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Angel Serrat
Chief Strategist, Capula Investment Management LLP

Suresh Sundaresan
Senior Adviser, Capula Investment Management LLP
Chase Manhattan Bank Professor of Economics and Finance, Columbia University

Indexed Investing
Market Capitalisation Weighted Indexes versus Macro Weighted Indexes

Abstract

Institutional investors use indexation to achieve diversification and strike the right balance between resolving the principal-agent conflicts which exist in a delegated portfolio management setting and the need to provide the portfolio manager with some flexibility to generate risk-adjusted excess returns. Using a replicable and verifiable benchmark index that is free from manipulation promotes transparency, and enables the investor to accurately measure performance of the portfolio manager. These goals are achieved by specifying the target return goals *relative* to the benchmark index with a maximum acceptable tracking error.

Market capitalisation weights are widely used in practice for indexing and this is grounded on modern portfolio theory, which says that the market capitalisation weighted indexes are mean-variance efficient. *Exclusive reliance* on market capitalisation weighted indexes by investors will, however, result in noisy price discovery, and tilt the index weights more towards weaker issuers who will have greater incentives to issue to take advantage of noisy price discovery. As a result, ultimately, investors will find that market capitalisation indexation will lead to poor performance.

Key macroeconomic indicators such as GDP and solvency measures such as current account deficit, government deficit, and household indebtedness shed light on the drivers of future cash flows of economies, which back the obligations of government debt. Hence, an appropriately macro weighted index is likely to suffer less from the "lemons problem" that may prevail in market capitalisation index. Using data from the last decade, this paper shows that a macro weighted index has outperformed market capitalisation weighted index by 70 basis points per year.

1. Introduction and Overview

Our approach is summarised in Figure 1 below:

Figure 1: Structure of Optimal Portfolio Construction

Sponsor's Objectives
1. Solve principle-agent problem
2. Promote transparency in measuring the performance
3. Preserve capital
4. Achieve excess returns over a transparent index with an acceptable tracking error

Market Capitalisation Weighted Index
1. Exclusive reliance leads to noisy price discovery
2. "Low quality" issuers take advantage of noisy price discovery
3. Index weights tilt more towards "lemon" issuers. Investor buys more of the debt with a high weight
4. Leads ultimately to poor performance

Macro Weighted Index
1. Macro variables such as GDP, and solvency measures such as the current account deficit, government deficit, and household deficit, are the drivers of cash flows of sovereign debt
2. Macro variables tend to have incremental power in predicting returns of debt securities
3. Macro variables are useful in "credit scoring" sovereign debt

This paper makes the following contributions:
1. Shows how a transparent and variable macro weighted index (with GDP and solvency measures) can be constructed based on data in the public domain.
2. Compares the performance of a macro weighted index with a market capitalisation weighted index over the last decade and shows that the macro weighted index proposed in the paper outperforms the market capitalisation index by about 70 basis points per year.

As Figure 1 illustrates, institutional investors seek multiple objectives in managing their portfolios. These objectives include the following essential dimensions:

1. **Preservation of their capital:** This is an important goal for many institutional investors. Corporate pension sponsors of defined benefits plans care about meeting their projected and vested benefits obligations, and insurance companies care about meeting their projected policy payouts. Central bank reserve portfolios need to not only preserve capital but also remain liquid to intervene in currency markets, and to be responsive towards any fiscal policy goals, or trade goals[1]. Sovereign wealth funds (SWF) may also have a strong incentive to preserve capital to avoid censure from their country's political leaders and/or elected representatives. To such sponsors, making sure that the market value of the managed portfolio stays above a certain level or above projected liabilities is paramount.

2. **Diversification across different sectors:** Any prudent investor will want to diversify their risk, and eliminate idiosyncratic risk as much as possible. Modern portfolio theory suggests that only systematic risk is compensated in the market. This calls for investing in a diversified portfolio.

3. **Achieving a surplus:** Sponsors would like to create a surplus of assets over their invested capital or projected liabilities to cushion them from future macroeconomic shocks. For a sponsor of a defined benefits plan, a simultaneous decline in interest rates (which increases the present value of their obligations) and a drop in equity prices (which shrinks the value of their assets) can represent such a macroeconomic shock.

4. **Ex-ante and ex-post transparency about the risks:** Institutional investors delegate portfolio management to fund managers. In so doing, they need to take account of the "principal-agent" problems that can arise in such a relationship[2]. Steps must be taken to ensure that there is sufficient transparency to mitigate the "principal-agent" problem.

