Ministry of Finance
Postboks 8008 Dep.
0030 Oslo

Date: 14.12.2017
Your ref.:
Our ref.:

Bonds in the Government Pension Fund Global

In its letter of 1 September 2017, Norges Bank advised on changes to the guidelines for bond investments in the Government Pension Fund Global. This letter contains additional information requested by the Ministry in its letter of 26 October 2017.

Additional information on the recommendation in our letter of 1 September
Our advice was designed to ensure that bond investments serve their intended purpose in the fund, cf. the discussion in the Ministry's letter to the Bank of 9 June 2017 and Report to the Storting No. 23 (2015-2016). The main analyses underlying our advice are presented in four discussion notes published on our website.[1] These analyses were conducted in a total portfolio context. This is an important premise, because the conclusions may depend on the split between equities and bonds in the portfolio. The choice of an equity share of 70 percent means that the fund's allocation to equities is higher than in a global, market-weighted index of equities and bonds. This can have implications for how the benchmark index for bonds should be constructed.

The proposed new benchmark index for bonds implies that the owner takes an explicit position on interest-rate risk. Other than the equity share, the exposure to interest-rate risk is the decision that has meant the most for the fund's risk and return. We also propose that the owner decides on a fixed list of currencies that will help reduce fluctuations in the fund's return and ensure sufficient liquidity. The proposed benchmark index for bonds has fewer technical shortcomings than today's benchmark index and can, in principle, be tracked more closely and at lower cost. The mandate requirement for

[1] NBIM Discussion Notes 2/2016, 1/2017, 2/2017 and 3/2017.

minimum overlap between the benchmark index and the portfolio ensures a sufficiently liquid bond portfolio that can help reduce fluctuations in the fund's overall return.

Bond investments should also provide exposure to risk premiums in the bond market. Besides interest-rate risk, bond investments have mainly exposed the fund to the credit premium, through investments in corporate bonds, and the carry premium, through investments in government bonds issued in high-yield currencies. Exposure of this kind has impacted on the fund's historical risk and return to a far lesser extent than the choice of equity share and exposure to interest-rate risk. The credit premium and the carry premium also have some similarities with the equity premium.

In its letter of 9 June, the Ministry asked the Bank to assess the degree to which exposure to risk factors other than interest-rate risk should be reflected in the benchmark index. Our analyses show that it is possible to establish systematic strategies that give the fund exposure to these risk factors in the bond market. Available benchmark indices are not constructed for this purpose.

The Bank therefore proposed removing government bonds in emerging-market currencies and corporate bonds from the benchmark index, but retaining the option of investing parts of the fund in these bonds. As is the case today, the scope to invest in bonds not included in the benchmark index would be governed by the management restrictions in the mandate. The Executive Board did not propose any new management restrictions, but noted that the Ministry could consider setting an upper limit on the proportion of the fund that may be invested in government bonds in emerging-market currencies and corporate bonds.

No changes were proposed to the limit on deviations between the portfolio and the benchmark index in the form of expected relative volatility, or tracking error. As a manager, we can deviate from the benchmark in two ways: we can invest either more or less than would follow from the benchmark index. Given the recommendation in our letter of 1 September, we would, as is the case today, be able to invest relatively more in the currencies and segments that we propose removing from the benchmark index for bonds. We would not, however, be able to invest relatively less in the currencies and segments that we propose removing from the benchmark index for bonds, due to the mandate's restriction on short selling. All else equal, the scope for relative deviations will therefore be smaller with a narrower benchmark index for bonds.

Execution of the management assignment

We have constructed an internal reference portfolio that serves as a starting point for all of the fund's investments. The internal reference portfolio currently includes allocations to asset types not included in the benchmark index, such as Chinese A-shares, real estate, and government bonds from India, Indonesia and Brazil. If the Ministry adopts the recommendation in our letter of 1 September, we will still be able to allocate capital to government bonds in high-yield currencies and corporate bonds. Both can be assigned an allocation in the internal reference portfolio.

