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Mobilising Private Capital for Green Energy Investments – International Banking Regulations

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This report is part of the Observer Research Foundation's "Financing Green Transitions" series which aims to find potential linkages between private capital, in all its forms, and climate action projects. The series will primarily examine domestic and international barriers to private capital entry for mitigation oriented climate projects, while also examining potential avenues for private capital flow entry towards adaptation and resilience projects.

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INTRODUCTION

Climate change is among the largest areas of concern for the world in the foreseeable future. A measurable rise in average global temperatures has occurred over the past century and a half, and forecasts predict temperatures will continue to rise exponentially in the 21st Century. With almost unanimous agreement scientists have pinpointed a rise in greenhouse gas emissions as the reason for the increase in temperatures. As a result, there have been concerted efforts to curtail greenhouse gas emissions from manmade sources over the past two decades, the most significant being the Paris Agreement, in which 195 nations came together to sign an agreement designed to limit the rise in global temperatures over the 21st Century.

In order to keep to the goals outlined in the Paris Agreement and conduct a successful transition to a low carbon economic model, a dramatic overhauling of the world's power generation and infrastructure is needed – a task that requires sizeable funding. Given the overall developmental needs of their populations, the amount of resources that can be devoted to climate mitigation actions from developing countries is limited. The Paris Agreement has attempted to solve this issue by promising $100 Billion in annual funding from developed nations towards the developing world for climate mitigation and adaption projects. The developed world has so far proven to be reticent in the provision of said funding, however, with less than fifty percent of the promised financing currently flowing to developing nations. Additionally, the $100 Billion figure itself dramatically undershoots the needs of the developing world, per experts[1].

To achieve the goals set under the Paris Agreement, there must be additional financing made available for climate action projects in the developing world. One potential source of financing could be institutional investors, who have as much as $100 Trillion worth of assets under management under their control[2]. The prospective returns from climate action projects (especially renewable energy projects) could attract private capital investment in developing countries. Certain barriers, however, have impeded the flow of private capital – among them Basel norms that dictate lending regulations across many of the developed economies across the world.

This paper, part of the Observer Research Foundation's Financing Green Transitions series, is the first of a two piece sequence analysing the ways in

which the Basel Norms impede private capital flow for climate action projects within developing nations. The paper will start off by explaining key financial concepts relating to equity and debt financing and the unique characteristics of the banking sector. It will go on to provide an overview of the Basel norms and illustrate how the capital requirements act as a barrier for climate project investment in developing countries, before providing policy solutions that can overcome the barriers.

FINANCING – DEBT AND EQUITY

In order to understand the impact the Basel norms have on climate action projects in the developing world, we must understand the unique financial makeup of banks. Banks, like all companies, have two sources of funding available to them – debt and equity.

Box 1: Financing through Debt and Equity

Chelsea wishes to start a bakery. She estimates that the start-up costs for the bakery (including a 12-month lease, baking equipment, and supplies) will be $100,000. She has managed to save up $50,000 but still needs an additional $50,000 to start the bakery. Having given the matter careful thought, Chelsea has narrowed her choices down to two options - she can take out a 5 year loan from her local bank at a rate of 10% per year (Debt) or she can take $50,000 from her brother in return for a 50% stake in the endeavour (Equity).

If Chelsea were to borrow money from the banks, she would have to ostensibly pay $25,000 in total interest over the 5 year period. Most major economies, however, make interest payments tax deductible, allowing Chelsea to lower the amount of taxes she has to pay on any profit made over the 5 year period.

Additionally, while Chelsea might not have to pay any interest to her brother, she will have to share 50% of the bakery's profit in perpetuity. If the bakery makes $200,000 in profit over the five year period, Chelsea would have to give up 50% of that to her brother. Is she took out a loan however, she would only have to pay 37.5% to the bank and would be free to collect 100% of the profits moving forward.

Taking the money from her brother would also add an additional layer of complication to the business. As co-owner, Chelsea's brother would have

equal share in how the business is run. This could be problematic, as his interference might make the running of day-to-day operations difficult, inefficient or unprofitable.

As illustrated in Box 1, despite the negative conations that are sometimes associated with it, debt can be extremely valuable for companies. The interest payments can help lower tax payments, the cost associated with debt are usually lower than the cost of ceding equity in the long term, and using debt allows a company to retain ownership[3].

By this logic, companies should use debt for all of their financing needs. Healthy firms shy away from overusing debt financing, however, for a number of reasons. Overuse of debt can lead to unmanageable interest payments and put a firm in financial distress. While bankruptcy regulations in most major economies allow companies the chance to recover from financial distress, the costs associated with bankruptcy proceedings and the reputational damage can negatively impact the future of the corporation[4].

Debt agreements are also often accompanied by certain covenants that restrict the choices a firm can make. Debt covenants can take many forms – constraints on the types of projects funded, limits to profit distribution, even changes in the management structure of the firm. As they are often tied to financial penalties, overly burdensome covenants can often force firms to function sub optimally[5]. Additionally, overdependence on debt can also heighten the perception of risk for the firm, making it difficult to conduct business with reputable suppliers and consumers.

Beyond the problems associated with possible financial distress, overuse of debt financing can also affect the way that the business is managed. One potential problem is risk-shifting, wherein managers feel emboldened to take on riskier projects as they have less "skin in the game"[6]. Using the example from Box 1, if Chelsea decided to borrow 90% of the money for her bakery from the bank and only put $10,000 of her own funds in, she would be more willing to take risks than if she were to commit all of her savings.

A second problem is the debt overhang, which dissuades companies from making otherwise sound investments, due to the fact that most of the return from an investment would end up going to the debt holder[7]. Let us once again use the example from Box 1 and assume that Chelsea borrowed 100% of the funds needed to start up her bakery, requiring her to pay $10,000 in interest

every year. Chelsea is offered a 12-month catering contract that would require her to buy $1000 worth of equipment but would pay her $11,000. Under the original scenario, Chelsea would stand to make $5,000 in profit. Under this scenario, however, Chelsea would reject the contract, and continue to look for a more lucrative and possibly riskier project so that she can pay off the debt and make a profit.

