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There is little sentiment in capital markets.

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Abstract
From time to time, market participants seem to exhibit “risk appetite” that causes sudden waves of capital from riskfree assets to riskier ones. Inversely, sometimes, they also tend to exhibit “risk aversion” that pushes capital to “flight to quality”. Due to the importance of this phenomenon market players and researchers have tried to proxy it, notably but not only by means of spreads in high yielding markets like credit or emerging markets. However, these measures might be biased because they hinge on series of prices that include both market movements that were due to systemic risk re pricing and movements that were due to specific risk re pricing. Being a macro factor that affects all the assets in the universe at the same time, risk appetite or risk aversion can only produce systemic risk re pricing. In this paper, we apply a methodology to discriminate between market movements that are due to systemic risk re pricing and market movements that are due to idiosyncratic risk re pricing. We work on emerging market debt capital markets and compute a “systemic risk only” indicator that enable one to point out more precisely periods in which risk appetite might have driven market returns. We find that from the end of 1997 to 2004 only about 14% of the return of the EMBI+ might have been due to changes in market sentiment.

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Introduction

Recently, the concept of "risk appetite" or "risk sentiment" has become fashionable among both international capital markets' participants and researchers[2]. In particular, changes in risk appetite are often used to justify movements in capital markets that seem unrelated to the flow of economic and politic news. This is particularly the case in emerging markets, probably because, since 1994 and the Mexican crises, these markets have been frequently hit by severe turmoil whose intensity appears to have been largely unrelated to the concomitant changes in economic fundamentals.

The idea underpinning the analysis in terms of risk sentiment is that investors' risk aversion or risk appetite might vary across time. Particularly, during periods of high distress, a certain share of investors may become more risk averse and may tend to oversell riskier assets in comparison with a situation where risk aversion would have been stable. In these special occasions, the market seems to exhibit a "bad" sentiment and everything seems to happen as if good news were forgotten but bad news magnified. Inversely during periods of euphoria the market may appear to have a "good" sentiment, certain investors becoming risk lovers, they might tend to overbuy risky assets pushing assets' prices higher.

Despite being somewhat different from the traditional framework, because it implies that the pricing of risk in financial markets is not stable over time[3], the approach in terms of varying risk appetite seems to be promising for justifying large and unexplained changes in the valuation of risky assets.

By essence measuring risk appetite is difficult because it is intimately linked to the way investors do form their expectations. As a consequence it usually falls in the field of experimental economics and therefore introducing risk appetite as a variable in the quantitative estimation of a model might appear ambitious and even impossible.

However, researchers and practitioners have tried to overcome this limit by mean of proxies of risk appetite. Spreads in emerging markets or in the US high yield market are the solutions taken by many market players and sometimes by researchers. The

[2] For instance, in the databases of both the *Financial Times* and *The Economist*, one can find the terms "risk appetite" or "market sentiment" in 249 articles since 1980. But among them only 27 are dated before 1994. Likewise, the database of the *Journal of Economic Literature* comprises 25 references with one of the two phrases in the abstract. Again, only two were written before 1994 but 15 since 2000.

[3] That is an asset bearing the same level of risk, at two points in time, might not be priced in the same manner. See Eichengreen and Mody (1998).

intuition behind these choices is that in periods of variation of risk appetite these indices, that include some of the most risky assets in the universe, should move in a way somewhat related to the changes in market sentiment. Basically higher risk appetite should involve a better valuation of risky assets and inversely.

However, this method does not enable one to make a clear difference between periods in which risky asset prices move because of changing risk appetites and periods in which risky asset prices move because of changes in the level of risk of the assets in the universe. Therefore it introduces a bias in the analyses.

The aim of this article is to apply a methodology that might enable one to discriminate between these two sources of market movements. The methodology is based on the theoretical implications of the CAPM which make a clear difference between idiosyncratic risk and systemic risk. As risk appetite is a macro factor that affects the complete set of assets in the universe at the same time, its variation should only generate systemic risk pricing. According to the CAPM, the differentiation between periods during which the market is mainly driven by idiosyncratic risk pricing and periods in which the market is mainly driven by systemic risk pricing can be estimated by means of a comparison of risk-return ratio for a given set of assets. Applying this methodology to any given index, we are able to generate a new series of valuations that does not take into account movements that were due to idiosyncratic risk pricing. We consider this new series as a better proxy for risk appetite[4].

