaches aiming at uniform risk contributions can have advantages.

Now that we have completed an in-depth look at the risk side of the equation over the past several articles, the next parts of the series will cover returns. We will introduce optimisation approaches that take into account differing levels of expected return.

Dr. Bernhard Pfaff, Portfolio Manager, Global Asset Allocation, Invesco Global Strategies

Notes:
1 Qian (2005, 2006, 2011). The concept, however, has been in existence since 1996 when it was coined by the investment firm Bridgewater. Zhu et al. (2010) describe solutions with restrictions or budgets for the individual risk components.
3 For more information here and below, see Maillard et al. (2010).
4 All performance indices with the exception of the EuroStoxx.
5 All calculations were conducted using the free statistical program environment R 2.15.2 (see R Development Core Team, 2010) and the packages FRAP (see Pfaff, 2013), Hmisc (see Harrell and et al., 2010), lattice (see Sarkar, 2008), PortfolioAnalytics (see Boudt et al., 2011b), PerformanceAnalytics (see Carl and Peterson, 2010) and timeSeries (see Würtz and Chalabi, 2012).
6 For the definition of diversification ratio and concentration ratio, see part 6 of this series, Risk & Reward, Q3/2012.

Bibliography


* All analysis shown is based on simulated portfolios.


Sovereign spreads are closely linked to the expected evolution of public debt. In this article, we present a methodology to forecast its path and sustainability, based on the history of a country’s macroeconomic fundamentals. This may help to detect deteriorations or improvements of public finances that could ultimately lead to changes in sovereign credit valuation. Our methodology forms the basis of the new Invesco Sovereign Debt Monitor, which will be updated regularly.

Assessing the sustainability and the expected path of government debt requires assumptions on the development of macroeconomic variables (primary surplus, interest rates, and economic growth rates, among others) that drive changes in total debt. However, a deterministic approach that assumes a predetermined path for these variables misses a key factor: the covariance between these main determinants of debt evolution. For example, an increase in fiscal primary balance (a fiscal tightening) can depress economic activity in the short term; an increase in real GDP growth can impact interest rates; an external shock, such as an increase in global liquidity, influences sovereign credit yields; among many others.

This correlation depends on structural relationships and may differ from country to country: a change in government spending does not influence growth equally, and interest rates do not change by the same amount across countries when the primary fiscal surplus changes. Also, the primary fiscal surplus is the result of revenue and expenditure decisions that are in essence economic policy variables.

This methodology assumes that the reaction of economic authorities, regarding expenditure and revenue, to future economic developments would be similar to the historical relationship experienced by the country in the estimation period. However, the estimation does not address contingent liabilities that can become a burden in times of crisis, e.g. the likely bailout of the financial, corporate or quasi sovereign corporate sector, because of the subjectivity and idiosyncrasy that it would involve for different countries under different scenarios.

Debt sustainability assessments usually require ad-hoc assumptions on the co-movement of fundamental variables. However, using country specific data can shed some light on their historical relationship. The methodology proposed in this paper uses the country specific evidence exhibited between these variables to forecast their joint evolution and ultimately the path of government debt and its sustainability in the medium term.

Denoting the stock of government debt in constant prices with \(D\), Gross Domestic Product in constant prices with \(GDP\), the real interest rate on government debt with \(r\), and the government’s primary (before interest payments) surplus in constant prices with \(PS\), the evolution of government debt is given by:

\[
D_{t+1} = (1 + r) D_t - PS_t
\]

This equation describes the change in government debt as the debt service incurred each period \(t\) (amortization plus interest payments) minus the primary government surplus in the same period.

Dividing both sides of the equation by \(GDP\) and the left hand side of the equation by \(GDP_{t+1}/GDP_t\), to express these variables as percentages of GDP gives:

\[
\frac{D_{t+1}}{GDP_{t+1}} \cdot \frac{GDP_t}{GDP_{t+1}} = \frac{(1 + r_j) D_t - PS_t}{GDP_t}
\]

Rearranging the terms:

\[
d_{t+1} = \frac{(1 + r_j) D_t - PS_t}{1 + g_t}
\]

