



**Graduate
School of Management**
St. Petersburg State University

Saint Petersburg State University

Graduate School of Management

Master in Corporate Finance Program

Valuation of Private Equity Deals in Emerging Countries: Application of the Accounting-based Model

Master's Thesis by 2nd year Student: Fanyu Meng

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ЗАЯВЛЕНИЕ О САМОСТОЯТЕЛЬНОМ ХАРАКТЕРЕ ВЫПОЛНЕНИЯ ВЫПУСКНОЙ КВАЛИФИКАЦИОННОЙ РАБОТЫ

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АННОТАЦИЯ

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Название магистерской диссертации	Оценка сделок частных капиталовложений в развивающихся странах: применимость бухгалтерских моделей
Факультет	Высшая Школе Мендежмента
Направление подготовки	Корпоративные финансы
Год	2016
Научный руководитель	Доцент, Гаранина Татьяна Александровна
Описание цели, задач и основных результатов	Мы взяли финансовые данные для пятидесяти компаний в Бразилии и Китае, и затем удалили те, информация о которых отсутствует. После этого, мы проанализировали методы оценки частных сделок с 2008-го до 2015-го годов. Мы используем модель остаточной прибыли для трех кейсов Бразильских и Китайских компаний. Финансовый данные компаний взяты из Bloomberg и Thomson Reuters Eikon. Все финансовые данные взяты в долларовом выражении. В результате, мы получили, что модель остаточной прибыли оценивает стоимость сделок слияния и поглощения для взятых компаний с отклонением меньше 15% от реального значения.
Ключевые слова	Модель остаточной прибыли, REM, сделки с частным капиталом, Бразилия, Китай, развивающиеся страны

ABSTRACT

Master Student's Name	Fanyu Meng
Master Thesis Title	Valuation of Private Equity Deals in Emerging Countries: Application of the Accounting Based Model
Faculty	Graduate School of Management
Main field of study	Corporate Finance
Year	2016
Academic Advisor's Name	Associate Professor, Tatiana A. Garanina
Description of the goal, tasks and main results	Taking the data for 50 companies in Brazil and China from 2008 to 2011 and controlling for the missing data, we discuss the application of accounting based valuation methods in the valuation of private equity deals in Brazil and China from 2008-2015. The Residual Earnings Model (REM) is used and applied to three private equity case studies in Brazil and three private equity cases in China. The regression model draws its data from Bloomberg terminals as well as Thomson Reuters Eikon. All amounts are in USD. We find that the REM model values private equity deals of non-traded companies (company takeovers) with an accuracy of <15% deviation from the final deal value.
Keywords	Residual Earnings Model, REM, private equity deals, PE deals, Brazil, China, emerging countries

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1. Private Equity: Global Context and Literature Review

Given the recent the economic sanctions placed on Russia by the West and the closer alliance with China, investors around the globe will see a growing importance over a few set of countries called BRICS: (Brazil, Russia, India, China, South Africa) and other emerging countries such as Saudi Arabia, which regulates oil production and thus the international macroeconomic dynamics. Uncertain market and changing economic conditions coupled with geopolitical events all point to the dynamic nature the international financial landscape. Possibilities include a decreasing reliance on the dollar among members of BRICS members along with new economic and trade alliances. Macroeconomic investments and developments shape the growth and strategic alliances of the emerging country, making private equity an important factor to understand. It is said that dynamic markets of developing economies contain both uncertainty and opportunity. While it will not be possible to cover every aspect of these the private equity developments in emerging countries, it is possible to develop preliminary suggestions on identifying and applying the proper private equity valuation technique to emerging countries.

The problem of transparency and regulation is brought up in several works (Spindler 2009; Cumming and Walz, 2010; Phalippou, 2009). Private equity (PE) managers have been known to provide inflated numbers for their PE fund. Furthermore, private companies are famous for not being completely transparent in their financial statements and annual reports, thus complicating the valuation process. There is existing classical research that deals with private equity valuation and this will be explored in more detail. The **goal** of the research is the verification of the residual earnings model in private equity deals evaluation in Brazil and China by assessing the deviation from the equity value of the PE deal. We will define success as a valuation <15% from the final equity value. In this case, the equity value is simply the transaction value plus the assumption or deduction of any debt in the PE deal.

We will set up several **objectives** for this task:

1. Research the country context for Brazil and China for private equity.
2. Gather the top 50 companies for Brazil and China, and control for the missing data in order to build the regression.
3. Apply the Residual Earnings Model (REM) to the select cases using the regression.
4. Compute the deviation from the official reported final deal value and assess the deviation from the mean.
5. Calculate and analyze the effect of different expected rate of returns (15%, 17%, and 20%) to the deal with the least deviation.
6. Make conclusions.

Understanding the accounting and legal context of a country will provide the right path in understanding PE in a particular country. Although the PE world is fraught with risks, PE often can provide a competitive advantage in buyouts of various firms (Felix, Michael 2007). Thus, the research seeks to establish a reliable regression model which can be used to value private firms and buyouts, regardless of the disclosure of the chosen firm. The chapters of the research will go into an introduction into private equity in the 21st century. Then, we will look at the literature used in the research progress as well as the managerial implications. In country context for private equity in Brazil and China will be addressed before going into the research methodology and the application of the accounting based Residual Earnings Model (REM).

1.1 Private Equity in the 21st Century

The motivation of understanding private equity comes from the fact that private equity can shape the spheres of influence of a country by attracting investment, bridging key strategic entities, and improve the overall economy. By understanding how to make more accurate forecasts of private equity deals, one can make better investment decisions. The PE landscape is ever developing and unique in each of the BRICS countries, and a cookie cutter approach is not ideal. The research will focus on Brazil, a partner with future potential for PE development with Russia, and China, Russia's closest geographical partner in the BRICS alliance.

The first task is to define what private equity is. One definitions says that private equity “include venture capital; mid-stage company finance; distressed firm investment; LBO of firms, divisions, or subsidiaries of public and private companies; and going private deals” (Masulis, Thomas; 2009). Although many cultural, organizational, and structural differences exist between organizations of the two countries, better analysis of the BRICS private equity deals would lead to overall economic standing in Russia. A brief overview of emerging markets will precede the research into private equity in Brazil and China. Although private equity in developing economics may lack the regulation in developed economies, many aspects are the same, although implementing a few adjustments may prove to be effective. Regardless of the status that developing countries are ‘developing’, we see a powerful rise in certain countries and Limited Holdings companies which are significant regardless of the fact that they are private companies. Private companies play a key role in the energy industry.

While the attention of most is on BRICS, there is a secondary set of developing countries named MINT, or Mexico, Indonesia, Nigeria and Turkey. While holding smaller economies and influence than the big players of BRICS, MINT presents strategic opportunities in any private equity related to energy or defense and military technologies, and thus should not be dismissed. One should not focus exclusively on set alliances such as BRICS due to the fact that the market is ever changing. To give a brief example, the recent lifting of sanctions on Iran by the US caused the massive export of oil, causing the price of oil to drop below 25 USD in January 2016.¹ For this reason, although we will only analyze two emerging countries, this particular study on private equity is not devoted to BRICS, but to emerging markets in general.

¹Smith, Grant. “Brent Trades Near 12-Year Low as Iran Comeback to Swell Gut.” *Bloomberg Business*.
<http://www.bloomberg.com/news/articles/2016-01-17/brent-oil-extends-decline-below-28-as-iran-set-to-worsen-glut>

1.2 Private Equity in Brazil

Brazil is a political economy in which private enterprise, including foreign investment, is assigned an expanded responsibility for economic development (de Onis, 2000). The country also is developing more public private partnerships to help alleviate its social problems (de Onis, 2000). The growing strategic alliance between Russia and Brazil calls for increased future PE deals in the upcoming years (Baliev). Brazil currently remains relevant to Russia due to the large amounts of agricultural and food product exports². In 2015, 20 joint Russian-Brazilian projects existed, with future plans for cooperation in the fishing industry as well as investments in transportation, energy infrastructure, forestry, environmental preservation, and the chemical and food industries (Baliev). Russia and Brazil also plans to increase joint projects in the area of space and clean nuclear energy (Baliev). Despite the fact that China would hold a higher priority to Russia than Brazil, Brazil nevertheless is worth analyzing. Increased cooperation on the national level would naturally lead to more opportunities for businesses in terms of private equity deals.

With large amounts of natural resources, Brazil has a large young population and an emerging middle class, conditions ripe for becoming a developed economy³. According to EY, the strategy of global investors is to invest in stakes of established Brazilian firms which already has large networks. Thus, we see many different types of PE deals where a fund in a developed economy will invest in large Brazilian companies. According to an Ernst & Young report in 2015,

“In September, The Blackstone Group announced that it had acquired a 40% stake in Pátria Investimentos. In October, Highbridge Capital, the hedge fund owned by JPMorgan Chase, acquired a majority stake in Gávea Investimentos. Gávea, which has approximately US\$6b under management, was founded by former central bank Governor Arminio Fraga...in December, a consortium led by J.C. Flowers & Co. and including sovereign wealth funds, GIC, China Investment Corporation and Temasek, acquired a 19% stake in BTG Pactual for US\$1.8b in the largest Brazilian deal of its kind. These deals contributed greatly to the total US\$6.6b in completed deals seen last year in Latin America. Overall, Brazil accounted for 70% of these new deals — or US\$4.6b — a 404% increase over 2009.”

² Baliev, Alexei. Russia-Brazil: Strategic Partnership is Expanding. Online Journal Strategic Culture Foundation. September 22 2015. <http://www.strategic-culture.org/news/2015/09/22/russia-brazil-strategic-partnership-is-expanding.html>

³ “Private Equity in Brazil.” EY. <http://www.ey.com/GL/en/Industries/Private-Equity/PE-opportunities-in-emerging-markets--Private-Equity-in-Brazil>

The excerpt above shows the potential the rapid growth of the Brazilian PE market from 2009 to 2015. Resulting in a 404% increase in dollar amount, Brazil takes up the majority of the Latin America private equity deals. It is for this reason, that we see the importance of analyzing the Brazilian market. Additionally from text, we see that it is not only Western financial firms which are taking an interest in the Brazilian market. GIC, a Chinese investment firm, also acquired an interest in a Brazilian company. This point to the growing influence of the BRICS countries as well as the interconnectivity of emerging countries in general. The minority stakes described above, while not constituting as mergers and acquisitions, nevertheless points to the high potential of the Brazilian economy.

Regarding the Brazilian economy, different practices in corporate governance often have a significant influence on PE development and transactions in a developing economy. State ownership of critical industries and large companies shapes PE development differently than in countries like entrepreneur oriented countries like the United States. In countries where high levels of state intervention exist, PE and entrepreneurship holds less emphasize than developed countries (Rabelo, Vasconcelos, 2002). Additionally, numerous family owned businesses exist where the sole shareholding is the controlling family. Family owned businesses in Brazil often do not reach the multinational stage and poses specific challenges. Nevertheless, in the privatization period of Brazil in the 1990s provided the foundations of further economic development for PE and multinational corporations. The finance minister of Brazil, Guido Mantega, stated that in 10-20 Brazil will reach the same standard of living as in European countries⁴.

⁴ Duailibe, Marcelo. "Brazil Standard of Living Outlook: Daily." The Rio Times. Dec. 27, 2011. <http://riotimesonline.com/brazil-news/rio-politics/brazil-standard-of-living-20-year-outlook/#>

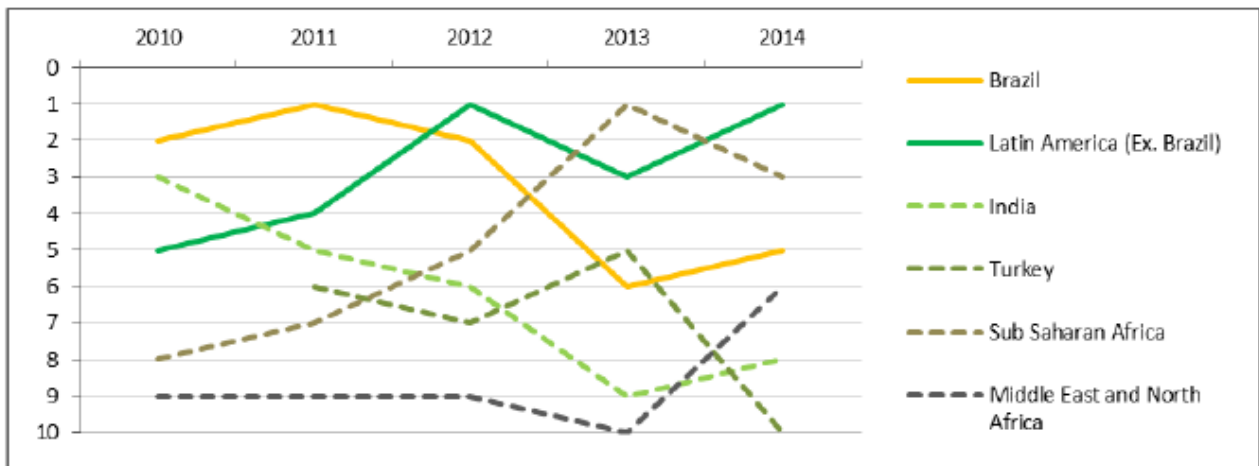


Figure 1.2a. Market Attractiveness Rankings, Greatest Shifts 2010-2014 (1=Most Attractive)

(Source: Carsalade, Richardo; 2014)

We see in Figure 1.3a that among the emerging countries, Brazil is in the middle in terms of market attractiveness, exceeding both India and Turkey. This higher attractiveness than India points to the potential of Brazil for investors. Translating to private equity, one can expect higher growth potential for PE in Brazil and Latin America in general.

