Infrastructure Debt in a Portfolio Context: A First Exploration

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Infrastructure relates to equipment, facilities and networks providing essential public services. These real assets generate predictable long-term contracted and/or regulated revenues. The rise of infrastructure as an asset class is supported by structural trends like the call by governments on private investors to invest in infrastructure projects. In particular, the EU and national governments have committed themselves to transition to clean and renewable energy, in line with the Paris climate agreement.

This leads to a growing pipeline of renewable energy and clean technology projects, see Exhibit 1. Investing in infrastructure can therefore fundamentally contribute to the energy transition and responsible investment initiatives. Examples are investments in wind and solar energy, environmental projects with a focus on recycling or re-using waste and reducing the carbon footprint with innovative transport projects.

Focusing on infrastructure debt (so excluding infrastructure equity), the total amount of investments in the European Union was €70bn in 2017. Germany, France, Italy, Benelux, Spain and Portugal represent 83% of the euro-denominated market, see Exhibit 2. The United Kingdom is the largest European market.

Infrastructure debt also has a lower capital charge than corporate debt under Solvency II.[1] The European Insurance and Occupational Pensions Authority (EIOPA), the regulator for European insurance companies, has argued that this is reasonable given evidence that infrastructure

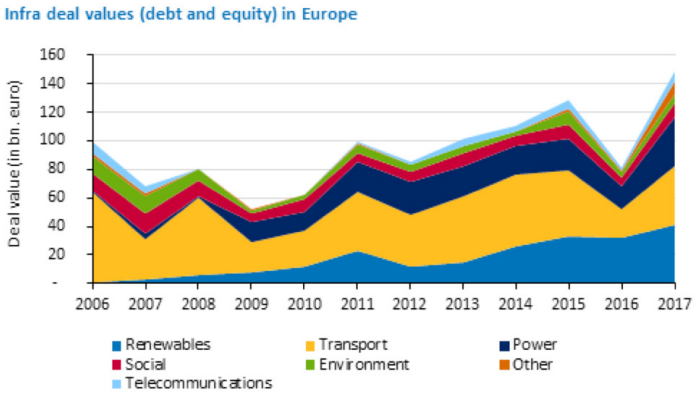

Exhibit 1: Infrastructure Deal Values (Debt and Equity) in Europe (in bn euro).
Source: Inframation, December 31, 2017

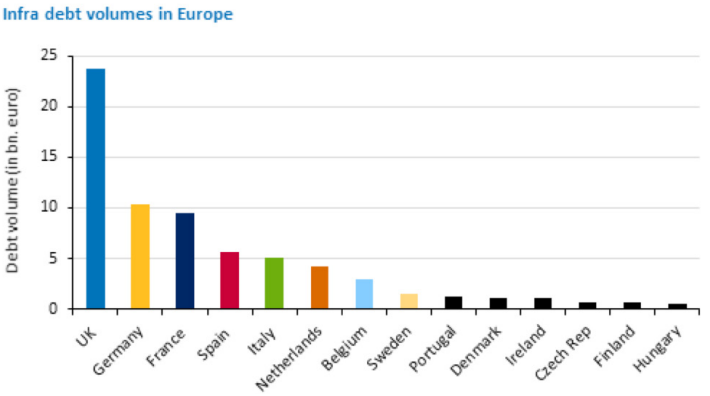

Exhibit 2: Infrastructure Debt Volumes in Europe (in bn Euro).
Source: Inframation, December 31, 2017

investments exhibit better recovery rates than corporate debt and are less sensitive to broader economic factors. This makes infrastructure debt attractive from a capital point of view for insurance companies.