FINANCING – BANKING SECTOR

As elucidated in the previous section, the explicit and implicit costs of financial distress, risk-shifting and debt overhang influence businesses to strive for an "optimal" debt and equity financing ratio. The current average debt to equity ratio for corporations in the United States is 1.5. The banking industry, however, operates in a different manner.

Banks have unique business models. At the most abstract level banks facilitate transactions – they connect consumers and suppliers and profit by acting as a middle man. In the transaction process, however, banks incur a debt – they have to return the money to the supplier with interest. Debt is more of a raw material, akin to steel for a manufacturing, rather than a source of funding for banks[8].

Additionally, unlike other corporations, banks are intrinsic to the function of any economy, with financial distress or bankruptcy having far reaching social and economic ramifications. Governments are therefore obligated to provide guarantees against the failure of banks, thereby removing the implicit and explicit costs of financial distress associated with bankruptcy for other corporations. This allows banks to operate with far larger amounts of debt financing than other sectors[9].

Banks are also able to obtain debt at far lower rates than other corporations. Individual asset owners view banks as a "safe" place to store their money given the guarantees provided by the sovereign, and are therefore willing to take low (and sometimes no) returns for their deposits. Central banks also often provide discounted rates to banks, in order to spur economic growth.

The previous section illustrated the ways in which debt can be a more cost effective source of financing for corporations. It is important to note that debt can also be used to amplify returns, providing further incentive for banks to reduce their share of equity financing. The amalgamation of these various factors has led to significantly higher debt to equity ratios for banks, with historical averages near 9.0.

Using high amounts of debt to enhance profits can be dangerous, however. The obvious downside is a situation in which projects backed by the bank, default. For a standard corporation, loss-making projects can be weathered and profits can possibly be recuperated in the future. A bank's dependency on debt, however, makes any large loss making activity a threat to its continued viability. If the loss is large enough, it is possible that the bank will not able to pay off the interest it owes to its own debtor, undermining consumer confidence and leading to a scenario where depositors attempt to withdraw all of their money. The Basel norms were created precisely to prevent such an event from occurring.

Leaving aside the possibility of bankruptcy, using large amounts of debt also creates a situation in which a banks economic viability is closely correlated to its equity. Therefore any changes to a bank's equity, such as the measures proposed under Basel III, can adversely affect its profitability (see Box 2).

It is important to note that in the context of the banking industry, the terms equity and capital are used interchangeable. Therefore, when banks are required to meet capital requirements under the Basel norms, it effectively means is that they must use a certain amount of equity to finance their activities.

Box 2: Correlation of profits to bank equity and debt

In Year 1, Hamilton Bank uses $15 million of equity and $85 million of debt to finance its activities. It is able to procure the $85 million at a rate of 3.5%. It makes a return of 5% on its loans and investments. In Year 2, Hamilton Bank decides to use $185 million of debt to finance its activities. It is able to procure the debt at the same rate of 3.5%. The amount of equity and return on loans and investments stay the same at $5 million and 5%, respectively. Simply by using more debt financing, Hamilton Bank is able to increase its return on equity by a third.

Revenue	**Year 1**	**Year 2**
Total Assets	$100.00	$200.00
Rate of Return	5.00%	5.00%
Gross Profit	$5.00	$10.00
Expense		
Amount of Debt	$85.00	$185.00
Interest Rate on Debt	3.50%	3.50%
Total Cost	$2.98	$6.48
Profit		
Gross Profit	$5.00	$10.00
Total Cost	$3.15	$6.65
Net Profit	**$2.03**	**$3.53**
Equity	$15.00	$15.00
Return on Equity (Net Profit/Equity)	20.3%	35.3%

In Year 3, Hamilton Bank is forced to conform to new regulations, requiring the bank to maintain a 10% share of equity. Hamilton Bank decides to use $22 million of equity and $198 million of debt to finance its activities. It is able to procure the $198 million at a rate of 3.5%. It makes a return of 5% on its loans and investments. The imposition of new regulations causes the return on equity to drop by half.

Revenue	Year 1	Year 2	Year 3
Total Assets	$100.00	$200.00	$220.00
Rate of Return	5.00%	5.00%	5.00%
Gross Profit	$5.00	$10.00	$11.00
Expense			
Amount of Debt	$85.00	$185.00	$198.00
Interest Rate on Debt	3.50%	3.50%	3.50%
Total Cost	$2.98	$6.48	$6.93
Profit			
Gross Profit	$5.00	$10.00	$10.00
Total Cost	$3.15	$6.65	$6.65
Net Profit	**$2.03**	**$3.53**	**$4.07**
Equity	$15.00	$15.00	$22.00
Return on Equity (Net Profit/Equity)	20.3%	35.3%	18.5%

BASEL OVERVIEW

Evolution of the Basel Norms

As previously mentioned, the Basel norms are a set of macro prudential regulations, designed to prevent widespread financial crises as a result of a collapse of global banking systems. The norms were created by the Basel Committee on Banking Supervision (BCBS), a forum designed to enhance cooperation among the central banks of the major economies of the world. Originally formed in 1974, the BCBS is currently comprised of 27 countries, with the stated aim of the forum being the strengthening of global banking regulations and supervisory practices.

The first iteration of the Basel norms emerged in 1988, largely as a response to the Latin American debt crisis of the eighties. The BCBS wished to ensure that banks would be able to weather an economic downturn and continue business operations for at least a year. In order to strengthen banking resilience in the face of economic downturns, the committee took two major steps – they implemented a systematic approach to measuring the risk of bank held assets and set forth a condition requiring banks to keep an acceptable amount of capital on hand, proportionate to the risk of the assets that the banks held.

The second iteration of Basel regulations was released in 2004, with the aim of closing off the loopholes that banks had exploited to bypass the first set of

norms. Basel II introduced a more complex classification and calculation system for the risk assessment of bank assets, while also providing regulators with more supervisory power. Additionally, Basel II also placed a greater prominence on disclosure requirement for banks, allowing greater transparency into the business operation activities undertaken by banking institutions.