The motivation for investment in Brazilian private equity investments often deals with tax benefits and reduced costs⁵. As expected, economic and political risk decrease the opportunities in private equity. Majority stake PE deals allow the acquirer tax efficiency in that the premium paid in the acquisition is tax deductible (ICLG). Minority stakes, on the other hand, allow the acquirer to mitigate the moral hazard of company's controlling shareholders (ICLG). Thus, the PE deals often have to do with a strategic company decision relating to corporate governance than simply the act of earning profit.

⁵ Brazil Private Equity 2015. ICLG- International Comparative Legal Guides. <http://www.iclg.co.uk/practice-areas/private-equity/private-equity/brazil>

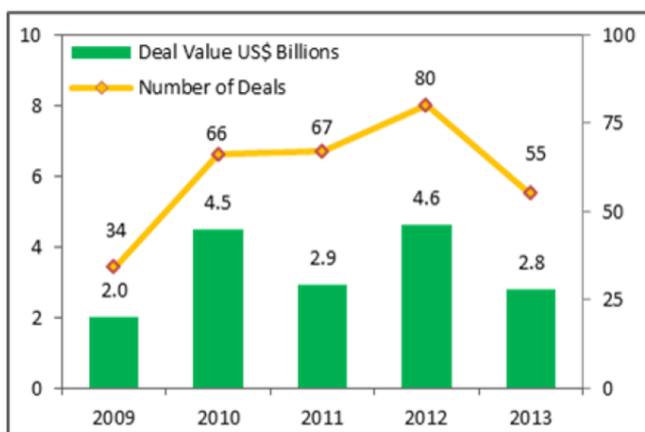


Figure 1.2b. Brazil PE Investments

(Source: Carsalade, Richardo; 2014)

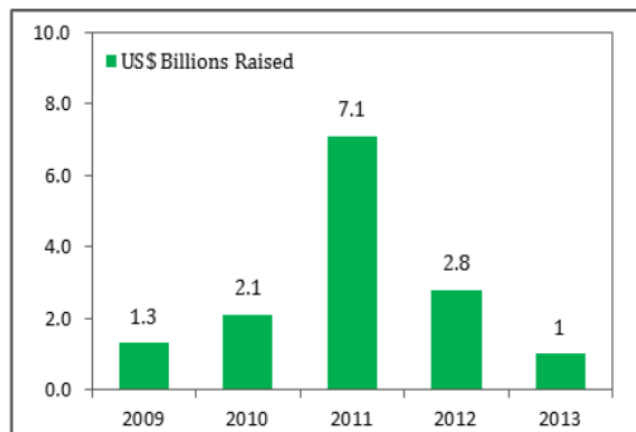


Figure 1.2c. Brazilian PE: Funds per Year

(Source: Carsalade, Richardo; 2014)

Regarding private equity investments, we see that Brazil holds a rather steady deal value from 2009 to 2013. Growth has been neither an upward trend nor a downward trend. With the amount of fund raised, we see that in 2011, the funds peaked at 7.1 billion USD. This, however, remains an anomaly and investors should not view this as the norm. When analyzing Figure 1.3c., one can view the excessive fund raising as “dry powder,” or capital left un deployed in investments⁶.

Closed	Vintage	Fund name	Fund Manager	Fund Type	Size (US\$m)
--	2013	P2 Brasil Private Infrastructure Fund III	Patria Investimentos	Infrastructure	1,600
--	2013	Gavea Investment Fund V	Gavea Investimentos	Balanced	1,500
2014	2014	Patria Brazilian Private Equity Fund V	Patria	Buyout	1,750
2013	2012	BTG Pactual Brazil Infrastructure Fund II	BTG Pactual	Infrastructure	1,380
2011	2011	GIF IV	Gavea Investimentos	Buyout	1,900
2011	2011	BTG Pactual Brazil Investment I	BTG Pactual	Buyout	1,500
2011	2011	Vinci Capital Partners II	Vinci Capital Gestora de Recursos	Buyout	1,400
2011	2011	Patria Private Equity Fund IV	Patria Investimentos	Buyout	1,250
2011	2010	P2 Brasil Private Infrastructure Fund II	Patria Investimentos	Infrastructure	1,155

Figure 1.2d. Brazil Billion-dollar Funds

(Source: Carsalade, Richardo; 2014)

Since 2011, the rise of billion dollar private equity funds in Brazil shows the potential of the Brazilian market. The large infrastructure fund and the ample opportunity to increase economic development in Brazil’s undeveloped areas points to opportunities for cooperation with foreign businesses and investors.

⁶ Pfeuti, Elizabeth. Private Equity’s \$1.2 trillion question. Raconteur. November 18, 2014. <http://raconteur.net/finance/1-2-trillion-question>

1.3 Private Equity in China

Closer partnership with China, a BRICS member, intuitively leads to a future increase in private equity deals involving Russia in the future. According to a Goldman Sachs report, “the economies of Brazil, China, India, and Russia could grow to be collectively larger than the G-6 economies (United States, Japan, United Kingdom, Germany, France, and Italy) in U.S. dollar terms before the middle of the twenty-first century”⁷.

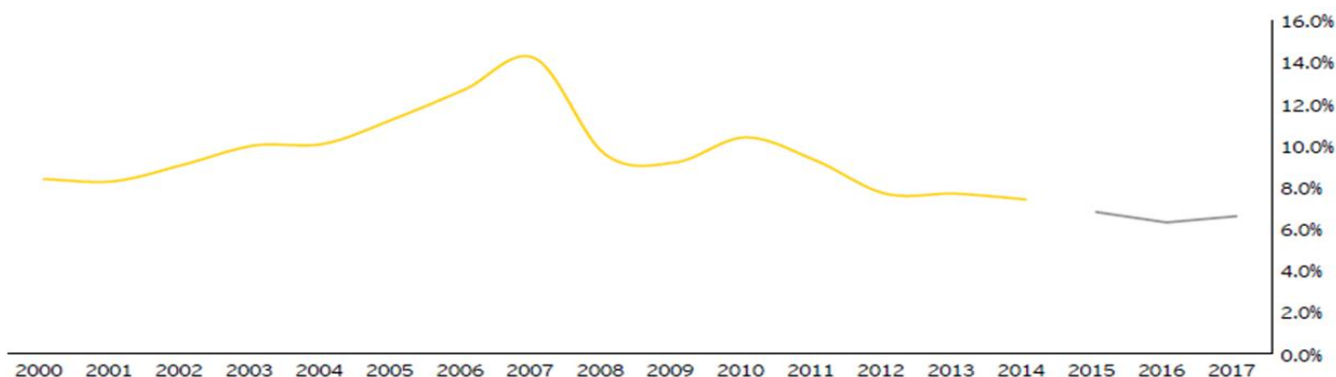


Figure 1.1a. Actual and projected GDP growth for China, 2000-2019

(Source: EY, 2015)

Table 1.1a. Top 10 Biggest Buyouts in 2014 (China)

Announcement date	Target	Financial sponsor	Deal value (US\$b)
29-Aug-14	China Huarong Asset Management Co Ltd (20.98%)	Warburg Pincus LLC	\$2.4
18-Feb-14	Iowa China Offshore Holdings (Hong Kong) Ltd (34%)	Hopu investment Management Co	\$2.4
28-Apr-14	Youku Tudou Inc (18.5%)	Yunfeng Capital	\$1.2
29-Dec-14	Beijing Xiaomi Technology Co Ltd (Stake%)	Hopu investment Management Co; Yunfeng Capital	\$1.1
30-Jul-14	NQ Mobile Inc	Bison Capital Asset Management LLC	\$0.6
19-Aug-14	Henan Jinkai Investment Holding Group Co Ltd (Industrial gas assets)	Warburg Pincus LLC	\$0.5
27-Jan-14	Shanda Games Ltd (24.0376%)	Primavera Capital Management Ltd	\$0.5
27-Aug-14	Fujian Sunner Development Co Ltd (18.0034%)	KKR & Co LP	\$0.4
05-Jun-14	Inner Mongolia Yili Livestock Development Co Ltd (60%)	CITIC Private Equity Funds Management Co Ltd; Yunfeng Capital	\$0.3
25-Apr-14	South Beauty Group (69%)	CVC Capital Partners Ltd	\$0.3

(Source: EY, 2015)

The context for PE deals in China must be understood in the context of its current economy. After the global financial crisis of 2008, we see that China has suffered a decreasing GDP growth

⁷ Khanna, Tarun and Palepu, Krishna G. “Spotting and Responding to Institutional Voids: Identifying Opportunities in Emerging Markets” *Harvard Business Review*. 2010.

rate with projections between 6%- 8%.⁸ A rising middle class and international investors make China still one of the high potential markets as PE develop for the growing middle class.

China has increasingly engaged in international mergers and acquisitions for increased domestic market potential. In 2014, we see that the highest M&A deal in China comes in at \$2.4 billion USD. According to the Earnest and Young private equity report for China in 2015, the future of private equity lies with the economic restructuring and the role of state owned enterprises (SOEs). The streamlining of many state owned enterprises cause and result in a large number of private equity transactions for the next few years. Despite the potentials, “China’s growth is highly volatile as it attempts to manage the difficult transition from the rapid expansion and investment that characterized its boom years to a more balanced growth model.”⁹ The volatility and the period of economic reshaping will present ample opportunities for the development of private equity deals with Russia and other BRICS countries.

According to *Bloomberg BNA World Securities Law Report* for 2015¹⁰, private equity in China falls into three categories. First, there are private securities listed from publically listed companies, which are regulated by the China Securities Regulatory Commission. Second, there are private equity and venture capital with regulation from entities including the China Securities Regulatory Commission and the National Development and Reform Commission. Lastly, there are securities listed by private companies, which presents the least regulation of the three and functions without well-defined rules. For investors, “private equity returns are positively associated with legality and negatively associated with corruption” (Cumming, Fleming, Johan, Takeuchi; 2010). This means that the less corruption and more enforcement, regulation, and transparency that exists, the higher the private equity investment return will output. Increased regulation points to the benefits of the PE market in China. Additionally for Russian companies and investors in particular, it is interesting to note that even with the amount of corruption in China, corruption is less destructive in China than in Russia due to various domestic policy (Sun 1999). The reason for this is that China allowed the market to reform while keep the central government structure relatively intact, while in Russia “economic shock therapy” was applied “after old authority and legal institutions are destroyed and before new ones are built (Sun 1999).

⁸ Private Equity Roundup China. EY 2015.

⁹ “Global Private Equity Report 2015.” Bain & Company. www.bain.com

There has been an overall trend to improve the regulation of private equity in China, with the State Council of China in 2014 releasing a statement to address the development of increased standardization of private equity:

“[a] private placement system shall be established and improved. It is important to formulate a set of criteria on qualified investors, specify the investor suitability requirements on the private placement of various products and the information disclosure requirements on private placement to the same type of investors, and standardize placement activities. No administrative examination and approval shall be instituted for private placement. Instead, issuers of all types are allowed to issue, on the basis of compliance, stocks, bonds, funds and other products to an accumulated number of investors that does not exceed the number specified by laws.”¹¹

The PE industry in China holds part of its success to the legal and state development and regulation for the industry. A short historical timeline will briefly give an overview of the steps leading to the regulation of the Chinese PE industry. The framework for the regulation of PE funds first started in 2003 with the Foreign Invested Venture Capital Enterprises (FIVCE) and also the by the National Development and Reform Commission (NDRC) commission two years later. At this point, the PE industry in China is not yet regulated institutionally. However, in 2008, with the document issued by the State titled *Several Opinions on Providing Financial Support for Economic Development*, the PE industry and its regulation in China began to form. Another document titled the *Administrative Rules of Private Equity Investment Funds* also furthered the regulatory development of the industry. With the 2014 State standardization of PE, investors can expect to see increased regulation of PE. Given the historical development of PE funds in China, increased regulation for the PE industries will occur on the horizon. In the next few years, further focus on increased standardization will bridge the gap between China's standardization of private securities and that of developed economies. However, we know that in developing countries like China that rules can be flexible and readily adjusted as the State desires. Thus, the improved regulation of private equity may take time, and loopholes may continue to exist in China's private equity regulation

¹¹ Mark, Liza. “China: Recent Developments in the Regulation of Private Placements.” Bloomberg BNA World Securities Law Report. Volume 21, No. 3. March 2015.