Economic Scenario Model

Our economic scenario model is built on the basis of the economic scenarios of Ortec Finance (Steehouwer, 2005). For infrastructure debt, we have developed a tailor-made scenario model. This scenario model is based on benchmark data from the EDHEC Infrastructure Institute.[2] Availability and granularity of benchmark data for infrastructure debt is – by definition – limited. To address this issue, EDHEC has developed an extensive suite of private infrastructure equity and debt indices. We use their benchmark data for project finance debt in continental Europe (Blanc-Brude, 2017).[3] This index includes 89 value weighted live exposures to senior private debt representing approximately €35bn equivalent of market value. The constituents are 8 percent of the identified investable universe by number of investments and 36 percent by outstanding face value.[4]

The historical performance of this benchmark is shown in the Exhibit below. This is an annual total return series between 2000 and 2016. For comparison, we also show the performance in this period of an (investment grade) euro credits benchmark[5] and a euro core sovereign bond benchmark.[6]

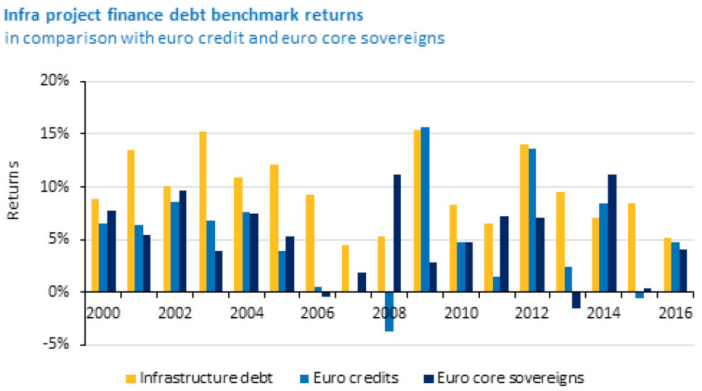

Exhibit 3: Infrastructure Project Finance Debt Benchmark Returns in Comparison with Euro Credit and Euro Core Sovereign Bonds
Source: EDHEC Infrastructure Institute, Merrill Lynch, Barclays

Some key characteristics of these series are shown in the exhibit below.

Characteristics Infrastructure Debt Benchmark (2000-2016)			
	Infrastructure Debt	**Euro Credits**	**Euro Core Sovereigns**
Average Return	9.6%	5.1%	5.2%
Volatility	3.5%	5.2%	3.9%
Autocorrelation	1%	-22%	28%
Correlation		0.69	-0.11
Cross Correlation (Lag 1 Year)		0.10	0.77

Exhibit 4: Characteristics of Infrastructure Debt, Euro Credits and Euro Core Sovereign Bonds (Annual Data from 2000-2016)
Sources: EDHEC, Aegon Asset Management

Infrastructure debt has a relatively high historical return in combination with a low volatility. The correlation with euro credits is relatively high (0.69). Interestingly, the cross correlation with the past year's return on euro sovereign bonds is also quite high (0.77).[7] This is an indication that the impact of interest rate movements may be absorbed by private infrastructure debt with a certain time lag.[8]

Based on the above characteristics, we modelled infrastructure debt as a total return series with an annual volatility of 3.5%, an autocorrelation of zero and the above correlations with euro credits and euro sovereign bonds. The expected return is set using forward-looking assumptions (instead of the high historical value of 9.6% per year). Going forward, we use an expected return which lies 2% above the average euro swap rate.[9] Because the average swap rate is increasing over time in the scenario set, this also implies an increasing expected return for infrastructure debt over time.

An overview of the scenario characteristics is given in the exhibit below. We use 1,000 scenarios with a length of 15 years each. The starting point of the scenarios is December 31, 2017. Notice the attractive return/risk characteristics of infrastructure debt, in comparison with other fixed income categories and equities.

Economic Scenarios: Average Return and Volatility		
	Average Return	**Volatility**
Infrastructure Debt	4.0%	3.5%
Euro Core Sovereigns	1.1%	4.6%
Dutch Mortgages	2.2%	4.3%
Euro Credits	2.1%	5.7%
World Equities (Hedged)	7.2%	17.1%

Exhibit 5: Return and Risk Characteristics of the Different Assets Classes for the Next 15 Years.
Sources: Aegon Asset Management, La Banque Postale Asset Management, Ortec Finance

An overview of the correlations between the different asset classes is given in Exhibit 6.