Goals 2 and 4 (listed above) can be made operational by specifying a well-defined indexation strategy. Goals 1 and 3 require a more nuanced approach, which combines and complements the indexation approach with overlay approaches to ensure value preservation, basis risk minimisation and surplus creation.

2.   Roadmap and a Framework

The roadmap for the paper is as follows. Section 3 discusses the role of indexation in the mitigating principal-agent problem, and the importance of distinguishing between market capitalisation weighted indexes and macro weighted indexes. Section 4 provides direct empirical evidence on the differences between these two types of indexes in terms of how their weights differ over time, and how quickly the weights react to deteriorating credit conditions. Section 5 provides a direct empirical comparison of the performance of these two indexes during the period 2000-2010. Our analysis demonstrates that much of the poor performance of indexed portfolios arises due to the fact that the rules of index construction force managers to over-weight sectors precisely when they may be performing poorly, and potentially under-weight sectors which may be

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[1] The central bank of Norway has to set aside 4% of its assets to meet the fiscal policy goals of Norway. This imposes a hurdle rate or an implicit liability. Likewise, China must manage its currency portfolio to be able to finance its imports and meet the objectives of its trade policy.

[2] We illustrate later typical principal-agent conflicts in a delegated portfolio management setting.

performing better. In particular, our analysis reveals that government deficit as a solvency measure adds incremental power over and above GDP in the outperformance of a macro weighted index. Section 6 concludes.

3.   The Role of Indexation

One simple mechanism that allows institutional investors to address the principal-agent problem is to require that their portfolio managers index their strategies to well-established benchmark indexes that are _transparent and replicable_. By specifying the benchmark index, acceptable levels of tracking errors, and target risk-adjusted returns, institutional investors attempt to (a) achieve diversification, (b) receive a certain minimum rate of return, and (c) strike the right balance in solving the principal-agent problem without unduly tying the hands of their portfolio managers.

When institutional investors delegate portfolio management to professional money managers, they are letting the managers act on their behalf and, through appropriate contractual provisions, in their best interest. Through investment management agreements, due diligence, and monitoring ex-post, the principal (the institutional investor) attempts to minimise costs associated with the agent (money manager) behaving in ways that are not in the interest of the principal, but potentially in the interest of the agent. An example of such an agent conflict might be to take excessive risks to try to produce superior returns – this strategy may result in greater fee incomes when the risk pays off, but can subject the principal to unwanted risk. This risk is mitigated by specifying a well-diversified index and specifying a tracking error. This limits excessive risk-taking and yet affords some flexibility to the agent to demonstrate his skills.

The indexation of portfolios to some chosen (ex-ante) benchmark index (whose construction and updating of weights are rule-based, verifiable, transparent and not subject to manipulation) is a practical way to implement ex-ante transparency onto the principal-agent problem. Through various provisions in the investment management agreements, investors also attempt to achieve a satisfactory level of ex-post transparency with regard to this issue.

3.1   Macro Weights versus Market Capitalisation Weights

While the principal-agent problem is effectively addressed through indexation, the goal of capital preservation is not so easily reconciled with conventional indexed investing. Institutional investors can still lose capital when the benchmark index goes down (this was the case in 2008 for many indexed investors). Likewise, indexes constructed without regard to the longer term macroeconomic health of economies may not serve the longer term needs of investors. Later in the paper, we address how these objectives can be reconciled with an indexation strategy.

One of the benchmark indexes most extensively used by institutional investors is the market capitalisation weighted index such as the aggregate fixed income indexes produced and maintained by a number of banks such as JP Morgan, Barclays and Citigroup.

The basic thesis of this paper is to suggest that investing in a benchmark index is economically identical to lending to the different sectors represented in the index in accordance with the weights specified in the index

and dynamically changing the lending in the manner in which the weights of the benchmark index evolve over time[3].

This isomorphic equivalence between "indexed portfolios" and lending then raises two important issues for institutional investors:

- *Relying on market prices (or yields) alone to make the allocation implies a view that macroeconomic variables such as current account deficit, debt to GDP ratios, etc, are not useful in explaining or forecasting bond returns over and above the information that is contained in the yield curve. We will present evidence that macroeconomic variables are indeed useful in this context.*

- *Exclusive reliance on market capitalisation weighted indexes by investors will result in "noisy price discovery" due to the low levels of research that lenders generally undertake before lending capital. Weaker issuers will quickly take advantage of such noisy price discovery, and the index weights will tilt relatively more heavily towards weaker credits. Thus, indexing investments to market capitalisation based indexes alone may result in greater exposure to weaker credits, if the market prices (yields) do not quickly incorporate information that may be present in macroeconomic data; which information may already point to structural problems with the ability of a government to pay its contractual obligations.*

It may be argued that at least two factors might mitigate the problems described above. Firstly, credit rating agencies do monitor issuers and provide signals about the quality of issuers. Intermediaries (such as the rating agencies) producing information about credit quality of constituent issuers underlying the index are, however, typically behind the curve. With investors (lenders) doing low levels of research, and rating agencies and other intermediaries not reacting quickly, market prices may not reflect information about deteriorating credit quality, which is costly to collect and analyse. Secondly, higher quality investors may try to separate themselves from low quality issuers. Unfortunately, in the sovereign debt markets actions by the European Central Bank may actually tend to weaken this separation[4].