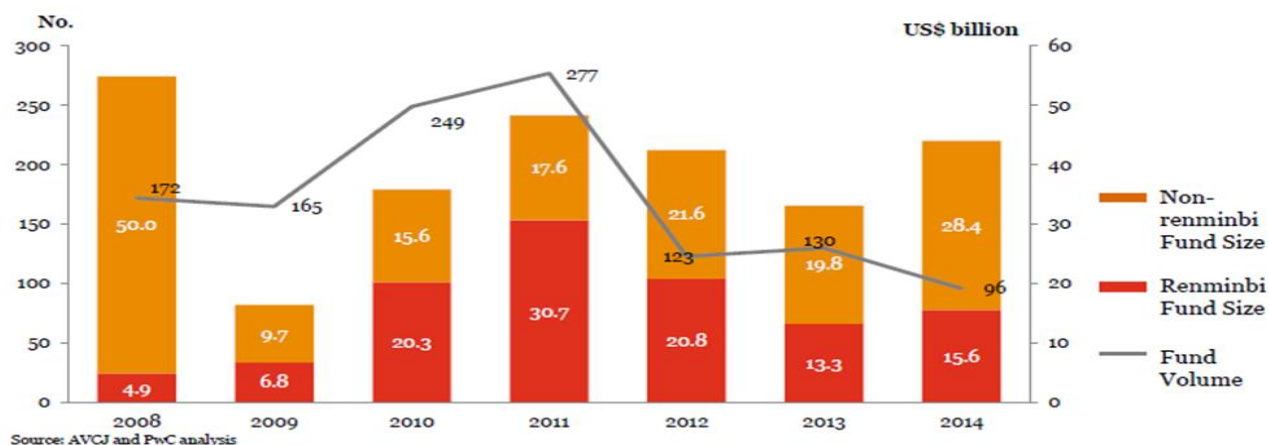
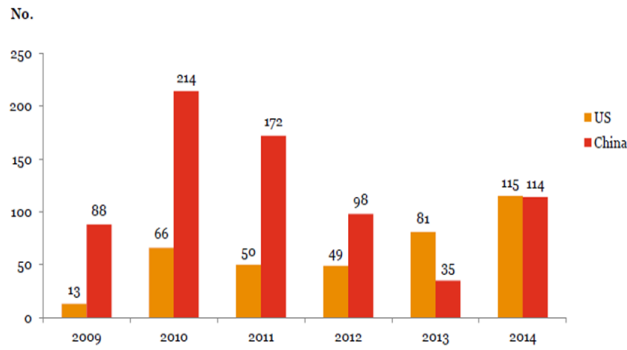


Figure 1.3a. PE/VC Fund Raising for China Investment: Excludes PEs Investing in China from non-region specific funds

(Source: PwC, 2015)

As we see in the Figure 1.2, two types of funds exist: renminbi (RMB) funds and non-renminbi funds. After 2008, the year of the financial crisis, we see that the size of non-RMB funds dropped dramatically from 50.0 billion USD to 9.7 billion USD while the fund volume decreased less dramatically from 172 to 165. After 2008, RMB funds have steadily increased from 4.9 billion USD in 2008 to 30.7 billion USD in 2011. Within recent years in 2013 and 2014, however, RMB funds has decreased to 13.3 billion USD in 2013 and 15.6 billion USD in 2014 with the fund volume also decreasing to its lowest of 96 in 2014. The patterns from 2008 to 2014 shows the fluctuation of the two main types of funds in China. The overall peak during these seven years lies in 2011 at 277 funds in general. Despite the varying levels of RMB funds and non RMB funds, the fact remains that over the course of seven years, China has seen an increase in the PE and VC funds, increasing 318.37 %. This means that while in the short run, one may see fluctuations such as the drop of PE volume after 2008 and 2011, in the long run, one can expect China to be a sustainable source of PE investment and development.



**Figure 1.3b. Exits: PE/VC backed IPO exits
China vs US (2009-2014)**

(Source: PwC, 2015)

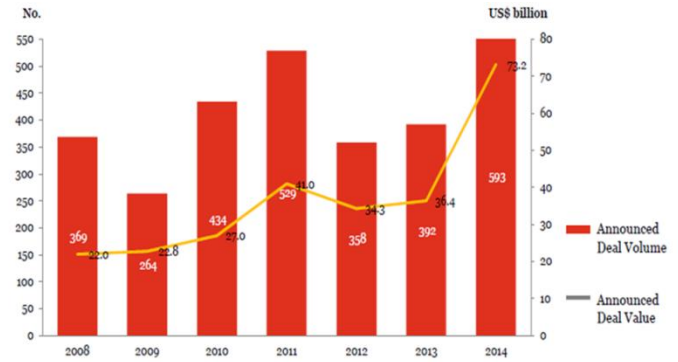


Figure 1.3c. PE Deals (2008-2014)

(Source: PwC, 2015)

The number of PE deals after 2008 has steadily risen after 2008, with 2014 containing the highest amount of announced deal volume at 73.2 billion USD (PwC Hong Kong). The trend shows that China has consistent and steady potential in terms of PE development. Additionally, in terms of PE exits, we see that throughout 2009, 2010, 2011, China contains more PE/VC IPO exits than the US. In 2014, the number almost equals, with the US at 115 and China at 114. From the statistics, we see that China holds very high potential for a neighboring country such as Russia in terms of business development and PE deals.

1.4 Description of the methodologies

Generally, valuation methods fall into three categories: market approach, income approach, and the cost approach. For private equity, the income approach will not be the most effective method simply due to the hidden nature of private equity financial statements, ie. the Discounted Cash Flow method. Not all private companies disclose their financial transactions and of those that do, sometimes even amount of the PE deal itself will be hidden, not to mention possibly the participants of the transaction. When looking at the various valuation methods, it is important to understand that the models are classical and based on theory. In a practical sense, one often works with incomplete data.

Private equity deals in this research falls under the context of mergers and acquisitions. The increasing cross border nature of mergers and acquisition not only brings up issues of foreign economy and culture analysis, but also the more practical issues of whether or not to conduct the valuation in the home currency, the buyer's home currency, or to an international standard (Weaver, Harris, Bielinski, and MacKenzie, 1991). Although the REM specific research conducted in part three of this research addresses the latter case of valuation using the international standard of the USD, many potential exist for honing in valuation models.

Table 1.4a. Approaches to the Valuation of Equity

Operating Approach		Capital Approach
Cash Flow	Discounted Cash Flow Models (DCFM)	
	Discounted Free Cash Flows Model (DFCFM)	Discounted Dividend Model- (DDM)
Residual Income	Residual Income Method (RIM)	
	Residual Operating Income Model (ReOIM)	Residual Earnings Model (REM)

(Source: Volkov 2004)

The first common valuation method comes from the use of multiples. Earnings, book value, cash flow may form the basis of the multiple based valuation, where one can obtain the model through a product of the base value and a chosen multiple. The downside to the multiples approach comes from the fact that it is “difficult to find comparable companies, [and that] accounting

cosmetics can lead to notoriously difficult problems” (Weaver, 1991). We see the case in many private equity buyouts in Bloomberg, where many times financial information for the previous two years preceding the announcement date of the takeover do not exist. While one can forecast the values based on the previous year’s growth rates, there is no certain way of obtaining an accurate ‘historical forecast,’ as simply too many financial and economic factors exist in real life to make accurate assumptions. Cash flows and earnings may also be oversimplified in the simple multiplication of the multiples valuation. Last but not least, “the use of multiples falls into the trap of being a backward-looking exercise instead of the forward-looking analysis critical to any valuation” (Weaver, 1991).

Before moving on to cover other valuation methods, it is essential to take a moment to explain the trap of applying valuation as a backward-looking exercise instead of the forward-looking analysis. Many models exist as well as the inevitable data gap. The tendency may be to fill in the data gaps with a fitting multiple or a variable. This practice hinders effective valuation, because the financial analyst or the investor has no way of knowing which value to look or use in the forward-looking analysis. Because valuation is more of an art rather than a science, understanding the nuisances and the complexity of the financial market is to the long-term benefit of the valuation practitioner. Therefore, in part three of this research, focus will be dedicated to the specific analysis of the type of variables chosen for test of the methodology.

Discounted Cash Flow Models (DCF)

Referring to the Table 1.4, we see that under the operating and cash based approach is one of most popular model in finance, the Discounted Cash Flow Model (DCF). While different from the model we are going to test, the DCF never the less provides interesting insights on valuation practices as well as the challenges of applying valuation models to real market and company data.

From the equation, we see:

I. Free Cash Flows, weighted average cost of capital

$$V_F = \sum_{t=1}^N \frac{FCF}{(1 + K_w)^t} + \frac{TVF}{(1 + K_w)^N} \quad (1)$$

where

FCF = Free cash flow prior to debt service

K_w = Weighted average cost of capital

TVF = Terminal value of the entire firm

N = planning horizon in years

V_F = Value of the firm

(Source: Weaver, 1991)

For the Free Cash Flows DCF model, we see that the weighted average cost of capital serves as a very part of the valuation process. The important aspect to notice is that the cost of capital here is that of the target company being acquired. The difficulty here lies with the fact that “prospective cash flows may incorporate operating synergies perhaps different in prospective risk than the target’s existing operations” (Weaver 1991). The importance of this claim cannot be overstated, as it demonstrates the imperfect nature of seeking the ideal discount rate. The reality is that often times ideal conditions do not exist, and one has to use what is available, ie. assumptions and estimates.

II. Equity residual cash flows, "cost" of equity

$$V_E = \sum_{t=1}^N \frac{ECF}{(1 + K_e)^t} + \frac{TVE}{(1 + K_e)^N} \quad (2)$$

where

ECF = Equity cash flow, after debt service

TVE = Terminal value of equity

K_e = Cost of equity capital

V_E = Value of equity = V_F - V_D

(Source: Weaver, 1991)

The second variation of the Equity DCF models is based on the idea that the value of the firm can be estimated using the equity cash flow after debt discounted by a cost of equity. The difficult in this variation is again K_e . More debt in the buyout would affect the discount rate. The equity cash flow model works best in leveraged buyouts (LBOs) and where capital structure is tied to the value of transaction. While the two models above deal with the public mergers, private mergers follow similar methodologies. The challenge faced by private companies is that private companies' financial reporting may not reflect their actual worth. Inflation and misrepresentation of the figures are common practice.¹²

With regards to the problems with the two types of DCF models, Weaver states four main reasons: “(i) the estimation of terminal values, (ii) the nature of incremental flows, (iii) the valuation of future options, and (iv) the choice of currency to be used” (Weaver 1991). In the case with the REM model, the terminal value for analysis is either the end result, thus making the first concern moot. Factors (ii) and (iii) are DCF specific, and will be addressed in this section. Factor (iv) the choice of currency remains a problem for all types of valuation models, including the REM. The choice of currency holds relevance because it deals with the concept of exchange rates and arbitrage. In theory, valuation using two different currencies may yield the same result, but it does not hold in practice. The author proposes that “cash flows in a foreign currency and discount such flows at a cost of capital based on foreign capital market conditions. The resultant value can then be translated back to a buyer's home currency at spot exchange rates. Alternatively, cash flows can be converted to home currency at projected future exchange rates and evaluated with a home currency discount rate” (Weaver, 1991). Whichever the choice of valuation, valuation using two different currencies in cross border private equity deals holds research potential in honing in on the accuracy. For this particular research on the REM model, the factor of currency is held at a constant in order to test the model itself. However, inclusion of a binary currency variable could hold future research potential.

Dividend Discount Model (DDM)

Moving on to the next Capital Approach valuation model, we will discuss the Dividend Discount Model, which falls under the cash based flow model. The basic definition of the DDM is valuating stocks by using predicted dividends and discounting them back to the present value¹³ As the name suggest, the DDM only works for companies that pay out dividends. In non-traded entities,

¹² DeChesare, Brian. “Private vs. Public M&A Deals: Got Divested Assets and a Stepped-Up Tax Basis?” *M&I Mergers and Inquisitions*. <http://www.mergersandinquisitions.com/private-company-ma/>

¹³ Dividend Discount Model. Investopedia. <http://www.investopedia.com/terms/d/ddm.asp>

this methodology may prove to be inconsistent for all available cases. According to the classical paper on the DDM (Farrell 1985), the DDM provides “a framework for comparing the sensitivities of stocks and bonds to unexpected changes in inflation rates” and also variations on the DDM “provide an important tool for comparing relative values across a sample of individual stocks.” (Farrell 1985). The important point to notice here is that the DDM focuses on stock valuation, and thus, public traded entities. For valuation of private equity deals, other approach may provide the best solution when stock does not exist. Additionally, the traditional dividend discount model fails to explain the volatile and dynamic stock price movement (Jiang and Lee 2005). In the cases of private companies, this argument remains moot. However, it shows that the DDM does not present a valid choice due to the nondisclosure of private companies. Due to these reasons, the cash based flow models of valuation for PE does not make the ideal model. Book value and accounting earnings provide more accurate valuation than the DDM and the residual income approach of valuation steps up as the next methodology of choice.

