Information Note

Default values for equity return for CDM projects

I. Background

This information note summarizes relevant background information on the development of default values for the expected return on equity which are contained the "Guidelines on the assessment of investment analysis". The information is based on a report prepared by Dr. Bhamy V. Shenoy for the UNFCCC secretariat.

One of the ways to prove the additionality of a CDM project is to show how the benefits from the CDM will make the project viable. This viability is influenced by the required minimum return on equity for the project developers.

An analysis of 50 CDM projects revealed **that there is no consistency** in the process of estimating the minimum equity rate of return to implement the project. Some projects use the CAPM methodology, some use the opinion of experts, others use the government mandated minimum rate of return. Since the minimum rate of equity return plays a critical role, there is a need to make the process of estimating it transparent and consistent.

For these reasons, a table of default values for the return on equity was developed for non-annex countries covering 15 industry sectors. The use of such a table of default equity value could make the estimation process transparent and consistent.

Since the table is based on long term real equity premium using data from the New York stock exchange, the US government treasury bonds and Moody's ratings for sovereign bonds there is no need to change them frequently unless there is dramatic increase in government bond yields in double digits as during late 70s and early 80s. Still it is recommended that the table be **updated every two years** to reflect the latest Moody's sovereign bond ratings.

II. Introduction

Investors either from the public sector or the private sector companies while investing in projects expect to earn returns which are higher than what they can expect to get by investing in risk free government bonds. Thus the expected return for any project can be expressed as risk free return plus an extra premium for the risk taken to invest in the project. Though this concept of estimating return on equity investment looks simple and straight forward, developing minimum required rates of return for a project is indeed complex.

There are many issues involved in this estimation. How does project proponents estimate risk free estimate? Should they base it on short term say of bond yields of one year or less or long term bonds of 10 years, 20 years or 30 years? Should they base it on geometric mean or arithmetic mean? Which time period should be considered to compute arithmetic or geometric mean? If the estimation will based on the stock market of developed countries, which market should be selected? Developing markets may not have a long history. They are likely to be even more volatile than the markets in developed countries. Finally they might not have matured enough to have credible and meaningful data.

Besides the problem of selecting an appropriate developed country market, there are two more factors which make this exercise even more complex. How do we reflect the additional

risk of investing in a developing country which is likely to be riskier than the developed country? Finally each industry has its own risk profile irrespective of the country where the investment is undertaken.

Needless to make the obvious point that estimating the minimum required rate of return on equity investment to undertake any project is most critical. It is also referred to as hurdle rate. The assessments of additionality in any CDM projects where internal rate of returns are computed are affected by the hurdle rate. As described above estimating this hurdle rate for each country and for 15 different industry groups is a complex exercise.

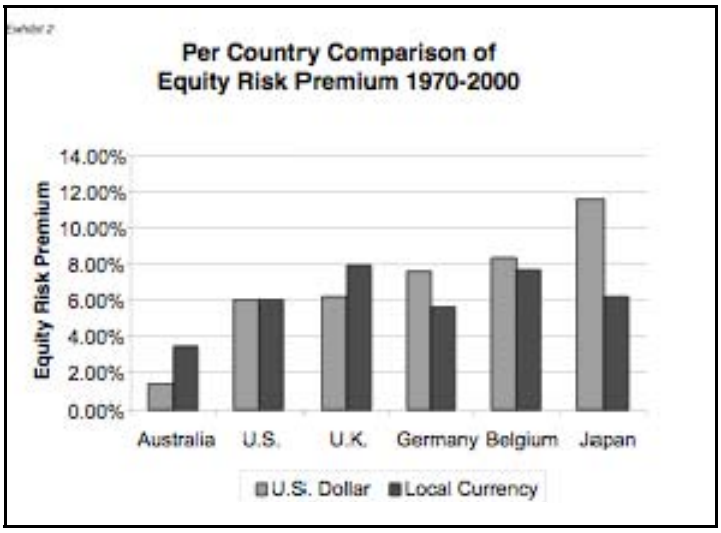
There are basically two different ways of handling this problem:

- Developing a methodology where a general model like CAPM or some modified version of it can be used. In this case project developer will estimate the hurdle rate by following the procedure suggested in these models of estimating risk free rates, beta values for the company or industry sector or the country etc. The problem in this case is lack of consistency and in most cases estimating parameters (for example beta to express the stock market volatility) to apply in these models;
- Developing a table of default values. While this assures consistency, developing such a table may pause huge problems. The table of default values has been developed by making some simplifying assumptions based on sound logic and market realities. This is not to suggest that one cannot find fault with this model also. The counter argument is that any procedure one develops is unlikely to satisfy everyone. But this alternative strategy of developing a table of default values for equity would be transparent, internally consistent and easy to implement. Based on the analysis of 50 CDM projects, the results show that such a table of default values gives credible results.