If we choose to allocate capital to government bonds in high-yield currencies or to corporate bonds, we will also need to reduce the allocation to other asset types. An allocation to US corporate bonds, for example, could be financed with a combination of US equities and US government bonds with a similar maturity. This financing solution helps the internal reference portfolio to have similar risk characteristics to the benchmark index over time along three of the most important dimensions of risk: market, interest-rate and currency risk. We currently manage market and currency risk in the reference portfolio along these lines, and we have had good experience of this.

The internal reference portfolio is based on custom indices that take account of the fund's size and any capacity restrictions in individual markets. The custom indices for government bonds issued in emerging-market currencies and corporate bonds will be constructed in such a way as to provide systematic and cost-effective exposure to the carry premium and the credit premium. Unlike today's benchmark index, these custom indices will focus specifically on government bonds issued in high-yield currencies and sub-segments of the credit market where it is reasonable to expect investors to be adequately compensated for credit risk. Corporate bonds with a short maturity have historically carried a higher risk-adjusted credit premium than those with a longer maturity. In the investment-grade segment, corporate bonds with a lower credit rating have had a higher risk-adjusted credit premium than those with a high credit rating. Studies also show that investors have been compensated for not selling corporate bonds moving out of the broad bond indices.

As is the case today, investment opportunities will be assessed on how they impact on other parts of the reference portfolio. Studies show that the returns on different systematic risk factors in some periods move differently.[2] It has therefore been possible to construct a portfolio that improves the trade-off between risk and return by viewing exposure to different risk factors in combination.

Decisions on the composition of the internal reference portfolio require the approval of NBIM's Investment Risk Committee. This reflects the importance and long-term implications of these decisions. The reference portfolio is monitored continuously and evaluated regularly, and can be modified if needed. As is the case today, separate investment mandates will be issued for the different investment areas. These mandates limit portfolio managers' scope to deviate from the custom indices. The custom indices in the reference portfolio will be the starting point for the measurement and assessment of results in this part of the fund's management.

In our public reporting, we will explain the differences in return between the portfolio and the benchmark index. Any contributions to the fund's overall excess return from its investments in government bonds issued in emerging-market currencies and corporate bonds could be explicitly disclosed. We will also report on the return on the bond portfolio relative to the benchmark index for bonds, in line with the requirements in the mandate. The measurement of bond management results should also take account of the types of

[2] See, for example, Ilmanen, A. and Kizer, J. (2012): "The Death of Diversification Has Been Greatly Exaggerated", *Journal of Portfolio Management* 38(3), 15-27.

risk these investments expose the fund to. The results of different investment strategies in the bond market can be measured against the custom indices and against the instruments the Bank has sold to finance these investments. Taken together, this reporting will provide a full and fair picture of the results of our management and ensure that the Ministry and others can assess our performance.

Alternative index specifications

In its letter of 26 October, the Ministry asks the Bank to look at alternative ways of constructing the benchmark index for bonds. The enclosures present a number of such alternatives. In all cases, the composition of the bond portfolio will differ from the benchmark index. We must stress that these calculations should not be interpreted as new advice from the Bank. The Bank's recommendation is set out in the letter of 1 September 2017.

The alternative calculations retain the principles set out in our letter of 1 September of a fixed currency list and GDP weights that are rebalanced annually. To limit complexity and transaction volumes in the index, market weights are used across the different bond segments within each currency. The split between government and corporate bonds is governed by an adjustment factor.