One concept that holds relevance according to the International Private Equity and Venture Capital Valuation Guidelines (IPEV) is the idea of industry benchmark. According to the international private equity valuation guide, “the use of industry benchmarks is only likely to be reliable and therefore appropriate as the main basis of estimating Fair Value in limited situations, and is more likely to be useful as a sanity check of values produced using other techniques.” This means that if an industry standard exists, for example the ROE, then it may provide a benchmark for the values used in the selected model. We will see this later on in the case section.

Residual Income Model (RIM)

The residual income based valuation serves as the second main group of equity valuation techniques. The Residual Income Model of Ohlson serves as a classical case in financial research literature. Many variations of the original model have been tested and developed over the years. The accounting model tested in this particular paper derives from the Ohlson (1991,1995) model. The two factor accounting model serves as a reliable method for valuating private companies and private equity deals in the Russian market, which currently lacks regulation for private equity. “The biggest drawback of the residual income method is the fact that it relies so heavily on forward looking estimates of a firm’s financial statements, leaving forecasts vulnerable to psychological biases or

historic misrepresentation of a firm's financial statements¹⁴.” Nevertheless, the RIM holds merit even if accounting data is incomplete (Easton, Taylor, Shroff, Sougiannis, 2002). Estimates of the expected rate of return (r) may be very sensitive to assumptions about the rate of growth in residual income (g) (Easton, Taylor, Shroff, Sougiannis, 2002). Additionally, accounting earnings may be summed over time in that “forecasts of the earnings for each of the next four years may be summed to obtain aggregate earnings for the entire four-year period” (Easton, Taylor, Shroff, Sougiannis, 2002). Due to the arithmetic nature of accounting forecasts, we are able to forecast accounting data for missing company years through an arithmetic average of the previous years on the assumption that previous year's earnings reflect the future earnings in relative stability. Of course, the more years that are missing, the more inaccurate the forecast will be. However, in the particular cases studies, we see that sometimes only two years are missing. Therefore, an arithmetic average will be conducted. Because the Residual Income Model breaks into the Residual Operating Income Model and the Residual Earnings Model and that there is little difference between the two variants, we will focus on the Residual Earnings Model as part of the research methodology procedures (Volkov 2004).

Due to the fact that the Russian Federation is a member of the BRICS alliance, the Residual Earnings Model in theory can be used as a model for other emerging countries. This research focuses on the research gap and the application of the accounting based model to countries not covered by prior research. This particular accounting based model describes the value of a company based on the book value of equity and the growth value of the fundamental value.

¹⁴ Valuing a Company Using the Residual Income Method Investopedia. Investopedia.
<http://www.investopedia.com/articles/fundamental-analysis/11/residual-income-model.asp>

1.5 Literary Review and Existing Research

The descriptive resources used in this research compose of the PwC Private Equity/Venture Capital 2014 Review and 2015 outlook for Hong Kong, published on February 15th 2015. Similar resources were also used for other emerging countries. PwC outlook for the Chinese market presents an international recognized standard to assess the current state of the economy. The report includes both the mainland and the Hong Kong market, and it offers trends on buyouts, IPOs, exits, and recommendations in a graphical brochure summarizing key statistics of the 2014-2015 year. This source does not provide any theoretical background, and offers a practical guide for investors and anyone interested in gaining the most recent market context on the Chinese market. The EY Private Equity roundup also provides an analysis of PE development in China and provides context on the fundraising, acquisitions and exits of the Chinese market on a macro level. Deloitte also provide advice for PE investors, although it delves more into the specific types of RMB funds and their structure rather than the overall macroeconomic overview.

Regarding valuation techniques, the International Private Equity Valuations guide 2015 (IPEV) guide provides a basic overview of existing methodology. The international standard serves as a particular valuable source of research and framework, because “the increasing importance placed by international accounting authorities on Fair Values reinforces the need for consistent use of valuation practices worldwide”. Regarding other works, the author Feldman also provides a detailed look into the corporate side of private entities, although it focuses on the firm itself and does not look into buyouts or M&A (Felman, 2005). His work provides context in specific firm specific subjects such as Goodwill, taxes, and liquidity discounts. Because emerging countries do not regulate PE to the extent of developed countries, how firms merge in leveraged buyouts holds relevance in how PE in a market takes shape. Various works provide context on PE in developing markets (Lerner, Leamon, Vase, 2011; Lerner, Sorensen, Stromberg, 2009; Kaplan and Strömberg, 2009; Stromberg, 2011) *Leverage Buyouts and Private Equity* (Kaplan and Strömberg, 2009) holds special significance, because the authors go into the basics of the PE industry as well as the effect of PE on capital structures, management incentives, and corporate governance.

Given its theoretical focus on PE development, the research of Kaplan and Strömberg falls under the category of classical papers which build context (Kaplan and Strömberg, 2009). The select markets do not pertain to BRICS or other emerging countries as Kaplan and Strömberg explore the cases of BlackStone, Carlyle, and KKR in the US in the late 1980s and continue to describe the

trends of PE in the US until the year 2007. Thus, the downside to this study lies in the time period of the research in that it occurs before the 2008 financial crisis. From the empirical analysis of the relation of PE return and fundraising, Kaplan and Strömberg concludes that PE does generate economic value and follows a boom and bust cycle. This conclusion reveals that PE can directly contribute to the economic development of a country and holds potential for management research. In emerging countries such as Russia, increased PE development would hold great potential in development of the economy given the proper regulation.

In terms of methodology, the bulk existing research on the Residual Earnings Model comes from classic finance research dating back to 1995 as well as more modern literature (Feldman, 2004; Ohlson, 1995; Volkov, 2004; Bukhvalov, Volkov, 2004; and Volkov, Berezinets, 2007). Weaver, Harris, Bielinski, and MacKenzie, 1991 provides an in-depth view of mergers and acquisitions and the DCF model. While in the context of public merger, Weaver and his colleagues do provide interesting insights into the problems of valuation in cross border transactions. Many of the issues brought up pertain directly to the application of the REM model, making the research relevant to this thesis in general. Additionally, Weaver and his colleagues provide a refresher on the DCF model in the context of M&As, making their research relevant to the financial analyst and managers in general (Weaver, et al 1991).

Regarding more recent research, Berezinets lays out the fundamentals of the residual income model, while the basis of the Residual Earnings Model is a combination of Volkov's and Bukhvalov's work (Berezinets, 2007, Bukhvalov, Volkov 2004). Volkov's work in 2004 proves that the Residual Income model and the Residual Earnings Model (REM) are all fundamentally the same (Volkov, 2004). It is due to this conclusion that this research tests only the REM model and not its variations. In the following section on methodology, the exact regression model will be explored more in depth.

James A. Ohlson of Columbia University in 1995 in the work analyzes a firm's market value in relation to current and future earnings, book values, and dividends (Ohlson, 1995). Although the work is rather dated, Ohlson does provide the foundation for the REM model as well as many other research which referenced his work. The foundation provided opens up a new direction in private equity and valuation. One of the conclusions of the model is that "dividends reduce current book value but do not affect current earnings." (Ohlson, 1995). Ohlson explores a concept called the clean surplus relation, or the "change in book value to equal earnings minus dividends (net of capital contribution)" (Ohlson, 1995). Ohlson looks at the statement of change to in owner's equity, in

particular the bottom line items of book value of equity and accounting earnings. While Ohlson demonstrates a classical paper, in the year 2015 Ohlson's 1995 paper remains rather dated. Ohlson also publishes a series of works later, and they provide additional context to the original (Feltham, Ohlson, 1999; Ohlson, 2001).

A number of works which cites Ohlson (Reverte, 2014; Callen, Segan, 2005). Additionally, existing research on the Ohlson model does not take into account the complete variables that occur in real life. The Ohlson model "could be enhanced to incorporate the effects of taxes, bankruptcy costs, agency costs, asymmetric information" (Kin, Lys, 2000). However, these are minor points, and one can work with the main results from Ohlson's research. All further research by Volkov, Berezinets, and Bukhvalov is built on the theoretical foundation of the Ohlson and applied to the context of the Russian market. Because Ohlson addresses theory, the 1995 date does not hinder the applicability and development of his findings. Ohlson also refers to Modigliana and Miller, 1961 regarding dividend policy irrelevancy, where "a dollar of dividends displaces a dollar of market value". From these findings we see that the dividend discount model does not make the ideal model of choice for the regression.

1.6. Research Problem: Residual Earnings Model and Valuation of Non-Traded Companies

The research problem of valuing private equity lies exclusively in the fact that private equity information remains inaccessible without insider information. Therefore, one has to value private equity with incomplete information. This, however, can be accounted for using the different methodologies covered by existing research. Even then, methodologies provide just a theoretical framework, and they do not provide a perfect fit the complexities of real life cross border transactions given the complexity of the international financial markets.

According to Harvard Business Review¹⁵, “recent years, private equity firms have pocketed huge—and controversial—sums, while stalking ever larger acquisition targets... 1 billion grew from \$28 billion in 2000 to \$502 billion in 2006.” The ever changing dynamics of emerging markets and global business reveal that private equity no longer serves as the small player in the world of finance. Perhaps the most revealing of all is the fact that private equity no longer focuses on buying just parts of a business, but rather entire companies.

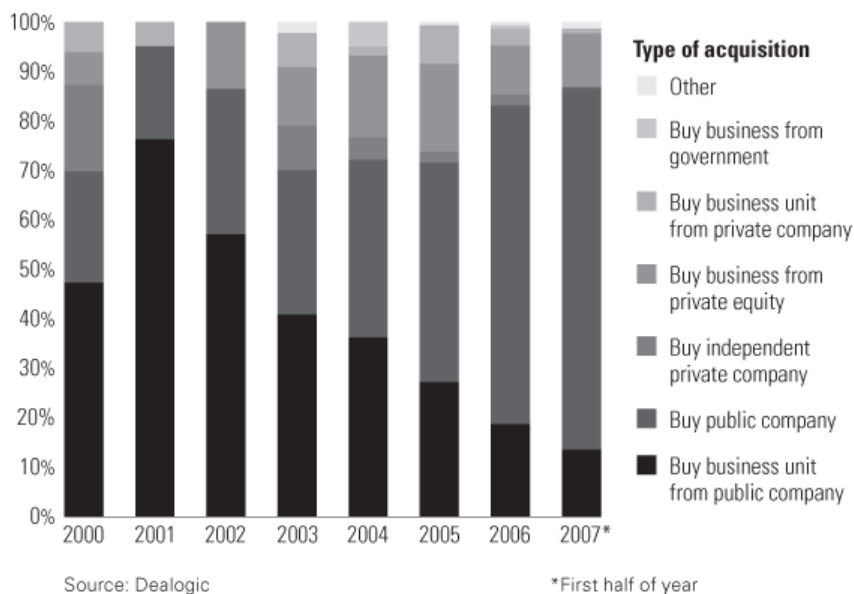


Figure 1.6a. Percent of total private equity deal value (deals worth \$1 billion or more)
(Source: Barber, Goold; 2007)

¹⁵ Barber, Felix and Goold, Michael. “The Strategic Secret of Private Equity.” *Harvard Business Review*. September 2007. <https://hbr.org/2007/09/the-strategic-secret-of-private-equity>

In Figure 1.6a, we see that the definition of private equities deals now include instances where private companies can now buy public companies, as indicated by the second to the last color coded block in the key. In addition to the usual private company acquisition by another private company, we see that private equity can now purchase even business units from even the government (Barber, Goold, 2007). While the diagram above deals with the years before the global financial crisis of 2008, we see a shift in what constitutes private equity. Private companies are having a much greater effect on established companies and the investment world in general. This also points to the importance for a company to devote time to research private equity.

Private company's selective disclose their financial information. Even if annual reports are published, figures are obscure and intentionally left vague. Nevertheless, financial databases such as Bloomberg hold a comprehensive source of financial information. Some of the financial data present are not found on the company website. Thus, databases such as Bloomberg comb the entire open source to find the most available data. For this reason, reliance on Bloomberg will serve as a foundation for this research. The method we are focusing on for this paper is the Residual Earnings Method, based off the works of A. Bukhvalov, D. Volkov and I. Berezinets (Berezinets, 2007, Bukhvalov, Volkov 2004). A tested model for private equity valuation in the Russian market, the Residual Earnings Model can be applied to other developing markets to see if this model fits and should be adapted.

The changing PE environment requires a developing and accurate method of PE estimation, especially in the turbulent times of today and in the upcoming years. To do this, the two factor model is used based off of the research of Bukvalov. Because developing economies and PE equity differs quite a bit from valuing publically traded companies, traditional methods such as the discounted cash flow analysis, market multiples approach, and adjusted present value approach do not apply due to the fact that many, if not all, of the indicators needed to value the company do not exist publically. Thus, the valuation delves into the areas of regression and statistics as overall market data is gathered and applied in the 'guesswork' of valuing PE deals.