The third instalment of the Basel norms were introduced in 2013, and were designed as a direct response to the global crisis of the late 2000's. The largest problems that banks had to deal with during the credit crunch was the failure of assets they deemed "safe" and a lack of available capital to meet short term obligations. To ensure that these issues would not occur again, Basel III increased the amount of risk proportional capital that banks were required to keep on hand. The norms also included additional requirements, forcing banks to keep a certain amount of base capital on hand, regardless of the "riskiness" of the asset. Additionally, liquidity requirements were also added to the norms in order to compel banks to keep enough cash on hand to fulfil their short term and medium term obligations.

Current State of Basel Norms

Although Basel III was introduced in 2013, the norms have been rolled out over a number of years, with the expectation that all phases will be implemented by 2019. While, the entire coda of the norms is elucidated over 176 pages of text, the core of the regulations centres on four ratios – the Capital Adequacy Ratio, the Leverage Ratio, the Liquidity Ratio and the Net Stable Funding Ratio. This paper will focus on the first two ratios, while the last two ratios will be addressed in second part of this two paper sequence.

Capital Adequacy Ratio

The capital adequacy ratio is the hearthstone upon which the Basel norms have been built. Introduced in the very first set of Basel standards, the capital adequacy ratio, in its most basic form, asks banks to assign a risk classification to each asset held by the institution. The broad risk classifications are outlined in the norms and have corresponding percentages, with the least risky assets being assigned 0% and the most risky assets assigned up to 150%. The value of the asset is then multiplied by its risk classification percentage, after which all the assets are collated to produce the Risk Weighted Average of the bank (see Table 1 and Table 2)

Table 1: Risk Weighted Average Calculation of Bank 1 Portfolio

Type of Loan	Value of Loan	Risk Weight	Risk Weighted Average
Loan to Indian Government	40	50%	20
Special Purpose Vehicle Loans	2	100%	2
Loan to B- rated Corporations	2	150%	3
Personal/Auto/Credit Card Loans	4	75%	3
Commerical Mortgage Loan	2	100%	2
Total	**50**		**30**

Table 2: Risk Weighted Average Calculation of Bank 2 Portfolio

Type of Loan	Value of Loan	Risk Weight	Risk Weighted Average
Loan to Australian Government	20	0%	0
Loan to AAA rated Bank	15	20%	3
Loan to AA rated Corporation	20	20%	4
Special Purpose Vehicle Loans	5	100%	5
Personal Mortgate Loan	20	35%	7
Total	**80**		**19**

Once the risk weighted assets has been calculated, the bank must ensure that it keeps capital equal to a certain percent of the risk weighted assets, on hand. For our example we'll use eight.

$$Capital\ Requirement\ Ratio \geq 8\% * RWA$$

$$Bank\ 1\ Capital\ Requirement\ Ratio: 8\% * 30mil = 2.4\ mil$$

$$Bank\ 2\ Capital\ Requirement\ Ratio: 8\% * 19mil = 1.5\ mil$$

Therefore, Bank 1 in our example must keep more 2.4 million dollars of capital on hand to fulfil the Capital Requirement Ratio under the Basel Norms, while Bank 2 is only obligated to keep 1.5 million of capital on hand.

Leverage Ratio

The leverage ratio was a new addition to the latest iteration of the Basel Norms, aimed at limiting the overall exposure of the banking sector. The leverage ratio was put into place for two reasons – the first was to provide a safety buffer for banks in case of a miscalculation of credit ratings; the second was to limit the over exuberance of banks in fertile economic scenarios.

The clause asks banks to keep capital on hand based on their total asset exposure rather than just their risk weighted exposure, by requiring banks to

keep at least 3% of their total exposure on hand. Total exposure incorporates the actual value of all assets on a bank's balance sheet, as well as any off-balance sheet items such as derivative exposure, securities financing exposure and trade finance exposure. It these off-balance sheet items that are the primary target of the leverage ratio. The value of the off-balance sheet items is calculated by multiplying the value of the assets by a credit conversion factor.

To illustrate how the leverage ratio restrains unchecked growth we can compare the example of the banks from Table 1 and Table 2.

$$Leverage\ Capital\ Requirement \geq 3\% * Total\ Exposure$$

$$Bank\ 1\ Leverage\ Capital\ Requirement: 3\% * 50mil = 1.5mil$$

$$Bank\ 2\ Leverage\ Capital\ Requirement: 3\% * 80mil = 2.4mil$$

The leverage capital requirement is not mean to act as an additive measure to the capital requirement ratio, so in our example, Bank 1 would be required to keep 2.4 million capital on hand as a result of its capital ratio requirement and Bank 2 would be required to keep 2.4 million on hand as a result of it leverage capital requirement. As we can see, despite having a less "risky" portfolio, Bank 2 must keep the same amount of capital on hand as Bank 1 due to their comparatively larger portfolio.

IMPLICATIONS OF BASEL III – CAPITAL ADEQUACY AND LEVERAGE RATIO

In order to counteract the effects of the higher capital requirements prescribed by Basel III and maintain they profitability, banks have three options.

1. Reduce the amount of loans they give out in toto
2. Reduce their risk weighted average by curtailing the number of loans given to "risky" projects
3. Pass the costs of the Basel III requirements on to customers by increasing their lending rates

The first two options are self-explanatory and could have clearly detrimental effects on any lending towards climate action projects in the developing world. Surveys indicate, however, that there has not been a significant reduction in risk weighted assets held by banks since the introduction of Basel III (see Table 3). The same study also indicates that, counterintuitively, there has been a rise in the total amount of loans given out

by banks. Bank profits have also increased since the implementation of Basel III (See Table 4).