We have been asked to consider alternative weighting regimes, including a GDP-weighted index from the index supplier Bloomberg Barclays. This index is based on GDP weights and is rebalanced annually, and therefore has similarities with our recommendation of 1 September and with the weighting principles that we have used in these alternative calculations. One difference is that the Bloomberg Barclays index measures GDP in local currency over three years, rather than in US dollars over three years.[3] This has little effect on the currency distribution or the cost of annual rebalancing. The cost of rebalancing is affected mainly by how often rebalancing is performed rather than what the portfolio is rebalanced to. Another alternative is market weights with adjustment factors that bring the currency distribution close to today's GDP weights. This can work well if the benchmark index consists of nominal government bonds. However, such an alternative may be challenging operationally if the Ministry wishes to keep corporate bonds in the benchmark index. When using adjustment factors, it is important that these are evaluated at regular intervals, and that there are thorough assessments of any unwanted effects.

Alternative 1 is closest to today's benchmark index for bonds. The difference, other than the weighting principle, is that government bonds issued in emerging-market currencies and corporate bonds in some currencies are omitted. Omitting these bonds from the benchmark index for bonds results in a slightly more liquid index that reduces the volatility of the fund's overall return to a slightly greater degree than today's index.

Alternative 2 illustrates the effect of reducing the allocation to corporate bonds in the benchmark index to around half the current level. This can be achieved by setting the

[3] The weights in the alternative index from Bloomberg Barclays are then calculated on the basis of the spot rate against the dollar at the end of October each year.

adjustment factor at 0.50. The benchmark index currently has a larger allocation to corporate bonds than would follow from a broad global bond index. This comes on top of the benchmark index having a higher allocation to equities than a global market portfolio. In our letter of 1 September, we emphasised that the similarities between the credit premium and the equity premium indicate that the Ministry should consider reducing the allocation to corporate bonds if it wishes to keep these bonds in the benchmark index.

To reduce uncertainty about the fund's volatility, the Executive Board recommended introducing an upper limit on the maturity of the bonds included in the index. Alternatives 3 and 4 show the effect of setting this limit at 15 and 10 years respectively. These two alternatives have a broader currency distribution than the Bank's recommendation. In these cases, an upper limit on maturity results in high ownership shares in some minor European currencies in the benchmark index for bonds. The Ministry can solve this by not having a limit on maturity in these currencies. Another possibility is not to include these currencies in a benchmark index where maturity is restricted. The currencies concerned account for less than 2 percent of the benchmark index for bonds in all of the alternatives presented in Enclosure 1.

In Alternative 5, the adjustment factor for corporate bonds is set to zero. The biggest difference relative to the recommendation in our letter of 1 September is that this alternative has a broader currency distribution. For an investor with 70 percent invested in a geographically diversified equity portfolio, our analyses show that there is little reduction in risk to be achieved by also diversifying the bond investments across a large number of currencies. A longer list of currencies would make the index slightly less liquid.

Alternative 6 is a combination of the Executive Board's recommendation and Alternative 1. In this case, we assign all currencies and sub-segments in Alternative 1 an adjustment factor of 0.3. The exception is nominal government bonds issued in US dollars, euros and pounds sterling, which are assigned a factor of 1. This results in a currency distribution that departs somewhat from GDP weights in dollars, euros and pounds. The upper limit for the maturity of bonds included in the benchmark index is set at 15 years. In this alternative, the currency list will have a higher share of nominal government bonds in liquid currencies, which helps reduce the fund's overall volatility.

The alternatives described so far are market-weighted within the euro area. This has been done to reduce the complexity of a benchmark index that includes multiple segments. In a benchmark index consisting solely of nominal government bonds, GDP weights within the euro area would be unproblematic. GDP weights within the euro area and an upper limit on maturity result in high ownership shares in some small countries issuing bonds in euros. These account for less than 0.2 percent of today's benchmark index and 0.4 percent of the Bank's proposed new benchmark index for bonds.

Enclosure 2 presents the same alternatives as Enclosure 1, but also imposes a minimum requirement for credit quality for issuers of government bonds. This particularly affects the composition of the benchmark index within the euro area.