Lower case variables represent the respective ratio of the upper case equivalent to GDP, and \(g_t\) the annual real growth rate of GDP. This equation summarizes the key relationships between the macroeconomic variables: a real interest rate that is higher than real economic activity growth will increase debt \((r > g)\) as a ratio to GDP, as will an increase in the primary deficit. If, as is the case for many emerging economies, a share \((\alpha)\) of government debt is denominated in foreign currency, this equation can be modified as:

\[
d_{t+1} = \frac{\alpha (1 + r_z j) (1 + r_j) (1 - \alpha)(1 + r_j)}{1 + g_t} - \frac{PS_t}{1 + g_t}
\]

with \(r_j\) and \(r_z\) denoting the real interest rate on foreign currency denominated debt and the real exchange rate depreciation, respectively. This equation differs from the one presented above because a real exchange rate depreciation increases the debt service. It is important to take this effect into account because sharp real exchange rate depreciations for a country that is highly indebted in foreign currency can rapidly increase the stock of total debt as proportion to GDP.

Clearly, these macroeconomic variables (real growth, primary government surplus, domestic debt interest rate, foreign debt interest rate, and depreciation of the real exchange rate) are fundamentally related. Debt sustainability assessments need to take into account this relationship and the extent to which future shocks to these variables, as well as shocks to global economic conditions, can influence them. The methodology proposed uses the statistical joint relationship between these variables to forecast their evolution and the change in the variable of interest, and the stock of government debt to GDP ratio.

The first step is to estimate the relationship among these variables through a Vector Auto Regression (VAR) model using country specific data. This
estimation technique explains the occurrences of each of the variables of interest as a function of its own lags and the lags of all other variables in the model:

$$Y_t = A + \Gamma Y_{t-1} + \epsilon_t$$

Where $Y_t := (q_t, r_t, ps_t, r^*_t, z_t, r^us_t)$ and $r^us_t$ is the real interest rate on US government securities, a proxy for global liquidity conditions that affect macro-economic fundamentals for each country. The rest of the variables were defined above. The vector $\epsilon_t$ denotes shocks to each of the equations and follows a multivariate normal distribution with zero mean and covariance matrix $\Omega$.

The second step uses the estimated relationship to forecast different paths for the variables of interest. In short, with the estimation of the vector of constants, $A$, the matrix of autoregressive coefficients $\Gamma$ as well as the covariance matrix of the random shocks to each equation $\Omega$, the method draws a large number of shocks (2000) from the estimated distribution and calculates different values for the fundamental variables and the implied paths of debt-to-GDP ratio for a number of periods ahead using the debt accumulation equation. The projected paths are used to calculate the probability that debt changes by a specific amount and to perform stress tests in which fundamental variables take a given path or trend to make an assessment of the sustainability on the debt profile.

The results of the different forecasted paths are summarized in “fan charts” that plot the frequency of possible outcomes with different colour intensity: a more intense colour denotes more frequent outcomes each period and the colour fades out as the probability of achieving certain values decreases. The solid line in the “Fan Chart” represents the median of predicted outcomes each period.

Data
The countries selected for the analysis are Brazil, Colombia, Mexico, Peru, Hungary, Poland, Turkey, South Africa, Malaysia, and the Philippines. These countries represent important emerging economies from different regions of the world for which there is sufficient data availability and considerable levels of outstanding public debt with market-determined interest rates. The Invesco Sovereign Debt Monitor will be periodically updated to include more countries and observations as they become available.

The frequency of data is quarterly and the period of estimation starts in March 2000. Quarterly series are preferred as the technique requires as many observations as possible to consistently estimate the parameters. The variables used are described in table 1. Data is retrieved using Thomson Reuters DataStream from different sources including the IMF’s International Financial Statistics (IFS), Oxford Economics, and national sources.

Annual real GDP is constructed adding the value of the current and three previous quarters of the quarterly series in constant prices. The annual growth rate is calculated as the log-difference from each quarter to the value in the same quarter one year before. The same method is used to calculate annual primary surplus in constant prices from the quarterly series. Results in each quarter are added to the results in the last three quarters to obtain annual primary surplus from the quarterly series. This transformation corrects for seasonal effects in the quarterly series that can be present in any of the variables. Real exchange rate depreciation is constructed by calculating the log-difference of the real effective exchange rate from the value in the same quarter one year before. Given the difficulty to obtain a domestic interest rate measure that denotes the cost of funding for the government that is uniform across different countries and debt profiles, a market interest rate is used and deflated using the growth rate of CPI to obtain the domestic real interest rate. For the foreign interest rate the strip spread from the J.P. Morgan EMBI+ or EMBI Global is used for each of the countries. The share of foreign currency debt, which is assumed constant throughout the period of consideration, is calculated using the mean ratio of foreign currency debt to total public debt in the last 4 years of the sample. Finally, as proxy for the US interest rate, the nominal yield on 10 year government bonds is used and converted to real terms using the growth rate of CPI.