Table 3: Increase in Bank RWA and Total Assets as % of base year (2011)

	H1 2011	H2 2011	H1 2012	H2 2012	H1 2013	H2 2013	H1 2014	H2 2014
Group 1 banks								
Tier 1 capital	100.0	105.3	114.0	120.0	125.9	135.3	145.5	154.0
Risk-weighted assets	100.0	98.7	97.2	95.3	96.8	96.4	96.5	98.1
Leverage total exposure	100.0	102.7	106.3	110.7	108.5	104.7	107.4	107.0
Accounting total assets	100.0	103.0	106.9	105.9	106.8	105.3	109.4	111.7
Of which: G-SIBs								
Tier 1 capital	100.0	104.7	113.5	118.4	124.0	134.1	144.2	153.5
Risk-weighted assets	100.0	97.0	94.3	90.8	91.2	89.9	90.7	91.6
Leverage total exposure	100.0	102.6	105.7	110.1	103.7	103.1	104.5	103.7
Accounting total assets	100.0	103.0	106.1	104.3	104.3	101.6	104.9	107.4
Group 2 banks								
Tier 1 capital	100.0	102.3	109.3	107.7	109.6	123.5	135.6	138.2
Risk-weighted assets	100.0	101.7	99.8	100.1	100.1	97.9	97.7	96.3
Leverage total exposure	100.0	103.2	105.5	106.8	102.7	99.7	101.3	100.8
Accounting total assets	100.0	103.2	104.7	104.7	105.7	103.2	104.9	105.6

H1 2011 = 100.

Table 4: Increase in Bank Profit as % of base year (2011)

	Group 1 banks			Of which: G-SIBs			Group 2 banks		
	Profit after tax	Common share dividend	CET1 raised	Profit after tax	Common share dividend	CET1 raised	Profit after tax	Common share dividend	CET1 raised
H1 2011	141.7	58.2	36.0	84.3	34.4	13.4	7.5	1.6	5.5
H2 2011	112.0	32.1	25.5	71.8	9.4	15.4	1.5	1.6	7.2
H1 2012	134.9	59.4	28.3	79.3	32.9	20.3	5.6	1.6	1.6
H2 2012	163.6	28.5	29.6	88.9	12.9	14.6	2.0	1.6	5.2
H1 2013	168.6	76.9	25.7	102.3	45.0	13.3	4.9	1.8	1.0
H2 2013	137.7	28.3	31.6	72.2	11.2	14.5	4.3	1.6	2.4
H1 2014	152.1	86.0	33.4	82.4	52.4	18.3	8.9	2.1	5.3
H2 2014	185.5	42.5	19.4	104.1	17.9	8.3	5.5	1.7	6.2

We can conclude therefore, that banks have opted to use the third option and pass on the costs associated with the capital requirements under Basel III, to their customers. While studies have been conducted measuring the overall impact that Basel III could have on bank lending rates, a sector specific study on climate action projects has not been conducted. By adapting the loan pricing model used by Elliot et. al[10] to examine the macro effects of the regulations, we can provide insight into exactly how Basel III could affect lending rates for

climate action projects in the developing world. The model structure is as follows:

$$L * (1 - t) = (E * r_e) + \big((D * r_d) + C + A - O\big) * (1 - t)$$

Box 3: Explanation of Loan Pricing variables and assumptions

- **L = The bank lending rate.**
  - This is the dependent variable in our equation – a rise or fall in this variable will show us how Basel III capital requirements effect bank lending rates
- **t = Marginal Tax Rate**
  - As mentioned in the Debt and Equity Financing section, interest payments are tax deductible for most major economies. We attempt to take this into account by showing the effective interest rate charged to consumers after tax deductions. We also attempt to reflect the effective interest rate on the opposite side of the equation by calculating the effective interest rate charged to the institution. This variable will stay constant throughout the paper.
- **E = Bank Equity**
  - Corporations are financed through either debt or equity, as previously mentioned. This variable indicates the percent of business activities currently being financed through equity, and is the crux of model (**NOTE:** the terms equity and capital are used interchangeably in the context of banks). All calculations in the paper will attempt to show how Basel III affects bank equity, and therefore affects lending rates.
- **r_e = Cost of Equity**
  - When a corporation takes out debt, it is on the explicit condition that the provider of the debt will receive due compensation. When a corporation takes out equity, there is an implied condition that certain returns will be provided to the shareholder. The cost of equity represents the expected rate at which the bank has to recompense its shareholders. This variable will stay constant throughout the paper.

- **D = Bank Debt**
  - This variable indicates the percent of business activities current being financed through debt. The equity and debt of a corporation should (in theory), always equal 100%. Therefore, as we see shifts in the bank equity in the scenarios laid out in the paper, we will see corresponding shifts in its debt.
- **r_d = Cost of Debt**
  - This variable represents the interest rate being charged for the use of the debt – the compensation to be given back to the provider of the debt. This variable will remain constant throughout the paper.
- **C = Credit Spread**
  - This variable represents the premium charged by the bank to make the loan. Credit spreads take into account the default probability of a project, based on the banks assessment and the profit that the bank would need to make in order to take on the project. We will assume that all projects in the scenarios put forward in the paper have identical qualities and will require the same credit spread from banks, in order to show the effect of the Basel Capital requirements ceteris paribus.
- **A = Administrate and other expenses**
  - This variable represents the costs incurred by the bank while conducting direct and indirect operational activities associated with lending activities. This variable will stay constant throughout the paper.
- **O = Other offsetting benefits/costs to the bank**
  - This variable is meant to represent any intangible costs or benefits to the bank. It will not be used in any of the scenarios illustrated in the paper.

IMPACT OF CAPITAL ADEQUACY RATIO ON CLIMATE ACTION PROJECTS IN DEVELOPING WORLD

To understand the effect of Basel III on lending rates for climate action projects in the developing world, we will follow a set of scenarios involving a hypothetical investor approaching a bank to procure debt for a climate action

project in the developing world. The borrowers in each scenarios are institutions/vehicles most likely to fund climate action projects in the developing world. Each scenario is independent of the other and will compare the change in the bank's lending rate as a result of it taking on the project.

In order to illustrate the effects of the capital adequacy ratio, all variables other than share of equity funding and share of debt funding will remain the same. It is important to note that this ceteris paribus assumption would not hold true in the real world, although opinions are divided on how the variables would actually affect lending rates.

Lending Rate for Corporate Loan

In this scenario, we will examine the effect a hypothetical loan made directly to an A+ corporation for a renewable energy project in a developing country.

The bank portfolio is currently at $900 million, with a Risk Weighted Average of $360 million and a lending rate of 2.8132%. The minimum capital adequacy ratio needed for the bank is 10%. The corporation is asking for a $100 million loan with an associated risk rating of 50%[11]. We will assume that the cost of equity is 12%; cost of debt is 2%; the credit spread is 3%; administrative expenses account for an additional 1%; and the corporate tax rate is 35%. The first step requires us to calculate the new Risk Weighted Average under the assumption that the bank takes on the loan.