The alternatives outlined in the enclosures overcome the challenges highlighted in our letter of 1 September to varying degrees. Should the Ministry choose to proceed with one of the alternatives presented in the enclosures, or with some other alternative, we assume that we would be given the opportunity to return to the details of how such a benchmark index should be specified. The decisions made in constructing the index could have major consequences for the composition of the fund's bond portfolio, and so affect the degree to which bond investments fulfil the objectives that the Ministry has set for these investments.

Yours faithfully

Trond Grande   Ole Christian Bech-Moen

Enclosures
Alternative specifications of the benchmark index for bonds

Enclosure 1 – Alternative specifications of the benchmark index for bonds as at 31 October 2017

- Includes all segments included in today's benchmark index (nominal government bonds, inflation-linked bonds, bonds issued by international organisations and corporate bonds, including covered bonds).
- Includes all developed-market currencies included in today's benchmark index for bonds.
- Includes corporate bonds (including covered bonds) issued in dollars, euros and pounds.
- Weighting principle: GDP by currency, market weights within each currency.
- Adjustment factors determine the split between government and corporate bonds within each currency.
- Where there is an upper limit on maturity, this applies to all segments included in the benchmark index.
- The Bank's recommendation includes only nominal government bonds and uses GDP weights within the euro area.

Specifications	Today's index	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6	Bank's proposal
Adjustment factor corporate bonds		*1,0*	*0,5*	*0,5*	*0,5*	*0,0*	*1/3*	
Maturity	*All*	*All*	*All*	*<15 years*	*<10 years*	*<10 years*	*<15 years*	*< 10 years*
Government bonds	**70%**	**74%**	**84%**	**84%**	**84%**	**100%**	**86%**	**100%**
USD	26.1%	25.0%	31.3%	32.3%	32.4%	42.0%	37.6%	54.2%
EUR	17.6%	20.9%	24.2%	23.4%	23.0%	28.6%	28.9%	37.0%