1.7 Research Questions

The main research questions to be discussed are:

1. What are the trends of PE in emerging markets after the 2008 financial crisis?

While most existing research deals with PE in developed countries, tremendous potential exists in developing markets. The potential growth opportunities in emerging countries shows the importance of understanding how PE work in the frontier of the finance world where the market has not yet its saturated state. The period after 2008 is chosen, because the global financial crisis of 2008 does not dictate the normal behavior of markets. While these risks exists that may interrupt the global finance market, theoretically it is advisable to analyze the effectiveness of the selected model in a stable financial environment. Adjustments could always be added to the main model after testing for its universal applicability in emerging countries.

2. How can one apply the Residual Earnings Model to PE deals in emerging countries?

The second research question deals with the actual process of the accounting based regression. The goal here is to assess how close the valuation is to the financial database value. While the term ‘emerging countries’ encompasses many different countries, the research question focuses on the select cases chosen for this research.

3. How does the Book value of Equity and Net Income explain the value of a PE deal in an incomplete information environment?

The accounting based model assumes that the book value of equity and net earnings/income accurately predicts the real value of a PE deal through the regression formula of the REM. The statistical significance of the final result will address how accurate these two variables account for the final valuation. Here we are looking at the coefficients in the regression.

Hypothesis:

The hypothesis tests the applicability of the accounting based Residual Earnings Model and its accurate in providing statistically significant estimates when compared to the reported PE value.

H_1 : Book value of equity and Net Income through the Residual Earnings Method does not provide accurate valuation of the final equity value within a 15% percent difference.

The equity value in this case is the transaction value plus any debt assumption from the acquiring party. A secondary hypothesis deals with the rate of return k_e , as already proved in Bukhvalov and Volkov 2005. In their work, they proved that the rate of return of equity used to calculate the Residual Earnings does not significantly affect the outcome. Because this hypothesis was only tested for the Russian market, it is worth repeating to other emerging countries for the consistency.

H_2 : The required rate of return of equity k_e does not significantly affect the valuation results of the regression for the select PE deals in Brazil and China.

We will analyze the statistical significance via. the final decision to reject or fail to reject the hypothesis via the F-test statistics. For the F-test, 5 % is used as the decisive measure. If F statistic is bigger than the F critical value, then we reject the null hypothesis. If so, then it would mean the required rate of return does in fact influence the valuation results and that the Book value of equity/Net Income do in fact accurately value the select deals.

2. Application of the Residual Earnings Model and Case Study

2.1 Research Methodology

2.1.1 Research Content

As mentioned in the introduction, the goal of the research is the verification of the residual earnings model in private equity deals evaluation in Brazil and China by assessing the deviation from the equity value of the PE deal. Determining on a valuation model to value private equities in emerging markets holds importance due to the fact that emerging markets are relatively uncharted, has less regulation, and holds more growth opportunities than developed markets. The differences in the select emerging market will dictate the nuances and set the context for how private equity valuation will work.

Private equity valuation serves as more of an art rather than a science simple due to the fact that financial statements do not need to be reported¹⁶. Because companies conduct their accounting under varying procedures, the exact value of a private equity can vary. Financial reports for private companies can be vague and opaque.

A. Bukhvalov, D. Volkov and I. Berezinets indicate that one can forecast the unknown of private equity market in Russia through the REM (Berezinets, 2007, Bukhvalov, Volkov 2004). This specific model of interest is an accounting-based valuation method based on J. Ohlson (Ohlson, 1995; Feltham, Ohlson 1995). In Bukhvalov's research, data for 31 traded companies were analyzed over four years. The Residual Income Model was tested and the two-factor econometrics model was used to identify the value of private companies with varying results. In our model, we will extend the period to eight years starting from 2008, the year after the global financial crisis.

Because the previous research deals only with the two-factor econometrics model with regards to Russia, the goal is to apply this model to other emerging countries and further test the applicability of the two-factor REM in valuing private equity deals in emerging countries. Thus, Brazil and China, the first of the two BRICS countries, are chosen. The success of the research will

¹⁶ Valuing Private Companies. Investopedia. <http://www.investopedia.com/articles/fundamental-analysis/11/valuing-private-companies.asp>

largely depend on the availability of the financial disclosure of the parties involved in the private equity transaction.

Since accurate estimation requires financial data for a large number of companies, country stock exchange sites, Bloomberg, and Thomson Reuters platforms will provide the solution since they already have a large number of commercial information by country listed as part of the function.

The **stages** of this research are:

1. Gather market data for the top 50 companies in various emerging markets from the year 2008 after the financial crisis and control for the missing data.

The source of the regression data comes from Thomson Reuters Eikon and the select cases from Bloomberg. During the financial crisis, PE buyouts and M&A acquisitions take a backseat as companies focus on retaining profits over the subsequent business quarters. The top 50 companies are selected based on current market capitalization in the year 2016. The reason 50 companies were selected without regard to industry is to model the same conditions set in the research conducted by prior works. Furthermore, in emerging countries, for industries like oil and gas, only a handful of companies exist with most having state ownership. Thus, if one takes only the companies for that industry, then the research would contain only a few companies for the time period tested. Data gaps will naturally occur given the fact that some companies ‘drop out’ or change places in the top 50 companies list. This is either because the companies have not gone public until that year or because data truly does not exist. For this reason, the data sample for the regression will be controlled, and the best regression will be conducted given the gaps understandable in the financial market. All companies with missing values for the book value of equity, net income, or market capitalization on any year from 2008 to 2015 was deleted from the regression sample.

2. Select specific cases of PE deals in emerging countries and provide the necessary PE background in the countries involved in the cases.

Fortunately, many private equity deals already exist and are reported and audited by leading auditing firms. The values of the deals are known in most cases. There are cases where either the transaction or the party involved are not disclosed, and these cases are not selected for this research. Because various private equity firms in China also publish an annual report, albeit a much more reserved one, the exact value of transaction already exist. However for consistency purposes, the

assumption holds that the audit from Bloomberg reported data contains the most professional and accurate edit. Because sometimes local auditing firms were used in calculating the Chinese and Brazilian deals, we will refer to the Bloomberg database value as the standard. This also makes regression testing a feasible task.

3. Apply the Residual Earning Model and compare the results to the Bloomberg reported value of the deal.

Last but not least, we will take a calculated difference of the regression-based valuation and the actual professional audit value. While the standard to assess the percent difference will vary depending on the discretion of the practitioner, for this experience we will define success as less than a 20% difference between the calculated value and the reported value simply due to the reason that the select cases include many different companies and are not dedicated to one specific industry. Of course, if a company is assessing zoning in on a specific industry for a narrow time period for a particular merger, they may implement a much narrowing margin of difference.

The methodology of the regression analysis follows the works of A. Bukhvalov, D. Volkov and I. Berezinets with varying time periods and market data- from the years 2008-2015 in particular for the markets of China (Berezinets, 2007, Bukhvalov, Volkov 2004). The regression will follow one variation of the Residual Income model, the two-factor Residual Earnings Model (Volkov, Berezinets, 2007). An important aspect of the case analysis is the gathering of industry averages from financial databases in order to find the k_e value necessary to proceed with the valuation. Then the research will proceed to the case studies involving international PE deals. The REM regression will build the necessary β s and output the resulting regression based market cap, which will output the tool necessary to value specific cases individually.

In the PE cases, the target company in the merger will be private companies' buyout of private companies. We will provide a short background of the company and its activities. The sources used will be the company's financial statements which are available. For private companies, often times recent annual reports are not disclosed, and does not pose a problem. The financial data can be found, for example, in the Bloomberg database and the company information can be found via old annual reports. Many PE deals exist in financial databases; many PE transactions have undisclosed transactions or disclosed transactions with undisclosed participants. Thus, cases with more than three years of unknown data are excluded due to the data gap. The cases selected deal with both international PE deals as well as deals that take place within one country. While going-

private deals are considered private equity deals, we will focus on the traditional private company buyout of other private companies. Corporate restructure is excluded from the case study, although the REM definitely could apply to those cases.

We will also calculate the industry average return on equity (ROE) required to fulfill the regression. In Section 2.2, one can notice that different rating standards are used, in particular, the Global Industry Classification Standard (GICS), SYWG in China and the Industry Classification Standard (ICS). All of the rating systems are taken from Bloomberg and hold different historical data, companies, and industry categories. Thus, it often happens that a particular industry does not exist in one specific classification due to terminology. We simply state the classification systems in order to help the reader understand the steps taken on Bloomberg to obtain the specific numbers.

2.1.2 Empirical Design

The foundation of the analysis comes from Thomson Reuters, along with the financial statements of companies. For the sample collection in China, the data was taken from the Thomson Reuters Eikon database with the company market capitalization as the identifying ranking criteria in selecting the top 50 companies of the financial exchanges of the selected particular country. The novelty of the ranking by market cap is as of Q1 of 2016. The top 50 countries of the chosen emerging country were taken during Q1 of 2016, and the data for the past seven years was gathered. To analyze a stable financial environment, the time frame of the research begins in 2008 and lasts until 2015, the most recent year. From the data, it is important to note that in some places the data shows NULL. In these instances, it simply means that the company has not started trading during that year. In these instances, the companies for the data are excluded from the sample. All of the values in the data are show to be in USD. Regarding the exchanges, the Eikon database pulled the entire available exchanges of that the chosen country:

Brazil exchanges: BM&F Bovespa, Bolsa de Valores, Mercadoria E Futuros

Chinese exchanges: Hong Kong Exchanges and Clearing LTD, Shanghai Stock Exchange, Shenzhen Stock Exchange, Singapore Exchange, Taiwan Stock Exchange

In the Chinese exchange an anomaly exists in that Singapore show up in the data. However, given the fact that the company listed is Overseas Chinese Banking Corporation Ltd, it will be included as part of the sample. Regarding the data selection, the top 50 companies native to the selected country are chosen based by market cap in the beginning of 2016. The companies are not industry specific and form the representative of the largest companies by market capitalization. The reason for taking the top companies in a chosen emerging country instead of taking the global top 50 industry specific companies is that emerging countries often share common characteristics regardless of the industry. As these are all publically traded companies, the companies are successful in their respective countries and do not present a problem in terms of capital. The sample only contains established companies which has already established themselves after the 2008 global financial crisis and thus hold reliability.

Additionally, the Ohlson model regression often takes the top companies by market cap without industry specifics. For example, in the variation of the Ohlson model for Spanish firms, the sample collection consisted of 35 largest firms by market cap excluding financial intermediaries (Revrte 2014). The two independent variable are the book value of equity, and the residual earnings

(net income including extra before distribution) of the company. The dependent variable is the market cap. All values are taken from the end of the year at Dec. 31st. Rate of equity k_e represents the control variable, which will be set at 20%. The regression will output the betas, which will form the input for the final model used to calculate the value of a select PE deal.

2.1.3 Formulation of the Residual Earnings Model

The methodology used is the Residual Earnings Model, a continuation of the research of Volkov and Berezinets 2007 (Volkov, Berezinets, 2007). The chosen methodology satisfies the goal of completing a valuation using the Residual Income method and comparing the regression accounting model valuation against the professionally audited version of the specific private equity deal in the chosen cases.