The remainder of this paper is organised as follows: we start by recalling why the concept of risk appetite in financial markets has little do to with the mainstream economic concept of risk aversion but has to be primarily related to sudden shifts in investors' expectations. Then we present the research methodology to discriminate between periods of idiosyncratic risk pricing and systemic risk pricing. We then make an application to emerging countries' debt market and compare the statistic properties of the new proxy with the initial.

[4] Yet, of course it cannot be considered as a pure measure of risk appetite as it also includes periods in which systemic risk is priced for fundamental reasons.

Risk aversion or risk appetite.

In this article, we adopt the most common and broad definition of risk appetite that circulates among markets participants: here and after risk appetite will simply be investors' variable will to buy risky assets without discrimination. There are two reasons for investors to buy risky assets without discrimination: i) they expect the general level of risk to decline over a medium term and therefore they rebalance their portfolio to profit from this ii) their risk aversion[5] has decreased which enhances their ability to bear risk. Transposed in the classical conditional mean-variance framework of the CAPM, the concept of risk appetite is simply the consequence of the changes in the relative value of the expected risk-return ratios of the different assets in the universe once possible changes of investors' risk aversion have been accounted for. Under this definition risk appetite might change following a shock on risk, on risk aversion or both.

However, this analysis runs counter to the view of how the representative agent behaves in mainstream economic theory. Since Bernoulli (1738), the investor's risk aversion has been assumed to be relatively stable and dependent solely on the value of the agent's total wealth. Therefore, introducing a variable risk aversion into the agent's utility function is akin to going beyond the underpinnings of the classical model. And even though advances in experimental economics have shown, empirically at least, that individuals do not always follow the principles of Bernoulli's utility theory, as yet there is no stream of research formally asserting that risk aversion is variable in the short term.

Our conclusion is that risk appetite as we defined it, might relate in some way to the agent's risk aversion but mainly and primarily to changes in the expected risk-return ratio of the assets in the universe. In the classical framework where investors do form expectations at time t for return in t+i on the basis of the information they hold at time

[5] The concept of risk aversion implies that when facing choices with comparable returns, the agents tend to choose the less risky alternative, that is, the asset having the smallest return variance. Said differently, an agent that is risk averse would require a larger premium to bear a certain risk, for instance investing in emerging markets bonds, than an agent that is less or not risk averse. This risk premium covers the difference between the non financial cost of holding a risky asset, i.e. of bearing risk, and the non financial cost of holding a "certainty equivalent" asset. Therefore, it is the maximum amount of income that an agent is willing to forego in order to obtain an allocation without risk. See Pratt (1964).

t, variation in risk appetite is simply the consequence of the continuous reassessment of the conditional distribution of the expected risk-returns ratio of the assets in the universe. In that sense risk appetite has little to do with the classical concept of risk aversion and one does not necessarily need to refer to it to describe the permanent variation in investors' will to buy risky assets.

For instance, in the special case of emerging markets, this phenomenon of waves of interest and sudden defiance is well described in Taylor and Sarno (1997). Lower returns in G7 countries at the beginning of the 1990s coupled with better fundamentals have lowered risk-return ratios in G7 countries while raising them in emerging countries. These relative changes in the relative value of the ratio have pushed investors to rebalance their portfolio in a way that boosted capital flows to emerging markets. However, periods of rising interest rates in the G7 or periods of deteriorating fundamentals have pushed back capital to the more advanced economies. These movements might have been accompanied by variations in risk aversion but not necessarily.

