

Government bond portfolios based on sovereign risk indicators

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Market capitalization indices require investors to buy more debt of countries issuing more debt. In this study we show that we can construct sovereign bond portfolios with higher Sharpe ratios based on ex-ante available debt-to-GDP, budget balance, GDP growth, current account, and political risk scores. Both for European Monetary Union (EMU) Euro bonds and for emerging market US Dollar bonds we find especially strong results for budget balance and the 1-year changes in debt-to-GDP and political risk. Autocorrelation in country fundamentals explains at least in part their ability to predict sovereign bond returns.

Key words: Euro sovereign credit crisis; country fundamentals; sovereign spreads

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1. Introduction

The Euro sovereign crisis has again highlighted the importance of fiscal sustainability and political risk for sovereign spreads. It also drove many investors away from the market capitalization weighted EMU government bond benchmark to countries with an AAA rating. Market capitalization weighted benchmarks increase weight of countries that issue the most new debt. This makes investors nervous in a period where there are doubts about the fiscal sustainability of a country.

In this study we look at a possible direction to improve upon the market capitalization benchmark. We show that ex-ante available indicators of country distress risk can be used to construct sovereign bond portfolios with superior risk-return trade-offs compared to the market capitalization weighted index. In our approach we select each month select the countries that rank highest amongst their peers in terms of levels and changes of debt-to-GDP, budget balance, GDP growth, current account, and political risk scores. We show that especially for budget balance, the 1-year change in the debt-to-GDP, and 1-year changes in Political Risk Scores the resulting bond portfolios have a higher return and a lower risk.

We look at both EMU and Emerging Market (EM) debt. For EMU Hagen et al. (2011) show that only since 2008 fiscal sustainability of the EMU countries explains sovereign spreads relative to Germany. Given that we have been in a crisis in Europe from 2008 to 2011 any low-risk alternative to the market capitalization index over this period will probably improve the Sharpe ratio. For EM debt, however, we both have seen actual defaults, multiple crises, but also multiple stories of strong growth. Hence testing sovereign distress risk indicators on EM debt will provide a more balanced picture than considering EMU bonds only.

There is quite some literature on EM USD debt. Most studies attempt to disentangle country specific and global effects on sovereign spreads¹. They often use a panel approach to explain simultaneously the cross-sectional and time-series dynamics of sovereign spreads by country fundamentals and global (risk) indicators. Remolona et al. (2008) find global risk aversion to be important, and Rocha et al. (2007) include VIX next to debt-to-GDP and World Bank governance indicators. Rocha and Moreira (2010) include fundamentals and products of

¹ Elton et al. (2001), and Colin-Dufresne et al. (2001) both show for corporations that the probability of default can explain 25 percent of credit spread dynamics, and the other 75 percent can to a large extent be attributed to a common systematic risk factor.

these fundamentals with High Yield spreads and the VIX. Dailami et al. (2008) conclude that the impact of US short-term rates on emerging market spreads depends on the level of debt-to-GDP. And Gande and Parsley (2005) find that a rating downgrade in one country impacts the sovereign spreads of other countries. Evidence on the importance of fundamentals for sovereign spreads is mixed, perhaps due to the impact of global (risk) factors on sovereign spreads. Baek et al. (2005), for example, find budget balance and current account not to be significant. On the other hand Genberg and Sulstarova (2008) do find current account to be significant, whereas Baldacci et al. (2011) find the budget balance to be significant.

Our analysis differs from the aforementioned studies in two dimensions. First we test whether country fundamentals can *predict* sovereign bond returns, rather than *explain* them. And second we construct every month rank portfolios to focus on the cross-sectional differences between countries². The results of this approach are remarkable. We find that several fundamentals show a strong ability to select ex-ante sovereign bonds with higher returns and lower volatility. And we show that this predictive ability of country fundamentals can at least partly be ascribed to the autocorrelation in these fundamentals. For example, countries that had a budget surplus (deficit) on average continue to have a budget surplus (deficit). And countries that have shown a reduction (increase) in debt-to-GDP continue to reduce (increase) debt levels. In addition several fundamentals do either better in good times (declining spreads) or in bad times (rising spreads) making it more difficult for investors to spot the importance of country distress risk indicators.

The results show that country fundamentals are important for expected sovereign bond returns, and our results also provide guidance for investors as to which fundamentals to pay close attention to when investing in sovereign bonds. We find it is important to consider a country's finances through the budget balance and changes in debt-to-GDP, and to incorporate an indicator of the change in the political risk of a country. It is, however, less useful for investors to consider the level of debt-to-GDP or the level of the governance of a country. These choices lead to low

² We found one study that also makes use of portfolios based on ex-ante available information. Erb et al. (1996b) use the political, economic and financial risk indices of the PRS group and the Institutional Investor to form portfolios of world-wide government bonds for the period 1985 to 1995. They conclude that country risk measures convey information with regard to world bond market expected returns similar to what we find for several country fundamentals and the same Political Risk Scores from the PRS group. There are some important differences though. We focus on USD denominated emerging debt and EUR denominated developed debt eliminating currency and business cycle differences, for a different sample period from 1999 to 2011, and using publicly available country fundamentals besides the only commercially available country risk scores from the PRS group.

risk but also low returns. Hence in general it is important to look at dynamic sovereign risk measures that say something about the direction a country is heading to. Bond portfolios based on higher loadings on these dynamic risk factors also ex-post exhibit lower volatility.

The remainder of this study is organized as follows. Section 2 describes the data for European Monetary Union (EMU) countries and emerging countries that issued USD denominated debt. The methodology is explained in Section 3. Section 4 shows the ex-post performance statistics of portfolios formed on ex-ante country fundamentals. It also shows how such fundamentals could have warned for downgrades to junk bond status and defaults, and investigates possible reasons for the results. Section 5 concludes.