In the context of these issues, it is important to note that index construction should pay attention to the issuance activities of weaker credits, as well as to key macroeconomic variables. Large and persistent issuances by some countries have the potential to influence adversely the weights of market capitalisation based indexes. In this context, a classic and recent example is the sovereign debt crisis in Europe: Massive debt issuances by certain countries might have influenced their market capitalisation weights in the index, but judged by most macroeconomic variables and fundamental credit analysis these countries have become less credit worthy. A prudent lender (institutional investor) should be cutting back lending or underweighting these countries in the index. A market capitalisation based lending might have lead to precisely the opposite decision.

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[3] In fact, the total amount of capital invested in indexed strategies may well exceed the outstanding value of debt securities in the economy. This is more likely to be the case when there is a glut of savings in one part of the world, which is allocated through bond indexes of borrowing economies. This will have the effect of driving down the cost of borrowing, and encourage further issuances.

[4] The ECB generally accepts debt securities issued by all member countries as collateral. This action lumps German debt together with debt securities issued by weaker sovereign borrowers.

4.   Choice of Benchmark Indexes

To illustrate the basic issues, let us take a look at the behaviour of European sovereign bond spreads, and their relationship to budget deficits[5]. Figure 2 shows the behaviour of sovereign yield spreads in Euro area, with Germany as the benchmark.

Figure 2: 10-year Government Bond Yields of Euro Area Countries, January 2007 to March 2009
(Monthly averages, percentage per annum)
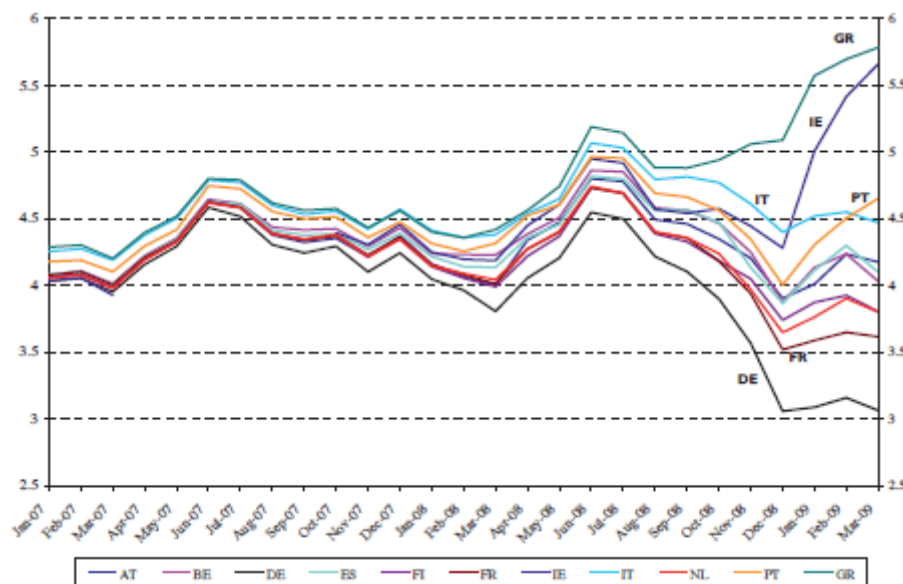
Source: Attinasi, Checcherita, and Nickel (2009)

Prior to the onset of financial crisis in mid-2008, spreads were relatively small, and allocations based on market capitalisation weights might not have resulted in any systematic biases. After September 2008, spreads exhibited a great deal of divergence, reflecting the deteriorating credit conditions in some European economies such as Greece and Ireland. Some such countries issued a great deal of debt and thus increased the level of their outstanding borrowing during this period.

The key question in this context is the following: Did the yields of debt issued by such weaker countries increase sufficiently to more than offset the increased supply of debt by these weaker credits to ensure that the market capitalisation weights actually decreased? In other words, was there sufficient price discovery?

