Accounting Measurement of Carbon Credits in Brazil, China and India

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Abstract

This paper proposed a model of accounting measurement at fair value to the Certified Emission Reductions (CERs) generated by Brazilian, Chinese and Indian companies to enable to recognition of assets arising from the implementation of projects Clean Development Mechanisms (CDM) during the period from 2005 to 2012. The proposal allows adoption of this measurement form from the time of register effectuation of CDM projects in the Executive Council of the United Nations Framework Conference on Climate Change (UNFCCC) and the classification as intangible assets developed internally by the host entities of projects in contrast to Equity until the moment of its realization. The fair values of Emissions Reductions (ERs) from 31 Brazilian CDM projects, 379 Chinese and 318 Indians were simulated on the value of equity of 15 Brazilian companies, 56 Chinese and 183 Indian with support of the Wilcoxon test. The results provided evidence that the fair value measurement of CER, and its recognition as an intangible asset, could have represented a positive impact on the group balance sheet accounts of the participating research companies. The empirical applicability of the 'Accounting Measurement Model of CERs' made it possible to carry out assessments of this asset as a heritage item capable of generating positive economic effects on equity of entities located in developing countries.

Keywords: Developing countries – Brazil – China – India. Clean Development Mechanism (CDM). Carbon credits. Measurement and accounting recognition.

1 Introduction

With the advent of the Kyoto Protocol, three types of mechanisms focused on reducing greenhouse gas emissions in the atmosphere were established, namely: the Emission Trade (ET); the Joint Implementation (JI); and the Clean Development Mechanism (CDM). The latter deals with agreements between developed and developing countries. These mechanisms are contained, respectively, within Articles 17, 6 and 12 of the Protocol (MCT, 1997).

To enable the assignment of different commitments to different countries, the Kyoto Protocol established two major groups of countries (Parties), the developed and/or industrial ones, listed in Annex I[1] – who took on GHG emission reduction commitments in the atmosphere –, and those not listed in Annex I (non-Annex I[2]), developing countries – with no GHG emission reduction commitments – such as Brazil, China and India, which are the focus of this research (MCT, 1997).

In order to boost practices referring to sustainability within developing countries, Kyoto Protocol guidelines offered incentives so that those countries' corporate equity structures would receive investments from developed countries, and thus reduce GHG emissions through the implementation of CDM. In this way, an Annex I country with an emission reduction commitment can purchase Certified Emission Reductions[3] (CERs) generated in developing countries (non-Annex I) to meet their reduction targets, assumed under the Kyoto Protocol (MCT, 1997).

The implementation of CDM projects can be basically carried out in two ways: (i) with investments made by the company itself, based on the improvement and enhancement of its operational process and, consequently, on the reduction of its environmental impacts – a situation in which the generation of CERs can be characterized as a secondary objective; and (ii) based on projects funded directly by entities in Annex I countries, holders of GHG emission reduction targets to be met.

In the long run, these projects must be able to provide real contributions to sustainable development in developing countries, as well as guarantee real and measurable benefits in favor of the mitigation of climate change at a global level. In both cases, CERs obtained, following financial compensation, are used to reach some of the Annex I countries' targets. The Protocol establishes that these goals cannot be met only with CERs generated by third parties; the company's activity itself should contribute with a part of the GHG reductions.

CDM projects must be approved by a Designated National Authority (DNA), responsible for the acceptance of projects installed within its national territory, whose function is characterized by the issuance of documents certifying (i) the ratification of the respective country to the Kyoto Protocol; (ii) the country's voluntary participation in CDM project activities; and (iii) the contribution of CDM projects to the sustainable development of the country (UNFCCC, 2012).

To this end, Brazil has its Interministerial Commission on Global Climate Change (ICGCC), for approval of its CDM projects. The Chinese government has the National Development and Reform Comission of the People's Republic of China (NDRC) for this purpose. India, in turn, approves projects through its Ministry of Environment & Forests Government of India – MoEF (UNFCCC, 2012).

The governments of Brazil[4], China[5] and India[6], through their DNAs, maintain databases that are available to public consultation about all CDM projects approved by the countries concerned, year by year, from 2004 on, in several sectoral scopes. These projects are also available in the site of the United Nations Framework Conference on Climate Change (UNFCCC)[7].

In research in the UNFCCC site, we found that, by December 31, 2012, registry of 7,510 CDM project activities had already been requested, of which: (i) 5,511 had already been registered; (ii) 546 were in the registry request phase; (iii) 1,407 were pending publication;

(iv) 44 were awaiting review; (v) 02 were awaiting correction (UNFCCC, 2013). Of this total, 7,167 projects had their registries carried out by the referred organization prior to September 01, 2014, when it research was closed in order to conclude this research (UNFCCC, 2014). Therefore, we found that there is discrepancy between requests and completion of registries by that organization; this may have occurred because of the sheer volume of CDM registry requests in 2012.

Among the total 7,167 CDM projects that had already been registered by the UNFCCC, concerning the 2004-2012 period, China was in first place, with 3,682 projects (51.37%); followed by India, with 1,371 projects (19.13%); and by Brazil, with 300 projects (4.19%). The remaining projects (1,814 or 25.31%) were formally registered by some of the other developing countries that signed the Kyoto Protocol (UNFCCC, 2014).

This information highlights that – within the study period – among all CDM projects registered by September 01, 2014, by the UNFCCC, a total 5,353, or 74.69%, were implemented in China, in India and in Brazil. Thus, these countries have established themselves as the greatest CDM project host countries among developing countries listed under the Kyoto Protocol's non-Annex I (UNFCCC, 2014).

Therefore, the large number of CDM projects implemented in Brazil, China and India – that mostly represent investments in the equity structures of companies in these countries – may cause positive economic impacts on the equity of these entities, especially in the long run, through the commercialization of CERs to developed countries. Furthermore, it meets the main goal, which is to provide a reduction in environmental impacts and an improvement in the sustainability of those nations.

So, with the registry of CDM projects by the Executive Board, accounting may have financial aids that allow for the identification, measurement and communication of economic information resulting from the recognition of emission reductions by the UNFCCC. In this way it could provide relevant information to users, based on fair value CER evaluations, which already possessed active markets for their commercialization to Kyoto Protocol Annex I countries.

1.1 Topic, problem contextualization and objective

When it comes to accounting measurement of CERs, academic discussions have been rather timid so far, and the few existing discussions have remained in line with the statutory guidance issued by international accounting standards for different groups of assets in which CERs may be recognized (Ferreira, Bufoni, Marques, and Muniz, 2007; Xiaozhu and Yunyun, 2011; Zhang, 2011; Wang, 2011; Tang, 2011; Agrawal, 2006; Bothra, 2010; ICAI, 2012).

Thus, the predominance of existing accounting guidelines in Brazil, China and India, both in legal terms, as in academia, and referring to the accounting processing that can be attributed to CERs, is focused on measuring values whose generating cause occurred in periods past or present, without envisioning temporal projections that are capable of reflecting future possible economic benefits resulting from their commercialization.

This has occurred, in large part, due to the fact that, to date, the use of the fair value accepted by the International Accounting Standards Board (IASB) can only be employed to measure a few equity items. In the case of assets that were internally generated within business processes, valuation should be carried at cost. This limitation has prevented the fair value measurement and recognition by entities of assets generated within business processes.

Given the above, and aiming to evolve existing discussions, this research will be characterized by theoretical and empirical analysis referring to the accounting measurement of

CERs at fair value, using the adjusted present value method, at the moment their existence is recognized by the UNFCCC, as a result of CDM projects registry under the Kyoto Protocol.

Thus, we will seek to verify whether the accounting measurement of CERs at fair value, promoting their recognition as intangible assets, and representing possible future economic benefits, in contrast to equity, would have caused an impact on the equity of Brazilian, Chinese and Indian companies, during the first phase of the Kyoto Protocol, following implementation of CDM projects in their production processes.

To this end, this research starts off from the assumption that, **if** CERs were measured at fair value and recognized as intangible assets, **then** the equity impacts of future cash flows expected from the implementation of CDM projects in the productive processes of companies in developing countries – such as Brazil, China and India – would be disclosed.

In this context, the question that arises revolves around the accounting measurement at fair value of values concerning CERs that result from the implementation of CDM projects in the productive processes of Brazilian, Chinese and Indian companies, which are being negotiated with entities from developed countries, in the long run.

So the question that motivates this research is: would the accounting measurement and recognition at fair value of CERs generated by the implementation of CDM projects within business processes have caused economic impacts on the equities of Brazilian, Chinese and Indian companies during the 2005-2012 period?

Its main objective is to propose an accounting measurement model to the fair value of CERs generated in the production processes of Brazilian, Chinese and Indian companies, in order to allow for the recognition of these assets resulting from the implementation of CDM projects during the 2005-2012 period.

The secondary objective is to identify economic impacts on the equity of Brazilian, Chinese and Indian companies, due to the recognition and disclosure of future flows of CER economic benefits, at the moment their existence is accepted by the UNFCCC.

2 Theoretical platform

2.1 The carbon market and international accounting regulation

Under the Kyoto Protocol, the core of the carbon market, worldwide, has been established between the the European Union's Emissions Trading Scheme (ETS) and the prospects of turning CERs generated by implementation of CDM projects into monetary values, through the ETS (Mackenzie, 2009; Cook, 2009; Ascui and Lovell, 2011; Mol, 2012).

At a global level, values traded in carbon markets over the 2005-2010 period were disclosed by the World Bank (World Bank, 2011), demonstrating that global carbon markets grew a lot since the Kyoto Protocol came into force in 2005. From then on, the year 2009 was the period in which the greatest negotiations were registered, presenting slight declines in 2010, adding up to a total of approximately 142 billion dollars traded. The same trend continued also for the year 2011 (World Bank, 2012), which registered an increase in trading volume, resulting in approximately 176 billion dollars traded in the carbon market, highlighting the relevance of this market at a global level.

Negotiations based on CDM projects remained throughout the analyzed period, in second place as to level of relevance in the carbon market, preceded only by negotiations resulting from ETS subsidies from the European Union.

To Ascui and Lovell (2011), the increasing development of CDM project implementation has caused a rise in the carbon market globally, with the appearance of implications in favor of the need for a global convergence in the financial accounting of carbon.

However, Ratatunga et al. (2011) call attention to the fact that accounting literature has been so far focused essentially on the best way of recognizing current values of emission

permissions and carbon credits, which are being distributed in the form of government subsidies and/or traded in the market, either in balance sheets as assets and liabilities, whether in net incomes. On the other hand, there is little discussion about the ability to generate future cash flows by CER assets during the creation phase which occurs within the company's internal efforts, and which require different accounting processing to those discussed so far.

In this same line of thought, Dhar (2012) also points out that, in accounting terms, two types of issues should be discussed by the profession – one referring to the financial implications of emissions trading for developed countries' entities; and another referring to financial implications concerning CDM projects in entities in developing countries, because they have different financial characteristics.

Thus, in view of the existing panorama concerning carbon market negotiations, the IASB, alongside the FASB, resumed discussions as to the emissions trading project in May 2008. However, at that time, no decision was made by the Council of Directors. The new project sought to address accounting of all the rights and obligations resulting from emissions trading programs, also including discussions concerning the accounting of activities undertaken by enterprises which aimed at receiving tradable rights in future periods, as is the case of CERs under the CDM (IASB, 2008; Ascui and Lovell, 2011; IASB, 2013).

These discussions were later resumed, based on the fact that IASB had to present an approach capable of enabling the accounting recognition of carbon credits, both in developed and in developing countries. Thus, a research project was prepared by an IFRS Foundation team, to guide the discussions of that body as of September 2014 (IASB, 2014).

The Project Emissions Trading Schemes – research project presented (i) basic information on the characteristics of emissions trading programs geared to developed countries (cap and trade[8]) and developing countries (baseline and credit); and (ii) discussions about accounting issues referring to the initial recognition of carbon credits in both emissions trading models mentioned (IASB, 2014).

This document adopted the IAS 38 – Intangible Assets to guide discussions concerning the accounting processing that can be attributed to carbon credits, both in developed and in developing countries (IASB, 2014).

Facing the above, what can be expected is that new discussion by the IASB no longer "focuses on the financial position at the reporting date", as had been happening up to then, to also include "the implications of expected future events", which must be considered "to the extent that they throw light on the existence of assets and liabilities at that date" (Cook, 2009, p. 465).