Exhibit 6 shows a high correlation with euro credits (0.6), in line with the historical benchmark data. The correlation with the other asset classes is low, meaning that infrastructure debt has diversification potential in a portfolio context.

A graphical illustration of the scenarios is given in Exhibit 7. We also show the scenarios for euro credits here. Notice the higher volatility of euro credits compared to infrastructure debt. The yellow line is an example of one specific scenario. This scenario illustrates the high correlation between the scenarios of these two asset classes.

Recall that we observed earlier that infrastructure debt historically has a high cross correlation with the euro sovereign bonds returns of the previous year. We model this effect in our scenario model in an additional sensitivity analysis. We also carry out several other sensitivity analyses in the next section.

Economic Scenarios: Correlations					
	Infrastructure	**Euro Core Sovereigns**	**Dutch Mortgages**	**Euro Credits**	**World Equities (Hedged)**
Infrastucture Debt	1.0				
Euro Core Sovereigns	-0.1	1.0			
Dutch mortgages	0.1	0.5	1.0		
Euro Credits	0.6	0.3	0.4	1.0	
World Equities (Hedged)	0.3	0.0	0.2	0.4	1.0

Exhibit 6: Scenarios Correlations Between the Different Asset Classes.
Sources: Aegon Asset Management, Ortec Finance

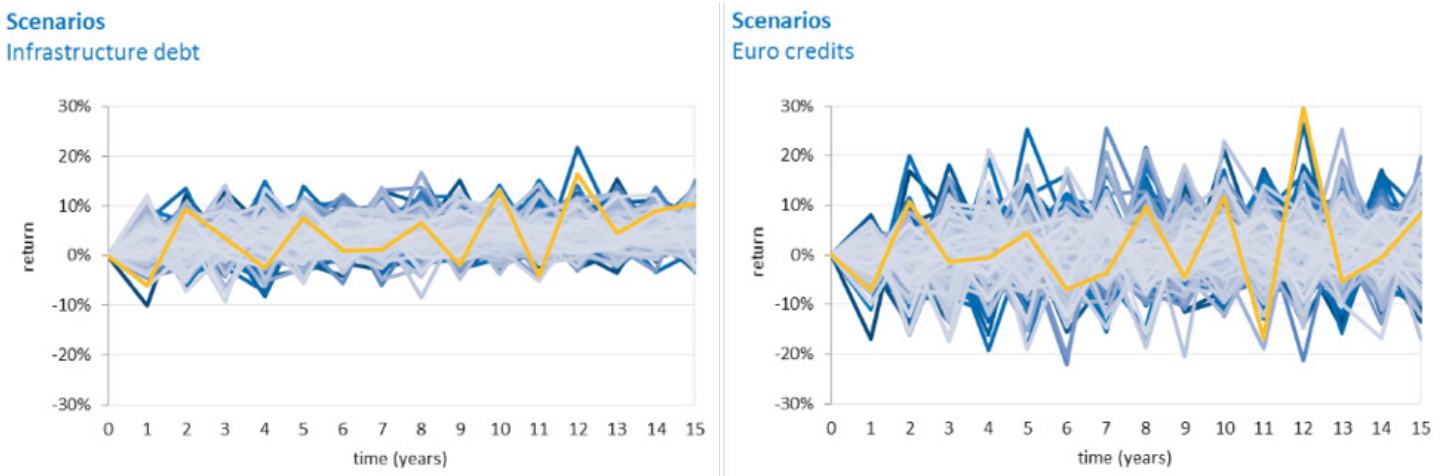

Exhibit 7: Illustrations of the Scenario Characteristics of Infrastructure Debt and Euro Credits for the Next 15 Years.
Sources: Aegon Asset Management, La Banque Postale Asset Management, Ortec Finance

Results

We now investigate the effect of adding infrastructure debt to the asset mix of a typical pension fund. We allocate 5% of the assets to infrastructure debt and study the effect on expected return and risk. We focus on the development of the ratio of assets and liabilities over the next 15 years. The analysis is based on a market valuation of the balance sheet (assets and liabilities). We assume that interest rate risk and currency risk are fully hedged. Exhibit 8 below shows the results.