2. Data

Erb et al. (1996b) note that currency risk is a dominating factor for bond markets when studying country risk. In addition business and monetary cycle differences between countries will affect local interest rates and hence local bond returns. Given our focus on the relationship between bond returns and fundamentals we therefore focus on two segments of the bond market where currency risk does not play a role, and the bonds are evaluated based on a common interest rate term structure plus the credit spread: Bonds issued by the countries in the European Monetary Union (EMU) in Euros, and bonds issued by emerging countries in US Dollars.

European Monetary Union (EMU) index

The JP Morgan EMU government bond index is a popular market capitalization weighted index that consists of bonds issued by 11 countries: Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, The Netherlands, Portugal and Spain. All bonds are issued in Euros. The EMU index started in January 1999 with 9 countries, and contains all bonds with a maturity larger than one year. Austria and Greece were added in April 2001. There is no rating restriction. The very small countries in terms of outstanding debt have not been added to the index. An overview is provided in Table 1.

– **Insert Table 1 about here** –

Emerging Market Bond Index (EMBI) plus

The EMBI+ index is J.P. Morgan's most liquid US dollar emerging markets debt index. A strict liquidity requirement rule is used to determine inclusion. Only issues with a current amount outstanding of \$500 million or more and a remaining life of greater than 2½ years are eligible for inclusion in the index. We choose this universe to make sure the portfolios we study can actually be traded. The EMBI+ index started in January 1994³. Table 2 shows all 24 countries that were part of the index at some point in time. By using historical constituents we avoid a survivorship bias.

– **Insert Table 2 about here** –

Political Risk Scores

We obtain Political Risk Scores (PRS) from the Political Risk Services group⁴. The aim of the political risk scores is to provide a means of assessing the political stability of the countries on a comparable basis. Experts assign points on the basis of a series of pre-set questions for each risk component to form an opinion about the future risks of an investment in a country. The following twelve risk components are currently used to produce the scores: Government stability, socioeconomic conditions, investment profile, internal conflict, external conflict, corruption, military in politics, religious tensions, law and order, ethnic tensions, democratic accountability, and bureaucracy quality. The World Bank governance index in all of its six components makes use of PRS next to other data providers. We analyze PRS here because it is adjusted and available on a monthly basis. The World Bank governance index is available on a yearly basis from 2002 onwards, and before that every 2 years.

In terms of country risk we could say that political risk is associated with a willingness to pay. We continue with country fundamentals related to financial risk, which says something about the ability to pay.

³ At the start at the end of 1993 only five countries were part of the index. Also country fundamentals are incomplete. For the results we therefore look from January 1999 onwards, covering the same sample period as the EMU index. Over time between 8 and 19 countries are included in the index.

⁴ See www.prsgroup.com for an extensive description of the approach. The PRS group is a commercial company that employs analysts to score countries on expected economic, financial, and political risk. Subsequently the PRS group sells aggregated data based on these scores. Erb et al. (1996a, 1996b) also provide a quite detailed description of this dataset.

Country fundamentals

Obviously there are dozens of country fundamentals related to the country's ability to pay. For clarity of the exposition we focus on four of the most popular fundamentals: debt-to-GDP, budget balance, current account and GDP. The first two provide information about the level of the debts and whether the debt pile is increasing or decreasing. The last two provide an indication of the ability to grow out of trouble and hence reduce the debt burden.

For debt-to-GDP, budget balance, current account and GDP data we make use of the IMF WEO database⁵.

3. Methodology

The fundamental variables are all assumed to be available by the end of April the following year. Hence, for example, the budget deficit of 2010 is considered to be available at the end of April 2011. PRS scores for a particular month become available during that month. We assume them to be available 1 month later. Hence the March 2011 PRS score is assumed to be available by the end of April 2011.

At the end of each month the universe consists of all countries included in the index at that moment (i.e. the market cap weight obtained from JP Morgan is larger than zero), for which also the country risk factor of interest is available. It can happen that for a particular country or multiple countries there are missing data. These countries are omitted from the universe at that point in time. Next we use the factor values known at the end of the month to form top four and bottom four portfolios. For example for debt-to-GDP the top four are the four countries with the lowest debt-to-GDP, and the bottom four portfolio consists of the four countries with the highest debt-to-GDP. We then keep these portfolios for one month and repeat the procedure. Of course for yearly factors such as debt-to-GDP the portfolios will only change once a year, except for additions to or deletions from the benchmark which can alter the universe and hence the ranking.

We then keep track of the returns of the top four, bottom four, and equally and value weighted portfolios (including all available countries) to compute performance statistics. To test

⁵ See www.imf.org/external/ns/cs.aspx?id=28. IMF data are freely available.

the significance of differences between return-risk ratios we use the test statistic of Jobson and Korkie (1981) using the correction of a typographical error presented in Memmel (2003).

We on purpose refrain from a regression approach. Erb et al. (1996b) find much weaker results for (pooled) regressions than for the portfolio approach. They state that there are two disadvantages of the time series cross-sectional methodology. First, stacking the time series of returns together eliminates important information regarding the cross-sectional correlation of the returns. Second, the regression (panel) approach imposes the same slope coefficient for all time periods, and it is possible that the slope coefficient could change through time. In fact using cross-sectional regressions Erb et al. confirm the time-variation in the slope coefficient. Their cross-sectional regression results merely confirm the portfolio results. We think the latter is also more convenient because it allows us to easily determine the ex-ante and ex-post fundamental exposures of the resulting portfolios. As we will see later this provides insight into the reason behind the predictive ability of publicly available country fundamentals.