4.1   Market Capitalisation Weights

Consider an institutional investor who had invested $500 million in a market capitalisation weighted European Sovereign Government bond index. What would have been the market capitalisation weights from January 2007 to August 2008? How would the weights have changed from September 2008 until the June 2010?

On the one hand, many of the weaker credits in the European Union increased the volume of their borrowings. This would have tended to increase their market capitalisation weights. On the other hand, the yields of these borrowers went up as the market (yield curve) began to incorporate relevant information.

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[5] This section draws on the evidence presented by Attinasi, Checcherita, and Nickel (2009).

We will show that while the yields increased (as is evident from Figure 2), the market weights of peripheral countries such as Greece actually did not decrease sufficiently. Figure 3 illustrates the behaviour of market capitalisation weights for Greece covering the period January 1998 to June 2010.

Figure 3: Market Capitalisation Weights for Greece, 1998-2009
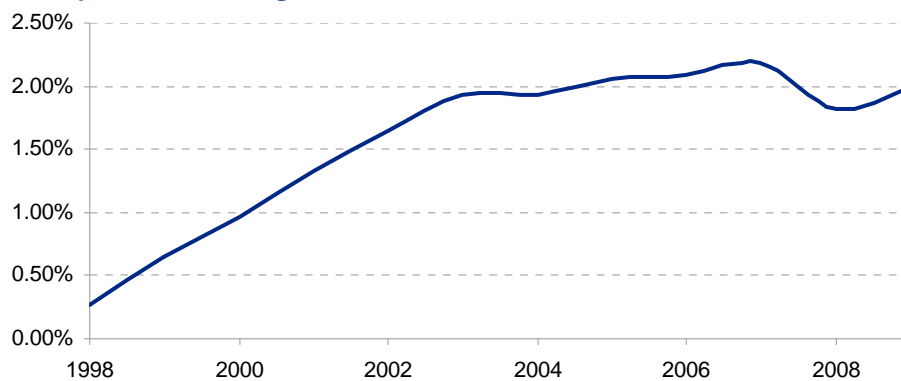
Source: Bloomberg & Capula Investment Management, Feb 2011

Note: These weights are computed on the basis of OECD countries listed in Table 1. The countries that are included in the index are the following: Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Japan, Netherlands, Portugal, Spain, United Kingdom, and USA.

We note that in Figure 3, the widening of spreads reflected the deteriorating credit conditions of Greece (see Figure 2), outweighs the increased volume of issuance by Greece during this period in market weights of the index. At a first glance, it seems like the market prices of Greek debt have incorporated lots of negative news about Greece's deteriorating credit conditions, and begins to under-weight Greece in the index.

The question for institutional investors is whether this decline occurred early enough in the game, and whether the quantitative declines were sufficient to offset the true increase in credit risk of Greece.

To illustrate this issue further, we reproduce in figure 4 the relationship between the average sovereign bond spreads over Germany and the expected budget deficit as analysed in Attinasi, Checherita, and Nickel (2009).

Figure 4: 10-year Government Bond Yield Spreads of Euro Area Over Germany, and the Expected Budget Balance Relative to Germany, August 2007 to March 2009
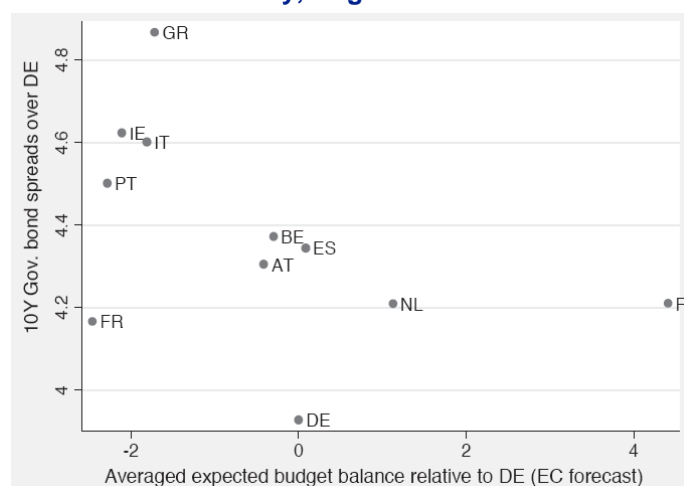
Source: Attinasi, Checherita, and Nickel (2009)

Figure 4 demonstrates that countries that are expected to have a less favourable budget balance compared to Germany have experienced larger bond yield differentials (France is an exception). Macroeconomic variables, which measure the financial well-being of countries, may be relevant in explaining the spreads. More importantly, they may have information that is not captured by the yield curve. We explore this possibility in the next subsection.