Germany	*4.9%*	*3.3%*	*3.8%*	*3.6%*	*3.7%*	*4.6%*	*4.8%*	*11.1%*
France	*3.6%*	*5.1%*	*5.9%*	*5.8%*	*5.5%*	*6.9%*	*7.2%*	*8.1%*
Italy	*2.7%*	*4.8%*	*5.5%*	*5.4%*	*5.2%*	*6.5%*	*7.0%*	*6.1%*
Spain	*1.7%*	*2.6%*	*3.0%*	*3.0%*	*2.9%*	*3.6%*	*4.0%*	*4.0%*
Netherlands	*1.1%*	*0.9%*	*1.1%*	*0.9%*	*1.0%*	*1.2%*	*1.3%*	*2.5%*
Belgium	*0.7%*	*1.1%*	*1.3%*	*1.1%*	*1.0%*	*1.2%*	*1.5%*	*1.5%*
Austria	*0.5%*	*0.7%*	*0.8%*	*0.7%*	*0.8%*	*1.0%*	*1.0%*	*1.2%*
Ireland	*0.3%*	*0.3%*	*0.4%*	*0.4%*	*0.4%*	*0.5%*	*0.6%*	*0.8%*
Finland	*0.3%*	*0.3%*	*0.3%*	*0.3%*	*0.3%*	*0.4%*	*0.5%*	*0.8%*
Slovakia	*0.1%*	*0.1%*	*0.1%*	*0.1%*	*0.1%*	*0.1%*	*0.2%*	*0.3%*
Luxembourg	*0.1%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.2%*
Slovenia	*0.1%*	*0.1%*	*0.1%*	*0.1%*	*0.1%*	*0.1%*	*0.1%*	*0.1%*
Latvia	*0.1%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.1%*
Lithuania	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.1%*
Malta	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*
Supranational	*1.3%*	*1.6%*	*1.8%*	*1.8%*	*1.8%*	*2.3%*	*0.8%*	*-*
GBP	4.3%	5.8%	6.3%	6.0%	6.0%	6.9%	7.4%	8.9%
JPY	6.5%	10.5%	10.5%	10.5%	10.5%	10.5%	5.7%	-
CAD	2.5%	4.0%	4.0%	4.0%	4.0%	4.0%	2.2%	-
AUD	2.0%	3.2%	3.2%	3.2%	3.2%	3.2%	1.7%	-
CHF	1.0%	1.6%	1.6%	1.6%	1.6%	1.6%	0.9%	-
SEK	0.8%	1.3%	1.3%	1.3%	1.3%	1.3%	0.7%	-
DKK	0.5%	0.8%	0.8%	0.8%	0.8%	0.8%	0.4%	-
SGD	0.4%	0.7%	0.7%	0.7%	0.7%	0.7%	0.4%	-
NZD	0.3%	0.4%	0.4%	0.4%	0.4%	0.4%	0.2%	-
Emerging markets	7.9%	-	-	-	-	-	-	-
Corporate bonds	**30%**	**26%**	**16%**	**16%**	**16%**	**-**	**14%**	**-**
USD	17.9%	17.0%	10.6%	9.6%	9.6%	-	8.5%	-
EUR	9.2%	7.8%	4.5%	5.2%	5.6%	-	4.8%	-
GBP	1.5%	1.1%	0.6%	0.8%	0.9%	-	0.8%	-
Other	1.6%	-	-	-	-	-	-	-
Yield to maturity*	1.8%	1.5%	1.4%	1.2%	1.1%	1.0%	1.2%	1.1%
Duration	7.05	7.44	7.51	4.85	4.31	4.29	4.74	4.16
Annualised volatility bond index**	5.3%	5.6%	5.6%	5.1%	4.9%	4.9%	5.0%	4.6%
Annualised volatility 70/30**	10.1%	10.0%	10.0%	10.1%	10.1%	10.1%	10.1%	10.1%
Average median credit rating	AA-	AA-	AA	AA	AA	AA	AA	AA+
Share USD, EUR and GBP	77%	77%	77%	77%	77%	77%	88%	100%