In the absence of standard guidelines established at an international level up to then, different accounting processing are being considered by companies, facing the challenge of deciding which method is most suitable and acceptable, and whose differentiated reflexes are being driven to the market. Thus, companies also have the responsibility of explaining this processing to the market, so that their environmental socioeconomic performance is understood by external users (Deloitte, 2007; Bebbington and Gonzáález, 2008; Fornaro et al., 2009; Pahuja, 2012).

2.2 Accounting for carbon credits in Brazil, China and India

Based on analyzes carried out in Brazilian, Chinese and Indian literature in favor of an accounting processing that can be attributed to CERs and to expenses incurred by companies in their respective countries – when implementing CDM projects within their production processes –, it is possible to infer certain characteristics, as follows.

So far, up to the development of this research, there are no guidelines referring to the accounting recognition and measurement of CERs by international regulatory bodies, a fact

that may be contributing to the low disclosure rate of segregated evidence, in traditional financial statements, of information concerning the financial flow of CDM projects that are being implemented in developing countries (IASB, 2013; IASB, 2014).

Concerning the three countries studied, Brazil is the one with the lowest levels of legal guidelines concerning this subject (CVM, 2009), and whose discussions have mainly revolved around the country's academia (Ribeiro, 2005; Bito, 2006; Ribeiro, 2007; Ferreira et al., 2007; Perez et al., 2008; Bufoni e Ferreira, 2010; Rocha, Silva Júnior, Andrade, and Ramos, 2010; Santos et al., 2011).

In China, state influence on the implementation of CDM projects in company productive processes has guided academic discussions by allocating accounting processing directed to local government requirements, in which are specified the criteria necessary to enable CER negotiations by companies in that country (China, 2005; Zhang, 2011; Tang, 2011; Wang, 2011).

On the other hand, India's local regulatory agencies issued their notes of guidance on the accounting of CERs, in which traditional accounting concepts can be strongly identified (ICAI, 2012). In contrast, that country's academic literature has been scarce in international scientific journals, so that the prevalence of the topic revolves around existing legal guidelines (Agrawal, 2006; Bothra, 2010; Ray and Ray, 2012; Dutta and Dasgupta, 2012).

The point of greatest consensus among existing legal guidelines and scientific research in Brazil, China and India revolves around the fact that CERs have all the characteristics stated in the definition of **asset** and, as such, must be recognized and measured in financial statements. On the other hand, no consensus was envisioned consensus as to in which asset group CERs should be classified, whose understanding, in the countries surveyed, basically revolves around classifying them as **financial instruments, stocks and/or intangible assets**. However, all the classifications of possible asset groups discussed by academia for their recognition ran into the practical impossibility of doing so, considering the accounting guidelines issued by the International Accounting Standards which were adopted in these countries.

With respect to the guidelines concerning measurement bases that could be adopted for CER valuation, again no consensus was found in the countries under review. However, we found that, in Brazil, in China and in India, the trend of most guidelines referring to the subject revolve in the same direction as the legal guidelines issued by international accounting standards, such as: a) Financial instruments: fair value measurement; b) Stocks: at cost measurement or net realizable value; c) Intangible assets: initial measurement at cost and subsequent, at fair value. **Thus, measurement of CERs has effectively been little discussed as ane asset that has the capacity to generate future economic benefits**, because the prevalence of existing accounting deliberations in the countries in question has revolved around the measurement of values spent or received in periods past or present, without envisioning future projections that are consistent with the characteristics of CERs.

In this context, the accounting processing that can be assigned by companies in developing countries, so far, has failed to reveal information concerning the economic flow of CERs under development, whose CDM projects have already been approved by the UNFCCC and are capable of providing future economic benefits to companies, for periods revolving around 10-21 years, with characteristics consistent to those contained in IAS 38 – Intangible Assets (IASB, 1998).

With regard to discussions about the recognition of CERs as intangible assets, existing literature in the countries concerned has been focused basically on expenditure in the physical implementation of CDM projects, because CERs are developed internally by companies in Brazil, China and India, countries which harbor legal impediments to the recognition of

intangible assets, whose acquisition costs are not clearly defined (Bito, 2006; Perez et al., Santos et al., 2011; Xiaozhu and Yunyun, 2011; Zhang, 2011; Agrawal, 2006; ICAI, 2012).

In legal terms, IAS 38 (IASB, 1998, para. 24) states that the recognition of intangible assets by business entities must be carried out only if the cost can be measured reliably, for "an intangible asset shall be measured initially at cost" to able to be shown in financial statements.

It is worth mentioning, on this occasion, that specifications concerning the use of the concept of fair value, accepted by IASB, for measurement of certain equity items, were centralized with the publication of IFRS 13; however, the latter specifies in its paragraph 5 that this standard "applies when another IFRS requires or permits fair value measurements or disclosures about fair value measurements" (IASB, 2011a, para. 5). IAS 38 (IASB 1998) had also adopted this approach, which means that intangible assets should be measured in compliance with this standard.

In addition, for the specific case of CERs, Perez et al. (2008, p. 63) explained that, in legal terms, "CER cannot be accounted for as assets, since they were developed internally and are not recognized by competent authorities as marketable securities". According to the authors, this occurs because each country must issue internal regulations for the effective registration of CERs, since the Kyoto Protocol does not have force of law.

In this sense, the existing legal limitations, both in IFRS standards and in national regulator bodies, have prevented measurement and recognition of the fair value of CERs as assets that were internally generated by business entities, whose securities are already being traded in carbon markets even before approval and registry of CDM projects by the UNFCCC.

Understanding by regulatory bodies has led intangible assets developed internally in the entities that do not have national regulations, such as CERs, to not be measured and recognized by accounting, which has registered only the values spent for the physical implementation of CDM projects – which, as we know, do not adequately represent the future cash flows that companies will obtain.

For an asset to be able to represent, in fact, future cash flows, as is the case of CERs, it is necessary to employ the present value method, based on their expected market values. This assertion is in line with the teachings of Hendriksen and Van Breda (1999, p. 391), who, when explaining the measurement of intangible assets, emphasized that "in principle, the most informative measure is the present value of its projected benefits".

Ribeiro (2005), in turn, pointed out that, in fact, the use of the present value method would be quite adequate for the measurement of carbon credits, considering that their expected benefits should occur over several subsequent years.

In this same line of thought, Bothra (2010, p. 5), like other authors, believes that permissibility for recognition of intangible assets should be wider, in order to allow for the recognition of equity items developed internally by companies. In the opinion of the author, "once the CER are approved by the Board, these should be recorded as intangible assets… as they meet the criteria of 'Intangible Assets' as defined in the Standard".

In the case of measurements carried out at fair value, the IFRS 13 itself, in paragraph 72, "establishes a fair value hierarchy that categorizes into three levels… the inputs to valuation techniques used to measure fair value'. This hierarchy "gives the highest priority to quoted prices (unadjusted) in active markets for identical assets or liabilities (Level 1 inputs) and the lowest priority to unobservable inputs (Level 3 inputs)". (IASB, 2011a, par. 72).

Thus, fair value measurement will be based on values quoted in active markets, for which the use of evaluation methods for pricing of constant inputs in equity balance items will not be required. If it is possible to carry out this measurement in active markets to which the entity has access at the date of measurement, items will be valued at Level 1.

For cases in which information concerning the equity item to be evaluated are observable, either directly or indirectly in the market (except for listed securities –Level 1), its measurement should be considered at Level 2, and it is possible to use evaluation methods, such as present value. As for the cases in which relevant information pertaining to the equity item to be evaluated by the entity is not available, its measurement should be classified at Level 3.

Thus, the IASB prioritizes assessments at fair value, based on values quoted in active markets, and that do not require evaluation methods. If this is impossible, however, estimated fair value may occur based on the significant information available.

Regarding the use of the present value method for evaluating equity items, significant information available on the market is: (i) the market price of the equity item to be evaluated; (ii) the expected cash flow from the equity item; (iii) a discount rate that accurately reflects the value of money over time; and (iv) the number of years of useful life offered by the asset item to be evaluated. Thus, the degree of reliability of such information will define at which hierarchical level the estimate of fair value can be classified, if at Level 2 or Level 3.

Therefore, it is understood that, with registry of CDM projects by the Executive Council, CERs are likely to be recognized as **intangible assets** that are developed internally by the CDM project host entities, and whose measurement should be carried out with support by the present value method on their market values for the entire period of project activities. This methodology will demonstrate the economic value of CERs closer to reality, and they can be included at Level 2 of the fair value measurement established by IFRS 13.

Given the above, this research presents a proposal for the accounting measurement of CERs that can be carried out when CDM projects are registered by the UNFCCC Executive Board. Therefore, the present value method on their market values will be used, adopting as basis the 'Emission Reduction Estimates of projects', year by year, for the entire period of activity, in order to allow the disclosure of the CERs' ability to generate future economic benefits within Brazilian, Chinese and Indian companies.

3 Proposal for accounting measurement of carbon credits

3.1 Proposal for accounting measurement of carbon credits of CERs

CDM projects implemented in companies located in developing countries begin to generate CERs after being approved by the DNA of each country, and facing their registration with the UNFCCC. On that occasion, CERs **then represent a potential for future benefits** to the entity that implemented the projects and, as such, could be measured and recognized in accounting, at fair value.

To make the approval of CDM projects by the DNA possible, its proponents must specify, among other factors, the **estimated potential** for reduction of GHG emissions in the atmosphere[9], along with the respective **period** during which they present propensity to obtaining CERs, which may include a maximum **10 years** for fixed period projects and/or **7 years** for renewable period projects, which can be twice renewed, thus covering a period of 21 years of propensity to obtaining CERs (MCT, 2011a).

CDM projects that are approved and registered by the UNFCCC platform, and implemented in Brazil, China and India during the 2005-2012 period present, in most cases, **constant estimates of emission reduction** for all periods subsequent to approval, as well as for periods in which renewal may occur, if applicable.

To make measurement of CERs resulting from the implementation of CDM projects possible, Ratnatunga et al. (2011, p. 133) presented a calculation model, from which "valuing an organization's capability of producing carbon credits" would be possible at fair value; they

called it the Environmental Capability Enhancing Asset – ECEA, defined by the authors as "the total intangible capacity of an entity to produce carbon credits".

According to Ratatunga et al. (2011), by knowing the values of emission reductions, carbon prices on the market in each year of the achieved reductions, and, if possible, by using as a basis a certain discount rate, the present value of future cash flows would be the ECEAs themselves. Subsequently, any changes that occur between the 'real' and the 'recognized' should be adjusted by companies, every year.

Thus, applying Equation 1 of the model proposed by Ratnatunga et al. (2011), it is possible to measure CERs as intangible assets belonging to entities located in developing countries, using the present value method, in order to achieve the economic goals of accounting measurement.

Thus, the variables referring to the estimated amount of CERs and the respective period in which they are generated can be obtained from the CDM projects implemented in the countries under review. It is noteworthy that, upon later issuance of the CERs, adjustments should be made to adapt the established quantities of emission reductions to their actual amounts of CERs to be issued by the UNFCCC, every year.

On the other hand, it should be emphasized that in Brazil, China and India there are no formalized active markets for selling CERs, also because their commercialization must be carried out with entities located in developed countries, which have the need to acquire them so that, where appropriate, they contribute to the completion of their emission reduction goals imposed by their country's adhesion to the Kyoto Protocol.

So, if formalized active markets for selling CERs do not exist in Brazil, China and India, the **fair values** of CERs can be obtained from European and North American carbon markets, where they are being in fact negotiated, with values defined by formalized active markets already established in those regions.

By having (e) projects**'** emission reduction estimates, (ii) the period over which they will be generated, and (iii) the fair value of CERs, it is possible to obtain the future estimated economic benefits from the implementation of CDM projects which, when registered by the UNFCCC Executive Board, can be then characterized as **intangible assets** belonging to the entities that developed them.

However, for their recognition to be possible, future benefits should be reduced to present values, in order to presently reflect their future ability to generate benefits. To this end, a discount rate defined by the entity should be used; it should be able to reflect, with the highest possible level of credibility, the value of money over time, and offer market reliability. These characteristics are envisioned in the **Euribor Interest Rates**, for example, because they are based on average interest rates in interbank loans made in euros, which are used by many banks in the European market, where CERs have an active market.

Thus, we can see that the characteristics involving CERs that are internally generated by entities in developing countries permit the use of the **present value** method, **based on fair values**, to carry out measurement. This is one way to enable their recognition as **intangible assets** in the financial statements of these entities, in order to highlight information referring to the cash flow of CDM projects implemented in developing countries.