4. Results

4.1 EMU portfolio results

Table 3 shows the results for EMU. For almost every factor the top 4 is significantly outperforming the bottom 4 in terms of returns, risk, and the risk-return trade-off. The only exceptions are the 1-year changes in budget balance and current account. We think that the improvement in returns is to a large extent due to investors mainly ignoring differences in fiscal sustainability prior to the sovereign credit crisis, and since the crisis the weaker countries in terms of fiscal sustainability and political risk have been penalized with widening spreads (see also Hagen et al., 2011). Hence any factor leading to investing in the safer countries looks good on a top versus bottom basis. Figure 1 for the budget balance is in that respect representative for most factors. The performance of top, bottom and equally weighting all countries is similar until September 2009, and from that point onwards the top 4 has a large outperformance relative to the bottom 4 portfolio. In the subsequent period the market started speculating about a possible Greek default with S&P downgrading Greece to BB+ (just below investment grade) on April

27th, 2010, also indicating bondholders were likely to get back only 30% to 50% were Greece to restructure its debt or default. Greek bonds returned -14.6% in April 2010, and also Portuguese, Spanish and Irish bonds posted negative returns resulting in a -6.5% return for the bottom 4 portfolio. In contrast the top 4 portfolio with Finland, The Netherlands, Germany and Austria returned 1.0%.

– **Insert Table 3 about here** –

– **Insert Figure 1 about here** –

4.2 Emerging market portfolio results

Table 4 shows the results for emerging markets that issued debt in US dollars. Compared to Europe for emerging markets investors always have paid attention to fiscal sustainability. Hence we have seen good and bad times (declining and rising spreads) whilst fiscal sustainability mattered, unlike for Europe where we have only seen bad times since investors cared about fiscal sustainability.

– **Insert Table 4 about here** –

The results in Table 4 indicate that levels of budget balance and GDP, and the 1-year changes in debt-to-GDP, budget balance, GDP and political risk all lead to top 4 portfolios that have a significantly higher risk-return trade-off than the bottom 4 portfolios. Interestingly we see a tendency for the more dynamic factors (budget balance and changes in factors) to lead to a better risk-return trade-off, whereas the more static factors (e.g. debt-to-GDP and PRS levels) generally have a lower risk and a lower return, but not a better trade-off between risk and return. Hence to protect the portfolio in bad times and to profit from the good times we need factors that can make the switch between safe and risky countries. With the exception of the 1-year change in GDP for all aforementioned factors the top 4 is also significantly better than the equally weighted portfolio of all countries. Budget balance (level and change) and GDP levels also lead to significantly better portfolios than the market cap weighted portfolio.

– Insert Figure 2 about here –

Figure 2 shows for the budget balance that unlike for EMU there are clear differences between the top and bottom portfolios throughout the sample. Besides the on average higher return for the top 4 based on budget balance, the lower volatility compared to the bottom 4 is also clearly visible. The bottom 4 portfolio, for example, has a much larger drawdown in Q4 of 2008, but also a stronger recovery⁶.

4.3 Early warning signs for downgrades to junk and defaults

EMU

In the recent period the EMU has, for the first time, seen countries being downgraded to junk bond status. Greece, for example, was downgraded to BA1 by Moody's on June 14, 2010, and to BB⁺ by S&P on April 27, 2010, and by Fitch on January 14, 2011. Before these (further) downgrades budget balance, debt-to-GDP, change in debt-to-GDP, current account, GDP, PRS and the change in PRS would all have put Greece in the bottom 4. Only the 1-year change in current account and the GDP growth would have put Greece in the top 4. Hence a large majority of fundamentals would have indicated to sell Greek bonds prior to their downgrade to junk bond status.

Portugal was downgraded to BA2 by Moody's on July 5, 2011. Fitch downgraded Portugal to BB⁺ November 24, 2011. Budget balance, the 1-year change in debt-to-GDP, current account, GDP, PRS and changes in PRS would have recommended selling prior to these downgrades. The changes in budget balance and current account would have, however, provided a buy recommendation.

Emerging markets

⁶ We obtain similar results when for example forming top 3/bottom 3 or top 5/bottom 5 portfolios, or when dividing the universe in 3 or 4 groups of equal size (hence with fluctuating group size for the top and bottom portfolios).

Argentina was downgraded throughout 2001 prior to its (selective) default in Q4 of 2001. Budget balance and GDP growth would have put Argentina in the bottom 4 providing the early warnings. None of the other factors would have put Argentina in the top 4. Illustrative, however, is that Argentina prior to Q4 2001 is bottom 5 on the change in debt-to-GDP, but top 5 on the level of debt-to-GDP. Hence, together with the importance of budget balance and GDP growth, it is clear that the more dynamic country fundamentals are more informative and predictive.

Ecuador defaulted (restructured) in December 2008. Already for many years Ecuador had the lowest rating of all countries in the EMBI+ index. Also the change in the budget balance, GDP level and growth, Political Risk Scores and changes in these scores would have put Ecuador in the bottom 4 portfolios well before the default. Only current account levels and changes placed Ecuador in the top 4. In terms of debt-to-GDP Ecuador ranked 8th out of 15, and 11th out of 15 for 1-year changes in debt-to-GDP (so just outside the bottom 4).

4.4 Market inefficiencies or rational explanations?

If markets would process all information publicly available in full and immediately, we would not find improved return-risk characteristics. The results in Tables 3 and 4 indicate that yield differences ('carry') cannot explain the improved return characteristics. Generally the top 4 portfolios have lower yields than the bottom 4 portfolios. Hence return differences must come from top 4 country yields declining more (rise less) than the bottom 4 country yields.

A possible reason is that new information becoming available during the investment period supports the top and bottom 4 portfolios. It could be, for example, that countries that experienced an increase (decrease) in debt-to-GDP, and hence ended up in the bottom 4 (top 4) portfolio, also exhibit an increase (decrease) in debt-to-GDP in the following year. If this is the case it could explain that the top 4 outperforms the bottom 4. Of course this still leaves the question whether the market could incorporate autocorrelation in country fundamentals into prices in a more efficient way.

To investigate this possible explanation for the results in Tables 3 and 4 we look at the ex-ante and ex-post factor exposures of the top and bottom portfolios. The results are shown in Table 5 for EMU and Table 6 for EM.