III. Rationale behind the development of default equity values

As described above minimum required return on equity for a country for any specific project is equal to the risk free rate of return + equity risk premium + risk premium for the country + risk premium for the specific industry group.

Since the US stock market has the longest well recorded data for government bonds as well stocks, estimating risk free rate of return and equity risk free return based on US market is justifiable. Also equity risk premium for different countries are converging to the same level because of increasing globalization, it is expected that equity risk premium for different countries will be more or less the same in the future.



The above graph giving the comparison of equity risk premium (ERP) for different countries show that for period 1970-2000, ERPs for the US, Germany and Japan are roughly equal to 6%.[1] Domodaran[2] argues in his paper that estimating risk premium for emerging markets using their stock markets where they do exist may not be meaningful. This is because in most countries **stock market represents only a small part of their economy** and also they have not reached the maturity of developed market.

Below the rationale for estimating the four components of the **Default Equity Model** to compute the minimum rate of return required for a CDM project is described. In this model all four components are expressed in real terms by excluding any inflationary impact. Estimating future inflation even for developed countries is a difficult task. Thus by excluding the need for developing cash flow using some estimate of inflation not only simplify the process, also improve consistency in assessing the additionality among different projects.

III-1. Real Return on US treasury long term bond

The first component in the Equity Default Model is the real rate of return for risk free long term treasury bonds. The value is based on a study[3] "Treasury Bills and Inflation", by Ruben C. Trevino, Ph.D., and Barbara M. Yates, Ph.D.

Table 1 below gives the real rate of returns for short term and long term bonds for the US as well as the stocks based on a time period for 1954 -2007. Based on this table the proposed value to use is 3.0% for the real rate of return for the risk free investment. One can raise a reasonable question, why should long term bond return be used instead of short term bills which happens be less in this case. One justifiable explanation is that most of the CDM projects are long term. Thus it is more correct to base the required return on long term bonds than on the short term T-bills.

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1. <https://corporate.morningstar.com/ib/documents/MethodologyDocuments/IBBAssociates/IntnlRiskPremium.pdf>.
2. <http://pages.stern.nyu.edu/~adamodar/pdfiles/papers/riskprem.pdf>.
3. <http://www.fpajournal.org/CurrentIssue/TableofContents/TreasuryBillsandInflation/>.

Table 1: Long-term Compounded Average Returns for 1954-2007				
	T-bills	T-bonds	Stocks	Inflation
Nominal Returns	5.17%	6.93%	12.85%	3.92%
Real Returns	1.23%	3.02%	8.76%	

The value of 3.0% for real risk free return is further corroborated by the recent US treasury inflation protected securities (TIPS).[4] During the latest auction of TIPS, the following coupon ratings were offered.

5 years	0.50
10 years	1.25
20 years	2.50
30 years	2.125

While the above TIPS rates suggest lower risk free return than 3.0% mentioned earlier, they were much higher for the 10 years TIPS offered between 97 and 2002. TIPS returns during that period averaged 3.6%. It was the time period when inflation expectations were very different than the ones now. This shows that real returns are influenced by expectation of future inflation rates.[5]

One can question why the real risk free returns is based on US dollar currency and not in other currencies like Euro or Russian ruble or Chinese Yuan. As mentioned earlier, there is longer historical credible data for US dollar than for any other currencies. Since most CDM projects are likely to be submitted if given the flexibility in US dollar currency, it is better to base risk free return on US dollar basis. Given all other factors like inflation, market maturity, free market conditions, etc one can argue that it does not matter which currency is used to base real risk free return. All free markets where competition is the final arbiter, risk free returns are likely to be the same.