In order to calculate the risk weighted average for the project we must multiply the value of the loan ($100 million) by the risk rating associated with the loan (50%).

$$RWA\ for\ R.E.\ Project = \$100mil * 50\% = \$50mil$$

The next step is to add to the RWA of the project ($50 million) to the bank's old RWA ($360 million).

$$New\ RWA\ for\ Bank\ with\ R.E.\ Project = \$360mil + \$50mil = \$410mil$$

Once the new RWA ($410 million) has been calculated we must multiply by the capital adequacy ratio (10%) to determine the new capital requirement.

$$New\ Capital\ requirement = \$410mil * 10\% = \$41mil$$

This allows us to determine the new equity and debt percentages that need to be used for the loan pricing model based on the new capital requirement ($41 million) and the addition to the bank's portfolio ($900 million + $100 million).

$$New\ Equity\ Percentage = \frac{New\ Capital\ Requirement}{New\ Total} = \frac{\$41\ million}{\$1{,}000\ million} = 4.1\%$$

$$New\ Debt\ Percentage = \frac{New\ Asset\ Total - \ New\ Capital\ Requirement}{New\ Total}$$

$$= \frac{\$1{,}000mil - \ \$41\ mil}{\$1{,}000\ mil} = 95.9\%$$

We can now plug these weights into the loan pricing model to determine the bank's new lending rate.

$$L * (1 - t) = \ (E * r_e) + \ \big((D * r_d) + C + A - O\big) * (1 - t)$$

$$(4.1\% * 12\%) + \big((95.9\% * 2\%) + 3\% + 1\%\big) * (1 - .35) = 4.3387\% * (1 - .35) = 2.8202\%$$

Per our calculations we can see that taking on the project would require the bank to increase its lending rate. We have not yet, however, determined the significance of this for the proposed project specifically. This can be done by plugging the equity and debt percentages for the hypothetical loan into our pricing model and comparing it with the average loan portfolio rate of the bank.

$$Loan\ Equity\ Percentage = \frac{Loan\ Capital\ Requirement}{Loan\ Total} = \frac{\$50\ mil * 10\%}{\$100\ mil} = 5\%$$

$$Loan\ Debt\ Percentage = \frac{Loan\ Total - \ Loan\ Capital\ Requirement}{Loan\ Total} = \frac{\$100mil - \ \$5\ mil}{\$100\ mil} = 95\%$$

$$L * (1 - t) = \ (E * r_e) + \ \big((D * r_d) + C + A - O\big) * (1 - t)$$

$$(5\% * 12\%) + \big((95\% * 2\%) + 3\% + 1\%\big) * (1 - .35) = 4.3387\% * (1 - .35) = 2.88275\%$$

The calculations show us that under this particular scenario, the Basel norms will increase lending rates by 7 basis points for the hypothetical loan.

Lending Rate for Special Purpose Vehicle Loan

In this scenario we will examine the effect a hypothetical loan made directly to a Special Purpose Vehicle set up to invest in a renewable energy project in a developing country.

Box 4: Special Purpose Vehicles

As previously covered, corporations, investments or projects are financed using a mixture of debt and equity. For large scale climate action projects, institutional investors overwhelmingly favour the creation of stand-alone corporations, specifically formed to facilitate investment for one particular project. Special Purpose Vehicles (SPV), as these stand-alone corporations are known as, allow investors to create a legal firewall separating an individual project from the overall portfolio. In addition to legal protection, SPV's also allow investors the opportunity to create optimal tax structures and amplify returns through increased debt financing.

Let us assume that the bank portfolio is currently at $900 million, with a Risk Weighted Average of $360 million and a lending rate of 2.8132%. The minimum capital adequacy ratio needed for the bank is 10%. The SPV is asking for a $100 million loan with an associated risk rating of 100%[12]. We will assume that the cost of equity is 12%; cost of debt is 2%; the credit spread is 3%; administrative expenses account for an additional 1%; and the corporate tax rate is 35%. The first step requires us to calculate the new Risk Weighted Average under the assumption that the bank takes on the loan.

In order to calculate the risk weighted average for the project we must multiply the value of the loan ($100 million) by the risk rating associated with the loan (100%).

$$RWA\ for\ R.E.Project = \$100mil * 100\% = \$100mil$$

The next step is to add to the RWA of the project ($100 million) to the bank's old RWA ($360 million).

$$New\ RWA\ for\ Bank\ with\ R.E.Project = \$360mil + \$100mil = \$460mil$$

Once the new RWA ($460 million) has been calculated we must multiply by the capital adequacy ratio (10%) to determine the new capital requirement.

$$New\ Capital\ requirement = \$460mil * 10\% = \$46mil$$

This allows us to determine the new equity and debt percentages that need to be used for the loan pricing model based on the new capital requirement ($46 million) and the addition to the bank's portfolio ($900 million + $100 million) .

$$New\ Equity\ Percentage = \frac{New\ Capital\ Requirement}{New\ Total} = \frac{\$46\ million}{\$1{,}000\ million} = 4.6\%$$

$$New\ Debt\ Percentage = \frac{New\ Asset\ Total - New\ Capital\ Requirement}{New\ Total}$$

$$= \frac{\$1{,}000mil - \$46\ mil}{\$1{,}000\ mil} = 95.4\%$$

We can now plug these weights into the loan pricing model to determine the bank's new lending rate.

$$L * (1 - t) = (E * r_e) + \big((D * r_d) + C + A - O\big) * (1 - t)$$

$$(4.6\% * 12\%) + \big((95.4\% * 2\% + 3\% + 1\%\big) * (1 - .35) = 4.3922\% * (1 - .35) = 2.8549\%$$

Per our calculations we can see that taking on the project would require the bank to increase its lending rate. We have not yet determined the significance of this for the proposed project specifically, however. This can be done by plugging the equity and debt percentages for the hypothetical loan into our pricing model and comparing it with the average loan portfolio rate of the bank.

$$Loan\ Equity\ Percentage = \frac{Loan\ Capital\ Requirement}{Loan\ Total} = \frac{\$100\ million * 10\%}{\$100\ million} = 10\%$$

$$Loan\ Debt\ Percentage = \frac{Loan\ Total - Loan\ Capital\ Requirement}{Loan\ Total} = \frac{\$100mil - \$10\ mil}{\$100\ mil} = 90\%$$

$$L * (1 - t) = (E * r_e) + \big((D * r_d) + C + A - O\big) * (1 - t)$$

$$(10\% * 12\%) + \big((90\% * 2\%) + 3\% + 1\%\big) * (1 - .35) = 4.97\% * (1 - .35) = 3.2305\%$$

The calculations show us that under this particular scenario, the Basel norms will increase lending rates by 42 basis points for the hypothetical loan.