We must highlight that, in China, CERs can only be considered company assets **if, and only if**, the CDM projects that they will result from have contracts with investors from Kyoto Protocol Annex I countries, whose information is available at the UNFCCC website for public consultation, project by project.

Facing this fact, it is understood that the accounting measurement of CERs should take into account specific characteristics referring to the equity item, in order to enable its recognition and disclosure to external users, as follows.

CERs are characterized as **intangible assets** at the time CDM projects **are approved by the relevant government agency** (that is, registered by the UNFCCC Executive Board). From that moment on, they have the ability to generate future economic benefits that will influence the cash flow of entities, arising from improvements in the sustainable development of non-Annex I countries that have ratified the Kyoto Protocol in the past, in order to generate real and measurable guarantees towards the mitigation of climate change at a global level

Since they have characteristics of intangible assets developed internally in the business processes of entities in countries that are not included in the Kyoto Protocol's Annex I, CERs do not present any acquisition costs in these locations, a fact that leads to the need for current market values to be used (**output values**) for their **measurement at fair value**. These values can be obtained from segments of consolidated sales markets in developed countries, where contracts for their commercialization are being established, with values varying in accordance with the demand generated by global investors.

Given the long period during which they will be generating future benefits, the **initial measurement** of CERs must be reduced to their **present value**, adopting as basis **active market values** at the moment projects are registered, with a financial projection about the constant potential amounts of estimated GHG emission reductions in the atmosphere, for the entire period of their approval by the competent government agency, using a discount rate – for example, the Euribor rate. These **intangible assets** are expected to be recognized against the **equity** of the CDM project host company (unrealized profit), until the moment they occur.

In the specific case of CERs whose initial measurement was based on estimated amounts of GHG emission reductions in the atmosphere, in CDM projects, **subsequent measurements** will be needed, so as to make annual adjustments up to **actual issuance** of CERs by relevant government entities. So, as actual emissions of CERs occur, the amount that was originally registered is reduced, leading to subsequent measurements of assets with a corresponding adjustment of the amount registered in equity.

Thus, **subsequent measurements** of CERs should be reduced to their **present value**, also using also, as a basis, active market values at the time of their **issuance** by relevant government authorities, with a financial projection about the **actual quantities** of CERs issued at the end of each period. The variations should be registered, every year, also in the equity of companies. The **accounting value** shall be established over the actual amount of CERs, according to carbon prices available in the market and, when there is impairment loss, this should be recognized in the equity of the companies.

It is noteworthy that the time horizon to calculate the present value will include the period from the **moment of CDM projects' approval to the last date of estimated reduction of GHGs in the atmosphere predicted by these projects**. Just as for establishing the discount rate, the precise identification of the time horizon is essential for correct calculation of the present value of CER measurements.

Thus, the accounting value of CERs, registered in companies' equities, must be transferred to retained profits **only at the moment they occur** (delivery) for Kyoto Protocol Annex I countries' investors. At that moment, costs and expenses incurred in their development should also be transferred, as well as recognized the amounts spent on their commercialization, which must be deducted from the proceeds from CER sales.

3.2 Population, data selection and sample selection

Because of the objective of this research, its **population** is characterized as Brazilian, Chinese and Indian companies that presented financial information to external users through Securities Markets regulatory agencies in Brazil, China and India, and that have also implemented CDM projects during the 2005-2012 period, ranking in the "Registered" status

at the UNFCCC website.

Obtaining **quantitative data** to be used to test the statistical hypothesis proposed in the study result from information referring to companies and CDM projects that made up the sample, from which were obtained: (i) the financial information referring to the Equity (E) of companies that have their shares listed in the capital markets of Brazil, China and India, and (ii) the 'Emission Reduction Estimates of projects' of CDMs, available at the UNFCCC website.

The **data collection** referring to the **financial information** of the companies that have made themselves available via regulatory bodies in the securities markets of the countries under study was carried out through Thomson Reuters Eikon's Electronic and Financial Database, on July 30, 2013. Thus, when collection was carried out, financial information was obtained, **converted into euro**s, referring to the Equity (E) of 380 Brazilian companies, 2,584 Chinese companies and 4,219 Indian companies, for the period under review.

Collection of data concerning **CDM projects** and under Status "Registered" in the UNFCCC site, on the other hand, was carried out by the Bloomberg Economic and Financial Database, on July 29, 2013, at which time were available for analysis a total of 289[10] projects registered by the Brazilian DNA; 3,651 projects registered by the Chinese DNA; and 1,296 projects registered by the Indian DNA, for the 2005-2012 period.

However, it was necessary to carry out new searches directly in the UNFCCC site, for supplementary information that was crucial to implementing the research, given the fact that it did not include, in its entirety, descriptions concerning the names of the receiving agencies in each country (**host party**), in the Bloomberg Economic and Financial database, at the date mentioned above, whose information was characterized as the **only link** between the CDM project database (Bloomberg) and the financial information database (Thomson Reuters Eikon). These searches were carried during the October 2013-May 2014 period.

Subsequently, on September 01, 2014, new searches were carried out in the UNFCCC website, in order to update information referring to CDM projects registered by the agency during the 2005-2012 period.

Thus, this research was carried out based on CDM projects located in the "Registered" Status in the UNFCCC site over the 2005-2012 period, whose records were finalized by the body prior to September 01, 2014, containing: **299** projects registered by the DNA of **Brazil**; **3,682** projects registered by the DNA of **China**; and **1,371** projects registered by the DNA of **India**, adding up to **5,353 projects**, that is **74.69%** of the total implemented in all developing countries that ratified the Kyoto Protocol.

To allow **measurement** to be applied to the fair value of 'Estimates of Project Emission Reduction' approved by the companies that make up the research, we from the Bloomberg Financial and Economic Database, on July 29, 2013, the Interest rate EURIBOR – Euro Interbank Offered Rate[11] (average annual rates), to adjust future flows of economic benefits of CER estimates to the present value. Rates to be used are listed in Table 1.

To the same end, we also collected information from the Bloomberg Economic and Financial Database, on December 5, 2013, referring to the historical series of carbon credit prices, based on contracts that possessed liquidity in European stock exchange markets over the 2005-2012 period.

With these results, we observed that only Intercontinental Exchange, Inc. (ICE) – ICE Futures Europe presented the historical series of carbon credit values for the whole period covered by the survey (2005-2012). Thus, values used were referring to the last business day of each year, as a basis for fair value measurement of the 'Estimates of Project Emission Reduction' of CDMs approved by the DNAs of Brazil, China and India, according to Table 2.

With the information listed in hand, we proceeded to organize the data, to enable the **selection of the survey sample**, separately for Brazil, China and India.

Next, we excluded from the sample the projects whose companies did not provide their equity (E) values over the respective accounting periods for approval of their CDM projects; and also the projects that were renewed during the survey period, since, when they were fisrt registered, we considered the entire project duration period for those that were renewable. We also excluded the projects that were registered by the Chinese DNA and presented no investor country(ies) in the UNFCCC website by September 01, 2014, and whose CERs, according to Chinese law, when issued, shall be retained by the state because they are characterized as 'state assets', up to their commercialization by CDM project 'receiving agencies'.

After carrying out these steps, the resulting **sample** for data processing and evaluation was made up of: 31 CDM projects referring to 15 Brazilian companies; 379 CDM projects belonging to 56 Chinese companies; and 318 CDM projects referring to 183 Indian companies.

3.3 Processing and assessment of data

The methodology used for the **processing and evaluation of survey data** revolved around verifying the existence or not of statistically significant mean differences in the group of balance sheets (Equity) of companies that make up its sample. Therefore, the real situation of Equity (original E) was observed in comparison to the projection of accounting measurement of CERs at fair value in the same group of equity accounts for the first project approval stage (1st phase projected E), and, also, for the overall period of existence/approval of projects (general projected E), if they are renewable.

For the projection of the fair value measurement of CERs, we adopted as base the calculation model proposed by Ratnatunga et al. (2011, p. 132), carried out according to equation 1 by the same authors, which was adapted for this research, as follows:

X = Sequestration of Y tons of CO_2 emissions = $ Equation 1
Where: X – represents the intangible asset;
Y – represents the carbon sequestration capacity, in tons;
$ – represents the value of the ton of carbon, at market prices

Thus, adopting as a basis the projects selected for processing and evaluation of data, based on information from annual estimates of CDM project emission reductions (estimated annual Emissions Reductions – ERs), we carried out multiplications to obtain 'total estimate of ER (1st phase)', project by project, in order to obtain the 'validity periods (1st phase)'. We proceeded in the same way to obtain the "total estimate of ER (general)' and the respective 'validity periods – general total', aiming to cover the total predicted activity development of renewable projects. Also, we added to the same database the 'value of the ton of CERs', which, when multiplied by the 'total estimate of ER (1st phase)', led to the 'total amount of ERs (1st phase)', and, when multiplied by the 'total estimate of ER (general)', led to the "total amount of ERs (general)'.

The interest rates adopted as basis for carrying out the survey (EURIBOR – Middle Rate) were also added to the same database, for each year, in accordance with the respective project registration periods and the value of equity (E) of its existing companies, so as to achieve the present value calculation, individually, for each project.

Thus, it was possible to reach the 'present value (1st phase)', using variables 'interest rate', 'validity period (1st phase)' and 'total amount of ERs (1st phase)'. And, also, the 'present value (general)', using variables 'interest rate', 'validity period (general)' and 'total amount of ERs (general)', separately for Brazil, China and India.

Next, 'present value (1st phase)' was added to 'original E' to obtain the variable 'projected E (1st phase)' and the 'present value (general)' was added to the 'original E' to

obtain the variable 'projected E (general)'. Thus, the statistically tested variables were: 'original E', 'projected E (1st phase)' and 'projected E (general)'.

However, to enable one single measurement per year for every company, no matter how many projects it registered over that period, we added all the variables 'present value (1st phase)' and 'present value (general)' from one same company in a specific year, for all periods of the survey, so that the projects registered over years 2005-2012 came to be represented by one single variable for each year, in a specific company. The variable 'original PL' was considered only once a year, avoiding duplication in calculations.

Following these steps, **variables for processing and statistical evaluation of the data** were obtained, resulting in the following: 20 observations for Brazil, referring to 15 Brazilian companies; 102 observations for China, belonging to 56 Chinese companies; and 255 observations for India, referring to 183 Indian companies; as shown in Tables 3, 4 and 5, respectively.

For **processing** and **statistical evaluation of the variables** ('original E', 'projected E (1st phase)' and 'projected E (general)'), we initially used the non-parametric tests of Shapiro-Wilk and Kolmogorov-Smirnov, whose "goal is to determine if a sample comes from a population with normal distribution" (Fávero, Belfiore, Silva, and Chan, 2009, p. 112).

The Shapiro-Wilk test was used to test whether variable distribution is normal or not in small samples (fewer than 50 observations), and the Kolmogorov-Smirnov test was used for the same purpose, for large samples (over 50 observations) (Maroco, 2007; Hair Jr., Black, Babin, Anderson, and Tatham, 2009; Fávero et al., 2009).

By performing the aforementioned tests, we found that the data of all the variables was not normally distributed. Thus, next, we used the non-parametric Wilcoxon test (Maroco, 2007; Fávero et al., 2009).

We should also point out that, because paired samples were used for processing and statistical evaluation of data, in order to make comparisons between two average populations made up of the same individuals, we chose not to assign any procedure for processing of possible outliers in the survey sample, since the same individual affects both samples in the same way (Favero et al. 2009).

Thus, we adopted as original values the real situations in Equity ('original E'), compared to projected values in the same group of accounts 'projected E (1st phase)' and 'projected E (general)', from the companies, while continuous variables were analyzed statistically.

Processing and evaluation of collected quantitative data was carried out using the IBM SPSS Statistics 22 statistical system, necessary for applying statistical tests that provided evidence for the verification of the statistical hypotheses of this research, such as:

H_0 – The fair value measurement of CERs as assets, at the time CDM projects were approved does not cause a statistically significant impact on the equity of the Brazilian, Chinese and Indian companies.

H_1 – The fair value measurement of CERs as assets, at the time CDM projects were approved causes statistically significant impacts on the equity of the Brazilian, Chinese and Indian companies.