Due to the importance of this phenomenon of waves of risk appetite and sudden defiance, market players and researchers have tried to capture it by means of proxies. The most common are measures of risk in markets. For instance, a sudden increase in the volatility index of a market might indicate a fall in risk appetite. Spreads in emerging markets or high yield markets are also considered as good indicators of risk appetite. That is because risky markets indices should rise in times of risk appetite but decrease during period of risk aversion. However, these proxies might bias the analysis because they do not enable one to make a clear difference between movements that were due to idiosyncratic risk pricing which cannot relate to a change in risk appetite and systemic risk pricing which might, but not necessarily, relate to a change in risk appetite.

In this paper we use a methodology that enables one to make a clear difference between systematic risk and idiosyncratic risk that is between periods during which risk appetite has remained stable and periods during which it might have changed.

Methodology

In day to day market activity it is difficult to discriminate between systemic risk reassessment and idiosyncratic risk reassessment especially because both of them can occur at the same time. However, according to the CAPM, these shifts would likely have a different impact on the order of returns for any given assets. Following a shock of systemic risk at time t, the order of price movements should be the same as the order of the ex-ante (past) level of risk of the assets. So the rank correlation between performances in t and a measure of riskiness in t-k should be strong. On the contrary, when specific risk changes, the order of price movements should only depend on the change in specific risk for each asset but not on the order of the past measure of risk.

More formally, we know from the CAPM that for an asset whose relative risk is given by its beta, the required return is given by the following equation:

$$R_{it} = r_{ft} + \beta_{it} (r_{mt} - r_{ft}) \quad (1)$$

Where R_{it} is the expected return of asset i at time t, r_{ft} the level of the risk free rate at time t, β_{it} is the risk of the asset i at time t relative to that of the market portfolio.

Substituting r_{ft} on both sides of equation (1) yields

$$R_{it} = \beta_{it} R_{mt} \quad (2)$$

Where R_{it} the expected excess return over the risk free rate of asset i at time t and R_{mt} is the expected excess return over the risk free rate of the market portfolio at time t.
From equation (2), we can see that a shift in systematic risk (R_{mt}) affects asset i excess return proportionally to the level of asset i past level of risk (β_{it}) while a shift in the specific risk affects the β of each asset by a magnitude unrelated with the past level of risk of asset i.
The methodology we use exploits this difference to discriminate between periods of systemic risk pricing and periods of idiosyncratic risk pricing. In terms of risk appetite, it implies that the correlation between the rank of past riskiness and present performances should be high during periods of changing risk appetite, because it is a shock of systemic risk, but near zero during periods of stable risk appetite.

To apply this methodology to emerging market debt capital markets we have calculated risk-return ratio for a given set of representative assets. For its wide diffusion among market participants we choose to work on the EMBI+ index. We first calculated the one month total return of a bullet position in the benchmark bond of each country included in the EMBI+. Then we estimated the risk of these positions relative to that of the market portfolio. Here we posit the market portfolio as being well described by the EMBI+ index[6]. The result of this analysis takes the form of series of 3-month rolling betas.

With this measure of the relative risk of each position to the benchmark in hand we were able to classify the bonds according to their relative level of risk. We do it on a scale from 1 to n for each vector of daily observations. N being the numbers of assets in the sample. We choose to classify the riskiest asset at time t at the top of the scale (1). We operate the same classification for the set of total returns. We choose to classify the highest return at time t at the top of the scale (1).

To measure the correlation between the two series, we use Spearman's rank correlation. This is a nonparametric (distribution free) rank statistic that measures the strength of the associations between two variables[7]. It is a measure of monotone association that is used when the distribution of the data make Pearson's correlation coefficient misleading.

The Spearman rank correlation coefficient is defined by

$$\boldsymbol{S} = \mathbf{1} - \mathbf{6} * \left(\frac{\sum_i \boldsymbol{V}_i^2}{\boldsymbol{N}(\boldsymbol{N}^2 - \mathbf{1})} \right)$$

where Vi is the difference in statistical rank of variable i. The result we obtain is a vector of correlation coefficients ordered according to the time.

We read this statistic as follow:

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6 Emerging Market Bond Index + is provided by JP Morgan. It tracks total return for external-currency-denominated debt instruments of the emerging markets: Brady bonds, loans, eurobonds and US dollar denominated local market instrument.