Lending Rate for PPP in El Salvador

In this scenario, we will examine the effect a hypothetical loan made for a public-private partnership (PPP) in El Salvador for a renewable energy project.

While it is rare for a government to borrow directly from a bank, there are cases in which a private-public partnership is used to invest in climate action projects in the developing world, in which case the sovereign rating of a country is taken into account.

The bank portfolio is currently at $900 million, with a Risk Weighted Average of $360 million and a lending rate of 2.8132%. The minimum capital adequacy ratio needed for the bank is 10%. The PPP is asking for a $100 million loan with an associated risk rating of 150%[13]. We will assume that the cost of equity is 12%; cost of debt is 2%; the credit spread is 3%; administrative expenses account for an additional 1%; and the corporate tax rate is 35%. The first step requires us to calculate the new Risk Weighted Average under the assumption that the bank takes on the loan.

In order to calculate the risk weighted average for the project we must multiply the value of the loan ($100 million) by the risk rating associated with the loan (150%).

$$RWA\ for\ R.E.Project = \$100mil * 150\% = \$150mil$$

The next step is to add to the RWA of the project ($150 million) to the bank's old RWA ($360 million).

$$New\ RWA\ for\ Bank\ with\ R.E.Project = \$360mil + \$150mil = \$510mil$$

Once the new RWA ($510 million) has been calculated we must multiply by the capital adequacy ratio (10%) to determine the new capital requirement.

$$New\ Capital\ requirement = \$510mil * 10\% = \$51mil$$

This allows us to determine the new equity and debt percentages that need to be used for the loan pricing model based on the new capital requirement ($51 million) and the addition to the bank's portfolio ($900 million + $100 million) .

$$New\ Equity\ Percentage = \frac{New\ Capital\ Requirement}{New\ Total} = \frac{\$51\ million}{\$1{,}000\ million} = 5.1\%$$

$$New\ Debt\ Percentage = \frac{New\ Asset\ Total - \ New\ Capital\ Requirement}{New\ Total}$$

$$= \frac{\$1000 - \ \$51\ million}{\$1{,}000\ million} = 94.9\%$$

We can now plug these weights into the loan pricing model to determine the bank's new lending rate.

$$L * (1 - t) = (E * r_e) + \big((D * r_d) + C + A - O\big) * (1 - t)$$

$$(5.1\% * 12\%) + \big((94.9\% * 2\%) + 3\% + 1\%\big) * (1 - .35) = 4.4457\% * (1 - .35) = 2.8897\%$$

Per our calculations we can see that taking on the project would require the bank to increase its lending rate. We have not yet determined the significance of this for the proposed project specifically, however. This can be done by plugging the equity and debt percentages for the hypothetical loan into our pricing model and comparing it with the average loan portfolio rate of the bank.

$$Loan\ Equity\ Percentage = \frac{Loan\ Capital\ Requirement}{Loan\ Total} = \frac{\$150\ million * 10\%}{\$100\ million} = 15\%$$

$$Loan\ Debt\ Percentage = \frac{Loan\ Total - Loan\ Capital\ Requirement}{Loan\ Total} = \frac{\$100 - \$15\ million}{\$100\ million} = 85\%$$

$$L * (1 - t) = (E * r_e) + \big((D * r_d) + C + A - O\big) * (1 - t)$$

$$(15\% * 12\%) + \big((85\% * 2\%) + 3\% + 1\%\big) * (1 - .35) = 5.51\% * (1 - .35) = 3.5783\%$$

The calculations show us that under this particular scenario, the Basel norms will increase lending rates by 77 basis points for the hypothetical loan.

IMPLICATIONS OF RISE IN LENDING RATE

Through our calculations we have been able to ascertain that the Basel III capital requirements increase lending rates across all three scenarios.

Table 5: Calculated Lending rates for scenarios

Scenario Type	Lending Rate	Increase in Basis Points
Base Case Scenario	2.8132%	0.00
Corporate Scenario	2.8828%	6.96
Lending Rate - SPV Scenario	3.2305%	41.73
Lending Rate - El Salvador Scenario	3.5783%	76.51

The increase in lending rates do not seem particularly significant upon first glance, ranging from .0696% to .7651%. To better understand the impact that the increases in basis points have on clean energy projects in developing

countries, it is necessary to take a step bank and analyse potential effects on the renewable energy sector overall.

As mentioned previously, the developing world needs $100 Billion of annual funding in order to successfully achieve the goals outlined under the Paris Agreement. Estimates show that approximately half of this funding is currently being provided, with $37 billion coming from public sector sources and $13 Billion originating from private sector sources. Using optimistic assumptions we can forecast public sector funding to rise to $50 Billion by 2020. This means $50 Billion of the funding needed for climate action projects in the developing world would have to come from the private sector.

Table 6: Increased cost due to Capital Requirements

Scenario Type	Lending Rate	Increase in Basis Points	Increase in Cost for $35 Billion debt financing
Base Case Scenario	2.8132%	0.00	$0
Corporate Scenario	2.8828%	6.96	$24,342,500
Lending Rate - SPV Scenario	3.2305%	41.73	$146,055,000
Lending Rate - El Salvador Scenario	3.5783%	76.51	$267,767,500

As described in prior sections, all investments are funded through a mix of debt and equity, with Climate Action Projects being no different. If we assume a 30/70 debt-equity split, $35 Billion of the private sector funding would be sourced from debt. Examining the additional interest costs incurred due to capital requirements on this $35 Billion debt figure shows the true impact of the Basel Norms.