The base case is a stylized representation of an average pension fund. If we allocate 5% to infrastructure debt, which is funded by selling 5% of euro core sovereigns, the average return on assets/liabilities increases with 0.3%-point (per year). A slightly smaller effect is visible when funding infrastructure debt with credits or mortgages. A slightly lower average return occurs when we fund infrastructure with equities. We see similar effects for the 5% most positive and negative scenarios, except when we substitute equities with infrastructure. In this case the return in the most positive scenarios decreases (with 0.6%-point). On the other hand, results improve (with 0.5%-point) in the most negative scenarios.

We also carried out several sensitivity analyses:

- A higher volatility for infrastructure debt. We set the volatility of infrastructure debt equal to the volatility of euro credits in this case (so, 5.7% instead of 3.5%).
- An increased correlation with euro sovereign bond returns of the previous year (59% instead of 10%).
- A different interest rate hedge percentage (25%, 50% and 75% instead of 100%).
- A lower expected return, starting at 2% above the average euro swap rate but then decreasing to 0.5% above swap in 5 years (instead of 2% above swap in all future years).
- A typical asset mix of a life insurance company (instead of a pension fund).

The first two sensitivity analyses have a small impact on the results. Decreasing the interest rate hedge percentage leads to similar effects as above, but the positive effect of adding infrastructure debt to the portfolio becomes smaller. Decreasing the expected return for infrastructure debt has a significant effect on the results, see Exhibit 9.

Impact of adding Infrastructure Debt for Pension Funds					
	Base Case	**Allocation from: Sovereigns**	**Allocation from: Mortgages**	**Allocation from: Credits**	**Allocation from: Equities**
% Infrastructure Debt	0%	5%	5%	5%	5%
% Soveregins	30%	25%	30%	30%	30%
% Mortgages	5%	5%	0%	5%	5%
% Credits	20%	20%	20%	15%	20%
% Equities	45%	45%	45%	45%	40%
Return Assets/Liabilities					
5% Most Positive Scenarios	9.4%	9.7%	9.6%	9.6%	8.8%
Average	4.1%	4.4%	4.3%	4.4%	4.0%
5% Most Negative Scenarios	-1.0%	-0.7%	-0.8%	-0.8%	-0.5%
Delta Return Assets/Liabilities					
5% Most Postive Scenarios	0.0%	0.3%	0.2%	0.2%	-0.6%
Average	0.0%	0.3%	0.2%	0.2%	-0.1%
5% Most negative Scenarios	0.0%	0.3%	0.2%	0.2%	0.5%

Exhibit 8: Impact on Return Assets/Liabilities When a Typical Pension Fund Allocates Assets to Infrastructure Debt.
Source: Aegon Asset Management

Impact of Lower Return Expectations for Infrastructure Debt					
	Base Case	Allocation from: Sovereigns	Allocation from: Mortgages	Allocation from: Credits	Allocation from: Equities
Delta Return Assets/Liabilites					
5% Most Positive Scenarios	0.0%	0.2%	0.1%	0.1%	-0.7%
Average	0.0%	0.2%	0.1%	0.2%	-0.2%
5% Most Negative Scenarios	0.0%	0.2%	0.1%	0.2%	0.4%

Exhibit 9: Impact on Return Assets/Liabilities when Using Lower Return Expectations for Infrastructure Debt.
Source: Aegon Asset Management

This exhibit, however, shows that adding infrastructure debt still has a positive effect on the portfolio level, even with these more moderate return assumptions.