7 See Lehmann and D'Abrera (1998).

i) a high level of the coefficient in absolute terms, implies that the riskiest assets have recorded the largest performances over the period, being positive if the sign of the coefficient is positive or negative if the sign of the coefficient is negative. In these situations, the market might have been driven by market risk premium or systemic risk considerations, investors have bought or sold the market as a whole. In theory, the relative risk of each bond to the market portfolio has not changed (betas remained stable) and all the return performances can be related, proportionally to the ex-ante level of the betas, to the performance of the market portfolio. Note that this can happen indifferently with a small or a large market return.

ii) Inversely, for values of the coefficient that are around zero, investors might have bought or sold assets on the basis of the revision of specific risk, that is the revision of the relative risk of each asset to the others within the market portfolio. In these situations, the return of each asset might be primarily related to a change in betas rather to a change in the market portfolio return. But again, this can happen indifferently with a small or a large market return.

All in all the correlation coefficient might enable one to discern between market movements that were due to the reassessment of systemic risk, and market movements that were due to the reassessment of idiosyncratic risk. Furthermore, we consider the absolute value of the correlation coefficient as a good indicator of the magnitude of systemic risk reassessment regardless of its direction[8]. Therefore, once multiplied by the effective performance of the market portfolio, the indicator becomes a measure of the share of daily return that was due to systemic risk pricing. We call this new series "EMBI+ systemic risk only". By difference we can also generate a measure of the share of daily return that was due to idiosyncratic risk pricing, an "EMBI+ idiosyncratic risk only".

Now, with the series of daily "systemic risk only" return we are able to recompose the valorisation of the EMBI + index as if it had only traded on systemic risk consideration and not on idiosyncratic risk consideration.

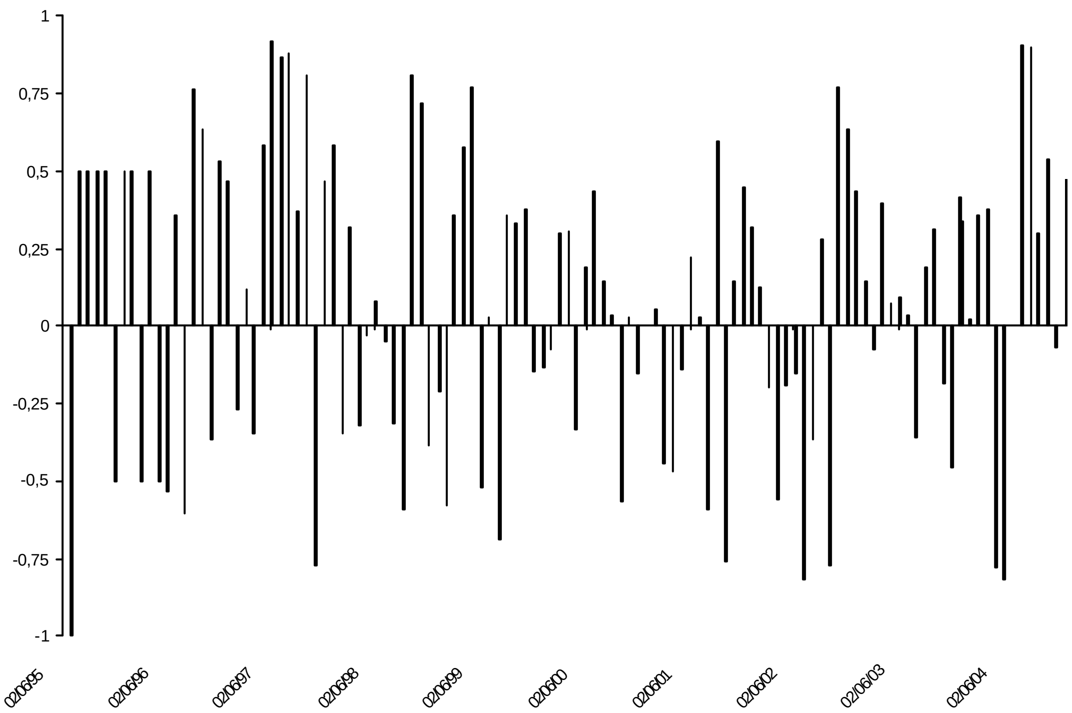
[8] It is important to note that working in an unconditional framework as is the case in Kumar and Persaud (2002), enables one to consider the correlation coefficient as a measure of risk aversion. However, as we consider our sample as being conditional we see our indicator primarily as a measure of systemic risk reassessment which might include risk aversion but not exclusively.