Results
The fan charts in figure 1 (see appendix) show the 5th to the 95th percentile of the frequency distribution of Government debt-to-GDP ratio with decreasing shading for less probable outcomes; the median forecast is depicted by the solid line. The forecasted paths start on the second quarter of 2012 and simulations are performed for 12 quarters.

Results show that Brazil (even though from a high level), Colombia, Poland, and Malaysia are expected to decrease the debt-to-GDP ratio slowly in the medium term; neither of these countries is expected to experience a vast decrease that could be related to future large changes in credit valuations. South Africa shows an expected stable value in the debt-to-GDP ratio. For Mexico the model's results suggest an increase of 5 percentage points in the median calculation during the next 12 quarters. For Peru, Turkey, and the Philippines, the results from the

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Real GDP growth</td>
<td>Annual growth of the quarterly series of Gross Domestic Product in constant prices</td>
</tr>
<tr>
<td>Domestic real interest rate</td>
<td>Treasury interest rate, Federal Funds rate or Deposit rate according to availability, deflated using the annual growth of CPI</td>
</tr>
<tr>
<td>Foreign interest rate spread</td>
<td>Strip spread on external sovereign debt, J.P. Morgan EMBI+ or EMBI Global Indices</td>
</tr>
<tr>
<td>Government primary surplus</td>
<td>Government revenues minus expenses (excluding interest expenses)</td>
</tr>
<tr>
<td>Government debt</td>
<td>General government debt (net or gross depending on availability)</td>
</tr>
<tr>
<td>Real exchange rate depreciation</td>
<td>Annual growth of the real effective exchange rate</td>
</tr>
</tbody>
</table>
model predict a rapid decrease in debt-to-GDP ratio whereas for Hungary there is a projected deterioration given that debt levels could reach values as high as 100% of GDP with positive probability. As was explained above, these results use the historical correlation between the fundamental variables, and should be understood as warning indicators on the possible path if policymakers keep adjusting the primary surplus as they have in the last decade, and without taking into account extra-budgetary shocks.

Another way to present the results of this analysis is to calculate the probability that for the period forecasted the debt-to-GDP ratio changes by a given value. Table 2 (see appendix) shows the probability that the debt ratio will reach an amount above the current level, plus/minus 15 percentage points, 10 percentage points, and 5 percentage points in any of the next 12 quarters. A larger probability of the debt-to-GDP ratio increasing is shown as larger quantities in the lower cells. For example, the probability that Brazil’s debt increases by more than 5 percentage points is 0 and the probability that it will be above the current level is 0.6%. This same measure is 17.6% for Mexico and 50.87% for Hungary. For the Philippines, the probability that debt decreases by more than 15 percentage points is 37.7% (100% minus 62.3%), 5.8% for Peru, and 6.6% for Turkey.

The last decade was characterized in emerging economies by high economic growth and a rapid recovery from the global financial crisis. The forecasted path of growth could be persistently higher, implying a faster decrease in debt-to-GDP that may not prove to be accurate if economic growth slows. To allow for this, the model supposes a growth path that is 2.5 percentage points lower than the ones initially forecasted. Results for this stress test are shown in table 3 for the same group of countries. The outlook for Hungary in particular is worsening under this scenario, as the probability of debt-to-GDP increasing by more than 15 percentage points from its current level is close to 25%. For Mexico and South Africa the probability that debt-to-GDP increases by more than 5 percentage points increases to 28.9% and 8.5% respectively.

Another possibility is that current loose global liquidity conditions imply total financing costs for countries that are too low. To calculate how tighter liquidity conditions influence the results, an increase of 100 basis points in the US real interest rate is added each quarter to the paths forecasted by the model. Results of this stress test are summarized in table 4. Finally, table 5 shows the results of repeating the exercise assuming the two scenarios: higher interest rates and lower growth rates. As the table summarizes, results do not change significantly for the countries in which debt paths were considered as sustainable in the benchmark estimation.