III-2. Equity Risk Premium for stocks

Equity Risk Premium is based on several studies. Depending upon which historic period one chooses, it can be negative or positive. Real equity returns (see Table 2)[6] for the US was -2.74% during 2000-2005 while it was 14.24% for 1990-1999. But for a longer time period of 1900-2005 it was only 6.52%. For this reason Equity Risk Premium is based on a longer time period of 1900 -2005.

In selecting this time period, discussion with practical experience of different experts in selecting investment projects was helpful. These projects are from various value chain groups like upstream, midstream, downstream and also from all different regions of the world. It is also useful to take a look at equity risk premium of different countries during the same period which only shows that basing equity risk premium is not an exact science. There is a great deal of variation in real equity returns from a low 2.4% in the case of Belgium to a high of 7.8% for Sweden. It finally depends upon the subjective judgment. Though one may have

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[4] Source: <www.bloomberg.com/markets/rates/index.html>.

[5] <www.bloomberg.com/markets/rates/index.html>.

[6] <Source: THE WORLDWIDE EQUITY PREMIUM: A SMALLER PUZZLE by Elroy Dimson, Paul Marsh, and Mike Staunton, London Business School, 2006>.

legitimate question regarding subjective judgment, it is far better (when based on sound logic and rationale) than simply basing on some mathematical analysis.

Table 2: Real Equity Returns in 17 Countries, 1900-2005

Country	2000 to 2005	1990 to 1999	1900 to 2005
Belgium	3.99	9.13	2.40
Italy	-0.73	6.42	2.46
Germany	-4.08	9.89	3.09
France	-1.64	12.53	3.60
Spain	2.48	12.16	3.74
Norway	10.91	8.25	4.28
Switzerland	1.11	13.95	4.48
Japan	0.64	-5.23	4.51
Ireland	5.14	11.79	4.79
World ex -US	0.11	3.41	5.23
Denmark	9.41	7.52	5.25
Netherlands	-5.41	17.79	5.26
United Kingdom	-1.34	11.16	5.50
World (USD)	-1.25	7.87	5.75
Canada	4.32	8.28	6.24
United States	-2.74	14.24	6.52
South Africa	11.05	4.61	7.25
Australia	7.78	8.98	7.70
Sweden	-0.70	15.02	7.80

Table 3: Annualized Equity Premiums for 17 countries, 1900 - 2005

Country	**Historical Equity Premium Relative to Bills**			**Historic Equity Premium Relative to Bonds**		
	Geometric mean	Arithmetic mean	Standard error	Geometric mean	Arithmetic mean	Standard error
Australia	7.08	8.49	1.65	6.22	7.81	1.83
Belgium	2.80	4.99	2.24	2.57	4.37	1.95
Canada	4.54	5.88	1.62	4.15	5.67	1.74
Denmark	2.87	4.51	1.93	2.07	3.27	1.57
France	6.79	9.27	2.35	3.86	6.03	2.16
Germany	3.83	9.07	3.28	5.28	8.35	2.69
Ireland	4.09	5.98	1.97	3.62	5.18	1.78
Italy	6.55	10.46	3.12	4.30	7.68	2.89
Japan	6.67	9.84	2.70	5.91	9.98	3.21
Netherlands	4.55	6.61	2.17	3.86	5.95	2.10
Norway	3.07	5.70	2.52	2.55	5.26	2.66
South Africa	6.20	8.25	2.15	5.35	7.03	1.88
Spain	3.40	5.46	2.08	2.32	4.21	1.96
Sweden	5.73	7.98	2.15	5.21	7.51	2.17
Switzerland	3.63	5.29	1.82	1.80	3.28	1.70
UK	4.43	6.14	1.93	4.06	5.29	1.61
US	5.51	7.41	1.91	4.52	**6.49**	1.96
Average	4.81	7.14	2.21	3.98	6.08	2.11
World-ex US	4.23	5.93	1.88	4.10	5.18	1.48
World	4.74	6.07	1.62	4.04	5.15	1.45

Based on the above Table 3,[7] Equity Risk Premium is assumed to be 6.50% using the arithmetic mean of the US for equity premium to bonds. Here also one can question that instead of arithmetic mean, why not use geometric mean which is less.

Michael W. Barad[8] has argued in favor of arithmetic mean rather than geometric mean. According to him, arithmetic means are appropriate for creating a forward looking equity risk premium while geometric means are used in purely historical analysis.