Data and results

We use a panel of 22 countries containing the core emerging market economies[9]. The data are daily and cover a period from January 1995 to December 2004[10]. The number of bonds included in the panel rises over the sample period from 3 in January 1995 to around 20 on average between the end of 1997 to 2004.

Figure 1 plots the correlation calculated according to the methodology introduced in the previous section[11].

Figure 1 : Indicator



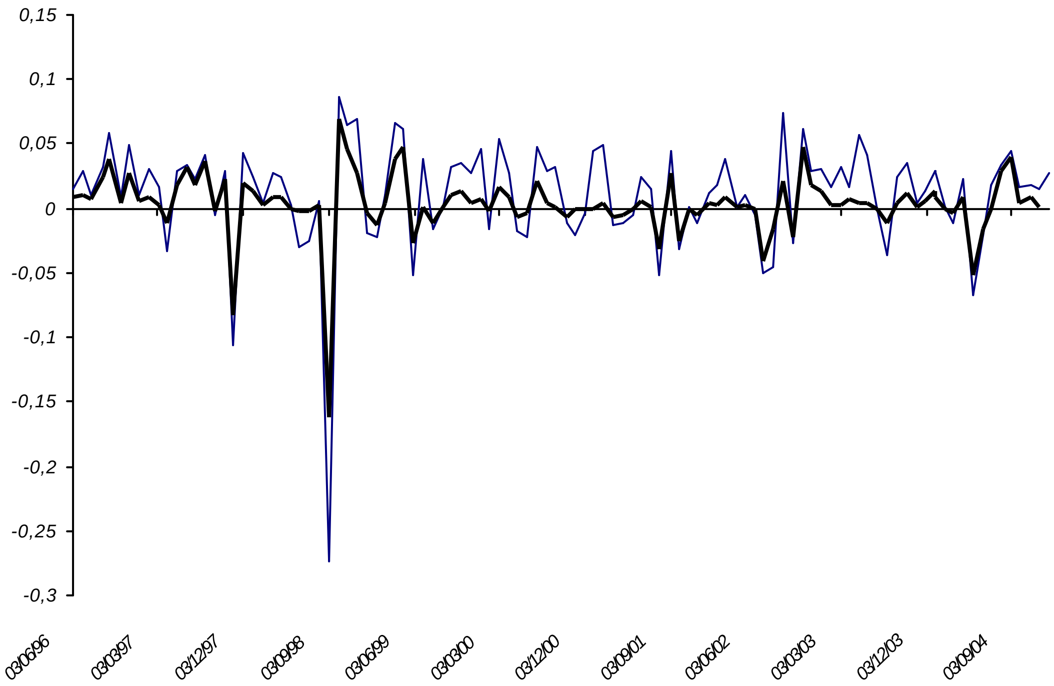
[9] The sample is: Argentina, Brazil, Chile, China, Croatia, Ecuador, Hungary, Indonesia, South Korea, Malaysia, Mexico, Morocco, Nigeria, Panama, Peru, the Philippines, Poland, Russia, South Africa, Thailand, Turkey, Venezuela. Due to the lack of reliable historical data for certain countries, the sample has not the exact structure of the EMBI+ but has 22 elements like the original and includes the largest debtors.

[10] The panel is unbalanced.

[11] At the one percent level, correlations are significantly different of zero at around 0.6 with 22 cross sections and 0.7 with 11 cross sections.