* Not comparable across alternatives due to different duration

** Based on weekly data from January 2010 to November 2017

Source: Bloomberg Barclays, NBIM

Enclosure 2 – Alternative specifications of the benchmark index for bonds as at 31/10/2017 October

- Includes all segments included in today's benchmark index (nominal government bonds, inflation-linked bonds, bonds issued by international organisations and corporate bonds, including covered bonds).
- Includes all developed-market currencies included in today's benchmark index for bonds. There is also a fixed country list of issuers that currently have a median credit rating of A or above.
- Includes corporate bonds (including covered bonds) issued in dollars, euros and pounds.
- Weighting principle: GDP by currency, market weights within each currency.
- Adjustment factors determine the split between government and corporate bonds within each currency.
- Where there is an upper limit on maturity, this applies to all segments included in the benchmark index.

Specifications	Today's index	Alternative 7	Alternative 8	Alternative 9	Alternative 10	Alternative 11	Alternative 12	Alternative 13*
Adjustment factor corporate bonds		*1,0*	*0,5*	*0,5*	*0,5*	*0,0*	*1/3*	
Maturity	*All*	*All*	*All*	*<15 years*	*<10 years*	*<10 years*	*<15 years*	*<10 years*
Government bonds	**70%**	**72%**	**83%**	**83%**	**82%**	**100%**	**84%**	**100%**
USD	26.1%	27.2%	34.1%	35.2%	35.3%	45.7%	42.7%	60.5%
EUR	17.6%	14.2%	17.3%	16.5%	16.2%	22.3%	19.3%	29.6%
Germany	*4.9%*	*3.5%*	*4.2%*	*4.1%*	*4.1%*	*5.6%*	*5.2%*	*12.4%*
France	*3.6%*	*5.4%*	*6.6%*	*6.4%*	*6.1%*	*8.4%*	*7.8%*	*9.0%*
Italy	*2.7%*	-	-	-	-	-	-	-
Spain	*1.7%*	-	-	-	-	-	-	-
Netherlands	*1.1%*	*1.0%*	*1.2%*	*1.1%*	*1.1%*	*1.5%*	*1.4%*	*2.8%*
Belgium	*0.7%*	*1.2%*	*1.4%*	*1.2%*	*1.1%*	*1.5%*	*1.6%*	*1.7%*
Austria	*0.5%*	*0.7%*	*0.9%*	*0.8%*	*0.9%*	*1.2%*	*1.1%*	*1.4%*
Ireland	*0.3%*	*0.4%*	*0.4%*	*0.5%*	*0.5%*	*0.6%*	*0.6%*	*0.9%*
Finland	*0.3%*	*0.3%*	*0.3%*	*0.4%*	*0.4%*	*0.5%*	*0.5%*	*0.9%*
Slovakia	*0.1%*	*0.1%*	*0.1%*	*0.1%*	*0.1%*	*0.2%*	*0.2%*	*0.3%*
Luxembourg	*0.1%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.1%*	*0.1%*	*0.2%*
Slovenia	*0.1%*	-	-	-	-	-	-	-
Latvia	*0.1%*	-	-	-	-	-	-	-
Lithuania	*0.0%*	-	-	-	-	-	-	-
Malta	*0.0%*	-	-	-	-	-	-	-
Supranational	*1.3%*	*1.7%*	*2.1%*	*2.0%*	*2.0%*	*2.8%*	*0.9%*	-
GBP	4.3%	6.3%	6.8%	6.6%	6.5%	7.5%	8.4%	9.9%
JPY	6.5%	11.4%	11.4%	11.4%	11.4%	11.4%	6.5%	-
CAD	2.5%	4.3%	4.3%	4.3%	4.3%	4.3%	2.5%	-
AUD	2.0%	3.5%	3.5%	3.5%	3.5%	3.5%	2.0%	-
CHF	1.0%	1.8%	1.8%	1.8%	1.8%	1.8%	1.0%	-
SEK	0.8%	1.4%	1.4%	1.4%	1.4%	1.4%	0.8%	-
DKK	0.5%	0.8%	0.8%	0.8%	0.8%	0.8%	0.5%	-
SGD	0.4%	0.8%	0.8%	0.8%	0.8%	0.8%	0.4%	-
NZD	0.3%	0.5%	0.5%	0.5%	0.5%	0.5%	0.3%	-
Emerging markets	7.9%	-	-	-	-	-	-	-
Corporate bonds	**30%**	**28%**	**17%**	**17%**	**18%**	**-**	**16%**	**-**
USD	17.9%	18.5%	11.6%	10.5%	10.4%	-	9.6%	-
EUR	9.2%	8.2%	5.0%	5.8%	6.2%	-	5.2%	-
GBP	1.5%	1.2%	0.6%	0.9%	0.9%	-	0.9%	-
Other	1.6%	-	-	-	-	-	-	-
Yield to maturity**	1.8%	1.5%	1.4%	1.2%	1.2%	1.0%	1.3%	1.1%
Duration	7.05	7.49	7.57	4.81	4.30	4.28	4.67	4.12
Annualised volatility bond index***	5.3%	5.4%	5.4%	4.7%	4.6%	4.5%	4.5%	4.1%
Annualised volatility 70/30***	10.1%	9.9%	9.9%	10.0%	10.0%	10.0%	10.0%	9.9%
Average median credit rating	AA-	AA	AA	AA	AA	AA+	AA	AA+
Share USD, EUR and GBP	77%	75%	75%	75%	75%	75%	86%	100%

* The Bank's proposal excluding issuers that currently have a median credit rating below A
** Not comparable across alternatives due to different duration
*** Based on weekly data from January 2010 to November 2017

Source: Bloomberg Barclays, NBIM