As Table 6 shows even a seemingly insignificant increase of approximately seven basis points can increase investor costs across the sector by $24 million. The results are far more pronounced in the SPV and El Salvador scenarios, which is particularly concerning, as special purpose investment vehicles and low sovereign debt ratings are prevalent in clean energy investments in the developing world. It should be noted that the figures do not reflect the opportunity cost associated with the increased price of debt. Accounting for the loss of potential economic activity would drive investor costs even higher.

IMPACT OF LEVERAGE RATIO ON CLIMATE ACTION PROJECTS IN DEVELOPING WORLD

The leverage ratio is often ignored in the Basel III conversation but it can have a significant impact on lending, particularly for climate action projects in the developing world. To fully grasp the potential impact of the leverage ratio, we

must first understand the importance of Letters of Credit for climate action projects in developing nations.

Box 5: Letters of Credit

While useful, SPV's also have distinct disadvantages. The inability to pursue legal recourse against the investor in case of bankruptcy raises the risk profile of SPV's for many vendors, suppliers and contractors. To assuage these concerns, SPV's often use credit enhancement mechanisms such as Letters of Credit from their bank. A letter of credit effectively underwrites a transaction undertaken by the SPV, guaranteeing payment for any contractor in case of non-payment. This is especially important in developing economies, where contractors are at times unwilling to conduct business without an existing Letter of Credit. Banks being for-profit entities, charge fees ranging from .75% to 1.5% of the transaction amount.

As Box 5 illustrates, letters of credit can be crucial for the construction and operation of clean energy projects, especially in developing nations. Unfortunately, the introduction of the leverage ratio has increased the fees charged by banks for LoC's. The best way to illustrate this is by once again looking at a hypothetical scenario.

Lending Rate for Letter of Credit

In this scenario we will examine a hypothetical scenario wherein a renewable energy SPV is asking for a letter of credit to provide to its vendors. The bank has a total asset exposure of $900 million, with a Risk Weighted Average of $250 million. The minimum capital adequacy ratio the bank must adhere to is 10% and the minimum leverage ratio required of the bank is 3%. The SPV is asking the bank to provide $50 million worth of coverage under the letter of credit. We will assume that the cost of equity is 12%; cost of debt is 2%; the credit spread is 1.5%; administrative expenses account for an additional .05%; and the corporate tax rate is 35%. The first step requires us to calculate the current capital requirement for the bank.

To calculate the capital requirement under the capital adequacy ratio we will take the risk weighted average ($200 million) for the bank and multiply it by the required CAR (10%).

$$Capital\ Requirement = RWA * Capital\ Adequacy\ Ratio = 200mil * 10\% = \$20mil$$

We also need to calculate the capital requirement per the leverage ratio. We can do this by multiplying the total asset exposure of the bank ($900 million) with the prescribed leverage ratio (3%).

$$Capital\ Requirement = Total\ Exposure * Leverage\ Ratio\ Required = \$900mil * 3\% = \$27mil$$

Due to the low risk weighted average of the bank's assets, the capital requirement under the leverage ratio ($27 million) supersedes the capital requirement under the capital requirement ratio ($20 million).

Having determined the bank's capital requirement, we will now take a look at how the addition of the Letter of Credit will affect the bank's capital requirement. To do so we take the value of the Letter of Credit ($50 million) and multiply it by the credit conversion factor (100%)[14] and then multiple it by the leverage ratio required (3%).

$$Leverage\ Requirement = Value\ of\ LoC * Credit\ Conversion\ Factor * \ Leverage\ Ratio\ Required$$
$$= \$50mil * 100\% * 3\% \ = \$1.5mil$$

To assess the effect of the leverage ratio on letters of credit, we also have to analyse what the capital requirement for the letter of credit without the introduction of the leverage ratio. Under the capital adequacy ratio the capital requirement for the line letter credit would be calculated by taking the value of the loan ($50 million), multiplying it by its associated credit conversion factor (20%)[15], and then multiplying it by the CAR (10%).

$$Capital\ Requirement = Value\ of\ LoC * Credit\ Conversion\ Factor * Capital\ Adequacy\ Ratio$$
$$= \$50mil * 20\% * 10\% = \$1mil$$

Having calculated the capital requirements under both scenarios we can now determine the lending rate for the letter of credit under both scenarios. First we will we will calculate the debt to equity ratio under the capital adequacy ratio (using the abbreviation CAR).

$$CAR\ Equity\ Percentage = \frac{CAR\ Loan\ Capital\ Requirement}{CAR\ Loan\ Total} = \frac{\$1\ million}{\$50\ million} = 2\%$$

$$CAR\ Loan\ Debt\ Percentage = \frac{CAR\ Loan\ Total - \ CAR\ Loan\ Capital\ Requirement}{CAR\ Loan\ Total}$$
$$= \frac{\$50\ million - \ \$1\ million}{\$50\ million} = 98\%$$

$$L * (1 - t) = \ (E * r_e) + \big((D * r_d) + C + A - O\big) * (1 - t)$$

$$(2\% * 12\%) + \big((98\% * 2\%) + 1.5\% + .05\%\big) * (1 - .35) = 2.5215\% * (1 - .35) = 1.63898\%$$

Next we will calculate the debt to equity ratio under the leverage requirement ratio (using the abbreviation LRR) and then plugging it into loan price model to determine the lending rate.

$$LRR\ Equity\ Percentage = \frac{LRR\ Loan\ Capital\ Requirement}{LRR\ Loan\ Total} = \frac{\$1.5\ million}{\$50\ million} = 3\%$$

$$LRR\ Loan\ Debt\ Percentage = \frac{LRR\ Loan\ Total - \ LRR\ Loan\ Capital\ Requirement}{LRR\ Loan\ Total}$$

$$= \frac{\$50\ million - \ \$1.5\ million}{\$50\ million} = 97\%$$

$$(3\% * 12\%) + \big((97\% * 2\%) + 1.5\% + .05\%\big) * (1 - .35) = 2.629\% * (1 - .35) = 1.70853\%$$

The calculations show us that under this particular scenario, the leverage requirement ratio will increase lending rates by approximately seven basis points for the line of credit.