This series is a measure of the rank correlation between past riskiness as measured by the Beta of each bond calculated over the past 3 months and the one month returns over the succeeding month. If the coefficient is around zero, it signifies that the series had a low degree of correlation and therefore that the pricing of idiosyncratic risk was the main source of performance. Inversely, the higher value of the indicator in absolute terms points out a situation where systemic risk pricing was the main source of performance. We think it is important to note that the behaviour of this indicator is *a priori* independent to the absolute level of performance of the market. That is idiosyncratic risk pricing and systemic risk pricing can produce indifferently small or large returns of the market portfolio.
With this series in hand, we are able to decompose the daily return of the EMBI+ into two components that are i) the performance due to systemic risk pricing ii) the performance due to idiosyncratic risk pricing. We do this by multiplying the daily return of the index by the value of the coefficient[12].

Figure 2 plots the result of this decomposition.



This graph shows the evolution of the one month return of the EMBI+ and the evolution of the estimation of the return of the index that is due to systemic risk

[12] By doing so we considered the absolute value of the coefficient of correlation as a measure of the likelihood that market movements are due to systemic risk pricing.

pricing. By definition the second series is always enveloped in the series of return of the EMBI+. The difference between the two series is the monthly return that is due to specific risk re pricing. Therefore the larger the difference between the two series the larger the share of the EMBI+ return justified by idiosyncratic risk pricing.

In this sense, it is interesting to note the differences in terms of risk pricing between the Asian crises in October 1997 and the Russian crises in August 1998. During the Asian crises, the EMBI+ recorded a negative return of 10.6% with 8.15% due to systemic risk which would tend to prove that there was not a particular country under investors’ attention. During the Russian crises, the EMBI+ lost 27.3% with only 16.2% due to systemic risk reassessment but 11.1% due to specific, most likely Russian, risk re pricing.

Following this analysis, the Brazilian devaluation was not seen as a shock of systemic risk as the EMBI+ lost 2.3% on that month (January 1999) with no more than 1.3% due to systemic risk. There is a long period between June 1999 and June 2001 during which the pricing of systemic risk is very low and during which the market moved mainly on the back of idiosyncratic risk pricing. The effective default of Argentina at the end of 2001 did not produce any systemic re pricing. However the shock is visible in July 2001 when it became evident that Argentina was in financial trouble. Finally it is interesting to mention that even in the emerging world the Enron crises of July 2002 produced a systemic crisis as the EMBI+ lost 5% during that month with 4.1% that was attributable to systemic risk pricing.

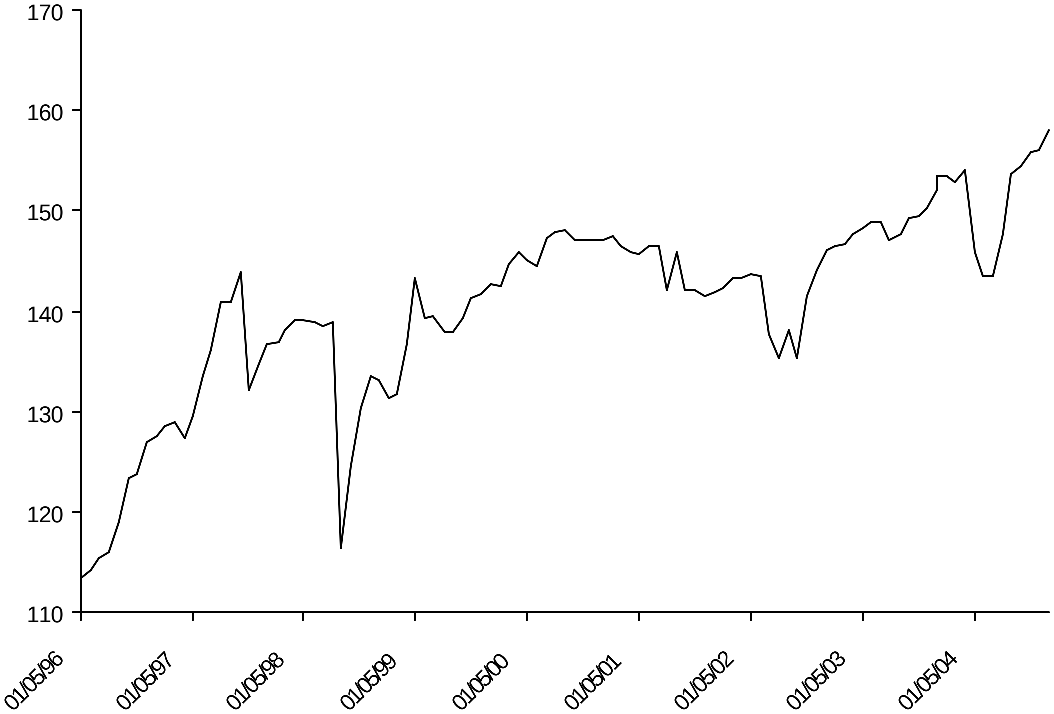
The study of the statistical properties of this series shows that one can reject the null hypothesis of normality. The series has a large left tail that makes the skewness negative. This was especially the case due to the returns recorded during the Russian crises. However, once corrected for this the skewness of the series is in line with a normal distribution. Due to the high number of small positive returns, the kurtosis is twice higher than the kurtosis of the normal distribution.