– Insert Tables 5 and 6 about here –

Confirming our hypothesis we do see for budget balance, 1-year change in debt-to-GDP, and the 1-year change in GDP (GDP growth) that also ex-post factor exposures are better for the top 4 than for the bottom 4 countries. These are exactly the factors for which in Table 3 and Table 4 it is shown the top 4 countries outperform the bottom 4 countries in terms of average returns.

For the 1-year change in debt-to-GDP, for example, we see in Table 5 that the selected top 4 EMU countries showed a reduction in debt of 3.0% in the year before formation, much better than the increase in debt of 2.6% for the bottom 4 countries. In the year after formation (ex-post) the same top 4 countries show a further reduction in debt of 1.1%, whereas the same bottom 4 countries show a further increase in debt of 2.6%. Similar for EM countries in Table 6 the top 4 countries reduced on average debt-to-GDP with 9.8% followed by another reduction of 5.2%. At the same time the bottom 4 countries increases the debt-to-GDP by 5.9% followed by another increase of 1.4%. Hence this provides at least a partial explanation why the top 4 based on the past change in debt-to-GDP has a higher average return (4.3% for EMU; 15.8% for EM) than the bottom 4 (1.5% for EMU; 8.6% for EM).

Only 1-year changes in Political Risk Scores, that also showed an improvement in returns for both EMU and EM, is somewhat different. Here we have monthly data instead of yearly data. Hence looking at the 1-year change in PRS scores following the formation can be a mismatch because every month the portfolio composition can change. Given that often PRS scores do not change from month-to-month we thought it to be prudent to look one year ahead. But if anything there is rather some mean-reversion in PRS scores than a continuing improvement. In fact, when using only March PRS figures to be used at the end of April for the next 12 months, the top 4 on 1-year changes is worse than the bottom 4. Hence the monthly updates are crucial for its performance.

Given these results we conclude that at least a partial explanation for the results in Tables 3 and 4 for budget balance, the 1-year change in debt-to-GDP, and the 1-year GDP growth is that

these fundamentals show autocorrelation⁷. The top 4 continues to outperform the bottom 4 in terms of budget balance, debt and growth.

4.5 Performance in good and bad times

When are fundamentals important? Some claim only in bad times, when there is a crisis. In this section we define good and bad times based on the spread movement of the index. Bad times are defined as periods where spreads (generally) widen. Good times occur when spreads decline. We have three objectives here. First, it will illustrate in a different way that in Europe fundamentals only matter in the most recent years of our sample, indeed in the bad times. Second, it might offer a second explanation of the ability of some fundamentals to select superior bond portfolios. If investing on fundamentals is only helpful in bad times investors will be less inclined to systematically exploit any inefficiencies, it makes it more difficult to observe the inefficiency, or they simply believe bad times are short-lived. Third, this analysis gives us more insights in the characteristics of the different fundamentals. Which fundamentals are able to avoid the really bad performing countries when it matters? Which fundamentals actually (also) do well in good times?

We use eyeballing to define the good and bad times to make it easier to visualize these periods⁸. Figure 3 shows the classification for EMU and Table 7 shows the results in good and bad times of the top 4 and bottom 4 portfolios based on fundamentals.

-Insert Figure 3 and Table 7 about here-

Figure 3 illustrates that since the introduction of the Euro country spreads have been quite modest until midway 2007. Since the start of the credit crisis spreads have generally increased, with the exception of especially Feb-Sep 2009 where the market believed the worst problems

⁷ We also looked at autocorrelation in fundamentals per country. For EM, for example, the autocorrelation in the annual budget balance figures averages 0.53 over the 24 countries under consideration. For the 1-year change in debt-to-GDP the autocorrelation is 0.29, it is 0.22 for GDP growth, and -0.15 for 1-year changes in Political Risk Scores.

⁸ We repeated the analysis by simply assigning each month to good (bad) times when spreads decline (increase). The results are similar.

were gone. Table 7 shows that the equally weighted portfolio had a 4.2% return in good times and 2.4% in bad times. Hence performance in bad times is not that bad at all, because during the bad times German yields strongly declined⁹ which, together with income from coupons, more than off-set the spread widening. In good times we see little differences between the top 4 and bottom 4 portfolios, with the biggest return spread just 0.7% for current account. In bad times, however, we see some large differences between the top and bottom portfolios. Budget balance and current account have a return spread in excess of 10%, and also GDP, political risk and the change in debt-to-GDP have strong positive returns for the top 4 and sizeable negative returns for the bottom 4 portfolios. Hence it is clear that the predictive ability of budget balance and the 1-year change in debt-to-GDP is achieved in bad times. Hence it is primarily bad times that fundamentals matter. But we should keep in mind that we have not seen the good times since investors paid attention to fundamentals.

-Insert Figure 4 and Table 8 about here-

We continue with repeating the analysis for the USD debt of emerging countries. Figure 4 shows the EMBI+ spread over time and the identified good and bad times. Unlike for EMU in Figure 3 we see here many more alternations between good and bad times, although the general pattern is that spreads have declined. Table 4 shows that in good times the equally weighted portfolio has an annualized return of 18.6% and in bad times -3.6%.

In good times we now see much larger differences between the top and bottom 4 portfolios compared to EMU. The 1-year changes in debt-to-GDP and budget balance, current account, and GDP growth provide a higher performance for the top 4 portfolio in good times. In contrast for the level of debt-to-GDP, 1-year change in current account and especially the level of political risk the bottom 4 has a better performance than the top 4. Hence the more dynamic fundamentals like budget balance and the change in debt-to-GDP can also perform in good times, whereas static low-risk indicators like the level of debt-to-GDP and political risk will stay behind in good times.

In bad times several variables are capable of putting some of the largest losses in the bottom 4 portfolio, in particular the level of debt-to-GDP, (change in) budget balance and the

⁹ The German bond index yield was 4.61% midway 2007 and 2.17% by the end of November 2011.

change in political risk. Current account and GDP growth, however, are quite disappointing in that top and bottom portfolios suffer a similar loss. Hence current account and GDP growth, indicating the ability of a country to grow out of trouble, are contributing positively in good times but not in bad times.