The use of the above listed statistical tools provides the researcher with information about the direction of the differences for each pair of variables that, in the case of this research, revolves around verifying whether there are statistically significant differences, with the measurement of the fair value of CERs in the group of balance sheets (Equity) of companies that make up its sample.

3.4 Empirical research results

Initially, we tested the normality of the variables with the support of SPSS, applying the

non-parametric tests of Shapiro-Wilk for small samples (Brazil) and Kolmogorov-Smirnov tests for larger samples (China and India), with a level of significance of 5%. The null hypothesis (H_0) states that the sample comes from a normal distribution, and the alternative hypothesis (H_1) states that the sample does not come from a normal distribution (Maroco, 2007; Favero et al., 2009). Test results are presented separatey in Table 6, for Brazil, China and India, respectively.

With the results obtained for the companies of the countries under review, we can infer that the three variables (Original Equity, Projected Equity and Projected Equity 2) do not meet the normality assumption, because the significance of the statistical result was below the level of significance established by the test, leading to the rejection of the null hypothesis, whose probability was less than 0.001 for all variables.

Considering that, when applying parametric testing, it is necessary that all variables meet the normality assumption, we used the non-parametric Wilcoxon test to compare two population averages, based on paired samples (Favero et al. 2009). The average test is able to explain whether the direction of the differences for each pair of variables is statistically identical or not. So they compared the averages of the 'Original Equity' variables with 'Projected Equity 1' and also 'Original Equity' with Projected Equity 2', with a 5% significance level. The null hypothesis (H_0) states that there is no difference between the groups, and the alternative hypothesis (H_1) states that there are differences (Maroco, 2007; Favero et al., 2009). Test results are presented separately for Brazil, China and India, in Tables 7 and 8.

With the results in hand, we can see that the pairs of variables 'Original Equity' and 'Projected Equity 1' as well as 'Original Equity' and 'Projected Equity 2', for the three countries, have statistically significant variations among themselves, as shown in Table 7. The results shown in Table 8 corroborate this statement, because the significance of the statistical results were below the significance level set in the test, which leads to rejection of the null hypothesis, whose odds were less than 0.001 for both variable pairs of the Brazilian, Chinese and Indian companies, which were carried out in a separate way.

These results provide evidence that the fair value measurement of CERs, and their recognition as intangible assets, to their respective disclosure in financial statements, may have a positive impact on group balance sheets of the Brazilian, Chinese and Indian companies that disclosed their financial information to external users through the securities market regulators from their respective countries, and also implemented CDM projects in their production processes during the 2005-2012 period.

Thus, the use of the present value method, highlighted by some of the literature as one of the most appropriate methods to achieving the economic goals of accounting measurement, would, in fact, based on the market value of the CERs, have allowed us to discover the present value of the expected cash flows resulting from selling these assets at the time CDM projects are registered by the UNFCCC Executive Board.

In this way, it would have been possible to carry out the recognition of CERs as intangible assets, developed through the productive business process of entities in Brazil, China and India, enabling the disclosure of the effects of future expected cash flows resulting from the implementation of CDM projects over the period of their execution.

Nowadays, however, in compliance with international accounting standards which have been adopted by Brazil, China and India, intangible assets developed internally in business processes must be recognized at cost which, as we know, does not in fact represent their economic value, since the costs involved in the bureaucratic process of obtaining CERs may be far below the market value of securities themselves (IASB, 2011b).

As demonstrated by this research, all the variables required to perform the accounting measurement of CERs at fair values are available in the market, with a high degree of

reliability and transparency, allowing for the economic valuation of this asset against its cost. With the use of this methodology, and if this information is available, measurement at fair value should be a priority when evaluating equity items.

The existing level of subjectivity in the accounting measurement process of CERs at fair value is arguably compensated by the level of the quality of economic information provided to external users, because it takes into account investors' future expectations of profits, enabling them to judge more safely.

With the applicability of the measurement model presented in this study, focused on valuation of the total intangible ability of an entity to generate carbon credits, the economic objectives involving the implementation process of CDM projects are then measured and divulged by accounting, thus enabling more accurate analysis in the process of making decisions and judgments by external users.

Measurement at fair value, in this case, is the link between the empirical world and the theoretical world, since it allows for understanding the characteristic of the phenomenon being measured, paving the way for evaluations of CERs as equity items capable of generating positive economic effects in the equity of entities located in developing countries.

Thus, the applicability of empirical research allows corporate entities located in developing countries to disclose, with high levels of credibility, future expected cash flows resulting from commercialization of CERs, through the use of measurements at current output values, with the use of the present value method for future projections discounted at current values, showing the increase generated in the equity of companies, with profits to be made in the future.

Considering the assumption of CER measurement at fair value, using the present value method, all the information necessary to this end are available in the market, with a high degree of reliability, allowing for the estimated fair value of this asset, with a hierarchical classification compatible to Level 2, defined in IFRS 13 (IASB, 2011a).

By using this methodology, information referring to the implementation of CDM projects and their future ability to generate CERs goes beyond the focus up to then assigned to the financial position of the entities on the date that financial statements are being prepared, revealing expectations as to future events, to be considered in that they shed light on the existence of assets and liabilities, on that date, that, as we know, will affect the equity situation of companies in various periods in the future.

With the accounting valuation model presented in this study, the E of the companies will demonstrate the increase in wealth resulting from operations carried out presently, and also, through assets maintained within the entity, from operations which will be carried out in the future. This information has the ability to enable analysis of the tendency of enterprises.

3.5 Limitations of the proposed model

In the accounting measurement model of CERs proposed by this research, certain limitations must be observed, namely:

Its discussions were limited to the regulated carbon market, failing to address specific aspects of the voluntary carbon market.

For model validation, the Euribor interest rate was used to discount at present values the expected future benefit flows, including in its configurations remuneration for risk protection; risks rates for the specific CER trade market were not observed.

Due to inaccessibility, we also did not observe the costs and expenses incurred from the development of CDM projects, and the expenses inherent to the commercialization of CERs, which may have been supported by the host companies of the projects. The knowledge and use of these values would enable the projection of net future cash flows expected from the

implementation of CDM projects.

The projection of the fair value measurement of ERs was carried out only as to the "Equity" of entities involved with research, and not as to the "Intangible Assets" accounts, in order to avoid possible duplications, in case there were already accounting records pertaining to these items in the accounting classification of the asset.

4 Final considerations

In quantitative terms, Brazil, China and India accounted for 74.69% of all CDM projects implemented in developing countries during the first phase of the Kyoto Protocol, that is, 2005-2012. Within that same time span, those countries also experienced major evolution in their accounting standards, with the adoption of International IFRS Accounting Standards – thereby demonstrating concern by the regulators of these countries as to their position in order to obtain the credibility of foreign investors regarding processing that is attributed to financial information by business entities in these places.

When it comes to international accounting regulations aimed at carbon bonds, very little had been done by the IASB up to then. However, from 2008 on, given the growth of negotiations concerning the carbon market, the agency went on to discuss a project that is able to address the accounting of tradeable carbon credits, both by developed and developing countries.

Nationally, the regulatory bodies of Brazil, China and India also made few efforts towards the accounting processing that must be used on CERs. In Brazil, we observed one single manifestation of the CVM to claim that CERs could not be treated as derivatives. In China, we saw that state participation in the implementation of CDM projects, within business processes, directed the local accounting discussions to meeting the criteria set by the State, so as to allow the negotiation of CERs by companies. In India, we observed that there were guidelines issued by the State on the accounting of CERs, in which traditional accounting concepts were strongly identified.

When it comes to academic literature, the three countries under study have scientific discussions revolving basically around the accounting classification that should be used to enable recognition of CERs, in order to disclose them in the financial statements of the entities. In this sense, the only point in which we glimpsed certain consensus in literature is its classification as entity asset; there is no agreement about what asset group CERs should be classified in. However, all possible asset group classification for their recognition, discussed in academia, ran into the practical impossibility of performing them, considering the accounting guidelines issued by IASB, which were adopted in the respective countries, and the lack of national regulation in each one of them.

This same lack of consensus can be observed when verifying the academic guidance that refers to measurement bases that could be used for valuation of CERs in the three countries in question. However, we found that, in Brazil as well as in China and India, there is a tendency to attribute bases of accounting measurements to CERs in compliance with the statutory guidance issued by international accounting standards.

Given the lack of legal advice by regulatory agencies, and the lack of agreement in academia, measurement of CERs, effectively, has been little discussed as an asset that has the capacity to generate future economic benefits, since, the accounting profession has mostly discussed the processing that they should be given, adopting as basis for measuring them the amounts spent and/or received in past or present periods, without envisioning future projections that are consistent with the characteristics of CERs.

The proposed accounting measurement of CERs that was developed in this study, used as a starting point the characteristics of the asset in question to verify, in Brazilian, Chinese and

Indian companies that disclosed their financial information to external users and also implemented CDM projects during the 2005-2012 period, the incidence of impact in their Es, if this measurement had been carried out by companies in the survey.

In this sense, measurement at present value, at the time of approval of CDM projects by the appropriate government agency (registration by the Executive Council), was used to measure, based on the market value of CERs and the estimated potential for GHG ERs in the atmosphere, along with the respective period during which they are likely to obtain CERs, and adoption of the Euribor discount rate, at the value of CER intangible assets, in order to facilitate their recognition in contrast to the E of the listed companies in the securities markets of Brazil, China and India.

Facing the applicability of the proposal in question, a reflection of the economic result should be evidenced in the E, separately, as an equity item not paid for in the current period, but that, as we know, will impact it in the future. Thus, the economic objectives referring to the implementation of CDM projects in the equity structure of these entities, which are seen as secondary, are now covered by accounting, in addition to the already known environmental benefits generated towards the sustainable development of these nations.

Considering the possibility of measuring CERs at fair value, IFRS 13 provides conditions to make their hierarchical classification compatible to Level 2, defined therein, in view of the fact that all the information necessary to this end are available in the market, so as to make possible the estimated fair value of this asset.

It is worth mentioning that, when it comes to market trading, where the values and the respective periods involving the future cash flow and the time required for reaching these values are known, the reliability of the discount rate to be used to reduce the future cash flow to present values is highly relevant. Thus, the Euribor interest rate was adopted in this research, because of its ability to reflect with greater accuracy the value of money over time, as well as to attract high reliability levels from markets.

With the empirical applicability of the “Accounting Measurement Model of CERs” developed by this research, it was possible to perform analyzes of existing market practices, enabling the validation of theoretical concepts available in accounting literature, facilitating the improvement of accounting sciences. This characteristic is what sets this research apart from the simulation developed by Ratnatunga et al. (2011).

Thus, with the results obtained through the processing and evaluation of research data, we can infer that the accounting measurement of intangible assets such as CERs, at fair value, in contrast with the group of entity assets of the Brazilian, Chinese and Indian companies, over the 2005-2012 period, would have played a statistically positive impact on the value of E in those companies.

With the development of this research, it was possible to reach its goal, since we proposed an accounting measurement model at fair value of CERs generated in the production processes of Brazilian, Chinese and Indian companies, to make possible the recognition of assets arising from the implementation of CDM projects during the 2005-2012 period.

Similarly, positive economic impacts were identified in the equity of Brazilian, Chinese and Indian companies, caused by the recognition and disclosure of future flows of economic benefits of CERs, at the precise moment their existence is accepted by the UNFCCC.

With the research findings, we can infer that the use of present value method, based on fair values available in active markets, enables the measurement of CERs at the time of registration of CDM projects by the Executive Board, providing the disclosure of future expected cash flows from their commercialization, in future periods.

These findings also make it possible to infer that a new approach must be adopted by the accounting profession so as to review old concepts (such as the measurement of future values discounted to present values) for evaluation of new assets (such as CERs) that, as shown in

this research, has found it difficult to process them according to their characteristics, especially when observing the legal aspects applied by accounting regulators.

The new approach adopted by the IASB, allowing the use of fair values for accounting measurement of certain balance sheet items, was a large step in that direction. However, the agency still lacks new developments to enable the accounting measurement of CERs as assets, providing discussions focused on the accounting recognition of intangible assets developed internally by companies in order to enable their evaluation at fair value with support from the present value method for reduction of their future values.

Among limitations for carrying out this research, we list, initially, the difficulty in obtaining data, such as the differences in the official names of companies registered by the regulatory authorities of Securities Markets in Brazil, China and India, and the name of the 'host party' of CDM projects registered in the UNFCCC site, a fact that may have caused a negative difference between the projects which were in fact approved by the companies and those used as research sample for measurement of CERs. This limitation, if overcome, will ratify its results.