Following the performance of both the Dickey-Fuller and Philipps-Perron test of stationarity, one cannot reject the null hypothesis of a unit root. By extension the analysis of the autocorrelation and partial autocorrelation functions does not show the series has the form of an MA or AR process.

EMBI+ and risk appetite

On the basis of the series of daily "systemic risk only" return we computed the evolution of the EMBI+ index as if the market would have been driven by systemic risk pricing only.

Figure 3 plots the behaviour of the EMBI+ "systemic risk only".



At first glance this series seems to be rather stable around a trend that has a small coefficient of slope. This is a first indication that the level of systemic risk has not changed dramatically during the period. Therefore, following our definition of risk appetite it is difficult to conclude to a permanent change of risk appetite in favour of emerging markets during the period. However this graph shows that there have been 5 distinct cases of systemic risk re pricing i) from mid 1996 to mid 1997 which might be related to the rally that followed the Mexican crises ii) during the Asian crises of the summer 1997 iii) during the Russian crises of the summer 1998 iv) during the Enron crises in July 2002 and v) following changes in the US monetary policy in early 2004. It is also interesting to note that the Brazilian devaluation of 1998 or the Argentina default of 2001 have had a small impact in the market in terms of systemic risk.

Concerning risk aversion, we can only suppose that the variations of risk aversion have prompted market movements in periods of systemic risk pricing, that is basically during the four periods we have already highlighted. The main breaks in the series correspond to the Asian crisis, the Russian crisis and the Enron crisis which were mainly attributable to an increase in the level of the global fundamental risk. Therefore, the only conclusion we can draw is that changes in risk aversion might have prompted the rally of the mid 1990s.

Our last work has been to compare the behaviour of the EMBI+ and the EMBI+ “systemic risk only”. The result shows that the difference of the cumulative total return between the two indices during the period is of 140.9% with a cumulative total return of 180.7% for the EMBI+ and 39.8% for the EMBI+ “systemic risk only”. In other words more than 2/3 of the total return of the EMBI+ came from the improvement of the specific risk of the assets included in the index. Concerning the re pricing of systemic risk, which according to our definition might have been due to variations in risk aversion but not necessarily, 26.3% of the 39.8% were achieved before the summer 1997 and the Asian crisis. Therefore the variation in risk aversion might have been behind no more than 14.0% of the cumulative total return of the EMBI+ from the end of 1997 to the end of 2004.

In this context, the use of spreads in emerging markets as a measure of risk appetite as we defined it can introduce an obvious bias in terms of intensity of its possible role over these years. Furthermore, a simple Chow test of structural change in the series once regressed against a trend exhibits two breaks in the EMBI+ series which are not detected in the EMBI+ “systemic risk only”. These breaks are visible and detected statistically in October 1999 and October 2002. This difference would tend to prove again that using the EMBI+ spread as a proxy for risk aversion might introduce a bias that might be removed by using the EMBI+ “systemic risk only” index.