4.2   Macro Weights

Duffee (2008) and Ludvigson and Ng (2009) have empirically shown that macroeconomic variables may contain important information relevant for forecasting bond yields that are not contained in the yield curve. Examining Figure 2 and Figure 4, it is reasonable to conclude that most countries that entered the crisis with high deficits and debt ratios have experienced the largest increases in their yield spreads during the crisis. This casual observation also suggests that measures of deficits, debt ratios and GDP may have some value in forecasting yields or proactively rebalancing bond indexes.

We constructed a bond index reflecting macro variables as follows: First, the key economic variables that we incorporated into the index were (a) GDP, (b) government deficit, (c) current account deficit, and (d) household indebtedness. It is our view that these macro variables get to the core of structural fiscal soundness of any economy and its ability to adequately deal with any future crisis.

The index was constructed in a way so that it does not "depend" on arbitrary mixing parameters: We take GDP weights and adjust them, one-for-one, with three year trailing twin deficits and private sector indebtedness changes

The index that we have constructed includes the following key steps:

- We begin with the premise that the GDP of a country, which is a flow measure, is a broad measure of the country's ability to pay.
- While GDP is a broad measure of the ability to pay, current account deficits and government deficits are important structural variables that have a bearing on the country's ability to pay. We reflect this in the construction of the index by taking these measures for the previous three years, and subtracting the sum of these measures from the GDP.
- Households form an important part of any country. The balance sheet of the household is a key determinant of the health of the economy. To reflect this in a concrete fashion, we subtract the net increase in household debt over the previous three years.

The main economic intuition behind constructing the index in this manner can be summarised as follows. The government deficits and current account deficits when combined with GDP provide a good way to mirror future tax increases and inflationary risks. These are clearly relevant for investors. Household debt is important in the ability of consumers to sustain consumption spending. This is clearly a key in a crisis period in determining the likelihood of whether an economy is more prone to slip into recession and how severe the recession might be. In addition, government actions in a crisis may have the effect of converting household debt into public debt (as was the case in Korea in the aftermath of 2007 crisis)[6]. In effect, the macro variables used in the index construction capture two key drivers of future cash flows of sovereign debt;

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[6] The index constructed using the macro-variables is based on information in the public domain, and is easily replicable and verifiable.

"ability to pay" and "ability to tax". High current account deficits signal acquisition of claims against the country's future output by foreigners, thus limiting to a certain extent ability to appropriate from residents' resources. Finally, higher household indebtedness means less income the government can tax without causing excessive duress.

The concept of "valuation-indifferent indexing" is well-known in equity markets, and there is some empirical evidence that such portfolios can outperform market cap weighted equity indexes[7]. Arnott, Hsu, Li and Shepherd (2010) construct non-market capitalisation weights for sovereign debt by incorporating the total population, land area, GDP, and energy consumption variables. They use five-year moving averages. PIMCO has recently launched a GDP-weighted index, where historical averaging is used in the index construction. The index is based on a five-year average and thus is less sensitive to material changes that may occur during a crisis, as the events during 2007-2010 have demonstrated. Moreover, credit rating is used to drop countries which fall below an acceptable rating. While this can be useful, it is generally agreed that ratings tend to be very sticky and by the time rating agencies have adjusted their ratings, spreads might have already widened.

Our main point in this context is that while GDP is informative, it does not fully capture the macroeconomic state of an economy by itself. This is especially the case when five-year averages are used. Structural variables such as current account deficit, government deficit, and household indebtedness are important additional variables that carry valuable information about the ability of a country to access capital markets at reasonable borrowing terms from investors. GDP alone will not be able to capture this.

The macro weights, which reflect GDP and these additional structural factors, were computed for Greece as an illustration. The weights for Greece in the Sovereign bond index are shown alongside the market capitalisation weights in Figure 5 next.

Figure 5: Weights for Greece in the Sovereign Bond Index
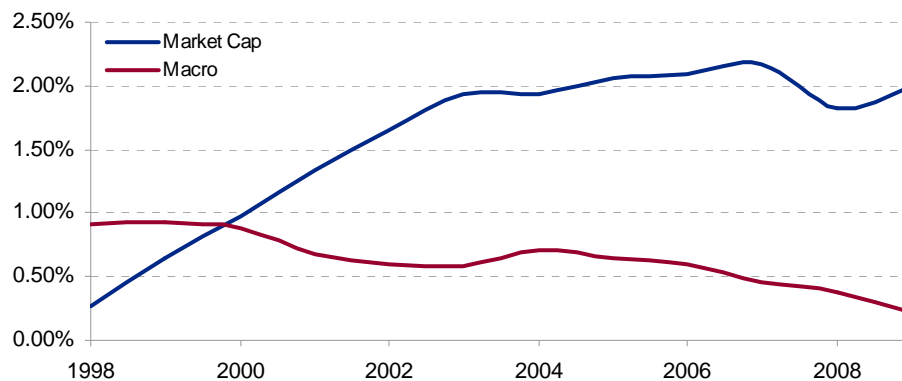
Source: Bloomberg & Capula Investment Management, Feb 2011