Subsequently, the difficulties in obtaining the historical series of carbon credit prices over the research period should be mentioned, since it was only possible to obtain one single historical series for the entire period, in Bloomberg's Economic and Financial Database. We highlight that the unavailability of this information in the academic environment can derail the development of new research.

In future research, we suggest further measurements of CERs at fair value to be carried out, using the historical time series of carbon credit prices in other markets, and use of other discount rates to reduce the future cash flow of CERs at present value, so as to allow comparability between the results obtained from this research.

Facing the validation of the results obtained through empirical research, we understand that further discussions focused on the accounting recognition of CERs should be carried out in greater depth, adopting as a basis for discussions the "Accounting Measurement Model of CERs" proposed by this research.

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Appendix

Table 1 – Euribor interest rates

Period	Euribor – Middle Rate
2005	2,335
2006	3,440
2007	4,448
2008	4,825
2009	1,610
2010	1,352
2011	2,008
2012	1,108

Source: Research data (2015).

Table 2 – Values of carbono credits ton (euro)

Date	Exchange	Ticker	Value of Carbon Credit ton (€)
30.12.2005	ICE Futures Europe	MOA Comdty	21,10
29.12.2006	ICE Futures Europe	MOA Comdty	6,45
31.12.2007	ICE Futures Europe	MOA Comdty	0,02
31.12.2008	ICE Futures Europe	MOA Comdty	15,45
31.12.2009	ICE Futures Europe	MOA Comdty	12,31
31.12.2010	ICE Futures Europe	MOA Comdty	14,02
30.12.2011	ICE Futures Europe	MOA Comdty	7,03
31.12.2012	ICE Futures Europe	MOA Comdty	6,48

Source: Research data (2015).

Table 3 – Variables for statistical analysis of the date – Brazil

Host country	Year of approval	Authorized participant (Brazilian company)	Equity Original E	Projectec E (1st phase)	Projected E (general)
Brazil	2009	AES Tietê S.A.	154.564.764,04	155.230.057,08	156.539.448,97
Brazil	2011	AES Tietê S.A.	889.539.570,13	907.850.156,35	907.850.156,35
Brazil	2006	BRF S. A.	747.641.429,68	748.757.957,67	748.757.957,67
Brazil	2009	BRF S. A.	1.268.083.397,48	1.273.940.927,07	1.273.940.927,07
Brazil	2012	Brookfield Energia Renovável S.A.	1.246.310.735,14	1.248.945.528,80	1.255.074.745,24
Brazil	2008	Celulose Irani S.A.	38.784.998,52	43.104.960,68	45.485.279,30
Brazil	2012	Companhia de Saneamento de Minas Gerais – COPASA MG	1.872.345.901,64	1.872.506.229,99	1.872.742.846,82
Brazil	2006	Cosan S.A. Indústria e Comércio	514.538.162,42	515.203.551,28	515.830.941,40
Brazil	2006	CPFL Geração de Energia S.A.	1.740.947.372,99	1.741.745.739,85	1.742.519.146,42
Brazil	2012	CPFL Energias Renováveis S.A.	2.918.685.513,24	2.930.236.146,97	2.941.349.232,27
Brazil	2010	Desenvix Energias Renováveis S.A.	264.132.997,26	265.510.179,75	268.466.821,31
Brazil	2008	EDP Energias do Brasil S.A.	1.503.921.593,87	1.513.284.387,61	1.516.578.901,64
Brazil	2010	JBS S.A.	6.688.425.261,39	6.694.892.462,50	6.697.299.300,87
Brazil	2006	Klabin S.A.	814.803.857,71	815.458.634,20	815.458.634,20
Brazil	2007	Petrobras - Petróleo Brasileiro S.A.	34.642.464.296,44	34.642.464.428,27	34.642.464.512,13
Brazil	2009	Petrobras - Petróleo Brasileiro S.A.	42.684.267.156,91	42.688.687.495,15	42.696.109.601,08
Brazil	2012	Renova Energia S.A.	267.154.317,58	279.094.874,56	296.717.064,40
Brazil	2006	Tractebel Energia S.A.	981.963.660,93	992.101.911,67	992.101.911,67
Brazil	2012	Tractebel Energia S.A.	2.249.977.037,60	2.259.592.161,58	2.273.782.415,88
Brazil	2012	Vale S.A.	59.283.880.361,60	59.284.854.614,41	59.285.496.013,62
TOTAL			**160.772.432.386,54**	**160.873.462.405,44**	**160.944.565.858,33**

Source: Research data (2015).

Table 4 – Variables for statistical analysis of the date – China

Host country	Year of approval	Authorized participant (Chinese company)	Equity Original E	Projectec E (1st phase)	Projected E (general)
China	2007	Anhui Conch Cement Co., Ltd.	685.150.502,32	685.157.608,83	685.157.608,83
China	2008	Anyang Iron & Steel Co. Ltd.	701.036.894,84	712.100.102,21	712.100.102,21
China	2010	Anyang Iron & Steel Co., Ltd.	1.068.537.712,47	1.091.916.815,87	1.091.916.815,87
China	2008	Beijing BBMG Group Co., Ltd.	805.092.161,94	810.873.833,27	813.933.697,31
China	2008	China Datang Corporation Renewable Power Co., Ltd.	116.773.106,10	176.061.482,12	208.645.379,49
China	2009	China Datang Corporation Renewable Power Co., Ltd.	297.963.696,78	375.534.368,24	488.200.523,94
China	2010	China Datang Corporation Renewable Power Co., Ltd.	393.267.427,73	653.475.695,08	1.086.470.250,88
China	2011	China Datang Corporation Renewable Power Co., Ltd.	942.575.244,16	1.001.843.778,75	1.075.084.819,06
China	2012	China Datang Corporation Renewable Power Co., Ltd.	1.112.366.813,42	1.177.570.734,12	1.268.717.686,22
China	2007	China Longyuan Power Group Co., Ltd.	190.846.563,42	190.874.585,33	190.892.239,99
China	2008	China Longyuan Power Group Co., Ltd.	268.318.288,23	304.297.002,87	324.064.863,77
China	2009	China Longyuan Power Group Co., Ltd.	408.604.654,28	521.585.266,35	681.562.795,28
China	2010	China Longyuan Power Group Co., Ltd.	2.235.803.561,06	2.581.428.215,52	3.072.553.924,21
China	2011	China Longyuan Power Group Co., Ltd.	2.632.775.386,47	2.835.448.104,38	3.082.379.508,65
China	2012	China Longyuan Power Group Co., Ltd.	3.119.766.707,49	3.158.457.071,76	3.217.584.066,18
China	2008	Chongqing Iron & Steel Co., Ltd.	595.188.488,19	625.741.996,63	642.577.117,46
China	2008	Chongqing Water Group Co., Ltd.	584.247.776,01	595.354.728,21	601.343.147,93
China	2010	Chongqing Water Group Co., Ltd.	729.383.129,11	780.196.124,64	889.285.381,32
China	2012	Chongqing Water Group Co., Ltd.	1.418.238.609,51	1.422.609.551,79	1.432.777.502,21
China	2008	Datang International Power Generation Co., Ltd.	2.752.278.022,29	2.759.448.150,12	2.763.242.834,23
China	2010	Datang International Power Generation Co., Ltd.	2.661.900.224,97	2.743.443.525,58	2.860.190.661,72
China	2011	Datang International Power Generation Co., Ltd.	3.476.907.910,88	3.485.745.160,38	3.496.406.538,55
China	2012	Datang International Power Generation Co., Ltd.	4.747.277.337,31	4.751.741.629,49	4.758.330.149,98
China	2010	Fujian Cement Inc.	149.029.463,32	154.511.551,28	154.511.551,28
China	2007	Gansu Qilianshan Cement Group Co., Ltd.	85.195.876,49	85.199.446,76	85.199.446,76
China	2010	GD Power Development Co., Ltd.	1.601.127.046,86	1.612.208.738,40	1.627.717.014,70
China	2010	Guangdong Baolihua New Energy Stock Co., Ltd.	303.547.515,44	311.527.955,66	322.696.184,95
China	2010	Guangdong Electric Power Development Co., Ltd.	946.584.170,98	952.762.106,59	961.941.373,38
China	2007	Guangdong Shaoneng Group Co., Ltd.	235.950.914,28	235.956.851,95	235.960.266,96
China	2012	Guangdong Shaoneng Group Co., Ltd.	368.251.603,74	376.236.862,77	388.021.719,27
China	2011	Guangxi Guiguan Electric			

		Power Co., Ltd	342.188.591,97	351.947.001,10	369.006.264,95
China	2009	Guangzhou Zhujiang Brewery Group Co., Ltd.	287.729.525,25	290.486.553,84	292.928.801,32
China	2011	Guodian Technology & Environment Group Co., Ltd.	696.481.622,92	706.080.925,00	717.661.653,79
China	2011	Henan Yinge Industrial Investment Co. Ltd.	230.941.710,35	235.206.729,70	235.206.729,70
China	2011	Huadian Energy Co., Ltd.	383.299.700,99	496.892.944,60	496.892.944,60
China	2007	Huadian Power International Co., Ltd.	1.299.752.822,53	1.299.780.055,93	1.299.797.259,20
China	2008	Huadian Power International Co., Ltd.	1.342.413.521,87	1.358.188.658,48	1.366.861.946,65
China	2009	Huadian Power International Co., Ltd.	1.161.713.183,74	1.174.637.005,68	1.193.442.425,54
China	2010	Huadian Power International Co., Ltd.	1.601.298.664,16	1.754.831.285,17	1.987.041.865,04
China	2011	Huadian Power International Co., Ltd.	1.801.599.629,01	1.831.031.974,84	1.859.944.203,46
China	2012	Huadian Power International Co., Ltd.	1.971.017.395,72	2.007.158.547,57	2.060.496.615,48
China	2007	Huaneng Power International, Inc.	4.059.678.300,07	4.059.698.924,37	4.059.711.766,51
China	2010	Huaneng Power International, Inc.	4.187.372.219,25	4.197.656.956,65	4.212.049.935,27
China	2011	Huaneng Power International, Inc.	5.982.904.664,56	5.998.724.727,14	6.020.721.942,83
China	2012	Huaneng Power International, Inc.	6.128.751.104,55	6.157.718.927,36	6.200.890.509,14
China	2009	Huaneng Renewables Corporation Ltd.	176.535.437,82	187.128.730,71	201.127.167,02
China	2010	Huaneng Renewables Corporation Ltd.	263.726.584,26	567.437.311,30	1.001.412.274,17
China	2011	Huaneng Renewables Corporation Ltd.	597.697.629,01	723.315.390,36	874.862.368,78
China	2012	Huaneng Renewables Corporation Ltd.	1.386.873.568,13	1.551.893.394,26	1.794.759.015,42
China	2009	Huaxin Cement Co., Ltd.	428.894.818,67	440.449.966,79	440.449.966,79
China	2010	Huaxin Cement Co., Ltd.	465.024.797,17	485.476.655,35	485.476.655,35
China	2012	Huayi Electric Co., Ltd.	225.443.377,16	229.375.159,17	235.552.498,49
China	2010	Hubei Energy Group Co., Ltd.	93.554.093,96	96.391.182,81	100.606.570,77
China	2011	Hubei Energy Group Co., Ltd.	968.285.745,40	971.744.739,66	975.917.717,45
China	2012	Hubei Energy Group Co., Ltd.	1.117.663.753,43	1.123.884.812,68	1.138.356.617,14
China	2012	Hubei Sanxia New Building Materials Co., Ltd.	94.370.125,22	96.927.032,70	96.927.032,70
China	2012	Hunan Valin Steel Co., Ltd.	1.624.041.557,11	1.631.294.631,01	1.631.294.631,01
China	2010	Inner Mongolia MengDian HuaNeng Thermal Power Co., Ltd.	348.434.883,39	360.305.399,62	380.826.551,54
China	2011	Inner Mongolia MengDian HuaNeng Thermal Power Co., Ltd.	461.263.268,89	467.179.516,63	474.316.958,51
China	2012	Inner Mongolia MengDian HuaNeng Thermal Power Co., Ltd.	578.283.818,96	582.382.144,24	588.430.561,11
China	2011	Jilin Yatai (Group) Co., Ltd.	822.754.355,52	829.254.947,34	829.254.947,34
China	2012	Jilin Yatai (Group) Co., Ltd.			