Prior research for the REM comes from *Models of fundamental equity valuation: the problem of compatibility* (Volkov, 2004) and *Study of interdependence between fundamental value and market capitalization of Russian companies* (Bukhvalov, Volkov, 2005). The two in essence applies the REM to the Russian market in a limited time period and applies the results from *Earnings, Book Values, and Dividends in Security Valuation* (Ohlson, 1995). The premise of the 2004 Volkov research is that the residual earnings model is equal to that of the residual operating income model (Volkov 2004). Because of this finding, we will interchange the term the Residual Income Model (RIM) with the Residual Earnings Model (REM)

The relevance of the model ties back to the goal of the research: to test if the book value and the Net Earnings results in an accurate version of the Bloomberg reported value. The Residual Earnings Model “implies that the fundamental value of equity of a company depends on four factors: (a) amount of investments at the moment of valuation; (b) actual returns on investments; (c) required returns on investments; (d) invariability of spread of the results, i.e. ability of a company to generate returns on investment above the required. After reformulating the key hypotheses of the residual income model we can say that the fundamental value of equity of a company is based upon the two main elements: (a) book value of equity at the moment of valuation; (b) discounted flow of residual incomes ensuring gain of the fundamental value over the book value of equity capital” (Volkov, Berezinets, 2007).

$$RI_j = \pi_j - k * I_{j-1}$$

Where:

I_{j-1} = Book value at the beginning of the year j or end of year j – 1

RI_j = Residual Income of the jth year

π_j = accounting income at year j

k = rate of required return

Again, from Volkov's findings, the residual earnings will replace the residual income, with $RI_j = RE_j$.

$$RE_j = NI_j - k_e * E_{j-1}$$

$$Cap_{t+\tau,i} = \alpha + \beta_1 * E_{t-1,i}^{BV} + \beta_2 * RE_{t,i}^* + e_{t+\tau,i}$$

$$RE_{t,i}^* = \frac{RE_{t,i}}{k_e} = \frac{NI_{t,i} - k_e * E_{t-1,i}}{k_e}$$

Where:

$Cap_{t+\tau,i}$ = market capitalization at year i

$E_{t-1,i}^{BV}$ = book value of equity at beginning year i

$RE_{t,i}$ = residual earnings at end of year i

k_e = required rate of return on equity

$e_{t+\tau,i}$ = error term

In the regression, market cap is the dependent variable. The beta coefficients will indicate the varying degree of influence posed by the book value of equity and the residual earnings. The first step consists of finding the residual earnings from the net income and book value of equity. An important step in calculating the residual earnings is to take the book value of equity at the end of the previous year. For this reason the data for year 2007 is included for the book value of equity in order to calculate the residual earnings. After figuring out the residual earnings, the next step is to take the regression of the market cap with the dependent variables, the book value of equity and the residual

earnings, after which we will get the betas for the regressions. With the betas, we can find the REM regression valuation, or V_E^{REM} .

$$V_E^{REM} = \beta_1 * E_{t-1,i}^{BV} + \beta_2 * RE_{t,i}^*$$

Where:

V_E^{REM} = REM regression valuation

$E_{t-1,i}^{BV}$ = book value of equity at beginning year i

$RE_{t,i}$ = residual earnings at end of year i

Applying the regression equations with the beta, one can now apply it into the select cases by finding out the company's book value of equity and residual earnings from the annual report. When applying to the cases, we will find the industry average k_e of the select company. With the regression REM coefficients and the industry average return on equity (ROE), we can predict the value of the PE deal and compare its deviation from the real value. In some cases, the Net Income and Book Value of equity do not exist in financial databases for the years in which the deals take place. This is expected. There is "no consistently meaningful way exists to condense all the historical financial data relevant for forecasting future performance into one measure (or a time series of one measure)" (Cornell, Landsman; 2003).

It is important to note that the industry average k_e differs from the required rate of return k_e , which is used to build the regression coefficients. The required rate of return on equity k_e can be adjusted and does not hold a significant impact on the end result according to prior research (Bukhvalov, Volkov, 2005). For this research k_e will be tested at various levels with the baseline at 20%, which is the same value used in Bukhvalov's 2005 research (Bukhvalov, 2005). The logic behind the $k_e = 20\%$ is for consistency's purposes of emulating the same procedures and test conditions of established research. However, to test the alternative hypothesis, we will analyze the effects of different levels of k_e on one select case with the least valuation deviation.

2.2 Results: Application of the Residual Earnings Model to Valuation of Non-Traded Companies in Brazil and China

The biggest challenge in conducting a case study of PE buyouts in emerging countries is data availability. Many private companies do not have recent annual reports. Of those that do, the filings often lack key financial figures. Because the book value of equity and the net income are crucial to the application of the REM model, many large PE buyouts in emerging countries had to be omitted from the research. In our regression after controlling for the missing companies, we have 38 and 35 companies in Brazil and China for 8 years, respectively. Thus, we have a total of 304 and 280 company years for Brazil and China. While the companies year differ, the two regression models can be treated separately. We have taken the top 50 companies, and this is the result after controlling for the missing data.

Table 2.2a. Descriptive Statistics of Regression Data for Brazil

In millions USD	Market Cap '08-'15	Book Value of Equity '07-'14	Residual Earnings '08-'15	Net Income '08-'15
Mean	17321,38	11537,29	-4731,65	1361,13
Standard Deviation	30494,51	23779,59	21035,34	3260,87
Median	6408,42	3530,50	-871,92	398,08

Table 2.2b. Descriptive Statistics of Regression Data for China

In millions USD	Market Cap '08-'15	Book Value of Equity '07-'14	Residual Earnings '08-'15	Net Income '08-'15
Mean	61192,25	32423,52	-2572,94	5970,12
Standard Deviation	69935,47	44713,24	17057,19	8367,17
Median	31898,85	14514,38	-526,92	2473,94

Taking the regression, the following output is obtained for China using $k_e = 20\%$, the rate used in Bukhvalov's research (Bukhvalov, 2005). In order to formulate the null hypothesis for the t- test, we will state:

$$H_o: \beta_1 = 0, \beta_2 = 0$$

$$H_A: \beta_1 \neq 0, \beta_2 \neq 0$$

Because the critical value is 1.97, if the t statistic is greater than 1.97^{17} , then it means that we reject the null hypothesis. This means that the variables are statistically significant at the 5% level. We have 304 observations for Brazil, thus, we have 303 degrees of freedom. Meaning that for 10%, 5%, and 1% levels of statistical significance, we have 1.65, 1.97, and 2.59 respectively¹⁸. Because we have 280 observations for China, the degrees of freedom is 279, and the critical values are also 1.65, 1.97, and 2.59. We will use this as the cutoffs for analyzing the statistic outputs later in the regressions with the different expected rate of returns and assign them the appropriate statistical significance.

¹⁷ Table of Critical Value for T. <http://www.jeremymiles.co.uk/misc/tables/t-test.html>

¹⁸ Online Critical t value Calculator. November 29 2013. <http://scistatcalc.blogspot.ru/2013/11/online-critical-t-value-calculator.html>

Table 2.2c. Brazil

No	Variables	Values Rounded to 6 Decimal Places
1	Regression coefficients:	
	• Coefficient β_0	--
	• Coefficient β_1	1,765247***
	• Coefficient β_2	1,243132***
2	Determination coefficients:	
	• R squared	0,834980
	• Adjusted R squared	0,831122
3	t-test (5% significance):	
	• Critical value	1,97
	• T-statistics β_1	37,836413
	• T-statistics β_2	21,731018
4	F test (5% significance)	
	• F critical value	3,1404
	• F statistic	764,039589
5	Conclusion on the null hypothesis	Reject

(10% significance *, 5% significance **, and 1% significance ***)

In Table 2.2c, of particular interest is the R squared. An R squared of 0.85 to 1.00 indicates a high explanatory power of the variables, where an R squared of less than 0.70 indicates low explanatory power of the variables¹⁹. In Brazil, we have an R squared of 0,834980 and an adjusted R squared of 0,831122. Because “the adjusted R squared is the best estimate of the degree of relationship in the basic population²⁰, it shows that there is there the value is close to the category of high explanatory power of the variables. Thus, we will say that there is a medium to high explanatory power of the variables in the Brazil regression.

¹⁹ R Squared. Investopedia. <http://www.investopedia.com/terms/r/r-squared.asp>

²⁰ What's the difference between r-squared and adjusted r-squared. Investopedia.

<http://www.investopedia.com/ask/answers/012615/whats-difference-between-rsquared-and-adjusted-rsquared.asp>

Table 2.2d. China

No	Variables	Values Rounded to 6 Decimal Places
1	Regression coefficients:	
	• Coefficient β_0	--
	• Coefficient β_1	1,614027***
	• Coefficient β_2	0,762957***
2	Determination coefficients:	
	• R squared	0,839282
	• Adjusted R squared	0,835107
3	t-test (5% significance):	
	• Critical value	1,996
	• T-statistics β_1	37,044240
	• T-statistics β_2	5,465911
4	F test (5% significance)	
	• F critical value	3,1404
	• F statistic	725,868110
5	Conclusion on the null hypothesis	

(10% significance *, 5% significance **, and 1% significance ***)

Plugging in the coefficients for residual earnings and book value of equity, we get the regression model for Brazil and China.

Brazil:

$$V_E^{REM} = 1,765247 E_{t-1,i}^{BV} + 1,243132 RE_{t,i}^*$$

China:

$$V_E^{REM} = 1,6140267 E_{t-1,i}^{BV} + 0,762957 RE_{t,i}^*$$

Now with the regression model, one can find the Book Value of Equity and Residual Earnings for the companies involved in the acquisition. To test the hypothesis that different rates of returns do not

affect the result as stated in Bukhvalov and Volkov 2005, various rate of return for equity will be used at a later section, $k_e = 5\%, 15\%, 17\%, \text{and } 20\%$.

To obtain V_E^{REM} , one would have to compare the regression output to the equity value. According to Bloomberg, equity value is defined as the value of the transaction for common equity shareholders, including holders of outstanding equity options: the target share outstanding (plus share equivalents from options using the treasury method)* deal price* percent sought.

Debt may be assumed during the PE transaction, and thus, we will compare the output V_t^{REM} with the reported final equity value instead of the transaction value to see if null hypothesis holds. We structured the cases in such a way so that the first three cases are PE deals in Brazil and the last three cases are PE deals in China.

2.2.1 Suspensys Sistemas Automotivos Ltda - Valuation of Non-Traded Companies

The first case deals with the merger of Suspensys Sistemas Automotivos Ltda, a company that falls in the industrial machinery industry. The transaction was announced on April 29th, 2013 and the final value resulted in 195 million USD. The deal was completed in cash and the acquirer Randon SA Implementos e Participacoes only acquired the remaining 50% of the target company. In this deal, we see that the Suspensys Sistemas Automotivos Ltda is the target company, Randon SA Implementos e Participacoes is the acquirer company, and Meritor Inc is the seller. According to the company description, “Meritor, Inc. manufactures automobile components for military suppliers, trucks, trailers and specialty vehicles. The Company also offers related replacement parts in the transportation and insutry sectors...including axles, drivelines, braking systems, and suspension systems” (Bloomberg). The significant part about this is that Meritor is an US company while both the acquirer and the target are Brazilian companies. Regarding the acquirer company, Randon SA is “a holding company that controls a conglomerate of companies in three large business areas: road equipment/special vehicles, auto parts/automotive systems, and product services. The company is based in Brazil and has customers in approximately 80 countries” (Bloomberg).

As expected, data for the target company does not exist on financial databases nor in annual reports for the year 2012 nor 2013, therefore one could only work with assumptions based on the previous years. The target company falls under the Industrial Machinery industry. 24 companies were taken to calculate the industry averages under the Industrial Machinery and Auto Components category of GICS industry classification for the buyout announcement date. The industry average k_e remains one of the most important determinants of the final value. Because mean may include outliers, the median provide a more accurate value in terms of valuation. Although in some cases, the mean may be more accurate than the median or when median/mean may be more accurate on the ending date, or vice versa, for experimental purposes we will control the variable to the median of the industry ROE on the announcement date. For this first case, we will demonstrate on how it does not make that much of a difference, and we will test the valuation with the median for both dates.

Table 2.2.1a. Median and Mean Industry Return on Equities k_e

<i>Industry Average ROE</i>	29/04/13	31/07/13
Median	15.61%	16.06%
Mean	12.47%	12.88%

(Source: Bloomberg)

50% of the target company was owned by the acquirer before the deal, and the deal covers the remaining 50%. Because the REM deals with the fair value, which is simply the long term value, one can apply 50V to the regression calculated value, where V is the fundamental value (Bukhvalov, Volkov, 2005). While there are many PE deals where minority or majority purchase occur, in our cases only this case is a partial acquisition. The rest of the cases are full buyouts.

According to Bloomberg, the Book Value of Equity is defined as:

$$\text{Book Value} = \text{Share Capital \& APIC} + \text{Retained Earnings and Other Equity}$$

Book Value in the database is defined as “the amount that all common shareholders have invested in a company.” The Bloomberg Net Income estimate is defined as the “profit after all expenses have been deducted.”

In order to apply the REM model, several important assumptions had to be made. The table below shows the data available, as well as the knowledge gap that occurs for the two years preceding the actual deal announcement date.

Table 2.2.1b. Net Income and Book Value of Equity 2008-2011

<i>In millions USD</i>	31/12/08	31/12/09	31/12/10	31/12/11	<i>2012 Est.</i>	<i>2013 Est.</i>	<i>Avg. ('08-'11)</i>
Net Income	44,9	33,1	54	59,7	66,00	72,97	47,925
Book Value	62,9	98,1	135,9	147,5	160,09		111,1

(Source: Bloomberg)

In the above table, the projected estimates for Suspensys Sistemas Automotivos Ltda are italicized with the actual values in the non-italicized text. Given the absence of growth rates for net income and return on equity, the rate of change for the preceding year was used to project values for 2012 and 2013. However, the average of the 2008-2011 financial values yielded the closest results, and it is important to take time to observe the difference between the projected values and the average values. The difference in value shows the uncertainty of a company and the problem of valuing a company with 8 quarters of data missing up to the announced merger date. Market

conditions in country can often present many factors which makes standard application of applying previous year's percentage of change ineffective.