Comparing Figure 3 with Figure 5, we find that macro weighted index has a meaningful predictive power over and above the market capitalisation weighted index. In particular, we find that the macro index would have significantly under-weighted Greece relative to the market capitalisation index, throughout the sample period. Macro weight of Greece for example would have collapsed to 0.22% by end'09 while market cap still showed a fairly high weight for Greece.

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[7] See Arnott, Hsu, Li and Shepherd (2010). They construct portfolios of bonds with five factors: total cash flow, total dividends, book value of assets, sales and face value of debt.

5. Comparative Performance of Macro Weighted Index

We have a sample of 14 countries for which we have collected macroeconomic variables and market prices to create both a macro weighted index (as described in the previous section) and a market capitalisation weighted index. These countries are listed in Table 1, and are broadly drawn from the OECD.

Table 1: Countries in the Index

Austria
Belgium
Finland
France
Germany
Greece
Ireland
Italy
Japan
Netherlands
Portugal
Spain
United Kingdom
USA

Note that, in addition to the Euro-zone countries, the list in Table 1 includes the USA and the UK. The sample period of data covers 2000-2010, which includes periods of expansion, recession and severe crises. In our analysis, we have restricted attention to 10-year maturity, and all the returns are in their respective local currencies.

The return performance of macro weighted and the market cap portfolio are shown in Table 2. These returns calculations embody some adjustments to control for differences in duration of macro weighted portfolios and market cap weighted portfolios[8]. We keep the duration exposure the same under both weighting schemes.

Table 2: Performance of Macro Weighted Portfolio and Market Cap Weighted Portfolio (in basis points, annualised, year-to-year changes)

Year	Market Cap Weighted	Macro Weighted	Outperformance of Macro over Market Cap
2000	9.9%	11.6%	1.7%
2001	4.7%	4.9%	0.2%
2002	10.9%	12.1%	1.2%
2003	1.0%	1.2%	0.2%
2004	5.7%	5.8%	0.1%
2005	4.3%	4.5%	0.1%
2006	-0.8%	-0.4%	0.3%
2007	3.9%	4.9%	1.0%
2008	10.9%	13.2%	2.3%
2009	-1.9%	-3.7%	-1.8%
2010	3.1%	5.4%	2.3%

Average outperformance 69.43 basis points per year

Source: Bloomberg & Capula Investment Management LLP, February 2011

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[8] The portfolio of each country was constructed so that its duration will be the same as that of that country's 10-year bond.

Table 2 shows the performance of the market capitalisation weighted index with the macro weighted index on a year by year basis[9]. First and foremost, note that the macro weighted portfolio outperforms the market cap weighted portfolio in 10 out of 11 years. This is significant as the sample covered expansion and recession. Note that the big outperformance by the macro weighted index occurred in 2008 and 2010. Over this sample period, the average outperformance of the macro weighted portfolio was about 70 basis points per year. The only year (2009) when the macro weighted index underperformed was in 2009, which saw a major sell off in US Treasury debt. Since macro weights had a higher weighting for the USA, this resulted in underperformance. In general, the weights of the macro weighted index will differ from those of the market capitalisation weighted index. Therefore, we need to examine the differences between the underlying indices to examine where the superior performance of the macro weighted index in 2008 and 2010 in particular, and in the overall sample in general, is coming from. In other words, we need to perform an attribution analysis to better understand the performance differences. For example, Tables 3 and 4 provide the composition of the sovereign indexes constructed from both the market capitalisation approach and the macro approach.