Damodaran,[9] who has done extensive research on equity premium, has analyzed the implications of using arithmetic mean vs. geometric mean. While he has not recommended which is a better estimate, his analysis supported the use of arithmetic mean for our model. He has also discussed the problem of estimating equity risk premium giving three main factors which will influence its determination. They are:

- Different periods used, use of short term treasury bills versus long term bonds for risk free rate; and
- Arithmetic mean versus geometric mean. Damodaran has developed the following table to illustrate the problem of assessing equity risk premium.

	Stock - Treasury Bills	**Stock - Treasury Bills**	**Stock T- Bonds**	**Stock T -Bonds**
	Arithmetic	Geometric	Arithmetic	Geometric
1926-1997	9.05%	7.13%	7.73%	6.10%
1962-1997	6.21%	5.64%	5.55%	5.48%
1981-1997	11.56%	12.02%	9.56%	9.07%

According to the above table, ERP can range from 5 to 12% depending upon which set of three factors one selects. He has further elaborated this concept in another recent paper,[10] and updated the values to take into consideration the dramatic fall in stock prices in 2008.

In conclusion, the use of Equity Risk Premium of 6.5% in the proposed model is supported by the arguments of different experts on ERP and the factors they have discussed to show the variability in its estimation and also the practical experience of using hurdle rates by the oil companies.

III-3. Premiums or discounts for Equity risk premium by different industry groups

Since there is some commonality between fifteen industry groups, it has been decided to classify them under three groups. On surface it may sound logical to develop risk premiums depending upon fifteen different industry groups since each of them have different risk

[7] Source: THE WORLDWIDE EQUITY PREMIUM: A SMALLER PUZZLE by Elroy Dimson, Paul Marsh, and Mike Staunton, London Business School, 2006.

[8] <https://corporate.morningstar.com/ib/documents/MethodologyDocuments/IBBAssociates/IntnlRiskPremium.pdf>.

[9] <http://pages.stern.nyu.edu/~adamodar/pdfiles/papers/riskprem.pdf>.

[10] <http://pages.stern.nyu.edu/~adamodar/pdfiles/papers/ERP2009.pdf>.

characteristics. However such seemingly sophistication of hair splitting of values between the fifteen groups may not achieve the desired results of proving additionality in a consistent manner.

The three groups are as follows.

Group 1 industries consist of:

1. Energy Industries;
2. Energy Distribution;
3. Energy Demand;
13. Waste handling and disposal.

Group 2 industries consist of:

4. Manufacturing industries;
5. Chemical Industries;
6. Construction;
7. Transport;
8. Mining/Mineral production;
9. Metal production;
10. Fugitive Emissions from fuels;
11. Fugitive Emissions from production and consumption of halocarbon, and Sulphur hexafluoride;
12. Solvent use.

Group 3 industries consist of:

14. Afforestation and reforestation;
15. Agriculture.

Rationale behind attaching either premium, or discount from the average equity premium for these four groups are as follows:

(1) For agriculture and forest industries, equity returns are less than for non agricultural sector based on a study done by Kenneth W. Erickson, Charles B Moss and Ashok K Mishra.[11] Considering the weather variability and risks involved in selling prices of agricultural commodities, it is possible to argue that rate of returns for agricultural and forest industry groups should be higher than for non- agricultural industries. However these authors have concluded otherwise. In the figure below returns for farm and non-farm sectors are shown. Excepting for one year, every year the farm sector returns are below that of non farm sectors. It is partly because of that in most of the developed countries the government gives subsidy. Based on these observations, rate of return for agricultural sector is assumed to be equal to utility minus 0.5%.

[11] <http://ddr.nal.usda.gov/bitstream/10113/38718/1/IND43661771.pdf>.

(2) Studies show that equity returns on utilities sector are historically lower than industrial sector since they are regulated and guaranteed by regulatory body. Historically in utility sector there has been no competition and it is a natural monopoly. Only in the developed countries, in recent years, by liberalizing power production and marketing has been made competitive. However in most developing countries, utility sector is still treated as monopoly with a guaranteed return. For these reasons, utility returns are less than industry returns.

(3) For group consisting of minerals and manufacturing, equity default value is assumed to be 1% above that of utility sector.