			957.043.066,16	964.057.948,07	964.057.948,07
China	2008	Liuzhou Chemical Industry Co., Ltd.	120.874.988,29	191.005.456,10	228.120.969,05
China	2008	Maanshan Iron & Steel Co., Ltd.	2.154.599.775,26	2.171.618.847,92	2.171.618.847,92
China	2009	Maanshan Iron & Steel Co., Ltd.	2.742.108.940,32	2.760.631.656,83	2.760.631.656,83
China	2009	Nanjing Iron & Steel Co., Ltd.	460.049.253,82	471.138.204,54	471.138.204,54
China	2007	PetroChina Company Ltd.	52.609.451.817,88	52.610.485.947,55	52.611.138.737,76
China	2008	PetroChina Company Ltd.	63.429.815.525,80	63.452.523.535,65	63.464.977.051,04
China	2011	PetroChina Company Ltd.	106.221.779.698,24	106.237.054.104,11	106.257.587.810,74
China	2009	Shaanxi Xinghua Chemistry Co., Ltd.	100.179.352,20	144.510.337,67	206.524.657,23
China	2012	Shaanxi Xinghua Chemistry Co., Ltd.	149.839.199,31	158.745.275,55	175.924.090,02
China	2008	Shanxi Taigang Stainless Steel Co., Ltd.	1.583.176.982,86	1.593.113.230,26	1.593.113.230,26
China	2008	Shanxi Zhangze Electric Power Co., Ltd.	325.973.312,11	344.168.663,34	354.147.348,75
China	2010	Shenergy Company Ltd.	2.002.738.741,52	2.030.055.749,46	2.068.284.543,82
China	2011	Shenzhen Energy Group Co., Ltd.	1.558.473.108,87	1.627.136.666,80	1.714.556.453,24
China	2012	Shenzhen Energy Group Co., Ltd.	1.775.233.895,53	1.777.268.948,61	1.780.272.333,77
China	2008	Sichuan Chemical Co., Ltd.	156.810.375,50	185.785.763,73	201.751.333,21
China	2009	Sichuan Lutianhua Co., Ltd.	255.055.204,55	280.469.799,23	316.022.106,02
China	2009	Sichuan Minjiang Hydropower Co., Ltd.	58.429.406,23	61.879.390,61	68.669.453,51
China	2010	Sinohydro Group Ltd.	1.001.721.158,19	1.017.161.307,14	1.038.769.027,89
China	2011	Sinohydro Group Ltd.	1.219.983.284,01	1.238.830.405,44	1.262.706.904,29
China	2009	Tangshan Jidong Cement Co., Ltd.	624.757.988,19	631.793.865,04	631.793.865,04
China	2009	Wuhan Iron and Steel Co., Ltd.	2.916.627.782,23	2.918.384.075,76	2.918.384.075,76
China	2010	Wuhan Iron and Steel Co., Ltd.	2.784.303.075,05	3.116.660.143,17	3.116.660.143,17
China	2012	Wuhan Iron and Steel Co., Ltd.	4.395.018.290,94	4.409.108.647,46	4.409.108.647,46
China	2010	Wuhan Kaidi Electric Power Co., Ltd.	171.232.209,27	226.724.641,50	304.383.541,23
China	2011	Wuhan Kaidi Electric Power Co., Ltd.	222.049.945,07	271.042.373,15	330.147.505,75
China	2012	Wuhan Kaidi Electric Power Co., Ltd.	308.493.149,80	309.576.311,02	311.665.606,59
China	2010	Xinjiang Goldwind Science & Technology Co., Ltd.	530.988.219,49	541.441.531,31	556.070.421,46
China	2011	Xinjiang Goldwind Science & Technology Co., Ltd.	1.503.211.178,30	1.507.713.188,68	1.513.144.475,32
China	2009	Xinjiang Urban Construction Group. Co., Ltd.	101.327.776,47	102.565.665,36	103.998.046,39
China	2011	Xishan Xishan Coal and Electricity Power Co., Ltd.	1.430.306.449,49	1.444.920.910,28	1.444.920.910,28
China	2007	Yangquan Coal Industry (Group) Co., Ltd.	302.521.326,83	302.841.453,43	303.043.676,61
China	2008	Yunnan Yuntianhua Co., Ltd.	310.943.440,40	322.108.170,43	328.259.987,00

China	2011	Yunnan Yuntianhua Co., Ltd.	523.091.800,67	532.934.773,59	532.934.773,59
China	2012	Zhejiang Guangsha Co., Ltd.	281.915.340,97	292.679.680,78	314.636.475,78
China	2011	Zhejiang Jingxing Paper Joint Stock Co., Ltd.	207.887.084,47	211.377.850,65	211.377.850,65
China	2006	Zhejiang Juhua Co., Ltd.	169.502.594,93	375.799.580,55	554.958.737,30
China	2007	Zhejiang Juhua Co., Ltd.	169.094.945,69	169.591.468,14	169.904.895,95
China	2008	Zhejiang Southeast Electric Power Co., Ltd.	1.071.267.534,41	1.144.136.578,13	1.184.287.749,60
China	2008	Zhengzhou Coal Industry & Electric Power Co., Ltd.	138.291.693,98	175.135.521,15	175.135.521,15
China	2012	Zijin Mining Group Co., Ltd.	3.060.823.661,38	3.061.749.097,80	3.063.372.885,78
TOTAL			**336.870.969.855,85**	**340.819.718.043,02**	**345.029.894.069,55**

Source: Research data (2015).

Table 5 – Variables for statistical analysis of the date – India

Host country	**Year of approval**	**Authorized participant (Indian company)**	**Equity Original E**	**Projectec E (1st phase)**	**Projected E (general)**
India	2012	A2Z Maintenance & Engineering Services Limited	163.420.253,79	175.517.203,34	175.517.203,34
India	2009	ACC Limited	712.348.300,30	714.774.352,57	714.774.352,57
India	2012	ACC Limited	1.012.362.542,20	1.013.052.799,85	1.013.052.799,85
India	2012	Adani Enterprises Limited	2.872.762.431,21	2.875.375.094,69	2.880.414.627,24
India	2009	Adani Power Limited	339.061.537,83	532.079.225,69	532.079.225,69
India	2010	Adani Power Limited	951.153.461,83	1.097.395.225,00	1.097.395.225,00
India	2008	Alembic Limited	53.697.323,78	54.562.339,10	54.562.339,10
India	2007	Amarjothi Spinning Mills Limited	4.379.101,44	4.381.608,82	4.383.170,08
India	2012	Amarjothi Spinning Mills Limited	6.707.236,05	7.084.037,07	7.640.129,99
India	2005	Ambuja Cements Limited	456.174.741,34	460.519.445,98	460.519.445,98
India	2007	Andhra Pradesh Paper Mills Limited	66.554.847,78	66.555.220,15	66.555.220,15
India	2008	Andhra Pradesh Paper Mills Limited	65.505.011,13	68.798.415,41	68.798.415,41
India	2011	Anik Industries Limited	34.104.378,41	34.647.209,21	35.226.041,40
India	2009	Ansal Properties and Infrastructure Limited	178.613.048,77	180.889.892,68	180.889.892,68
India	2006	Apollo Tyres Limited	117.557.195,63	118.634.723,09	118.634.723,09
India	2006	Ashok Leyland Limited	261.903.206,11	263.581.394,20	265.163.745,05
India	2010	Ashok Leyland Limited	603.936.278,00	606.459.985,06	606.459.985,06
India	2012	Asian Electronics Limited	2.057.899,62	4.270.752,00	4.270.752,00
India	2012	Asian Star Company Limited	62.771.591,27	63.572.064,95	63.572.064,95
India	2011	Associated Stone Industries			

		(Kotah) Limited	23.675.783,33	24.188.590,64	24.188.590,64
India	2007	Bannari Amman Spinning Mills Limited	28.480.682,47	28.569.560,38	28.569.560,38
India	2011	Bannari Amman Spinning Mills Limited	32.823.561,19	34.052.650,65	34.052.650,65
India	2012	Bannari Amman Spinning Mills Limited	28.204.214,72	29.138.178,06	29.138.178,06
India	2007	Bannari Amman Sugars Limited	75.291.912,87	75.294.406,83	75.294.406,83
India	2008	Bannari Amman Sugars Limited	73.641.106,08	80.600.385,28	80.600.385,28
India	2010	Bannari Amman Sugars Limited	112.671.634,20	122.525.344,69	122.525.344,69
India	2007	BF Utilities Limited	112.041.433,34	112.043.764,08	112.045.215,36
India	2012	Bhagyanagar India Limited	31.906.445,49	33.225.787,70	33.225.787,70
India	2007	Bharat Electronics Limited	461.445.101,06	461.445.794,79	461.445.794,79
India	2011	Bharat Electronics Limited	811.027.471,04	811.387.629,00	811.387.629,00
India	2007	Bharat Forge Limited	257.489.809,83	257.490.659,87	257.491.189,16
India	2009	Bharat Petroleum Corporation Limited	1.976.106.592,49	1.977.131.639,19	1.977.131.639,19
India	2012	Bhushan Steel Limited	1.172.660.940,20	1.172.902.440,41	1.172.902.440,41
India	2006	Birla Corporation Limited	71.326.135,06	72.662.638,88	72.662.638,88
India	2011	C. Mahendra Exports Limited	109.314.700,90	110.560.962,69	110.560.962,69
India	2012	C. Mahendra Exports Limited	127.136.217,80	128.306.933,93	130.034.707,75
India	2012	CEAT Limited	99.878.846,07	100.783.964,04	100.783.964,04
India	2006	Century Textiles and Industries Limited	157.553.232,00	164.593.470,56	164.593.470,56
India	2006	CESC Limited	684.805.570,68	684.982.222,82	684.982.222,82
India	2007	CESC Limited	659.395.529,90	659.399.655,81	659.399.655,81
India	2008	CESC Limited	713.558.158,43	713.948.374,95	713.948.374,95
India	2010	Chennai Petroleum Corporation Limited	569.914.694,51	574.105.264,23	574.105.264,23
India	2009	Claris Lifesciences Limited	77.451.054,94	84.617.148,08	84.617.148,08
India	2008	Dalmia Bharat Sugar and Industries Limited	184.270.959,93	188.773.013,11	188.773.013,11
India	2011	Dalmia Bharat Limited	495.635.989,38	499.518.549,79	499.518.549,79
India	2006	DCM Shriram Consolidated Limited	97.446.068,58	99.303.744,51	99.303.744,51
India	2007	DCM Shriram Consolidated Limited	95.759.573,21	95.766.955,02	95.766.955,02
India	2012	D C W Limited	62.868.063,38	64.806.101,16	64.806.101,16
India	2009	Deepak Fertilisers & Petrochemicals Corporation Limited	120.285.287,42	121.787.129,30	121.787.129,30
India	2010	Deepak Fertilisers & Petrochemicals Corporation Limited	152.099.668,01	195.457.587,74	195.457.587,74
India	2012	Deepak Fertilisers & Petrochemicals Corporation	178.860.536,93	193.955.896,52	193.955.896,52