Table 3: Market Capitalisation Weights

Market cap weights	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Austria	0.89%	1.00%	1.24%	1.36%	1.43%	1.49%	1.46%	1.47%	1.57%	1.66%	1.47%	1.33%	1.24%
Belgium	3.10%	2.84%	2.99%	3.17%	3.29%	3.27%	3.08%	2.89%	2.83%	2.69%	2.50%	2.26%	1.87%
Finland	0.87%	0.71%	0.64%	0.62%	0.56%	0.63%	0.66%	0.57%	0.56%	0.53%	0.46%	0.45%	0.42%
France	9.10%	8.67%	8.89%	8.87%	8.94%	9.26%	9.29%	8.81%	8.95%	8.56%	7.84%	7.52%	6.67%
Germany	10.17%	9.10%	9.31%	9.17%	9.49%	10.12%	10.53%	9.84%	10.10%	10.06%	8.85%	7.67%	6.45%
Greece	0.27%	0.65%	0.97%	1.33%	1.65%	1.93%	1.93%	2.06%	2.09%	2.18%	1.83%	1.99%	1.13%
Ireland	0.41%	0.34%	0.31%	0.25%	0.34%	0.43%	0.45%	0.44%	0.35%	0.42%	0.43%	0.71%	0.55%
Italy	7.80%	8.13%	8.48%	8.87%	9.05%	9.89%	9.77%	9.44%	9.49%	9.76%	8.47%	8.56%	6.99%
Japan	16.80%	22.78%	24.68%	25.53%	27.18%	28.22%	28.43%	28.00%	27.80%	29.35%	34.04%	29.99%	31.96%
Netherlands	3.46%	2.81%	2.67%	2.53%	2.51%	2.68%	2.67%	2.55%	2.45%	2.39%	1.97%	1.99%	1.78%
Portugal	0.46%	0.50%	0.61%	0.62%	0.78%	0.81%	0.79%	0.84%	0.92%	0.92%	0.87%	0.88%	0.67%
Spain	3.73%	3.68%	3.68%	3.66%	3.63%	3.66%	3.70%	3.53%	3.45%	3.32%	3.10%	3.43%	2.83%
UK	7.22%	6.72%	6.03%	5.49%	4.99%	5.07%	5.21%	5.72%	6.19%	6.28%	5.12%	6.21%	6.24%
US	35.71%	32.09%	29.52%	28.54%	26.16%	22.54%	22.04%	23.84%	23.28%	21.88%	23.06%	27.00%	31.20%

Source: JP Morgan

Note from Table 3 that the market capitalisation based index would have significantly under-weighted Germany and over-weighted Japan as the time moved from 2007 to 2010.

On the other hand, note from Table 4 that the macro weighted index would have over-weighted Germany and under-weighted Japan. These differences contribute to the differences in the performances of these two indexes.

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[9] We have also broken down the performance into (a) yield changes, and (b) carry.

Table 4: Macro Weights

Macro weights	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Austria	1.02%	1.00%	1.00%	1.02%	1.17%	1.30%	1.37%	1.32%	1.30%	1.31%	1.39%	1.44%
Belgium	1.33%	1.41%	1.55%	1.64%	1.84%	1.92%	1.90%	1.72%	1.61%	1.48%	1.43%	1.34%
Finland	0.64%	0.70%	0.83%	0.90%	0.99%	0.98%	0.98%	0.89%	0.85%	0.84%	0.86%	0.79%
France	7.02%	7.23%	7.58%	8.17%	8.55%	8.62%	8.32%	8.21%	7.69%	7.25%	7.06%	6.49%
Germany	9.89%	9.75%	9.49%	9.91%	10.89%	12.01%	13.04%	13.58%	14.34%	14.66%	15.47%	15.40%
Greece	0.92%	0.93%	0.88%	0.68%	0.60%	0.58%	0.71%	0.64%	0.60%	0.45%	0.38%	0.22%
Ireland	0.47%	0.52%	0.59%	0.63%	0.69%	0.02%	0.00%	0.00%	0.44%	0.36%	0.25%	0.24%
Italy	6.86%	6.76%	6.81%	7.00%	6.91%	6.77%	6.60%	6.14%	6.15%	5.95%	5.90%	5.94%
Japan	14.28%	13.42%	12.94%	14.22%	14.89%	16.47%	17.19%	18.31%	18.85%	19.41%	19.19%	17.94%
Netherlands	2.10%	2.27%	2.24%	2.15%	2.21%	2.30%	2.35%	2.39%	2.48%	2.54%	2.80%	2.61%
Portugal	0.73%	0.68%	0.52%	0.45%	0.45%	0.55%	0.59%	0.57%	0.52%	0.48%	0.45%	0.43%
Spain	3.68%	3.63%	3.73%	1.17%	1.41%	1.39%	4.15%	3.80%	3.59%	3.19%	2.84%	2.90%
United Kingdom	6.95%	6.99%	7.29%	7.46%	7.54%	7.05%	6.68%	5.70%	6.25%	5.66%	6.18%	5.72%
US	44.11%	44.72%	44.56%	44.58%	41.86%	40.06%	36.11%	36.72%	35.33%	36.41%	35.80%	38.55%

Source: Havers Analytics & Capula Investment Management LLP, February 2011

Our analysis shows that the market capitalisation weighted indexes reacted slowly during the credit crisis in terms of scaling down their exposures to the peripherals in Europe. Furthermore, they gave greater weights to issuers with poorer macroeconomic fundamentals. A clear case study in this context is Greece at end-09 and its descent to "junk status" in Q2 2010 (market cap failed to adjust weight downwards sufficiently early).