In general this analysis underscores that some fundamentals only perform well in good times and others only in bad times. This makes it harder for investors to identify the predictive ability in the long-run of these fundamentals.

5. Conclusion

We form top and bottom portfolios based on ex-ante available fundamentals instead of simultaneously modeling the cross-sectional and time-series behavior of sovereign spreads. We find that the more dynamic fundamentals such as budget balance, the change in debt-to-GDP, GDP growth and changes in political risk all are able to select superior government bonds in terms of higher returns at lower risk. Such fundamentals are also able to avoid the downgrades to junk bond status of Greece and Portugal, and for example the (selective) defaults of Argentina at the end of 2001 and Ecuador at the end of 2008.

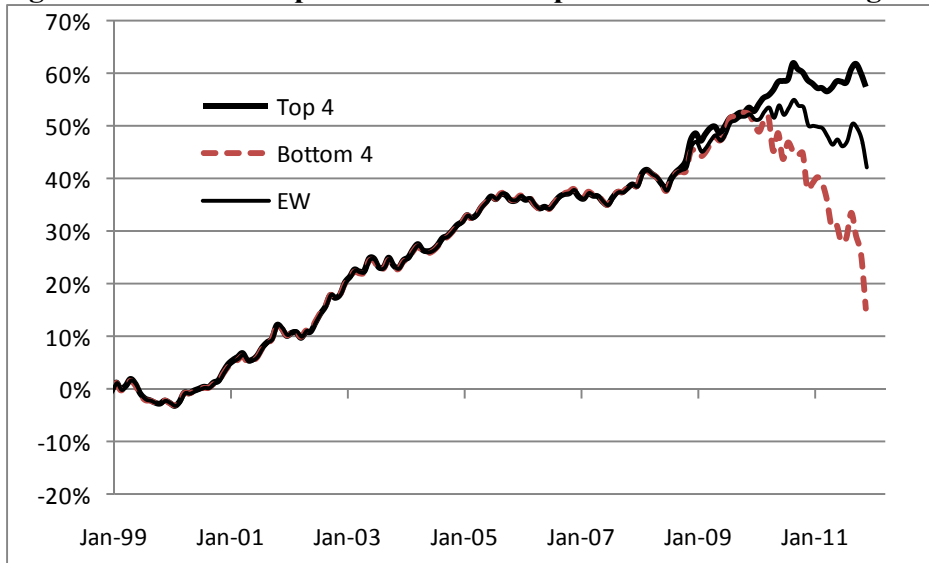
One explanation for these findings is that countries that do well in terms of having a budget surplus, reducing debt, or strong growth, continue to do better than countries that did poorly on these fundamentals. Hence even if the market fully incorporates the publicly available information into bond prices, they fail to properly account for autocorrelation in fundamentals. Another explanation is that some fundamentals are only important in bad times and do poorly in good times. Given that bad times occur less often investors may pay on average little attention to fundamentals.

For future research it would be interesting to investigate whether market information such as spreads, return volatility and return correlations could further help in selecting superior bond portfolios in terms of return and risk.

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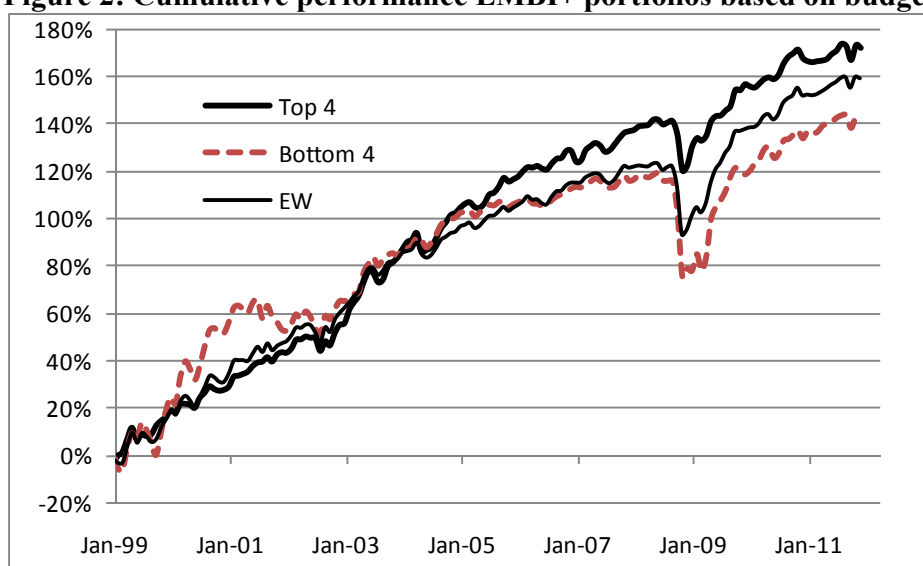
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Figure 1: Cumulative performance EMU portfolios based on budget balance