Conclusions
Debt sustainability assessments for sovereigns require assumptions on the expected paths of fundamentals that drive the debt-to-GDP ratio. In this paper, we have presented the Invesco Sovereign Debt Monitor. On the basis of the historical relationship between these variables in different countries, it assesses the medium-term sustainability of sovereign debt using a stochastic framework.

Results show that for most of the selected Emerging Market economies, debt levels are stabilizing or decreasing. For Mexico, the median forecast shows a slow increase for the next 3 years. The only case in which forecasts show an unsustainable path is Hungary with levels surpassing 90% of GDP and high probability of reaching close to 100% of GDP in the medium term.

The Invesco Sovereign Debt Monitor will be periodically updated and complemented as new observations and more countries are included in the sample.

Armando Armenta, Economics Research Analyst
Invesco Fixed Income

Notes:
1 A similar methodology is employed at policy making institutions such as the IMF and the European Commission to identify macroeconomic vulnerabilities in public finances and recommend policy actions. See Celasun, Debrun, and Ostry (2006), Primary Surplus and Risks to Fiscal Sustainability in Emerging Market Countries: A “Fan-Chart” Approach, IMF Working Paper and Joao Medeiros (2012), Stochastic debt simulation using VAR models and a panel fiscal reaction function: results for a selected number of countries, Economic Papers, European Economy.
2 For Chile and Russia data is available but in the past few years the level of debt has decreased rapidly to levels of around 5% and 8% of GDP which from any metric we believe can be considered as sustainable.
Appendix

Figure 1 Expected development of government debt-to-GDP ratio (for the 12 quarters from Q2 2012)

Brazil: Government debt (% of GDP)

Colombia: Government debt (% of GDP)

Mexico: Government debt (% of GDP)

Peru: Government debt (% of GDP)

Hungary: Government debt (% of GDP)

Poland: Government debt (% of GDP)

Turkey: Government debt (% of GDP)

South Africa: Government debt (% of GDP)

Malaysia: Government debt (% of GDP)

Philippines: Government debt (% of GDP)

Source: Thomson Reuters DataStream and Invesco Sovereign Debt Monitor, as at January 2013.
### Table 2: Probability of debt-to-GDP ratio being above different thresholds in any of the 12 quarters from Q2 2012

<table>
<thead>
<tr>
<th></th>
<th>Brazil</th>
<th>Colombia</th>
<th>Mexico</th>
<th>Peru</th>
<th>Hungary</th>
<th>Poland</th>
<th>Turkey</th>
<th>South Africa</th>
<th>Malaysia</th>
<th>Philippines</th>
</tr>
</thead>
<tbody>
<tr>
<td>-15%</td>
<td>99.90%</td>
<td>99.73%</td>
<td>100.00%</td>
<td>96.73%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>97.55%</td>
<td>100.00%</td>
<td>98.36%</td>
<td>75.03%</td>
</tr>
<tr>
<td>-10%</td>
<td>98.06%</td>
<td>97.43%</td>
<td>100.00%</td>
<td>82.25%</td>
<td>100.00%</td>
<td>99.51%</td>
<td>87.79%</td>
<td>99.97%</td>
<td>93.48%</td>
<td>49.45%</td>
</tr>
<tr>
<td>-5%</td>
<td>76.77%</td>
<td>81.03%</td>
<td>100.00%</td>
<td>45.87%</td>
<td>100.00%</td>
<td>92.11%</td>
<td>54.49%</td>
<td>98.73%</td>
<td>77.71%</td>
<td>17.50%</td>
</tr>
<tr>
<td>0%</td>
<td>7.25%</td>
<td>10.32%</td>
<td>96.27%</td>
<td>0.61%</td>
<td>99.19%</td>
<td>35.75%</td>
<td>4.79%</td>
<td>50.60%</td>
<td>20.68%</td>
<td>0.02%</td>
</tr>
<tr>
<td>5%</td>
<td>0.79%</td>
<td>0.73%</td>
<td>32.75%</td>
<td>0.04%</td>
<td>68.95%</td>
<td>1.45%</td>
<td>0.99%</td>
<td>8.54%</td>
<td>4.53%</td>
<td>0.00%</td>
</tr>
<tr>
<td>10%</td>
<td>0.05%</td>
<td>0.05%</td>
<td>9.55%</td>
<td>0.00%</td>
<td>46.76%</td>
<td>0.10%</td>
<td>0.20%</td>
<td>1.22%</td>
<td>1.10%</td>
<td>0.00%</td>
</tr>
<tr>
<td>15%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>2.13%</td>
<td>0.00%</td>
<td>33.00%</td>
<td>0.00%</td>
<td>0.05%</td>
<td>0.10%</td>
<td>0.26%</td>
<td>0.00%</td>
</tr>
</tbody>
</table>