On the other hand, macro weighted indexes reacted much more quickly to the credit crisis and started to underweight the peripherals much earlier than market capitalisation weighted indexes. Moreover, they assigned lower weights to the peripherals in general. In spite of providing a more defensive portfolio compared to the market cap weighted portfolio, the macro-index approach would have delivered an outperformance of almost 70 basis points per year for the last decade, for a portfolio with an equal-duration control for the 14-countries developed bond markets index.

In general, by moving to a macro weighted index, the investor is looking for a longer-term perspective than the view implied by market capitalisation indexation. This is inherently due to the fact that macro variables change slowly over time. In effect, this may lead to differences in performance between the market capitalisation index and the macro weighted index. We have no reason to suggest that one will outperform the other at all times.

Within macro weighting, we found that the Government deficit measure of solvency had a measurable effect on outperformance over and above the GDP variable. Including both macro variables in the index improved outperformance. The current account deficit did not contribute to outperformance, presumably because its inclusion reduced the weights of the US, which performed well on average during our sample.

6.　　　Conclusions

This paper provides a simple, *parameter-free,* macro weighted index that combines GDP with solvency measures. The index is replicable and verifiable using data from reliable publicly-available sources.

It shows the relationship between the performance of macro weighted indexes and the relative weighting of GDP and solvency measures. The paper makes the case that solvency measures are of incremental value in forecasting deteriorating credit quality and hence can be useful in "credit scoring". The arguments presented in the paper to suggest that market prices may be imperfect aggregators of credit quality can be understood in the light of the theory developed by Rothschild and Stiglitz (1976) and Grossman and Stiglitz (1980). The reason for the conflict between these papers and modern portfolio theory (which advocates market capitalisation weighting) arises from the fact that modern portfolio theory works with full information; whereas in reality there is the possibility of adverse selection, and information collection is costly.

Our analysis is based on the sample period of 2000-2010, and it uses 10-year maturity as the benchmark. It would be useful to expand the analysis to a broader sample and a wider maturity spectrum.

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Biographies

Angel Serrat
Partner & Chief Strategist

Angel Serrat is a partner and Chief Strategist at Capula. Angel spent eight years at JP Morgan, most recently as Managing Director and Global Head of Research for JP Morgan's Global Proprietary trading business. Before joining JP Morgan in 2001, he was at Credit Suisse First Boston as Vice President of financial institutions structured sales. From 1998 to 2000, Angel was an Executive Director of the Exotics desk at Goldman Sachs in London. Prior to this, from 1996 to 1999, Angel was assistant professor of finance at the University of Chicago.

BSc in Mathematics, Universitat Aut. De Barcelona, 1988
BSC in Economics, Universitat Aut. De Barcelona, 1988
MSc in Economics, C.E.M.F.I (Bank of Spain), 1990
PhD in Finance, Massachusetts Institute of Technology , 1996

Suresh Sundaresan
Consultant / Senior Adviser

Suresh Sundaresan is a consultant and senior adviser to Capula. Suresh has spent 27 years on the Economics and Finance faculty, Columbia University as Chase Manhattan Bank Professor of Economics and Finance and Chairman of the Finance subdivision. He has published in the areas of Treasury auctions, bidding, default risk, term structure of interest rates, pension asset allocation, swaps, options, forwards, futures, fixed income securities markets and risk management. Dr. Sundaresan's research papers have appeared in major journals such as the Journal of Finance, Review of Financial Studies, Journal of Business, Journal of Financial and Quantitative Analysis, European Economic Review, Journal of Banking and Finance and Journal of Political Economy. He has also consulted for Morgan Stanley Asset Management and Ernst & Young and conducted training programs for Goldman Sachs, Morgan Stanley and CSFB. He has trained MBA and PhD students who serve in senior capacities at major banks, and financial institutions. Dr. Sundaresan is an associate editor of the Journal of Finance and Review of Derivatives Research. He is the author of "Fixed-Income Markets and Their Derivatives (third edition)" to be published by academic press/Elsevier publishers.

MS in Finance, Carnegie Mellon University, 1979
PhD, Carnegie Mellon University, 1980

Served as a resident scholar at the Federal Reserve Bank of New York
Served as a member of Treasury Borrowing Advisory Committee
Testified to US Congress on Transparency of Corporate Bond Markets
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