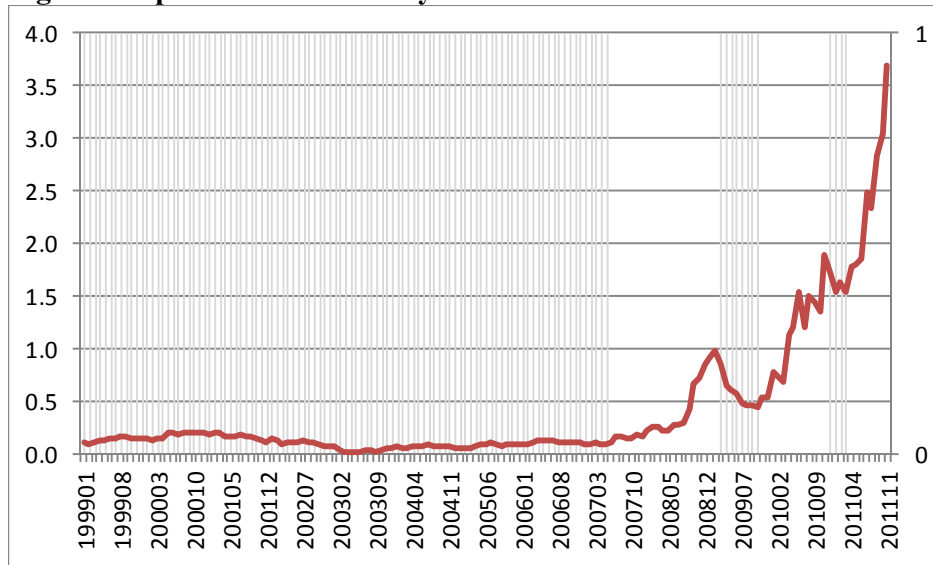
Note: At the end of each month we rank the countries (that are at that time part of the JP Morgan EMU government bond index) based on the most recently available budget balance figures. The four countries with the highest budget balance end up in the top 4 portfolio, and the four countries with the lowest budget balance end up in the bottom 4 portfolio. In addition we keep track of the equally weighted (EW) portfolio that includes all countries that are part of the index. We then compute the returns in the next month. Apart from index deletions and additions for the yearly budget balance figures this means the portfolios are rebalanced once a year.

Figure 2: Cumulative performance EMBI+ portfolios based on budget balance



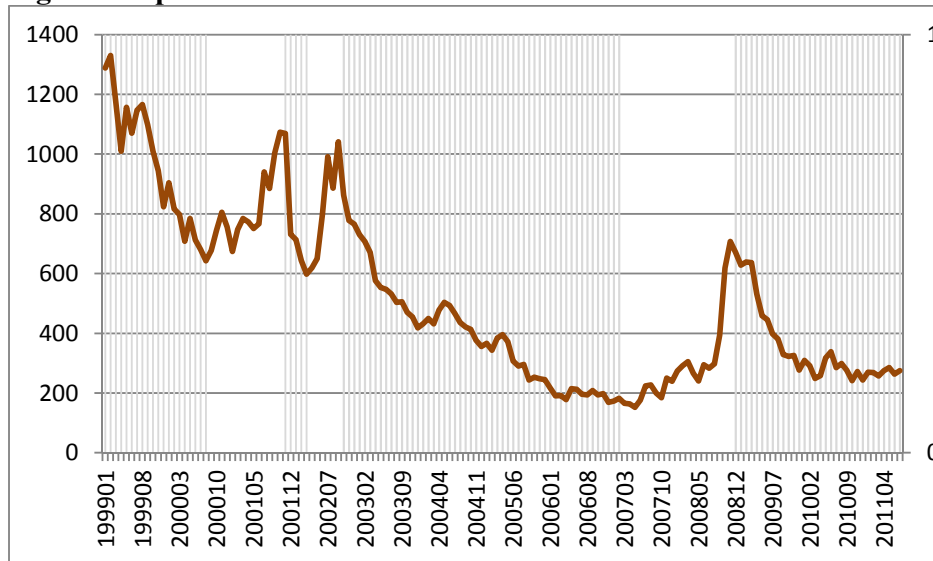
Note: At the end of each month we rank the countries (that are at that time part of the JP Morgan EMBI+ government bond index) based on the most recently available budget balance figures. The four countries with the highest budget balance end up in the top 4 portfolio, and the four countries with the lowest budget balance end up in the bottom 4 portfolio. In addition we keep track of the equally weighted (EW) portfolio that includes all countries that are part of the index. We then compute the returns in the next month. Apart from index deletions and additions for the yearly budget balance figures this means the portfolios are rebalanced once a year.

Figure 3: Spread over Germany of the EMU index



Note: This figure shows the market cap weighted spread of the EMU index relative to the German yield. The bars are defined as good times, based on subjectively marking areas of (generally) rising spreads as bad times and the remainder as good times.

Figure 4: Spread over US of the EMBI+ index



Note: This figure shows the market cap weighted spread of the EMBI+ index relative to the US yield. The bars are defined as good times, based on subjectively marking areas of (generally) rising spreads as bad times and the remainder as good times.

Table 1: Composition JP Morgan EMU government bond index (Nov 2011)

Country	Member of index	Country	Member of index
Austria	4/2001 – current	Ireland	1/1999 - current
Belgium	1/1999 - current	Italy	1/1999 - current
Finland	1/1999 - current	The Netherlands	1/1999 - current
France	1/1999 - current	Portugal	1/1999 - current
Germany	1/1999 - current	Spain	1/1999 - current
Greece	4/2001 - current		

Note: The JP Morgan EMU government bond index is a market cap weighted index for fixed rate government bonds. Ultimo November 2011 France (23.3%), Germany (23.1%) and Italy (20.8%) had the largest index weights.

Table 2: Composition JP Morgan EMBI+ government bond index (Nov 2011)

Country	Member of index	Country	Member of index
Argentina	1/1994 – current	Nigeria	1/1994 – 9/2006
Brazil	1/1994 – current	Panama	1/1994 – current
Bulgaria	1/1994 – current	Peru	1/1994 – current
Columbia	5/1999 – current	Philippines	1/1994 – 8/1998; 4/1999 – current
Croatia	3/2011 – current	Poland	1/1994 – 3/2007
Ecuador	1/1994 – current	Qatar	11/2000 – 7/2002
Egypt	5/2002 – 3/2008	Russia	1/1994 – current
Hungary	4/2011 – current	South-Africa	12/1994 – 1/1997; 4/2002 – current
Indonesia	10/2006 – current	South-Korea	4/1998 – 6/2002
Malaysia	1/2002 – 11/2004	Turkey	7/1999 – current
Mexico	1/1994 – current	Ukraine	7/2001 – current
Morocco	1/1994 – 10/2006	Venezuela	1/1994 – current

Note: The JP Morgan EMBI+ (Emerging Market Bond Index) is a market cap weighted index for fixed rate government bonds. This is the smallest emerging market bond index for USD denominated debt in terms of number of countries due to two selection criteria: A country must be at least Investment Grade, and bond trading must be sufficiently liquid. Ultimo November 2011 Brazil (13.4%), Mexico (14.0%), Rusia (12.6%) and Turkey (13.3%) had the largest index weights.