		Limited			
India	2008	Deepak Spinners Limited	8.509.067,26	11.071.804,12	11.071.804,12
India	2009	DLF Limited	3.585.735.807,33	3.611.721.996,14	3.646.061.272,23
India	2011	DLF Limited	4.160.889.019,92	4.166.952.600,12	4.174.267.785,87
India	2007	Dwarikesh Sugar Industries Limited	27.752.069,10	27.757.412,41	27.757.412,41
India	2008	Dwarikesh Sugar Industries Limited	21.130.360,29	27.014.181,16	27.014.181,16
India	2010	Dwarikesh Sugar Industries Limited	24.359.968,49	25.200.428,59	26.717.064,39
India	2007	E.I.D. Parry India Limited	160.961.809,46	160.973.020,92	160.973.020,92
India	2006	Electro Steel Castings Limited	141.047.978,48	144.652.767,53	144.652.767,53
India	2012	Electrotherm India Limited	2.745.649,25	4.845.209,53	4.845.209,53
India	2012	EMCO Limited	75.500.278,62	76.661.620,15	77.266.117,82
India	2008	Empee Distilleries Limited	38.106.677,25	40.250.367,01	41.384.883,11
India	2010	Energy Development Company Limited	20.105.476,22	23.427.801,47	23.427.801,47
India	2007	Essar Oil Limited	517.665.139,46	517.682.712,96	517.682.712,96
India	2010	Ester Industries Limited	29.245.579,53	30.415.059,03	32.525.420,35
India	2011	Gayatri Projects Limited	74.965.436,80	75.901.674,61	75.901.674,61
India	2011	GeeCee Ventures Limited	40.081.620,87	40.558.412,39	40.558.412,39
India	2011	Gillanders Arbuthnot & Co. Limited	33.313.011,97	35.332.432,04	35.332.432,04
India	2006	Godawari Power and Ispat Limited	18.630.717,43	19.450.648,27	19.450.648,27
India	2007	Godawari Power and Ispat Limited	35.854.264,66	35.860.816,32	35.860.816,32
India	2008	Godawari Power And Ispat Limited	62.065.454,33	77.489.519,37	77.489.519,37
India	2006	Godrej Industries Limited	78.619.802,61	79.376.219,62	79.376.219,62
India	2011	Gokul Refoils and Solvent Limited	71.522.666,48	72.072.872,59	72.072.872,59
India	2006	Graphite India Limited	88.356.195,17	88.484.234,63	88.484.234,63
India	2006	Grasim Industries Limited	897.005.218,44	899.393.632,63	899.393.632,63
India	2007	Grasim Industries Limited	1.147.611.208,70	1.147.613.170,44	1.147.613.170,44
India	2011	Grasim Industries Limited	2.302.823.438,26	2.304.062.900,26	2.304.062.900,26
India	2007	Greenply Industries Limited	18.798.897,90	18.801.159,65	18.801.159,65
India	2006	Gujarat Alkalies & Chemicals Limited	134.075.428,85	138.649.804,06	138.649.804,06
India	2007	Gujarat Alkalies & Chemicals Limited	153.560.435,30	153.562.193,58	153.562.193,58
India	2012	Gujarat Alkalies & Chemicals Limited	236.984.693,22	243.403.688,87	243.403.688,87
India	2005	Gujarat Fluorochemicals Limited	70.559.273,41	573.089.016,15	573.089.016,15
India	2008	Gujarat Fluorochemicals Limited	176.313.134,88	180.327.100,05	182.528.436,82

India	2012	Gujarat Fluorochemicals Limited	400.634.961,86	401.382.013,04	402.484.530,93
India	2010	Gujarat Gas Company Limited	116.781.231,15	118.767.050,77	118.767.050,77
India	2008	Gujarat Hotels Limited	1.543.238,81	2.033.372,36	2.033.372,36
India	2011	Gujarat Mineral Development Corporation Limited	263.850.102,15	265.546.330,66	267.592.683,84
India	2012	Gujarat Mineral Development Corporation Limited	301.530.929,04	305.913.975,14	305.913.975,14
India	2009	Gujarat Narmada Valley Fertilizer Company Limited	299.004.020,73	333.939.656,04	333.939.656,04
India	2012	Gujarat NRE Coke Limited	230.915.455,43	236.247.787,17	236.247.787,17
India	2009	Gujarat State Fertilizers & Chemicals Limited	286.735.082,28	286.825.950,38	286.825.950,38
India	2010	Gujarat State Fertilisers & Chemicals Limited	352.956.734,62	354.986.193,24	354.986.193,24
India	2012	Gujarat State Fertilisers & Chemicals Limited	518.363.358,46	524.668.945,94	524.668.945,94
India	2012	Gujarat State Petronet Limited	377.480.668,91	382.919.966,50	382.919.966,50
India	2007	Hindustan Zinc Limited	1.318.227.615,69	1.318.234.295,35	1.318.234.295,35
India	2009	Hindustan Zinc Limited	2.131.443.135,21	2.148.638.964,48	2.171.362.278,51
India	2012	Hindustan Zinc Limited	3.962.248.674,13	3.972.638.018,61	3.987.970.887,99
India	2011	I.C.S.A. India Limited	133.545.325,29	134.849.730,97	134.849.730,97
India	2007	India Cements Limited	373.679.261,51	373.685.930,56	373.685.930,56
India	2010	India Glycols Limited	63.446.857,85	76.950.063,51	76.950.063,51
India	2007	Indian Acrylics Limited	21.779.793,77	21.785.936,82	21.785.936,82
India	2007	Indian Sucrose Limited	5.796.889,29	5.798.264,72	5.798.264,72
India	2006	Indowind Energy Limited	9.739.990,71	10.253.659,22	10.737.993,37
India	2011	Indowind Energy Limited	22.359.027,31	24.032.263,22	26.050.877,82
India	2006	ITC Limited	1.709.883.400,71	1.711.436.477,02	1.711.436.477,02
India	2007	ITC Limited	1.840.108.215,84	1.840.123.858,91	1.840.123.858,91
India	2009	ITC Limited	2.082.539.350,76	2.095.756.977,73	2.095.756.977,73
India	2010	ITC Limited	2.380.069.137,73	2.383.301.442,93	2.387.824.893,35
India	2011	ITC Limited	2.601.264.812,58	2.605.566.539,23	2.605.566.539,23
India	2006	Jai Balaji Industries Limited	11.996.344,77	14.129.737,85	14.129.737,85
India	2012	Jain Irrigation Systems Limited	258.487.315,91	261.458.718,37	262.531.391,91
India	2006	Jaiprakash Associates Limited	483.180.674,69	485.034.487,36	485.034.487,36
India	2010	Jayaswal Neco Industries Limited	97.576.956,21	102.121.663,76	102.121.663,76
India	2007	Jindal Saw Limited	165.556.262,08	165.565.333,70	165.565.333,70
India	2008	Jindal Stainless Limited	290.194.239,79	297.445.650,93	297.445.650,93
India	2006	Jindal Steel & Power Limited			

			353.020.184,70	370.848.345,48	370.848.345,48
India	2012	Jindal Steel & Power Limited	2.669.543.092,93	2.671.775.214,25	2.671.775.214,25
India	2009	Jocil Limited	13.159.030,83	15.810.879,31	19.315.146,83
India	2007	JSW Energy Limited	193.593.519,49	193.698.558,97	193.698.558,97
India	2012	JSW Energy Limited	840.179.917,16	890.367.156,04	890.367.156,04
India	2007	JSW Steel Limited	978.045.642,26	978.144.955,70	978.144.955,70
India	2007	K M Sugar Mills Limited	7.308.809,89	7.316.511,12	7.316.511,12
India	2011	K.P.R. Mill Limited	94.233.225,80	96.797.492,83	96.797.492,83
India	2009	K.S. Oils Limited	135.768.793,86	137.517.952,25	137.517.952,25
India	2010	K.S. Oils Limited	237.422.362,36	238.567.721,52	240.170.594,71
India	2011	K.S. Oils Limited	172.121.073,50	174.392.027,89	174.392.027,89
India	2012	K.S. Oils Limited	172.121.073,50	172.711.446,06	172.711.446,06
India	2006	Kalyani Steels Limited	68.211.413,60	71.106.926,60	71.106.926,60
India	2012	Kamdhenu Ispat Limited	11.771.668,14	12.251.645,37	12.960.008,47
India	2008	KCP Sugar and Industries Corporation Limited	24.921.198,19	26.837.078,36	26.837.078,36
India	2006	Kesoram Industries Limited	77.145.808,67	77.356.678,26	77.356.678,26
India	2009	Kilburn Chemicals Limited	5.640.161,26	6.185.789,55	6.185.789,55
India	2012	Kilburn Chemicals Limited	9.293.320,82	9.477.014,21	9.477.014,21
India	2008	KRBL Limited	56.756.069,14	58.470.957,90	58.470.957,90
India	2009	KRBL Limited	62.711.328,57	64.772.544,38	64.772.544,38
India	2012	KRBL Limited	105.708.267,03	106.233.868,07	106.233.868,07
India	2007	Lanco Infratech Limited	261.065.260,22	261.070.637,44	261.070.637,44
India	2008	Lanco Infratech Limited	288.387.159,00	290.169.251,29	291.112.397,28
India	2012	Lanco Infratech Limited	693.663.330,33	694.621.689,08	696.470.254,77
India	2012	M and B Switchgears Limited	15.705.924,13	16.099.438,27	16.858.482,58
India	2012	Madras Cements Limited	302.222.270,70	311.293.067,57	311.293.067,57
India	2010	Magma Fincorp Limited	77.100.964,77	77.953.641,39	77.953.641,39
India	2011	Magma Fincorp Limited	115.609.230,66	116.863.444,73	116.863.444,73
India	2008	Mahalaxmi Rubtech Limited	1.292.075,35	4.000.557,02	5.433.980,88
India	2012	Mahalaxmi Rubtech Limited	5.943.680,19	6.803.701,87	6.803.701,87
India	2008	Malu Paper Mills Limited	6.833.464,67	13.930.081,57	13.930.081,57
India	2011	Man Industries India Limited	78.212.187,82	78.910.375,63	78.910.375,63
India	2011	Mangalam Cement Limited	62.372.474,30	63.694.686,19	63.694.686,19

India	2011	Mangalam Timber Products Limited	3.022.764,19	20.097.776,42	20.097.776,42
India	2011	Maruti Suzuki India Limited	2.261.017.185,00	2.262.342.623,91	2.262.342.623,91
India	2012	Maruti Suzuki India Limited	2.310.392.698,96	2.312.784.543,56	2.312.784.543,56
India	2007	Mawana Sugars Limited	33.158.703,11	33.181.195,78	33.181.195,78
India	2008	Mawana Sugars Limited	42.227.765,90	43.823.352,19	43.823.352,19
India	2009	MMTC Limited	205.265.551,91	207.566.319,53	207.566.319,53
India	2006	Monnet Ispat and Energy Limited	76.028.367,26	81.472.941,67	81.472.941,67
India	2007	MSP Steel & Power Limited	14.379.577,61	14.387.226,42	14.387.226,42
India	2011	Mukand Limited	337.792.535,33	341.917.410,02	341.917.410,02
India	2011	Nagarjuna Agrichem Limited	32.022.363,32	32.698.480,65	32.698.480,65
India	2007	Nahar Industrial Enterprises Limited	93.743.255,63	93.749.056,60	93.749.056,60
India	2005	Nahar Spinning Mills Limited	101.549.627,86	105.279.571,12	105.279.571,12
India	2011	Nakoda Limited	44.612.004,08	45.395.823,05	45.395.823,05
India	2008	Nava Bharat Ventures Limited	130.303.218,97	131.521.919,08	132.166.898,09
India	2007	Navin Fluorine International Limited	33.467.508,50	33.830.185,57	33.830.185,57
India	2009	NHPC Limited	2.908.646.923,05	2.935.980.187,71	2.996.032.724,28
India	2012	NMDC Limited	3.597.452.930,05	3.598.830.833,59	3.598.830.833,59
India	2012	NTPC Limited	10.966.835.484,25	10.967.117.423,64	10.967.661.252,84
India	2006	OCL India Limited	41.773.792,51	44.298.708,54	44.298.708,54
India	2007	Oil and Natural gas Corporation Limited	11.530.481.678,17	11.530.496.026,96	11.530.496.026,96
India	2008	Oil and Natural Gas Corporation Limited	12.283.149.204,47	12.283.997.245,46	12.283.997.245,46
India	2009	Oil and Natural Gas Corporation Limited	13.690.966.442,82	13.691.390.668,82	13.691.390.668,82
India	2010	Oil and Natural Gas Corporation Limited	16.693.155.465,97	16.700.816.981,60	16.711.538.891,78
India	2012	Oil and Natural gas Corporation Limited	20.110.878.803,40	20.208.340.327,19	20.208.424.710,58
India	2009	Oil India Limited	1.385.229.088,59	1.390.798.904,19	1.390.798.904,19
India	2012	Orient Abrasives Limited	19.416.452,10	19.757.349,31	20.260.454,44
India	2012	Orient Green Power Company Limited	175.214.309,06	182.133.357,60	188.700.509,55
India	2008	Oudh Sugar Mills Limited	16.818.615,54	17.837.465,01	18.398.855,65
India	2008	Patspin India Limited	7.969.496,83	9.220.870,86	9.220.870,86
India	2006	Phillips Carbon Black Limited	17.467.939,76	19.570.702,71	19.570.702,71
India	2006	Polyplex Corporation Limited	63.406.660,27	66.518.653,77	66.518.653,77
India	2011	Polyplex Corporation Limited	253.816.671,37	255.172.421,17	255.172.421,17
India	2009	Rai Saheb Rekhchand Mohota Spinning & Weaving Mills	4.925.636,32	7.280.756,91	7.280.756,91