At face value, seven basis points is not significant. As illustrated previously in this paper, however, seemingly small increases in basis points can have a significant impact on the sector. It should also be noted that a letter of credit is essentially an insurance policy – the SPV does not receive any debt which it can use to generate additional revenue. Given the fact that interest payments on letters of credit are sunk costs, the potential economic activity of the additional expenses is an addition investor cost without any potential value further down the line. It also important to highlight one last point – letters of credit are oftentimes a de facto requirement in developing economies and it is difficult to find substitutable products. As such the leverage ratio impact on letters of credit can significant impact investment decision making for climate action projects across the developing world.

POLICY RECOMMENDATIONS

The deterrents created by the capital adequacy and leverage ratio are substantial, but not unsurmountable. Adjustments to the risk weighting of certain asset classes and lowered credit conversion factors for off-balance sheet assets are possible solutions.

Adjustments to Risk Weighted Assets

The risk classifications of the three asset types mentioned under the Impact of Capital Adequacy Ratio section tend to act as the largest barriers for climate

action projects in developing countries. The risk weightings for the three assets types are listed below.

Loan Type	Risk Weight
Corporate Loan	20-150%
Special Purpose Vehicle	100%
Sovereign Loan	0-150%

One possible way to bypass the increased lending rates caused by these risk weights is to introduce a "green factor". A certifying body, such as the Climate Bond Initiative, could evaluate and certify any project wishing to obtain a "green" designation. Banks would then be allowed to discount the risk weight of such projects by a certain percentage (say 50%), which would reduce the risk weight and exposure factor of the projects as shown in the following scenario.

LENDING RATE FOR SPECIAL PURPOSE VEHICLE WITH GREEN FACTOR

In this scenario we will examine the effect the proposed green factor will have on the lending rate of the previously discussed scenario wherein a Special Purpose Vehicle invests in a renewable energy project in a developing country.

Let us assume that the bank portfolio is currently at $900 million, with a Risk Weighted Average of $360 million and a lending rate of 2.8132%. The minimum capital adequacy ratio needed for the bank is 10%. The SPV is asking for a $100 million loan with an associated risk rating of 100%. We will assume that the cost of equity is 12%; cost of debt is 2%; the credit spread is 3%; administrative expenses account for an additional 1%; and the corporate tax rate is 35%. The green factor will be assumed to be 50%. The calculations are listed below.

$$RWA\ for\ R.E.\ Project\ with\ Green\ Factor = \$100mil * 100\% * 50\% = \$50mil$$

$$New\ RWA\ for\ Bank = \$360mil + \$50mil = \$410mil$$

$$New\ Capital\ requirement = \$410mil * 10\% = \$41mil$$

$$New\ Equity\ Percentage = \frac{New\ Capital\ Requirement}{New\ Total} = \frac{\$41\ million}{\$1{,}000\ million} = 4.1\%$$

$$New\ Debt\ Percentage = \frac{New\ Asset\ Total - New\ Capital\ Requirement}{New\ Total}$$

$$= \frac{\$1{,}000mil - \$41\ mil}{\$1{,}000\ mil} = 95.9\%$$

We can now plug these weights into the loan pricing model to determine the bank's new lending rate.

$$L * (1 - t) = (E * r_e) + \big((D * r_d) + C + A - O\big) * (1 - t)$$

$$(4.1\% * 12\%) + \big((95.9\% * 2\%) + 3\% + 1\%\big) * (1 - .35) = 4.3387\% * (1 - .35) = 2.8202\%$$

The lending rate in the previous scenario was 3.2305% which shows us that the green factor can reduce the lending rate by 41 basis points.

ADJUSTMENTS TO CREDIT CONVERSION FACTOR

While the effect of the credit conversion factor of Letters of Credit is the largest deterrent for climate action projects in the developing world, the credit conversion factor of other items such as revolving credit facilities and note issuance facilities have also been known to act as barriers. The aforementioned green factor can also be reduced to adjust credit conversion factors, as shown in the scenario below.

Lending Rate for Letter of Credit with Green Factor

In this scenario we will examine the effect of the green on the previously discussed scenario wherein a renewable energy SPV is asking for a letter of credit to provide to its vendors.

We will assume that the bank has a total asset exposure of $900 million, with a Risk Weighted Average of $250 million. The minimum capital adequacy ratio the bank must adhere to is 10% and the minimum leverage ratio required of the bank is 3%. The SPV is asking the bank to provide $50 million worth of coverage under the letter of credit. We will assume that the cost of equity is 12%; cost of debt is 2%; the credit spread is 1.5%; administrative expenses account for an additional .05%; and the corporate tax rate is 35%. The green factor will be assumed to be 50%. The calculations are below:

$$\begin{aligned} Leverage\ Requirement &= Value\ of\ LoC * Credit\ Conversion\ Factor * \\ &\quad Leverage\ Ratio\ Required * Green\ Factor \\ &= \$50mil * 100\% * 3\% * 50\% = \$.75mil \end{aligned}$$

$$LRR\ Equity\ Percentage = \frac{LRR\ Loan\ Capital\ Requirement}{LRR\ Loan\ Total} = \frac{\$.75\ million}{\$50\ million} = 1.5\%$$

$$\begin{aligned} LRR\ Loan\ Debt\ Percentage &= \frac{LRR\ Loan\ Total - LRR\ Loan\ Capital\ Requirement}{LRR\ Loan\ Total} \\ &= \frac{\$50\ million - \$.75\ million}{\$50\ million} = 98.5\% \end{aligned}$$

We can now plug these weights into the loan pricing model to determine the bank's new lending rate.

$$(1.5\% * 12\%) + \big((98.5\% * 2\%) + 1.5\% + .05\%\big) * (1 - .35) = 2.468\% * (1 - .35) = 1.6042\%$$

The lending rate in the previous scenario was 1.708525% which shows us that the green factor can reduce the lending rate by 10 basis points.

ABOUT THE AUTHOR

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ENDNOTES

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