Table 3: Performance statistics of top and bottom portfolios for EMU countries

	Factor	Top 4	Bottom 4	Factor	Top 4	Bottom 4
return p.a.	Debt-to-GDP	4.0%	1.7%	1-year chg Debt-to-GDP	4.3%	1.5%
stdev p.a.		4.0%	5.6%		3.8%	6.0%
return/std		1.00 ^{a,b}	0.31		1.13 ^{a,b,c}	0.25
yield		4.2%	4.8%		4.1%	4.8%
return p.a.	Budget balance	4.4%	1.2%	1-year chg budget balance	2.7%	3.3%
stdev p.a.		3.7%	6.3%		4.9%	5.0%
return/std		1.20 ^{a,b,c}	0.19		0.54	0.68
yield		4.0%	4.9%		4.4%	4.4%
return p.a.	Current account	4.9%	0.6%	1-year chg current account	3.2%	4.1%
stdev p.a.		3.7%	6.5%		5.2%	3.9%
return/std		1.32 ^{a,b,c}	0.09		0.61	1.06
yield		4.0%	4.9%		4.6%	4.1%
return p.a.	GDP	4.1%	1.4%	1-year chg GDP	3.3%	2.5%
stdev p.a.		3.8%	6.0%		4.6%	5.1%
return/std		1.09 ^{a,b,c}	0.24		0.73 ^a	0.49
yield		4.2%	4.8%		4.4%	4.5%
return p.a.	PRS	5.1%	1.3%	1-year chg PRS	4.8%	2.4%
stdev p.a.		4.1%	5.8%		4.2%	5.6%
return/std		1.24 ^{a,b,c}	0.23		1.16 ^{a,b,c}	0.42
yield		4.0%	4.8%		4.2%	4.6%

Note: Each month the universe consists of all countries that are at that moment member of the JP Morgan EMU government bond index and have factor data available. The best scoring countries are then put in the 'Top 4' portfolio, and the worst 4 in the 'Bottom 4' portfolio. All countries are put in the Equally Weighted (EW) portfolio and the Value (market cap) Weighted (VW) portfolio. Then the returns are computed for the subsequent month. ^{a,b,c} denotes that the return-standard deviation ratio of the Top 4 is significantly (at the 5% significance level) higher than the Bottom 4 (^a), EW (^b) and VW (^c) portfolios, respectively. The EW (VW) portfolio had a 3.3% (3.9%) average return per annum, 4.2% (3.7%) standard deviation per annum, a 0.78 (1.05) ratio of the average return and standard deviation, and a 4.4% (4.3%) average yield. The sample period is Jan 1999 to Nov 2011 (143 months). The average German index yield is 3.94% over this period.

Table 4: Performance statistics of top and bottom portfolios for EM countries

	Factor	Top 4	Bottom 4	Factor	Top 4	Bottom 4
return p.a.	Debt-to-GDP	10.2%	12.5%	1-year chg Debt-to-GDP	15.8%	8.6%
stdev p.a.		10.7%	12.3%		12.3%	9.9%
return/std		0.96	1.02		1.28 ^{a,b}	0.87
yield		8.2%	11.3%		10.6%	10.7%
return p.a.	Budget balance	13.3%	11.0%	1-year chg budget balance	15.4%	10.3%
stdev p.a.		9.5%	15.2%		11.8%	13.0%
return/std		1.39 ^{a,b,c}	0.72		1.30 ^{a,b,c}	0.80
yield		8.6%	13.2%		10.2%	11.8%
return p.a.	Current account	15.3%	11.2%	1-year chg current account	11.9%	12.5%
stdev p.a.		12.9%	11.4%		10.9%	12.4%
return/std		1.19 ^a	0.98		1.09	1.00
yield		12.5%	9.2%		10.5%	11.4%
return p.a.	GDP	15.5%	12.7%	1-year chg GDP	13.3%	11.2%
stdev p.a.		10.9%	13.8%		12.2%	12.7%
return/std		1.41 ^{a,b,c}	0.92		1.10 ^a	0.89
yield		9.0%	11.2%		9.7%	11.9%
return p.a.	PRS	7.7%	16.4%	1-year chg PRS	13.5%	11.7%
stdev p.a.		8.3%	14.6%		10.5%	16.0%
return/std		0.92	1.12		1.29 ^{a,b}	0.73
yield		7.0%	13.2%		10.1%	11.9%

Note: Each month the universe consists of all countries that are at that moment member of the JP Morgan EMBI+ government bond index and have factor data available. The best scoring countries are then put in the 'Top 4' portfolio, and the worst 4 in the 'Bottom 4' portfolio. All countries are put in the Equally Weighted (EW) portfolio and the Value (market cap) Weighted (VW) portfolio. Then the returns are computed for the subsequent month. ^{a,b,c} denotes that the return-standard deviation ratio of the Top 4 is significantly (at the 5% significance level) higher than the Bottom 4 (^a), EW (^b) and VW (^c) portfolios, respectively. The EW (VW) portfolio had a 12.3% (13.3%) average return per annum, 10.8% (10.6%) standard deviation per annum, and a 1.14 (1.26) ratio of the average return and standard deviation. The sample period is Jan 1999 to Nov 2011 (143 months).