Conclusion

Changes in risk appetite are often used to justify movements in capital markets that seem unrelated to the flow of economic and politic news. Using spreads in high yielding markets as a proxy for risk appetite can introduce an important bias in the analysis. We correct this bias by excluding from the series the proxy risk appetite, variations that were due to idiosyncratic risk re pricing. We do this because being a macro factor that affects all the assets in the universe at the same time, variations in risk appetite can only generate systemic risk re pricing and not idiosyncratic risk pricing. Following this analysis, we find few periods of time during which changes in risk sentiment might have justified market movements.

References

Bernoulli Daniel, 1738, Specimen theoriae novae de mensura sortis, Commentarii academiae scientiarum imperialis petropolitanae, 5.

Cochrane, J. H., 2001, Asset Pricing, Princeton University press.

Eichengreen, B. and Ashoka Mody, 1998, What explains changing spreads on emerging market debt : fundamental or market sentiment ? NBER working paper n°6408.

Kumar, M. S. and A. Persaud, 2001, Pure contagion and investors' shifting risk appetite: analytical issues and empirical evidence, IMF working paper 134.

Lehmann, E. L. and D'Abrera, 1998, H. J. M. *Nonparametrics: statistical methods based on ranks*, ed Englewood Cliffs, NJ: Prentice-Hall.

Taylor, M. P. and Lucio Sarno, 1997, Capital flows to developing countries : long and short term determinants, The World Bank economic review, vol 11, n°3.

Pratt, J. W., 1964 risk aversion in the small and in the large, Econometrica, 32.

Appendix I

We use daily observations of sovereign stripped spreads. The sovereign spread is defined as the security's yield premium above the yield on the comparable default free bond. The use of stripped yields (i.e. yields that take apart the cash flows of the security coupon, see Fabozzi 2000 for example) allows one to compute spreads with reference to the US zero-coupon curve as the risk free curve. By doing so we obtain more homogenous spreads than by using the classical US treasury curve because the coupon effect is removed. We calculate the risk free rate by linear interpolation between the two maturities on the US zero-coupon curve that closely surrounds the maturity of the security. The alternative method uses only the key maturities of the US zero-coupon curve like 2 years, 5 years, 7 years but creates a time varying component in the spread that would bias econometric tests. To control for the liquidity of the bonds, and hence for the quality of the data, we only used issues that are, at a time of their life, countries' benchmarks.

Table 1: Bonds in the sample

Country	Issue Date	Redemption date	coupon	Average spread	Standard-error
Argentina	31/03/1993	29/03/2005	Libor 6M +13/16	815	550
Brazil	15/04/1994	15/04/2014	8.00%	802	237
Bulgaria	28/07/1994	28/07/2011	Libor 6M +13/16	780	267
Chile	28/04/1999	28/04/2009	6.875%	179	43
China	15/12/1998	15/12/2008	7.30%	137	52
Croatia	27/02/1997	27/02/2002	7.00%	257	135
Ecuador	23/08/2000	15/11/2012	12.0%	1494	349
Hungary	19/04/1999	19/04/2006	6.50%	127	20
Indonesia	30/07/1996	01/08/2006	7.75%	649	274
Malaysia	01/06/1999	01/06/2009	8.75%	214	34
Mexico	07/07/1996	15/05/2026	11.5%	404	93
Morocco	10/01/1990	01/01/2009	Libor 6M +13/16	551	177
Nigeria	21/01/2000	15/11/2020	6.25%	1410	608
Panama	26/09/1997	30/09/2027	8.875%	437	68
Peru		07/03/2007	Step-up	566	136
Philippines	01/12/1992	15/04/2008	8.875%	456	132
Poland	27/10/1994	27/10/2014	7.0%	213	52
Russia	14/05/1996	14/05/2011	3.00%	1405	1111
South Africa	15/05/1999	19/05/2009	9.125%	314	47
South Korea	17/04/1998	15/04/2008	8.875%	260	142
Thailand	15/04/1997	15/04/2007	7.75%	260	142
Turkey	19/09/1997	19/09/2007	10.00%	580	184
Venezuela	18/12/1990	18/12/2007	Libor 6M+7/8	1005	540