Source: Thomson Reuters DataStream and Invesco Sovereign Debt Monitor, as at January 2013.

### Table 3: Probability of debt-to-GDP Ratio being above different thresholds (lower growth scenario) 12 quarters from Q2 2012

<table>
<thead>
<tr>
<th></th>
<th>Brazil</th>
<th>Colombia</th>
<th>Mexico</th>
<th>Peru</th>
<th>Hungary</th>
<th>Poland</th>
<th>Turkey</th>
<th>South Africa</th>
<th>Malaysia</th>
<th>Philippines</th>
</tr>
</thead>
<tbody>
<tr>
<td>-15%</td>
<td>98.4%</td>
<td>99.0%</td>
<td>100.0%</td>
<td>94.2%</td>
<td>100.0%</td>
<td>99.9%</td>
<td>93.4%</td>
<td>100.0%</td>
<td>96.2%</td>
<td>62.3%</td>
</tr>
<tr>
<td>-10%</td>
<td>88.0%</td>
<td>92.6%</td>
<td>100.0%</td>
<td>74.9%</td>
<td>100.0%</td>
<td>97.1%</td>
<td>76.6%</td>
<td>99.8%</td>
<td>87.8%</td>
<td>40.9%</td>
</tr>
<tr>
<td>-5%</td>
<td>51.1%</td>
<td>67.0%</td>
<td>100.0%</td>
<td>39.3%</td>
<td>99.8%</td>
<td>79.4%</td>
<td>41.6%</td>
<td>96.0%</td>
<td>66.1%</td>
<td>16.5%</td>
</tr>
<tr>
<td>0%</td>
<td>0.6%</td>
<td>3.6%</td>
<td>92.3%</td>
<td>0.1%</td>
<td>96.0%</td>
<td>19.1%</td>
<td>1.1%</td>
<td>33.1%</td>
<td>10.5%</td>
<td>0.0%</td>
</tr>
<tr>
<td>5%</td>
<td>0.0%</td>
<td>0.1%</td>
<td>17.6%</td>
<td>0.0%</td>
<td>50.8%</td>
<td>0.1%</td>
<td>0.1%</td>
<td>2.7%</td>
<td>1.1%</td>
<td>0.0%</td>
</tr>
<tr>
<td>10%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>2.4%</td>
<td>0.0%</td>
<td>23.4%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.2%</td>
<td>0.2%</td>
<td>0.0%</td>
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<tr>
<td>15%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.2%</td>
<td>0.0%</td>
<td>9.9%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
</tbody>
</table>

Source: Thomson Reuters DataStream and Invesco Sovereign Debt Monitor, as at January 2013.

### Table 4: Probability of debt-to-GDP Ratio being above different thresholds (higher US real interest rate), 12 quarters from Q2 2012

