Climate Finance Portfolio Management: Measuring Efficiency $(/CO2)atRisk$

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11 March 2019

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Measuring Efficiency ($/$CO_2$) at Risk

Working Paper

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In this paper, we introduced the Efficiency ($/$CO_2$) at Risk indicator. It could be used to compare performance, to evaluate asset allocation, to execute a portfolio optimization and/or to establish risk appetite policies.

March 2019

I. Climate Finance & Portfolio Management

Climate Finance is defined as the "finance that aims at reducing emissions, and enhancing sinks of greenhouse gases and aims at reducing vulnerability of, and maintaining and increasing the resilience of, human and ecological systems to negative climate change impacts" (UNFCCC, 2014, p. 2).

The Biennial Assessments and Overview of Climate Finance Flows report recommends efforts to improve measuring, reporting and verifying of climate finance flows, and to advance the effectiveness and developing country ownership of climate finance by inviting and encourage providers to continue supporting climate finance (UNFCC, 2014, p. 5), however the Standing Committee on Finance does not suggest any steps towards the "regulation" of the funds that provide climate finance.

Credit portfolio management at banks, where the financial institutions should understand the aggregate credit risk, improve returns on those risks identify and manage concentration of risk (Nario et. al, 2016), it is not quite different from the loans granted under climate finance.

Banks can have capital constraint and climate finance funds can have budget constraint (e.g. reduction of funds providers). Bank investors need indicators to measure value at risk, climate finance funds invertors need indicators to measure efficiency at risk.

II. Efficiency at Risk (EaR)

Efficiency is measured as the ratio: total investment in a project divided by total tons of CO_2 equivalent avoided, where an efficiency ratio of 1.0 means that a USD million dollar invested anticipated a million of tons CO_2 equivalent avoided.

If the total investment increase and/or the tons of CO_2 reduce, there will be an Efficiency Loss.

Projects can have construction delays that produces a cost-overrun increasing the total investment required and the need of a loan restructuring; also, a guarantee mechanism (or an equity investment) can have a higher default rate (or return loss) than the original expected reducing the number of projects that can be supported therefore reducing the CO_2 estimations; even a grant can have less impact than expected if the scope of the project should be reduced for financial, environmental, social, technical, or legal reasons.

II.1. GCF Private Portfolio

Next table summarized the Green Climate Fund (GCF) private portfolio efficiency rate of 12.42 $/$CO_2$:

Project ID	Region	Country	Instrument	Life Span (years)	Total Investment (US$ million)	CO_2 (million tons)	Indicator ($/CO2eq)
FP106	Africa	South Africa	Loan	20	537.0	14.4	37.29
FP105	Africa	Multiple	Loan + Grant	20	139.3	4.8	29.02
FP104	Africa	Nigeria	Loan	21	467.0	9.5	49.16
FP99	Africa	Multiple	Equity + Grant	20	821.5	53.7	15.30
FP98	Africa	Multiple	Loan + Grant	20	170.6	29.7	5.74
FP96	Africa	Congo	Loan + Grant	23	89.0	0.6	158.93
FP95	Africa + LatAm	Multiple	Loan + Grant	20	745.4	36.0	20.71
FP81	Asia	India	Loan	20	250.0	5.2	48.08
FP80	Africa	Zambia	Loan + Grant	23	154.0	4.0	38.50
FP48	LatAm	Guatemala/Mexico	Loan + Grant + Equity + Guarantee	15	158.0	9.2	17.17
FP47	Asia	Kazakhstan	Loan + Grant	20	557.0	12.9	43.18
FP46	Asia	Mongolia	Loan	10	17.6	0.3	57.39
FP39	Africa	Egipto	Loan + Grant	18	1,000.0	18.9	52.91
FP38	Africa + LatAm + Europe + Asia	Multiple	Equity + Grant	15	765.0	369.0	2.07
FP30	LatAm	Argentina	Loan + Grant	22	653.0	15.3	42.68
FP29	Africa	South Africa	Equity	10	34.1	33.0	1.03
FP28	Asia	Mongolia	Loan + Grant	5	60.0	1.2	50.00
FP27	Africa	Multiple	Equity + Grant	15	301.6	50.6	5.96
FP26	Africa	Madagascar	Equity + Grant	10	69.8	10.0	6.98
FP25	Africa + Europe + Asia	Multiple	Equity + Grant	15	1,400.0	27.5	50.91
FP17	LatAm	Chile	Loan	20	181.0	3.7	48.92
FP06	LatAm	Mexico	Grant + Guarantee	6	184.5	2.6	70.96
FP05	Africa	Kenya/Rwanda	Equity + Grant	12	110.0	1.5	73.33
				Total:	8,865.4	713.6	12.42

II.1. GCF Private Portfolio EaR

For the estimation of an Efficiency Loss we ran Monte Carlo simulations (5,000 trials) using an *ad-hoc* random change in any three projects of the current portfolio given by: 10% of an increase in the total investment, 10% of a reduction in the tons of CO_2, and 10% of an increase in the total investment combined with a 10% of reduction in the CO_2.