(4) Even though energy production group of industries like oil production has higher rate of return, its equity value is considered to be slightly higher (1.0%) than the utility sector. This is because not many oil exporting countries do not allow the so called "fugitive gas" to be burnt. Thus it is mandatory for oil companies to invest.

(5) For group of industries to make use of emission of land fill gases, equity return is assumed to be 1.0% higher than utility returns because of higher risk than utility sector.

In the application of Equity Default Model, the following premium or discounts is applied depending upon which group the industry sector falls under:

Group 1 Utility sector group industries = average historical returns

Group 2 Manufacturing and land fill group of Industries = Utility group value + 1.0%.

Group 3 Agriculture group = Utility sector - 0.5%

Estimating the premium or discount for equity premium for different industry group is not an exact science. RDK Strategies[12] have developed a "periodic table" for 9 industry groups[13] like IT, Energy, Financial, Health Care, Telecom, and Utilities etc. showing the annual returns from 1991 to 2009. These returns are extremely volatile. For example, IT sector had returns in

[12] <http://www.rdkstrategies.com/index-return/index-returns-q12010>.

[13] <http://www.rdkstrategies.com/sites/default/files/Periodic%20Table%20Sectors%202010_0.pdf>.

1998 and 1999 of 78.1% and 78.7% followed by negative returns of 40.9%, 25.9% and 37.4% in 2000, 2001, and 2002.

III-4. Additional equity risk premiums for investing in developing countries

Experience has showed that risk of investing in developing/emerging economies and that too in countries with higher political risks would be higher. For this reason one can argue that investing in developing/emerging economies will require higher equity returns. The following table shows that this argument need not be true all the time.

Table 4: Real GDP growths and annualized equity returns

	Jan-Dec 2009		2000-2009		1985-2009	
Country	**GDP %**	**Return %**	**GDP %**	**Return %**	**GDP %**	**Return %**
China	8.7	68	9.9	7.7	9.9	2.6
India	5.6	72	7.0	9.5	6.2	11.2
Indonesia	4.0	96	5.1	6.8	4.7	0.4
Sri Lanka	3.0	111	4.9	9.4	4.7	2.2
Brazil	-0.4	67	3.2	13.9	2.9	11.1
France	-2.3	28	1.5	-18	1.9	8.7
USA	-2.5	25	1.9	-2.7	2.8	7.3
UK	-4.8	28	1.8	-1.0	2.4	6.7
Germany	-4.8	24	0.8	-2.5	1.8	6.1
Japan	-5.3	9	0.7	-4.8	1.9	0.2

Source: Credit Suisse Report for 2010

According to Credit Swiss Report 2010, in the late 1970s, emerging markets gave similar returns to those of developed markets, but they underperformed in the 1980s and 1990s. In the 2000s, however, they beat developed markets. Based on this argument one can justify the use of the equity risk premiums and risk free returns of the US to estimate the equity values for developing/emerging countries. Still there is a need to take into consideration the higher risk of investing these countries. As proxy for this risk it is suggested to use the Moody's rating[14] for sovereign bonds. Regularly Moody updates the sovereign ratings. Moody also gives default swaps (see Table 5) for sovereign ratings class.

[14] <http://moodys.com/moodys/cust/content/loadcontent.aspx?source=staticcontent/businesslines/sovereign-subsovereign/ratingslistgbr.htm&param=all>.

Table 5: Defaults Spreads by Sovereign Ratings Class -September 2008 and 2009

Rating	**Sovereign Bonds/CDS 2008**	**Corporate Bonds 2008**	Sovereign Bonds/CDS 2008	Corporate Bonds 2008
Aaa	0.15%	0.50%	0.25%	0.70%
Aa1	0.30%	0.80%	0.35%	0.80%
Aa2	0.60%	1.10%	0.70%	0.90%
Aa3	0.80%	1.20%	0.80%	0.95%
A1	1.00%	1.35%	0.95%	1.10%
A2	1.30%	1.45%	1.10%	1.20%
A3	1.40%	1.50%	1.25%	1.35%
Baa1	1.70%	1.70%	1.75%	2.15%
Baa2	2.00%	2.00%	1.90%	2.25%
Baa3	2.25%	2.60%	2.00%	3.10%
Ba1	2.50%	3.20%	3.00%	4.25%
Ba2	3.00%	3.50%	3.55%	4.50%
Ba3	3.25%	4.00%	4.00%	4.75%
B1	3.50%	4.50%	5.50%	5.0%