<table>
<thead>
<tr>
<th></th>
<th>Brazil</th>
<th>Colombia</th>
<th>Mexico</th>
<th>Peru</th>
<th>Hungary</th>
<th>Poland</th>
<th>Turkey</th>
<th>South Africa</th>
<th>Malaysia</th>
<th>Philippines</th>
</tr>
</thead>
<tbody>
<tr>
<td>-15%</td>
<td>99.93%</td>
<td>99.74%</td>
<td>100.00%</td>
<td>95.58%</td>
<td>100.00%</td>
<td>99.98%</td>
<td>97.06%</td>
<td>100.00%</td>
<td>98.24%</td>
<td>70.23%</td>
</tr>
<tr>
<td>-10%</td>
<td>97.88%</td>
<td>96.92%</td>
<td>100.00%</td>
<td>78.91%</td>
<td>100.00%</td>
<td>99.56%</td>
<td>85.59%</td>
<td>99.94%</td>
<td>93.45%</td>
<td>46.23%</td>
</tr>
<tr>
<td>-5%</td>
<td>75.02%</td>
<td>78.43%</td>
<td>100.00%</td>
<td>42.46%</td>
<td>99.99%</td>
<td>92.83%</td>
<td>51.07%</td>
<td>98.74%</td>
<td>77.52%</td>
<td>17.07%</td>
</tr>
<tr>
<td>0%</td>
<td>6.45%</td>
<td>7.74%</td>
<td>96.51%</td>
<td>0.23%</td>
<td>99.04%</td>
<td>37.03%</td>
<td>3.33%</td>
<td>50.26%</td>
<td>20.79%</td>
<td>0.01%</td>
</tr>
<tr>
<td>5%</td>
<td>0.71%</td>
<td>0.40%</td>
<td>28.88%</td>
<td>0.01%</td>
<td>64.90%</td>
<td>1.72%</td>
<td>0.56%</td>
<td>8.45%</td>
<td>4.38%</td>
<td>0.00%</td>
</tr>
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<td>10%</td>
<td>0.04%</td>
<td>0.03%</td>
<td>7.30%</td>
<td>0.00%</td>
<td>40.18%</td>
<td>0.12%</td>
<td>0.13%</td>
<td>1.17%</td>
<td>0.96%</td>
<td>0.00%</td>
</tr>
<tr>
<td>15%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>1.28%</td>
<td>0.00%</td>
<td>24.71%</td>
<td>0.00%</td>
<td>0.03%</td>
<td>0.11%</td>
<td>0.20%</td>
<td>0.00%</td>
</tr>
</tbody>
</table>

Source: Thomson Reuters DataStream and Invesco Sovereign Debt Monitor, as at January 2013.

### Table 5: Probability of debt-to-GDP Ratio being above different thresholds (low growth, high US interest rate), 12 quarters from Q2 2012

<table>
<thead>
<tr>
<th></th>
<th>Brazil</th>
<th>Colombia</th>
<th>Mexico</th>
<th>Peru</th>
<th>Hungary</th>
<th>Poland</th>
<th>Turkey</th>
<th>South Africa</th>
<th>Malaysia</th>
<th>Philippines</th>
</tr>
</thead>
<tbody>
<tr>
<td>-15%</td>
<td>98.5%</td>
<td>99.3%</td>
<td>100.0%</td>
<td>95.7%</td>
<td>100.0%</td>
<td>99.9%</td>
<td>95.2%</td>
<td>100.0%</td>
<td>96.5%</td>
<td>66.5%</td>
</tr>
<tr>
<td>-10%</td>
<td>88.8%</td>
<td>94.0%</td>
<td>100.0%</td>
<td>78.3%</td>
<td>100.0%</td>
<td>96.8%</td>
<td>80.4%</td>
<td>99.9%</td>
<td>88.7%</td>
<td>42.9%</td>
</tr>
<tr>
<td>-5%</td>
<td>52.0%</td>
<td>69.8%</td>
<td>100.0%</td>
<td>41.1%</td>
<td>100.0%</td>
<td>79.3%</td>
<td>44.4%</td>
<td>96.6%</td>
<td>67.0%</td>
<td>16.6%</td>
</tr>
<tr>
<td>0%</td>
<td>0.8%</td>
<td>4.7%</td>
<td>92.9%</td>
<td>0.1%</td>
<td>98.4%</td>
<td>19.8%</td>
<td>1.9%</td>
<td>35.0%</td>
<td>11.8%</td>
<td>0.0%</td>
</tr>
<tr>
<td>5%</td>
<td>0.0%</td>
<td>0.1%</td>
<td>21.2%</td>
<td>0.0%</td>
<td>59.4%</td>
<td>0.1%</td>
<td>0.3%</td>
<td>2.7%</td>
<td>1.3%</td>
<td>0.0%</td>
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<tr>
<td>10%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>4.0%</td>
<td>0.0%</td>
<td>33.8%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.2%</td>
<td>0.2%</td>
<td>0.0%</td>
</tr>
<tr>
<td>15%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.5%</td>
<td>0.0%</td>
<td>18.5%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
</tbody>
</table>

Source: Thomson Reuters DataStream and Invesco Sovereign Debt Monitor, as at January 2013.
Dividends: Sustainability is what counts

In the present low-yield environment, for many investors the current income from bonds is no longer sufficient.Equities with high dividend yields might be of interest to them. We demonstrate why we believe dividend sustainability, and not just the current dividend, should play a crucial role in the stock selection, and present an alternative to a simple dividend yield strategy.