Next figures depict portfolio total investment, total tons of CO_2, Efficiency Ratio and the Efficiency Loss (Efficiency Ratio – 12.42) simulations using Oracle Crystal Ball software:

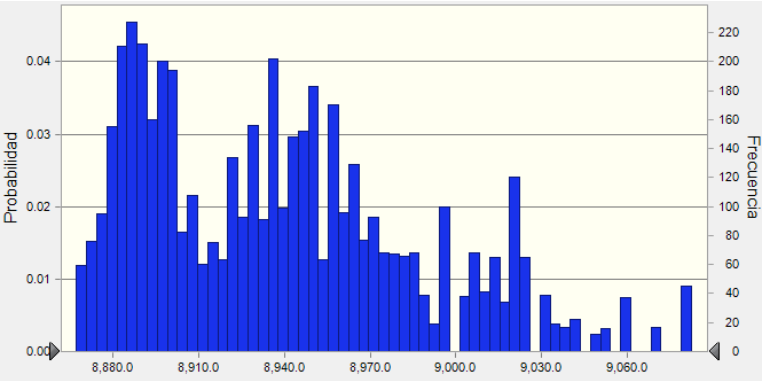

Figure 1. Total Investment Simulations

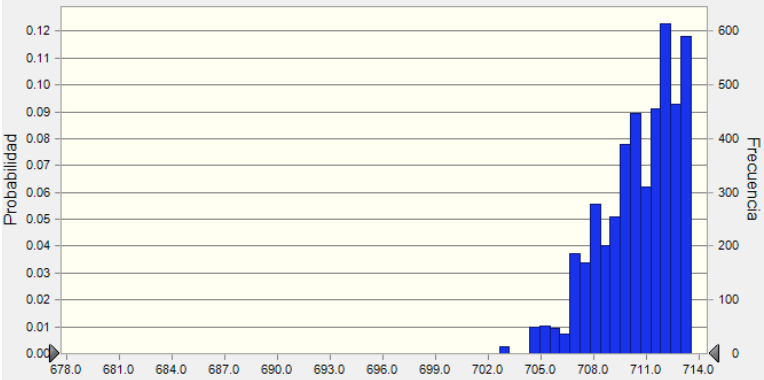

Figure 2. Total Tons CO_2 Avoided Simulations

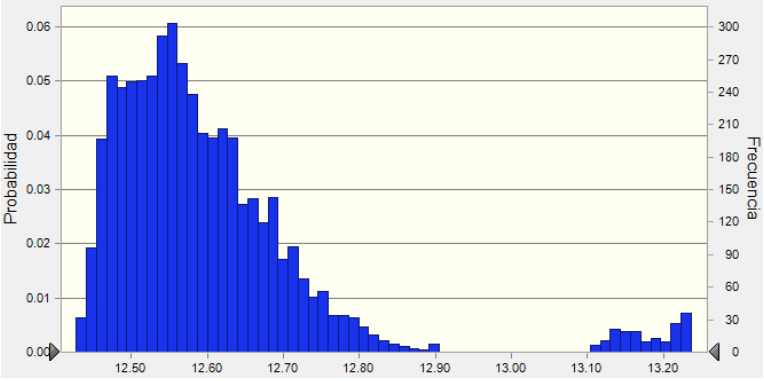

Figure 3. Efficiency Ratio Simulations

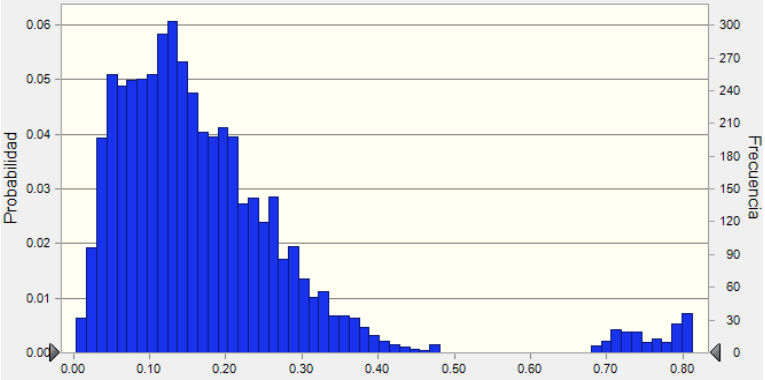

Figure 4. Efficiency Loss Simulations

Similar to the Loss Distribution Approach (LDA) commented by the Basel Committee on Banking Supervision to estimate Operation Risk (BCBS, 2004, p. 11) measure of risk is applied at the 99.9th percentile of the simulated expect efficiency loss data, computing an EaR at a 99.9% confidence level of 1.03, in other words there is a 99.9% probability that the maximum efficiency loss in one year of the current portfolio will be 1.03 $/C0$_2$ so the efficiency rate could raise up to 13.45 therefore it will be require to invest $1.03 million more to achieve same tons of CO_2 equivalent, or with the initial amounted invested will be achieved 76,580 tons less of CO_2 equivalent (12.42/(1-0.076580)).

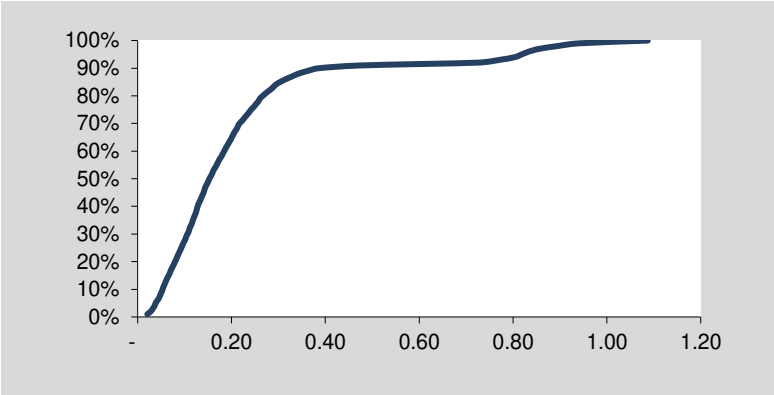

Figure 5. Efficiency Loss Cumulative Distribution

III. CONCLUSION

We have conducted an illustration of the measure of the efficiency at risk, this indicator could be used to compare performance, to evaluate asset allocation, to execute a portfolio optimization and/or to establish risk appetite policies. Next steps of the Standing Committee on Finance should be in the direction of standardizes climate finance impact and risk evaluation framework.

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