For $k_e = 15.61\%$:

$$RE_{2013,i}^* = \frac{RE_{t,i}}{k_e} = \frac{NI_{t,i} - k_e * E_{t-1,i}}{k_e}$$

with:

$$NI_{2013,i} = 47,925 \quad E_{2012,i} = 111,1 \quad k_e = 15.61\%$$

Moving on to the residual taken from the regression with a 0,50V fundamental value specific to this deal:

$$\begin{aligned} V_E &= 0,50 * (1,765247 E_{t-1,i}^{BV} + 1,243132 RE_{t,i}^*) \\ &= 0,50 * (1,765247 * E_{2012,i} + 1,243132 * RE_{2013,i}^*) = 219,81 \text{ million USD} \\ \Delta &= 12,74\% \end{aligned}$$

For $k_e = 16.06\%$:

$$RE_{2013,i}^* = \frac{RE_{t,i}}{k_e} = \frac{NI_{t,i} - k_e * E_{t-1,i}}{k_e}$$

with:

$$NI_{2013,i} = 47,925 \quad E_{2012,i} = 111,1 \quad k_e = 16.06\%$$

$$\begin{aligned} V_E &= 0,50 * (1,765247 E_{t-1,i}^{BV} + 1,243132 RE_{t,i}^*) \\ &= 0,50 * (1,765247 * E_{2012,i} + 1,243132 * RE_{2013,i}^*) = 214.49 \text{ million USD} \\ \Delta &= 9.99\% \end{aligned}$$

Using the same procedures, but $k_e = 16.06\%$, we come up with a 9.99% difference from the audited value of 195 million USD. Therefore we see that the range of difference by using the median industry average is 9.99% to 12.74%. Due to the fact that there is no distinct pattern on which date is more accurate, we will use the announcement date for the rest of the cases.

Using the REM and the Bloomberg estimates, we see only a 12.74% difference for the acquired target company by using the averages of the available data for the company from years 2008 to 2011. The more accurate the assumptions, the more closer the output value will be to the actual transaction value. Gathering as much data as possible before the acquisition will make for as accurate a forecast as possible. Therefore, it is often stated that valuation of private equity is “an art rather than a science.”²¹

²¹ Valuing Private Companies. Investopedia. <http://www.investopedia.com/articles/fundamental-analysis/11/valuing-private-companies.asp>

2.2.2 Prezunic Comercial Ltda - Valuation of Non-Traded Companies

Cencosude S.A. has agreed to buyout Prezunic Comercial Ltda for 492,01 million USD with an announcement date of 16/11/2011 and a completion date of 03/01/2012. According to the company description, “Prezunic Comercial Ltda. Operates a chain of supermarkets. The company retails and sells canned foods such as potato salad, marinated salad, fruit cocktail, spaghetti with meatballs sausage, quick chicken with wine, and imperial cocada. Prezunic Comercial operates throughout Brazil.” The company operates 31 supermarkets and 1 distribution center in Rio de Janeiro. In order to form the industry average, the GICS classification was used in the categories of Food Distributors, Food Retail, Food Products, Hypermarkets& Super Centers, and Food & Staples Retailing for Brazil. The categories produced a total of 18 companies with 12 available averages.

Table 2.2.2a. Median and Mean Industry Return on Equities k_e

<i>Industry Average ROE</i>	16/11/2011	03/01/2012
Median	5,99%	6.61%
Mean	6.34%	6.68%

(Source: Bloomberg)

As indicated in the previous case, we will take the median value of 5.99% on the announcement date. While the mean is shown to illustrate the relation to the median, it will not be considered due to outliers. The transaction value includes 106,44 million USD of debt assumption in addition to four installment payments in 5 years.

Table 2.2.2b. Net Income and Book Value 2008- 2010

<i>In millions USD</i>	31/12/2008	31/12/2009	31/12/2010	31/12/2011 (Est)
Net Income	11,2	13,9	16,4	19
Book Value	38,4	67,5	70,1	--

(Source: Bloomberg)

$$RE_{2013,i}^* = \frac{RE_{t,i}}{k_e} = \frac{NI_{t,i} - k_e * E_{t-1,i}}{k_e}$$

$$V_E = (1,765247 E_{t-1,i}^{BV} + 1,243132 RE_{t,i}^*)$$

with:

$$NI_{2013,i} = 19 \quad E_{2012,i} = 70.1 \quad k_e = 5,99\%$$

$$= (1,765247 * E_{2010,i} + 1,243132 * RE_{2011,i}^*) = 430,92 \text{ million USD}$$

$$\Delta = -12,42\%$$

In this case, we see an undervaluation of 12,42%. Nevertheless, it provides evidence that the H_A may not be true. The REM method from the cases tested have so far fallen within the 15% deviation from the final deal value.

2.2.3 Spaipa S.A. Industria Brasileira de Bebidas - Valuation of Non-Traded Companies

Announced on August 31st 2013, Coca-Cola in Mexico completed the company takeover Spaipa S.A. Industria Brasileira de Bebidas for 1855 million USD in cash payment on October 29th, 2013. The acquirer, Coca-Cola Femsa SAB de CV, “bottles and distributes branded beverages in parts of North, Central, and South America...some countries in Femsa also markets water, beer, and other products” (Bloomberg). The target company produces beverages products and soft drinks, with the exception that they operate worldwide and also produce name brand soft drinks such as Coca Cola (Bloomberg). Using the GICS classification, the target company falls under the beverages and soft drinks industry. To account for the lack of companies in the select industries, Latin America and the Carribeans were added to the industry average ROEs. Taking the median ROE of 15.61% on the announcement date, we can proceed to the REM calculation.



Figure 2.2.3a. Area of Operations for Spaipa and Coca Cola FEMSA in Brazil

(Source: Yahoo Finance)

In Figure 2.2.3a, we see that Spaipa, represented by the dark red, covers a significant area of Brazil. Represented by the light red area, Coca Cola FEMSA is represented via its ticker on the NYSE-KOF²²The acquisition of Spaipa by Coca Cola fits the acquirer’s operational area of Mato Grosso do

²² Coca Cola Femsa. <https://www.coca-colafemsa.com/>

Sul and the state of São Paulo, allowing it a 40% increase in volume of Coca Cola sold. This allows Coca Cola to cover approximately one third of Brazil's population with the addition of Spaipa²³.

Table 2.2.3a. Net Income and Book Value 2008-2011

<i>In millions USD</i>	31/12/2008	31/12/2009	31/12/2010	31/12/2011	2012 Avg. BV	2013 Avg. NI
Net Income	157,0	159,9	190,9	173,9		170,425
Book Value	478,0	596,9	541,9	666,6	570,825	--

(Source: Bloomberg)

$$V_E = (1,765247E_{t-1,i}^{BV} + 1,243132 RE_{t,i}^*) = 1655,25$$

with:

$$NI_{2013,i} = 170,425 \quad E_{2012,i} = 570,825 \quad k_e = 15.61\%$$

$$\Delta = -10,77\%$$

From the historical data, we see that both the Net Income and the Book Value of Equity do not exhibit irregularity. Nevertheless, we will average the year end values from 2008 to 2011 to obtain 170,425 and 570,825 respectively. We see that under these conditions, our valuation models undervalues the deal by -10,77%, well landing within 15% range.

²³ Coca-Cola FEMSA Successfully Closes the Acquisition of Spaipa S.A. Industria Brasileira de Bebidas in Brazil. Yahoo Finance. <http://finance.yahoo.com/news/coca-cola-femsa-successfully-closes-213151656.html>

2.2.4 Shandong Luihe Group Co. Ltd - Valuation of Non-Traded Companies

According to the Bloomberg database, a consortium led by New Hope Group Co. Ltd. sold Shandong Liuhe Group Co. Ltd. to New Hope Liuhe Co. Ltd for 779,38 million USD. The deal was announced 13/09/10 and completed on 14/10/2011 and constitutes a 100 percent stock acquisition company takeover. Shandong Liuhe Group falls under the Agricultural Products industry. Because the industry ROE estimate only appears for the current year in 2016, we will have to use the current year's ROE as an estimate for the previous year. Agricultural Product Processing and Agriculture industries were taken, and 85 companies' best ROE was calculated using Bloomberg's SYWG China sector classification.

Because historical data did not exist for the industry averages, the current year information was used. For year 2016, we have an average of 8,85% and a median of 11,50%.

Table 2.2.4a. Net Income and Book Value of Equity 2009-2010

<i>In millions USD</i>	31/12/2009	31/12/2010
Net Income	--	97,9
Book Value	251,8	--

(Source: Bloomberg)

$$RE_{2013,i}^* = \frac{RE_{t,i}}{k_e} = \frac{NI_{t,i} - k_e * E_{t-1,i}}{k_e}$$

$$V_E = 1,6140267 E_{t-1,i}^{BV} + 0,762957 RE_{t,i}^*$$

with:

$$NI_{2013,i} = 97,9 \quad E_{2012,i} = 251,8 \quad k_e = 11,50\%$$

$$= 863,81 \text{ million USD}$$

$$\Delta = 10,83\%$$

We see here that the REM model applied using the industry ROE outputted a very successful result with a difference around 10 percent. While much of the process depend on the ROE used for the REM model, this model nevertheless has potential in proving an accurate valuation.

2.2.5 Zhejiang Materials Industry Group Co. - Valuation of Non-Traded Companies

Announced on February 13th, 2015 at a deal value of 2003,10 million USD, Materials Industry Zhongda Group completed the company takeover on September 11th, 2015 at a value of 3853,74 million USD. In this private equity deal, we see that the final value deviates from the initial announced value. While many factors may influence this, we will take the final value of the buyout since it is more representative of the fair value of the company. Friendly 100% company takeover with stock payment of 1,204.2977 million shares. Here we have a case where the final value deviates from the initial announcement value. The acquirer, Materials Industry Zhongda Group, is in the import/export industry in China.

The target company Zhejiang Materials Industry Group Corporation produces steel materials in China. The company produces metal material including steel, ferroalloy, metal plate, iron ore, scrape steel, electrolytic aluminum, and other materials (Bloomberg). Zhejiang Materials Industry Group also provides goods trading, logistics services, international trade, energy supply, and other services (Bloomberg). Zhejiang Materials Industry Group Co. falls under the metal industry. China is currently the world's largest steelmaker and consumer²⁴. High levels of competition exist in the steel market in China (Tang). Thus, in order to calculate the industrial average, we took 144 companies industrial average in Industrial Metals and Mining, and Iron and Steel industry in China taking the value of the announcement date using the Industry Classification Benchmark. Like in the previous cases, the Industry Classification Benchmark is used due to the largest number of companies outputted. This way a more accurate industry average can be calculated especially when sometimes only a limited number of companies exist in a select industry classification.

Table 2.2.5a. Median and Mean Industry Return on Equities k_e

Industry Average ROE	13/02/2015	11/09/2015
Median	3,53%	1,18%
Mean	3,23%	3,93%

(Source: Bloomberg)

²⁴ Tang, Rachel. China's Steel Industry and Its Impact on the United States: Issues for Congress. Congressional Research Service. September 21' 2010. <http://fas.org/sgp/crs/row/R41421.pdf>

Table 2.2.5b. Net Income and Book Value of Equity 2013-2014

<i>In millions USD</i>	31/12/2013	31/12/2014
Net Income	--	144,2
Book Value	1021,1	--

(Source: Bloomberg)

$$RE_{2013,i}^* = \frac{RE_{t,i}}{k_e} = \frac{NI_{t,i} - k_e * E_{t-1,i}}{k_e}$$

$$V_E = 1,6140267 E_{t-1,i}^{BV} + 0,762957 RE_{t,i}^*$$

with:

$$NI_{2013,i} = 144,2 \quad E_{2012,i} = 1021,1 \quad k_e = 3,53\%$$

$$= 3985,70 \text{million USD}$$

$$\Delta = 3,42 \%$$

One peculiarity about this case is the data availability. Because we did not have sufficient historical data to conduct an average, we had to use the 2014 and 2013 data from the company. The industry average ROE historical medians were available and did not pose a problem. This case shows that even if one year is missing, it is possible to use what is available in building a very accurate valuation. Future research could expand on this subject.

2.2.6 Hubei Energy Co. Ltd. - Valuation of Non-Traded Companies

Announced on September 18th, 2009, China Yangtze Power Co. Ltd. sold Hubei Energy Co. Ltd. to Hubei Energy Group Co. Ltd. for 1'612,87 million USD in 100% stock payment of 1782.4100 million shares. The seller is in the electric-generation industry. The deal was completed on 22/12/2010, lasting a total of 460 days. Using the betas from the regression, one comes up with a 2,61 % deviation from the actual reported value.