Rating	**Sovereign Bonds/CDS 2008**	**Corporate Bonds 2008**	Sovereign Bonds/CDS 2008	Corporate Bonds 2008
B2	4.25%	5.50%	6.50%	5.50%
B3	5.00%	6.50%	8.00%	6.25%
Caa1	6.00%	7.00%	8.50%	8.25%
Caa2	6.75%	9.00%	9.50%	9.50%
Caa3	7.50%	11.0%	11.00%	11.50%

Norbert Gaillard[15] has done an analysis of ratings estimation made by Moody, S & P and Fitch for 1993 - 2007 to compare how they perform against JP Morgan's Emerging Markets Bond Index Global (EMBIG). This analysis shows that though there is some minor differences between these three rating agencies, their recommendations are more or less the same. An article[16] by the World Bank has also showed that the correlation coefficient of the ratings of these rating agencies is 0.97 or higher.

Several articles written on the topic of equity risk premium were quoting sovereign default swaps based on Moody's Ratings. Since they were readily available it was decided to use Moody's data. As mentioned earlier, even using default swaps by other agencies, results would not be any different since all these ratings are highly correlated.

The above Table 4 shows how sovereign default swaps can change over time. Since 2009 represents a time period which is soon after the financial melt down, 2008 statistics which is before the global financial melt-down may be more appropriate. It is possible to argue that the period before 2008 may not be a true representation of a stable economic cycle since it was the time when oil prices and commodity prices were high. In fact it is difficult to state which is more representative time period. The table which gives Sovereign Default Spreads for 2008 and 2009 are quoted from Domodaran's two articles.[17] [18]

Another justification that can be given in support of 2008 data is that Equity Default Values based on that time period has been proven to be credible based on the analysis of 50 CDM projects discussed later.

[15] <http://www.eurojournals.com/irjfe_26_04.pdf>.
[16] <http://papers.ssrn.com/sol3/papers.cfm?abstract_id=996175>.
[17] <http://pages.stern.nyu.edu/~adamodar/pdfiles/papers/riskprem.pdf>.
[18] <http://pages.stern.nyu.edu/~adamodar/pdfiles/papers/riskfreerate.pdf>.

One of the minor drawbacks of Moody's ratings are that they are not available for all the countries.[19] Moody's rating agencies or other rating agencies also offer their services only to those countries which pay for their services. investors or donor agencies which are interested in the developing countries may also buy the services from rating agencies. For some countries they have done it to help them to get loans at better rates. Some countries which are not interested to borrow from outside may not be interested to pay for these services. In case of some countries they may not like to give answers to a complex set of questions revealing the political, economic, social conditions prevailing in their countries. However a simple way to get over this problem has been suggested in the next section.

IV. Computing default values for equity returns

Based on the **Default Equity Model**, equity return for a country and for any group of industry is equal to real rate of return on US treasury long term bonds + Equity Risk Premium + discount/premium for the group of industry + Additional risk of investing in an emerging economy

The following Table 6 illustrates the development of default equity values using the examples for three countries India, Mexico and Pakistan.

Table 6: Examples of Development of Default Equity Values for three countries

Country	Sovereign bond rating	Group 1	Group 2	Group 3
India	Baa3 (2.25%)	3 + 6.5 +2.25 = **11.75%**	3 + 6.5 + 1 + 2.25 = **12.75%**	3 + 6.5 - 0.5+ 2.25 = **11.25%**
Mexico	Baa1(1.70%)	3 + 6.5 + 1.70 = **11.20%**	3 + 6.5 + 1+ 1.70 = **12.20%**	3 + 6.5 - 0.5 + 1.70 = **10.70%**
Pakistan	B3 (5.0%)	3 + 6.5 + 5.0 = **14.5%**	3 + 6.5 + 1 + 5.0 = **15.5%**	3 + 6.5 - 0.5 + 5.0 = **14.0%**

Using the model explained above, default equity value has been computed for 153 non-Annex I countries for three different industry groups. These are given in the following table. There is no need to revise these values often because the parameters used to compute default values are based on long term excepting for country risk premiums, only when there is dramatic change either in economy (like extremely high inflation rate expectations of double digits) or major revision in Moody's sovereign bond ratings, these values need to be revised. Otherwise it will be enough if the table is revised once in two years to reflect the latest change in sovereign bond ratings.