In recent years, the yields on so-called risk-free investments have fallen continuously. With short-term Bund and US Treasury yields close to zero investors are finding it increasingly more difficult to generate current income. This makes stocks that pay high dividends all the more attractive. But they also have their pitfalls.

Beware of simple dividend strategies...
For sure, strategies focussing solely on a high dividend or on the dividend yield have frequently outstripped the capitalisation-weighted indices of late. But from a risk viewpoint we still do not consider them to be optimal.

The results of a historical simulation confirm this view: for the period 31 December 1996 to 30 June 2012, we have compared the performance of the MSCI World with that of a portfolio containing only stocks with a dividend yield of at least 3% which otherwise essentially corresponds with the index (“MSCI World with a dividend focus”). Table 1 and figure 1 highlight the results.

While an investment in this ‘simple’ dividend strategy in the last 15 years would have generated a higher return than an index strategy, the risk ratios do not confirm the advantages usually ascribed to dividend-oriented investing: the simulated dividend portfolio was even slightly more volatile than the MSCI World (16.7% compared with 16.6%), the extreme returns were similarly high and the maximum drawdown was slightly higher. The higher long-term earnings of the simple dividend strategy offer little consolation in difficult market phases.

... and of high dividend yields
And another point to consider: in the current market conditions, the dividend yields of many companies (such as utilities and telecoms) are only high because investors are expecting dividends to fall and this assumption has already been partially factored into the share prices. When, however, the falling dividends become a reality, this is frequently accompanied by further losses – the stock is “punished”. It may thus be wise to avoid equities with the prospect of dividend reductions no matter how high the current dividend yield appears to be.

Sustainability is what counts
Hence, in our view, crucial for the success of a dividend strategy is the genuine sustainability of the dividends. The company should display not only a high dividend yield but also stable (or, preferably, rising) earnings so that the dividends can rise or at least do not fall. The earnings should also be higher than the dividends.

Other factors are more difficult to recognize but are no less important: for example, we believe there is little to gain over the long term from a company paying a dividend but at the same time raising its debt – or if only a small part of the earnings is generated operationally and the cash flows are correspondingly low.

Below we present a dividend strategy which takes all these considerations into account.

The practical realisation
Anyone wishing to compile a portfolio with a higher dividend yield can do two things: the first possibility is to restrict the investment universe to stocks with above-average dividend yields. But it is vital to ensure here that there are still enough stocks to choose from. If, for example, one were to select a minimum dividend yield of 3% for the MSCI World,
Global option strategy

The model strategy covered in this article is a defensive strategy. An additional strategy that can be used in conjunction with the model strategy for smoothing returns is that of selling call options. Here, advantage can potentially be taken of the fact that the expected (i.e. implied) volatility often exceeds the volatility actually realized, in other words the expected volatility is on average overstated over the long term. It is possible for sellers of options to benefit from this.

If, for example, call options are written with a life of three months and a strike 10% above the current index reading, two possibilities exist upon expiry of the option: if the index has risen less than 10% in the three-month period and is quoting below the strike, the seller receives the option premium (the exact amount of which depends on the implied volatility at the time of opening the transaction) and has no further obligations. If, by the same token, the index has risen by more than 10% and lies above the strike, every further index increase will be disadvantageous to the option writer. But since the option position is taken in addition to an equity portfolio, they only forfeit the price gains which exceed 10% in the quarter. Therefore, the option premium is still received. As a complement to the equity portfolio, this strategy means that an option premium is still gained, regardless of the market development, and in return, the price gain is limited to 10% in the quarter, except in the circumstances described in the next paragraph.

There is a basis risk between the equity portfolio and the index underlying the option. Owing to the equity portfolio’s low beta (i.e. high tracking error), the option can already be in the money before the equity portfolio has actually reached the 10% hurdle. This generally only happens when markets are rising and the investor’s aggregate return is reduced albeit in most cases still remains positive. By additionally adjusting the country allocation of the options (or, in an extreme case, closing the option positions) the basis risk can remain manageable in the long run.