		Limited			
India	2008	Rama Paper Mills Limited	5.912.353,69	7.828.431,45	8.842.487,26
India	2009	Rashtriya Chemicals and Fertilizers Limited	248.227.308,33	352.195.565,35	497.636.065,88
India	2009	Ratnamani Metals and Tubes Limited	42.784.739,62	45.298.826,91	45.298.826,91
India	2006	REI Agro Limited	60.435.067,87	60.929.427,12	60.929.427,12
India	2010	REI Agro Limited	148.408.261,57	150.321.758,13	150.321.758,13
India	2011	REI Agro Limited	373.104.379,38	374.089.541,05	374.089.541,05
India	2012	REI Agro Limited	403.467.120,22	406.358.100,10	406.358.100,10
India	2011	Relaxo Footwears Limited	21.272.520,28	21.864.447,09	21.864.447,09
India	2006	Reliance Industries Limited	9.461.840.258,24	9.465.003.072,01	9.465.003.072,01
India	2007	Reliance Industries Limited	11.790.686.735,53	11.790.689.027,32	11.790.689.027,32
India	2011	Reliance Industries Limited	24.349.096.767,97	24.351.834.767,06	24.352.295.250,41
India	2012	Riddhi Siddhi Gluco Biols Limited	148.907.385,23	152.653.395,43	152.653.395,43
India	2010	Ruchi Infrastructure Limited	33.149.398,06	35.605.072,40	35.605.072,40
India	2011	Ruchi Soya Industries Limited	349.124.262,73	353.133.080,11	353.133.080,11
India	2012	Ruchi Soya Industries Limited	327.809.046,25	333.017.058,49	333.017.058,49
India	2012	Rural Electrification Corporation Limited	2.182.359.695,91	2.185.844.182,45	2.185.844.182,45
India	2012	Sadbhav Engineering Limited	172.940.318,70	173.790.756,05	175.045.853,99
India	2011	Sanwaria Agro Oils Limited	34.434.683,68	35.192.513,65	35.192.513,65
India	2011	Savita Oil Technologies Limited	62.441.385,01	63.321.207,68	63.321.207,68
India	2012	SEL Manufacturing Company Limited	161.299.942,24	164.679.029,98	164.679.029,98
India	2007	Sesa Goa Limited	278.109.651,93	278.124.194,08	278.124.194,08
India	2010	Shilpa Medicare Limited	16.671.415,78	20.984.812,12	20.984.812,12
India	2007	Shree Bhawani Paper Mills Limited	5.059.900,94	5.061.712,02	5.061.712,02
India	2006	Shree Cements Limited	65.081.709,84	73.134.260,36	73.134.260,36
India	2007	Shreyans Industries Limited	4.817.913,79	4.819.541,74	4.819.541,74
India	2011	Shreyans Industries Limited	10.445.305,89	11.498.811,13	11.498.811,13
India	2012	Shriram EPC	107.669.797,72	109.035.360,25	111.050.693,54
India	2007	Simbhaoli Sugar Mills Limited	17.525.798,52	17.531.581,63	17.531.581,63
India	2009	Sintex Industries limited	253.102.544,45	255.738.558,68	255.738.558,68
India	2011	SPML Infra Limited	69.368.234,47	71.108.575,35	71.108.575,35
India	2012	SPML Infra Limited	73.146.848,19	75.790.581,99	75.790.581,99
India	2009	Sree Sakthi Paper Mills Limited	5.243.298,63	5.654.933,21	5.654.933,21

India	2005	SRF Limited	79.629.245,42	721.789.557,34	721.789.557,34
India	2009	SRF Limited	144.780.602,50	148.441.138,78	148.441.138,78
India	2012	Srinivasa Hatcheries Limited	13.442.846,25	13.668.809,28	14.002.291,51
India	2009	Sterlite Industries India Limited	3.802.381.324,22	3.804.278.641,69	3.804.278.641,69
India	2012	Suashish Diamonds Limited	107.725.945,67	107.899.714,39	107.899.714,39
India	2009	Surana Corporation Limited	20.287.736,91	21.515.400,57	21.515.400,57
India	2012	Surana Industries Limited	114.378.203,23	115.933.415,87	115.933.415,87
India	2007	Suryachakra Power Corporation Limited	11.012.981,77	11.029.007,04	11.029.007,04
India	2007	Suzlon Energy Limited	607.271.764,74	607.276.572,21	607.276.572,21
India	2012	Swan Energy Limited	27.706.965,65	29.238.730,54	29.238.730,54
India	2006	Tamil Nadu Newsprint & Papers Limited	96.887.588,92	98.536.832,80	98.536.832,80
India	2011	Tamil Nadu Newsprint & Papers Limited	144.709.397,87	152.352.353,11	152.352.353,11
India	2007	Tamil Nadu Newsprint & Papers Limited	99.639.819,22	99.641.686,99	99.641.686,99
India	2012	Tamil Nadu Newsprint & Papers Limited	143.077.389,42	144.730.223,63	144.730.223,63
India	2006	Tata Chemicals Limited	411.521.573,09	411.853.905,39	411.853.905,39
India	2007	Tata Chemicals Limited	444.502.094,72	444.503.919,79	444.503.919,79
India	2007	Tata Motors Limited	1.334.579.593,35	1.334.583.791,09	1.334.583.791,09
India	2010	Tata Power Company Limited	2.026.077.248,33	2.036.254.206,13	2.036.254.206,13
India	2012	Tata Power Company Limited	1.829.133.234,61	1.840.504.290,58	1.840.504.290,58
India	2006	Tata Sponge Iron Limited	27.273.551,23	28.734.323,24	28.734.323,24
India	2009	Tata Steel Limited	4.114.301.424,98	4.120.682.233,09	4.120.682.233,09
India	2010	Techno Electric & Engineering Company Limited	76.158.083,84	83.312.625,51	93.325.050,83
India	2007	Torrent Power Limited	467.586.434,44	467.999.271,90	467.999.271,90
India	2012	Torrent Power Limited	849.088.662,88	922.832.823,00	922.832.823,00
India	2006	Transport Corporation of India Limited	30.044.811,14	30.311.789,96	30.311.789,96
India	2006	Triveni Engineering and Industries Limited	102.423.785,76	106.354.652,31	106.354.652,31
India	2007	Triveni Engineering and Industries Limited	124.874.305,50	124.885.540,89	124.885.540,89
India	2012	Ultramarine & Pigments Limited	12.068.928,10	12.217.372,51	12.436.450,68
India	2007	UltraTech Cement Limited	305.609.665,11	305.611.848,69	305.611.848,69
India	2006	United Phosphorus Limited	236.872.214,28	239.437.740,53	239.437.740,53
India	2012	United Spirits Limited	687.136.067,46	687.507.807,15	687.507.807,15
India	2007	Upper Ganges Sugar & Industries Limited	28.161.271,32	28.171.589,72	28.171.589,72
India	2006	Usha Martin Limited	113.147.173,70	115.646.334,67	115.646.334,67

India	2012	Ushdev International Pvt Limited	76.372.507,32	77.288.201,42	78.639.606,99
India	2012	Varun Industries Limited	44.787.068,23	45.297.521,10	45.297.521,10
India	2012	Videocon Industries Limited	1.134.907.431,94	1.135.626.054,02	1.137.012.194,79
India	2007	Vikash Metal & Power Limited	12.832.042,06	12.837.733,52	12.841.326,22
India	2006	Vishal Exports Overseas Limited	37.479.123,07	38.853.339,67	38.853.339,67
India	2008	Welspun India Limited	83.072.548,25	86.460.757,98	86.460.757,98
India	2007	West Coast Paper Mills Limited	40.128.662,29	40.133.281,97	40.133.281,97
India	2007	Yash Papers Limited	6.540.186,14	6.543.636,46	6.545.620,89
India	2012	ZF Steering Gear India Limited	29.748.636,73	30.553.593,87	31.210.660,08
TOTAL			**234.454.889.105,47**	**236.978.696.266,27**	**237.341.339.943,22**

Source: Research data (2015).

Table 6 – Tests of Normality

	Brazil			**China**			**India**		
	Shapiro-Wilk			Kolmogorov-Smirnov			Kolmogorov-Smirnov		
Variables	Statistic	df	Sig.	Statistic	df	Sig.	Statistic	df	Sig.
Original Equity	0,521	20	0,000	0,408	102	0,000	0,374	255	0,000
Projected Equity 1	0,521	20	0,000	0,409	102	0,000	0,373	255	0,000
Projected Equity 2	0,521	20	0,000	0,410	102	0,000	0,373	255	0,000

Source: Research data (2015).

Table 7 – Ranks

		Brazil			**China**			**India**		
Variables		N	Mean Rank	Sum of Ranks	N	Mean Rank	Sum of Ranks	N	Mean Rank	Sum of Ranks
Projected Equity 1 – Original Equity	Negative Ranks	0[a]	0,00	0,00	0[a]	0,00	0,00	0[a]	0,00	0,00
	Positive Ranks	20[b]	10,50	210,00	102[b]	51,50	5253,00	255[b]	128,00	32640,00
	Ties	0[c]			0[c]			0[c]		
	Total	20			102			255		
Projected Equity 2 – Original Equity	Negative Ranks	0[d]	0,00	0,00	0[d]	0,00	0,00	0[d]	0,00	0,00
	Positive Ranks	20[e]	10,50	210,00	102[e]	51,50	5253,00	255[e]	128,00	32640,00
	Ties	0[f]			0[f]			0[f]		
	Total	20			102			255		

a. Projected Equity (1) < Original Equity
b. Projected Equity (1) > Original Equity
c. Projected Equity (1) = Original Equity
d. Projected Equity (2) < Original Equity
e. Projected Equity (2) > Original Equity
f. Projected Equity (2) = Original Equity
Source: Research data (2015).

Table 8 – Statistics Wilcoxon[a] tests

	Projected Equity 1 – Original Equity			Projected Equity 2 – Original Equity		
	Brazil	**China**	**India**	**Brazil**	**China**	**India**
Z	-3,920[b]	-8,768[b]	-13,843[b]	-3,920[b]	-8,768[b]	-13,843[b]
Asymp. Sig. (2-tailed)	0,000	0,000	0,000	0,000	0,000	0,000

a. Wilcox on Signed Ranks Test.
b. Based on negatives ranks.
Source: Research data (2015).

Notes

[1] The Annex 1 is integrated by signatory members from United Nations Framework Conference on Climate Change (UNFCCC), inside 1990 to the Organization for Economic Co-operation and Development-OECD and the industrialized countries of the former Soviet Union and Eastern Europe.
[2] Non-Annex 1 is composed by all the Signatory Members from UNFCCC not listed in Annex 1.
[3] Certified Emission Reductions (CERs) are popularly known as Carbon Credits.
[4] Recovered from http://www.mct.gov.br/index.php/content/view/47952.html
[5] Recovered from http://cdm.ccchina.gov.cn/english/item_new.asp?ColumnId=68
[6] Recovered from http://www.cdmindia.gov.in/approved_projects.php
[7] Recovered from http://cdm.unfccc.int/Projects/projsearch.html
[8] A cap-and-trade program is a market-based approach in which "allowances" or "credits" are used to provide incentives to companies to reduce emissions by assigning a monetary value to pollution… The "cap" phase of the program begins when a government or regulatory body establishes an economywide target for the maximum level of specific emissions permitted by companies in a specified time frame… The "trade" aspect of the program occurs when a company's actual emissions are greater or less than the amount covered by its owned allowances (Fornaro, Winkelman, and Glodstein, 2009, p. 1).
[9] At the implementation moment of CDM projects, the proposers must submit an estimated quantity of emission reductions, as they are certified later, may change between the estimated amount and the actual amount of CERs to be issued afterward by the UNFCCC.
[10] In 2004, on November 18th, it had been effected the register just 01 project by Brazilian DNA, entitled "Brazil NovaGerar Landfill Gas to Energy Project". (UNFCCC, 2014). Such project was eliminated from research because of its set limits defined between 2005 and 2012, the first stage of the Kyoto Protocol.
[11] Euribor - *Euro InterBank Offered Rate*, are rates have to base the average of interest rates executed on interbank loans by a representative group of banks in mutual loans made in euros. There are rates for 8 different periods of time, varying from one week to 12 months. Euribor is used by other banks to set their own interest rates. (Recovered from http://pt.global-rates.com/).