Table 5: Ex-ante and ex-post factor exposures for EMU country portfolios

	Factor	Top 4	Bottom 4	Factor	Top 4	Bottom 4
Ex-ante	Debt-to-	44.9%	93.2%	1-year chg Debt-	-3.0%	2.6%
Ex-post	GDP	45.7%	93.6%	to-GDP	-1.1%	2.6%
Ex-ante	Budget	1.1%	-4.0%	1-year chg	1.0%	-1.5%
Ex-post	balance	0.4%	-4.5%	budget balance	-0.5%	-0.5%
Ex-ante	Current	4.6%	-6.1%	1-year chg	1.0%	-1.5%
Ex-post	account	4.6%	-6.2%	current account	0.2%	-0.2%
Ex-ante	GDP	1487	157	1-year chg GDP	7.4%	2.6%
Ex-post		1531	164		6.0%	2.7%
Ex-ante	Political	90	78	1-year chg PRS	1.8	-2.4
Ex-post	risk scores	89	78		-0.5	-0.2

Note: Each month the universe consists of all countries that are at that moment member of the JP Morgan EMU government bond index and have factor data available. The best scoring countries are then put in the ‘Top 4’ portfolio, and the worst 4 in the ‘Bottom 4’ portfolio. The table shows the ex-ante and ex-post factor exposures. For example the top 4 includes the countries that reduced their debt-to-GDP the most from year x to year x-1. Then ex-post we look at the change in debt-to-GDP from year x to year x+1 for the same 4 countries. Budget balance and current account are expressed as a percentage of GDP. GDP is denoted in billions of US Dollars. Political Risk Scores (PRS) can vary from 0 to 100, with 100 the best score. The sample period is Jan 1999 to Nov 2011 (143 months).

Table 6: Ex-ante and ex-post factor exposures for EM country portfolios

	Factor	Top 4	Bottom 4	Factor	Top 4	Bottom 4
Ex-ante	Debt-to-GDP	29.5%	76.4%	1-year chg Debt-to-GDP	-9.8%	5.9%
Ex-post		28.9%	70.7%		-5.2%	1.4%
Ex-ante	Budget balance	2.3%	-6.9%	1-year chg budget balance	3.1%	-2.7%
Ex-post		0.9%	-5.5%		0.0%	0.1%
Ex-ante	Current account	8.0%	-7.1%	1-year chg current account	5.4%	-4.8%
Ex-post		6.2%	-5.4%		-0.4%	0.1%
Ex-ante	GDP	304	0.03	1-year chg GDP	8.4%	-0.1%
Ex-post		310	0.03		6.5%	2.8%
Ex-ante	PRS	74	53	1-year chg PRS	3.8	-4.1
Ex-post		73	54		-0.6	0.4

Note: Each month the universe consists of all countries that are at that moment member of the JP Morgan EMBI+ government bond index and have factor data available. The best scoring countries are then put in the 'Top 4' portfolio, and the worst 4 in the 'Bottom 4' portfolio. The table shows the ex-ante and ex-post factor exposures. For example the top 4 includes the countries that reduced their debt-to-GDP the most from year x to year x-1. Then ex-post we look at the change in debt-to-GDP from year x to year x+1 for the same 4 countries. Budget balance and current account are expressed as a percentage of GDP. GDP is denoted in billions of US Dollars. Political Risk Scores (PRS) can vary from 0 to 100, with 100 the best score. The sample period is Jan 1999 to Nov 2011 (143 months).

Table 7: Performance in good and bad times of EMU country portfolios

	Good times		Bad times	
	Top 4	Bottom 4	Top 4	Bottom 4
Debt-to-GDP	4.3%	4.5%	3.2%	-1.5%
Chg in debt-to-GDP	4.2%	4.3%	5.8%	-2.8%
Budget balance	4.0%	4.4%	6.5%	-4.0%
Chg in budget balance	4.0%	4.4%	4.4%	-0.9%
Current account	3.8%	4.5%	8.0%	-5.2%
Chg in current account	4.4%	4.2%	-1.1%	4.7%
GDP	4.1%	4.4%	4.7%	-3.0%
Chg in GDP	4.3%	3.9%	0.5%	2.9%
Political risk	4.0%	4.4%	7.1%	-1.9%
Chg in political risk	4.2%	4.4%	5.8%	-0.3%
<i>Equally weighted</i>		4.2%		2.4%

Note: Periods where spreads decline are classified as good times, and periods with increasing spreads are labeled bad times, see Figure 3. Each month the universe consists of all countries that are at that moment member of the JP Morgan EMU government bond index and have factor data available. The best scoring countries are then put in the 'Top 4' portfolio, and the worst 4 in the 'Bottom 4' portfolio. The table shows the annualized performance of the top 4 and bottom 4 portfolios, as well as the equally weighted portfolio of all countries.

Table 8: Performance in good and bad times of EM country portfolios

	Good times		Bad times	
	Top 4	Bottom 4	Top 4	Bottom 4
Debt-to-GDP	15.2%	21.5%	-2.4%	-9.8%
Chg in debt-to-GDP	22.4%	13.1%	0.1%	-2.0%
Budget balance	18.4%	19.1%	1.3%	-9.4%
Chg in budget balance	21.5%	17.1%	0.0%	-7.4%
Current account	22.4%	16.7%	-2.7%	-3.0%
Chg in current account	16.7%	19.0%	0.0%	-4.5%
GDP	20.0%	19.1%	1.4%	-4.3%
Chg in GDP	21.3%	17.5%	-5.8%	-4.5%
Political risk	11.3%	23.9%	-0.7%	-2.5%
Chg in political risk	19.1%	19.5%	0.2%	-8.5%
<i>Equally weighted</i>	18.6%		-3.6%	

Note: Periods where spreads decline are classified as good times, and periods with increasing spreads are labeled bad times, see Figure 3. Each month the universe consists of all countries that are at that moment member of the JP Morgan EMU government bond index and have factor data available. The best scoring countries are then put in the 'Top 4' portfolio, and the worst 4 in the 'Bottom 4' portfolio. The table shows the annualized performance of the top 4 and bottom 4 portfolios, as well as the equally weighted portfolio of all countries.