For those countries, where Moody's sovereign ratings are not available, default value for countries are based on an approximate relationship between per capita GNP and default value.

[19] <http://papers.ssrn.com/sol3/papers.cfm?abstract_id=996175>.

According to a study done to understanding the economic determinants of sovereign credit rating,[20] using data for the two major agencies: S&P and Moody's, it has been found that the variables that seem to have statistically significant explanatory power for the rating levels are GDP per capita, external debt as a percentage of exports, the level of economic development, default history, real growth rate, and the inflation rate.

It has been found that of the several variables that has influence on sovereign rating, per capita GNP has the most. Based on this rationale, default equity values for countries were computed using the relationship between per capita GNP and default value.

As explained above, country risk refers to the uncertainty of investing in a country other than one's own home country. Some of the factors that can give rise to such uncertainties are currency controls, devaluations or regulatory changes, political stability factors like civil wars, mass riots, or any events that can affect the company's operations affecting its profitability, etc. According to Damodaran,[21] there are at least three measures to assess country risk. They are: 1 Sovereign ratings, 2. Country risk scores and 3. Market based measures. Of these three sovereign rating to assess country risk was used for the model.

The results for the default values are contained in the "Guidelines on the assessment of investment analysis".

To apply the new default equity values, cash flow of the projects should be computed without any inflation since risk free return and equity risk premium are expressed in real terms. Also cash flow needs to be computed based on 100% equity to ensure consistency. It has been found while analyzing 50 CDM projects that there is inconsistency in developing cash flow when loans are taken to undertake projects. Cash flows were not properly computed. There are some cases where there is double counting. This comes about as a result of handling cash outflow based on 100% equity (i.e. though equity might have been just 30%, cash outflow represents 100%) while cash inflow is based on processing loans (interest costs on 70% loan is considered as expenses).

III.-5. Nominal versus real rate of return

To separate the effect of inflation while estimating, nominal and real rate of return concepts are used. If the future cashflows are based taking into consideration, then rate of return will be higher than the return computed based simply on non inflated cashflows and those returns are nominal rate of return. If rate of returns are computed without factoring inflation then the resultant rates of returns are real rate of returns.

For example let us assume a project where initial investment is $1000 and annual cashflow without inflation is $200 for 8 years. Such a project will give a discounted internal rate of return of 11.8%. If the cashflows are based on inflation, then depending upon the rate of inflation IRRs will be different as shown below. Inflated cashflows if inflation is assumed to be 10% will be $220 in the second year, $242 in the third year, $266 in the forth year etc.

[20] <http://www.allbusiness.com/finance/3502560-1.html>.

[21] <Aswath Damodaran, Equity Risk Premiums (ERP): Determinants, Estimation and Implications- A post crisis update, October 2009, Stern School of Management.

IRRs for different levels of inflation

Inflation	IRR
0%	11.8%
5%	16%
10%	20%
15%	24%
20%	28%

As it can be seen, the IRRs vary from 11.8% at 0% inflation to 28% at 20%. It is not easy to predict what the inflation rate will be and the returns will be inflated depending upon the rate of inflation. Since the purpose of IRR estimation is to compute the rate of return based on the actual purchasing value of the cashflow and not simply on the then value (i.e inflated), it is more useful to compute the IRR on uninflated cashflow.

Another example. Assume that keeping $100 in the bank an investor can get an annual interest of 5%. If the inflation is 10%, then the value of $105 which we get at the end of one year is really $95.45 ($105/1.1). On the other hand let us assume that the bank pays just 1% interest, but the inflation is negative -4%, then the value of $101 which we get at the end of one year is $105 ($101/.96). Though 1% interest is less than 5% in the first example, because of lower inflation, it is much better. In other words the real rate of return in the second was = 1% - (-4%) = 5%. While in the first example real rate was = 5% - (10%) = -5%. It is to get a more realistic and comparable estimate of return, it is preferable to compute "real" rate of return rather than "nominal" return which takes into consideration inflation.

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History of the document

Version	Date	Nature of revision
01	EB 62, Annex # 15 July 2011	To be considered at EB 62.
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