The target company in this particular deal deals with “hydropower, thermal power, wind power, coal, and natural gas.”²⁵ According to the International Hydropower Association, in 2015 China added more hydropower facilities than the rest of the world combined and hold a leadership position in clean energy.²⁶ Analyzing the Hubei Energy Co. Ltd. case provides an insight into valuating a very relevant industry that is currently expanding in China. China plans to target clean energy by 20% of its primary energy consumption by 2030, according to its plan to the United Nations in 2015²⁷. While there are environmental costs associated with building hydropower plants, China sees the industry as a “win-win” in terms of global investment (McDonald, et al, 2009). Because China is expanding to other locations in its dam project, such as Sudan in Africa, we are once reminded of the relevance of emerging countries and private equity projects (McDonald, et. al, 2009). The Hubei Energy Co. Ltd. case currently just analyses a domestic case involving two Chinese companies. However, given the rapid expansion of Chinese business in other emerging continents, understanding private equity valuations holds importance for foreign companies and investors alike. Hubei Energy Co. Ltd. falls under the utility industry in China. Using the Industry Classification Benchmark for the industry average calculation, we calculated ROE using 227 Chinese companies on September 18th, 2009 for a median value of 9,77% and a mean of 10,67%. Applying the more conservative median value for $k_e = 9,77\%$, one obtains 1655,00 million USD, resulting in a delta of 2,61%.

²⁵ Bloomberg Markets. Hubei Energy Group Co. Ltd. <http://www.bloomberg.com/quote/000883:CH>

²⁶ International Hydropower Association. Country Profile-China. <https://www.hydropower.org/country-profiles/china>

²⁷ Walker, Beth and Qin, Liu. “The Hidden Costs of China’s Shift to Hydropower.” The Diplomat. July 29, 2015. <http://thediplomat.com/2015/07/the-hidden-costs-of-chinas-shift-to-hydropower/>

Table 2.2.6a. Net Income and Book Value of Equity 2008-2009

<i>In millions USD</i>	<i>31/12/2008</i>	<i>31/12/ 2009</i>
Net Income	--	94,5
Book Value	1077,5	--

(Source: Bloomberg)

$$RE_{2013,i}^* = \frac{RE_{t,i}}{k_e} = \frac{NI_{t,i} - k_e * E_{t-1,i}}{k_e}$$

with:

$$NI_{2013,i} = 94.5 \quad E_{2012,i} = 1077.5 \quad k_e = 9.77\%$$

$$V_E = 1,6140267 E_{t-1,i}^{BV} + 0,762957 RE_{t,i}^*$$

$$= 1655,00 \text{ million USD}$$

$$\Delta = 2,61\%$$

Using the REM method, here we have a rather accurate valuation in the context of the null hypothesis where the deviation is <15%. This particular case holds the smallest deviation of the cases analyzed. Despite the small deviation, different rates of returns on equity would result in differing coefficients. Thus, in the following section, we will analyze the effect of using a different required rate of return on equity and the effects of varying coefficients on the estimated value.

2.2.7 Regression Model Test Using Different Expected Rates of Return on Equity

To demonstrate the effect of the return on equity on the regression coefficients, we run the regression using the rates of 5%, 15%, 17%, and 20%. For the cases, 20% was used. Table 4.1 shows the effect of the different rate of return on equity for China during 2008 to 2015 as described in the previous sections.

Table 2.2.7a. Effects of Different Expected Rate of Return on Equity in Brazil

		Expected rate of return on equity k_e			
		5%	15%	17%	20%
No	Variables				
1	Regression coefficients:				
	• Coefficient β_0	--	--	--	--
	• Coefficient β_1	0,832898***	1,454464***	1,578777***	1,765247***
	• Coefficient β_2	0,310783***	0,932349***	1,056662***	1,243132***
2	Determination coefficients:				
	• R squared	0,834980	0,834980	0,834980	0,834980
	• Adjusted R squared	0,831122	0,831122	0,831122	0,831122
3	F test (5% significance)				
	• F critical value	3,1404	3,1404	3,1404	3,1404
	• F statistic	764,039589	764,039589	764,039589	764,039589
4	Conclusion on the null hypothesis	Reject	Reject	Reject	Reject

(10% significance *, 5% significance **, and 1% significance ***)

In Brazil, we see that the coefficients for β_1 (Book Value of Equity) and β_2 (Residual Earnings) increase with an increased expected rate of return. The coefficients are definitely statistically significant, as they all are greater than the 5% critical value of 1.996 and yield 1% statistical significance. An interest detail to notice is that the F statistic is greater than the F critical value, so thus, we reject the null hypothesis than the expected rate of return does not significantly

influence the valuation result. In the section after Table 2.2.7b, we will prove this with one particular case.

Table 2.2.7b. Effects of Different Expected Rate of Return on Equity in China

		Expected rate of return on equity k_e			
		5%	15%	17%	20%
No	Variables				
1	Regression coefficients:				
	• Coefficient β_0	--	--	--	--
	• Coefficient β_1	1,041808***	1,423287***	1,499583***	1,614027***
	• Coefficient β_2	0,190739***	0,572218***	0,648513***	0,762957***
2	Determination coefficients:				
	• R squared	0,839282	0,839282	0,839282	0,839282
	• Adjusted R squared	0,835107	0,835107	0,835107	0,835107
3	F test (5% significance)				
	• F critical value	3,1404	3,1404	3,1404	3,1404
	• F statistic	725,868110	725,868110	725,868110	725,868110
4	Conclusion on the null hypothesis	Reject	Reject	Reject	Reject

(10% significance *, 5% significance **, and 1% significance ***)

Taking the smallest value of difference of the cases, we will apply the coefficients of 15% and 17% to compare it with the existing coefficient of 20%. The purpose is to demonstrate the difference in outcome in the required rate of return. Going back to the basics, we have a 1627,87 million USD deal that occurred in 2009. The return on equity picked used is 9.77%, which we will hold constant from the previous case. The data shown previous in the case is repeated below.

Table 2.2.7a. Net Income and Book Value of Equity 2008-2009

1612,87 million USD	31/12/2008	31/12/2009
Net Income	--	94,5
Book Value	1077,5	--

(Source: Bloomberg)

For 15% expected rate of return on equity:

$$\begin{aligned}
 V_E &= 1,423287 E_{t-1,i}^{BV} + 0,572218 RE_{t,i}^* \\
 &= \mathbf{1470.40 \text{ million USD}} \\
 \Delta &= -8.83\%
 \end{aligned}$$

For 17% expected rate of return on equity:

$$\begin{aligned}
 V_E &= 1,499583 E_{t-1,i}^{BV} + 0,648513 RE_{t,i}^* \\
 &= \mathbf{1544.30 \text{ million USD}} \\
 \Delta &= -4.25 \%
 \end{aligned}$$

For 20% expected rate of return on equity:

$$\begin{aligned}
 RE_{2013,i}^* &= \frac{RE_{t,i}}{k_e} = \frac{NI_{t,i} - k_e * E_{t-1,i}}{k_e} \\
 V_E &= 1,6140267 E_{t-1,i}^{BV} + 0,762957 RE_{t,i}^* \\
 &= \mathbf{1655,00 \text{ million USD}} \\
 \Delta &= 2,61\%
 \end{aligned}$$

We see here that from 20% to 17% to 15%, we went from a positive 8,83% difference to a negative 4.25% difference, to a final negative 2,61 % difference. With this being the smallest case, common sense tells us that with private equity deals whose margin of difference is higher, that a slight percentage change in the expected rate of return on equity would yield massive differences. Therefore, choosing the appropriate expected rate of return on equity is also an important matter in conducting the REM analysis of private equity deals. Thus, we see that the H_B hypothesis is rejected, in that the expected rate of return does in fact influence valuation results.

Managerial Implications

The value and managerial implication of assessing the Residual Earnings Model in the various emerging countries from 2008-2015 is to test the validity of a REM that could value PE deals in a chosen emerging country. While one research would definitely not cover it all, testing the reliance of multiple cases of PE deals in multiple emerging countries over an 8 year period serves as a first step to testing the applicability of the REM across different countries under different conditions. Knowing the REM does not suffice. In order to arrive at an accurate valuation, one must also know when to apply the REM model over the other valuation models.

Regarding the choice of emerging country, the successful testing of PE deals in emerging countries will open many opportunities for Russian companies with China and other emerging countries in the future. Given the strengthening economic and political ties Russia is developing with BRICS and other emerging countries, it will greatly benefit Russian companies to understand cross border valuation from a managerial point of view. Better valuation of private companies, whether involved in a merger and acquisition or simply in a joint venture, would allow for managers and investors alike to develop better financial forecasting, which would have strategic benefits in market shares.

2.2.8 Research Limitations and Recommendations

While the chosen cases value the private equity deals within the select deviation, the cases chosen definitely do not represent private equity in its entire complexity across different time periods, locations, and financial context. The research on REM applied to emerging countries only serves as an introductory step for valuation in an incomplete information environment. Through the mergers and acquisition database, the researcher could take the regression using the different variables and characteristics of the deal. Payment type in cash or stock, transaction date, time period between announcement and completion date, industry of target/acquirer company could all serve as regression variables to explain the factors that could impact the effect of the REM and other valuation models for mergers and acquisitions.

Additionally, the regression methodology does not include a panel data analyze. Partially this is based on previous research methodology. This also is attributed to the fact that the data taken are raw finance data in a snapshot in the historical values of the selected companies. Future research could analyze the effects of using regular regression verses using panel data regression for the application of the REM model. From the research results, we see that using a simple regression dose not influence the validity of the REM method, and that the REM method applied under the current conditions definitely values PE deals with less than 15% deviation from the actual value. Thus, the issue of panel data methodology in the regression becomes moot in terms of practicality and applicability.

While one can find various successful cases stating the applicability of the REM model, the existence of unsuccessful cases indicate that the exceptions to the rule do exist, and that it is essential to prepare for these obstacles in valuation. Because the REM does not work 100 percent of the time, it means that real life M&As and PE deals have more factors and dimensions than a simple model could provide. Through these unsuccessful cases, one can have a glimpse at the variables that may hinder a successful valuation, and discovering these factors pave the way for future research in finding an improved methodology.

3. Conclusion

From the results we see that the REM applied to Brazil and China rejects the initial hypothesis that the Net Income and the Book Value of Equity does not accurately value private equity deals in the chosen markets with within a 15% deviation. The two regression models for Brazil and China are regressed under the conditions where the required rate of return is equal to 20 percent, as it is with the case of the Russian market. With the test setup of the expected rate of return at 20% and the industry average of the target company, we have come within a 15% deviation from the actual audited value. After the top 50 companies per country from 2008 to 2015 and controlling for the missing data, we are able to come up with the beta coefficients for the book value of equity at the beginning of the year and the net income at the end of the year. With the coefficients of variables, we are able to apply the REM model to the select cases in Brazil and China across a variety of industries.

Table 3a. Summary of Percent Deviation of the Cases Analyzed

Brazil	Suspensys Sistemas Automotivos Ltda	Prezunic Comercial Ltda	Spaipa S.A. Industria Brasileira de Bebidas
% Deviation	12,74 %	−12,42 %	−10,77%
China	Shandong Luihe Group Co. Ltd	Zhejiang Materials Industry Group Co	Hubei Energy Co. Ltd.
% Deviation	10,83%	3,42 %	2,61%

The results in Table 3 shows that the REM model can be applied to different countries, and among the cases analyzed, we see that the REM method is better applied to China. One possible explanation is simply the availability of the data. China has more company and market information than Brazil. We do not believe that this is a country specific issue, but rather an issue of data availability. The more financial data available in the company analyzed and the more specific the industry ROE, the more accurate the REM model will be in valuations.

Additionally, we find that the expected rate of return k_e does in fact influence the valuation. From Table 3b, we find that a slight deviation from in the expected rate of return used will yield large changes. With deals in the millions of USD, a few percent is a large percentage.

Table 3b. Influence of the Expected Rate of Return on Valuation of Case 2.2.6

Expected Rate of Return k_e	15%	17%	20%
% Deviation	-8,83 %	-4,25%	2,61%

Having analyzed recent private equity trends in the select two emerging countries, we see that great potential exist in Brazil and China for further PE development. A wide variety of industries was chosen for the select cases, and the REM model values the chosen cases within a 15% deviation from the final deal value. With the accounting research by the classical Ohlson model as well as more recent research pertaining to the Russian market, we see that the first steps have already been taken to address the challenge of private equity valuation for private companies in emerging markets (Ohlson, 1995; Bukhvalov, Volkov, 2005; Berezinets, 2007). Both Brazil and China serve as strategic and economic partners for further private equity development as well as increased ties with the Russian Federation. Although China has the geographical proximity to Russia and has a higher GDP and private equity activity than Brazil, Brazil has high potential in furthering its industry with Russia in a variety of industries. Thus, investment opportunities, joint ventures, and buyouts are all possible in the future if Russian companies choose to further its business with Brazilian counterparts.

The results points to the potential for further research. Further regression analysis has the potential to increase the accuracy of the said approach. Of course, the REM model is not always ideal for all valuations. However, in the cases where the REM model is ideal, work could be done to increase its accuracy. So far in our research, we have looked at private equity buyouts and mergers and acquisitions. Further research of the REM model could extend to joint ventures, corporate restructuring, management buyout, venture capital, and other types of private equity in emerging countries. Because emerging countries are always changing and hold high amounts of uncertainty in its financial markets, there also exist great opportunities. In these opportunities, companies have the opportunities to make better decisions and make wiser managerial and strategic decisions during the merger and acquisition process.

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