All in all, a global option strategy allows for the possibility of the return of the model portfolio to be boosted (by 100-150 basis points in this example), with the opportunity cost of an index increase of more than a given percentage already factored in (10% in this example). In combination with the model portfolio, the global option strategy can potentially contribute towards a further slight reduction in the volatility of the overall portfolio.

Figure 2a: Dividend yield distribution of the MSCI World (relative to market capitalisation)

Figure 2b: Dividend yield distribution of the MSCI World (relative to the number of stocks)

Figure 3: Comparison of bond and dividend yields

This would leave only 570 shares out of the original some 1,600 stocks, around 43% of the market capitalisation (figures 2a and 2b). This would prove a sizeable hindrance to active stock picking that also takes dividend sustainability and possibly other criteria into account.

We therefore see more sense in targeting only a high average dividend yield - not least because we consider the dividend yield to be less suitable as a sole selection criterion than, for example, our multi-factor model. This model is based on four concepts and considers the companies from a number of viewpoints that are decisive for the sustainability of the dividends.¹

The important thing for us is to not simply pick the stocks with the highest dividend yield but to seek out the less potentially volatile, high-quality stocks with an above-average dividend yield. Stocks which are especially attractive can also be purchased even if the dividend yield is lower, something which might not be possible if the limit were rigidly set at, say, 25...
Based on these specifications we have constructed a global model portfolio, the dividend yield of which averaged out at 4.4% in the simulation period and fluctuated between 3.6 and 5.9%. On 31 December 2012, the yield was 5.33% (figure 3). This would have been comparatively attractive in the present low-yield environment. In average terms, the portfolio would have achieved a 2.5 percentage point higher dividend yield than the MSCI World.\(^2\)

The risk and return indicators of the model portfolio look promising: volatility lies a good 20 to 30% below the volatility of the MSCI World, the beta pans out at between 0.5 and 0.7 and the annual portfolio turnover stands at around 60 to 80%. The performance not only would have clearly outstripped the index but also that of the simple dividend strategy described at the beginning of this paper (figure 4, table 2).

Due to the benchmark-free optimisation, the sector and country structure of the model portfolio diverges in some cases visibly from the MSCI World. The average market capitalisation and weightings of the factors “volatility” and “growth” are also lower.

Conclusion
When bond yields are low, there is a tendency for investors to focus on stocks with high dividends. However, as shown in this article, stock picking based on the current dividend yield is not necessarily a robust approach. The simulated figures show that, on average, the risk profile of such a strategy would not have been better than that of the portfolio that simply tracks the index: the resultant dividend portfolio would even have been slightly more volatile and it would not have mitigated the risk of extreme losses in difficult market phases.

We, therefore, developed a different approach and simulated its performance. This model strategy does not define a minimum dividend yield for each stock but only the average for all the positions, selecting stocks according to factors which have already proved their worth in real use and which offer vital indicators for the sustainability of the dividends. In terms of earnings and stability, the simulations in this article show that this strategy would have performed better than both the capitalisation-weighted MSCI World index and the simple dividend strategy that relied solely on the current dividend yield being equal or exceeding 3%. The results of the model portfolio would, therefore, seem to support our view that more important than the current dividend yield is the sustainability of the dividends.

Dr. Martin Kolrep, Senior Portfolio Manager, Global Quantitative Equities, Invesco Global Strategies

Notes:
1. The Invesco stock picking model dates back to 1983. The objective is to pick the most promising stocks from a universe of more than 4,000 stocks. The model is based on four investment concepts: earnings revisions, relative strength, management behaviour and valuation. We consolidate the underlying indicators into alphas which provide an indication of the expected relative return of each stock. A detailed description can be found in M. Fraikin, New and improved indicators for the Invesco stock selection model, Risk & Reward Q1/2010.
2. Similar results were achieved when we applied the same strategy to US equities and compared the results to the Russel 1000 index.
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Source: Invesco, as at 31 December 2012. The listed investment teams do not all provide their products or services globally. Not all funds and strategies listed are
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Source: Invesco, data as at 31 December 2012.
For important information details please see last page of the publication.