Results for the last sensitivity analysis, where we consider a life insurance company, are shown in Exhibit 10.

Note that the average returns are lower than for a typical pension fund. This is due to the more conservative asset mix (e.g., only 10% instead of 45% equities). However, adding infrastructure debt again has a positive effect on the portfolio level although the effect is smaller than for a typical pension fund.

Impact of Adding Infrastructure Debt for Life Insurance Companies					
	Base Case	**Allocation from: Sovereigns**	**Allocation from: Mortgages**	**Allocation from: Credits**	**Allocation from: Equities**
% Infrastructure Debt	0%	5%	5%	5%	5%
% Sovereigns	40%	35%	40%	40%	40%
% Mortgages	10%	10%	5%	10%	10%
% Credits	40%	40%	40%	35%	40%
% Equities	10%	10%	10%	10%	5%
Return Assets/Liabilities					
5% Most Positive Scenarios	3.6%	3.8%	3.7%	3.7%	3.0%
Average	1.7%	1.9%	1.8%	1.9%	1.5%
5% Most Negative Scenarios	0.1%	0.3%	0.2%	0.3%	0.2%
Delta Return Assets/Liabilities					
5% Most Postive Scenarios	0.0%	0.2%	0.1%	0.1%	-0.6%
Average	0.0%	0.2%	0.1%	0.1%	-0.2%
5% Most negative Scenarios	0.0%	0.2%	0.1%	0.2%	0.1%

Exhibit 10: Impact on Return Assets/Liabilities when a Typical Insurance Company Allocates Assets to Infrastructure Debt.
Source: Aegon Asset Management

Conclusion

We have explored the added value of infrastructure debt in a portfolio context. Results are shown for both pension funds and insurance companies. This asset class appears to have an attractive risk-return tradeoff in combination with diversification potential in a fixed income portfolio. Given the limited available benchmark data, care is needed when interpreting the results of the asset and liability management model. We therefore also carried out several sensitivity analyses, which in general support the robustness of our findings.

Disclosure: The views and opinions expressed in this paper are those of the author and do not necessarily reflect the official policy or position of Aegon Asset Management or Aegon N.V.

Endnotes

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1. When comparing infrastructure and corporate loans with a similar rating and spread duration. See Van Bragt (2018) for more information.
2. See http://edhec.infrastructure.institute/ for more information.
3. We exclude the UK from our analysis and focus on continental Europe. The specific benchmark that we use is: EDHECinfra Senior Private Debt Continental Europe Project Finance NFX – VW.
4. As of 27 September 2018.
5. Barclays Euro Aggregate Corporate Index.
6. Merrill Lynch Core Eurozone Government Bond Index (customized).
7. These two correlations are statistically significant at the 5% level.
8. This effect can be observed in all available private infrastructure debt benchmarks of EDHEC.
9. This is a gross expected spread, so excluding management fees and expected losses. Source: La Banque Postale Asset Management.
10. We model euro core sovereigns.
11. We model Dutch residential mortgages.
12. We model investment grade euro credits.
13. We model world equities (developed markets, euro hedged).
14. Based on aggregate data for all Dutch pension funds as collected by the Dutch Central Bank. See www.dnb.nl for more information.

References

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2. Steehouwer H. (2005), Macroeconomic Scenarios and Reality: A Frequency Domain Approach for Analyzing Historical Time Series and Generating Scenarios for the Future", PhD Thesis, Free University of Amsterdam. Available at http://dare.ubvu.vu.nl/handle/1871/9058.
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David van Bragt is a member of the Investment Solutions team at Aegon Asset Management. David holds a M.Sc. and Ph.D. in applied physics and a M.A. in philosophy. From 1998-2002, he worked at the Dutch research institute for mathematics and computer science (CWI). From 2004-2011 he worked as an ALM consultant for insurance companies at Ortec Finance. David is a Certified European Financial Analyst (RBA / CEFA) since 2007.