7th International Scientific Conference
"Business and Management 2012"
May 10-11, 2012, Vilnius, LITHUANIA

ISSN 2029-4441 print / ISSN 2029-929X online
ISBN 978-609-457-116-9 CD
doi:10.3846/bm.2012.035
*http://www.bm.vgtu.lt*


# THE APPLICATION OF ADJUSTED DUPONT MODEL IN FINANCIAL PERFORMANCE EVALUATION

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**Abstract.** Enterprise performance evaluation, not only appears in book values, but also is included in the company management. The comprehensive evaluation of the enterprise operation state and the efficiency of management is an important measure for the enterprise management and for investors to get information. In the developed countries with mature market economy, there are excellent evaluation methods. However, in China, due to the new-born market economy, the developments of performance evaluation are far behind that of the western world. In this paper, a comprehensively adjusted DuPont schema, combined with cash flow ratios, will be designed according to previous researches. Meanwhile, China National Petroleum Corporation (CNPC) will be used as an example to employ new DuPont Model.

**Keywords:** financial performance, adjusted DuPont model, cash flow, ratio, CNPC.

**Jel classification:** G39

## 1. Introduction

As early as the 1980s, shareholder activists started to pay attention on enterprise performance (Bacidore *et al* 1997). For example, 'angry investors' (Smolowe 1996) closed out to put pressure on managers to associate executive compensation with corporation performance. Many decades later, Enron, the biggest energy corporation in the world, made declaration of 'bankruptcy' (Paul, Krishna 2003) in the December of 2001. Behind this tragedy, unreliable, unauthentic and 'overpriced' (McLean 2001) performance of financial report is charactered as one of the primary causes of Enron's financial woes (Kaldec *et al* 2002; Francis, Schipper 1999). These facts stroke the alarm and exert obvious urgency for managers to select proper method to evaluate enterprise 'financial health' (Lauzen 1985). However, this is especially difficult in China because many evaluation methods, employed by developed countries, are not suitable to this 'emerging' (Roach 2004) and immature economic market. In this paper, according to previous researches, a comprehensively adjusted DuPont schema, combined with cash flow ratios, will be tailored for Chinese firms. To clearly demonstrate this new model, there will be a detailed application on China National Petroleum Corporation (CNPC) from 2008 to 2010, together with assessments and suggestions.

## 2. Brief introduction of Adjusted DuPont Model

The original DuPont method, if without any adjustment, is no longer adaptive to the Chinese market. Because this model is 'too far removed from normal activities' (Slater, Olson 1996) to reflect the ability to obtain cash, whose importance is seriously emphasized in Chinese market. Hence, many Chinese scientists, (e.g. Cheng 2001; Wang 2006; Zhang, Gao 2008; Chen 2009; Dai, Chen 2009) put forward that cash flow ratios, obtained from cash flow statements, should be added into DuPont model, and they have already made further study on this topic. In this paper, a comprehensively adjusted DuPont schema combined with cash flow ratios will be redesigned based on previous articles.

In the adjusted DuPont method, ROE will be still remained as the dominate factor but with some necessary adjustments. ROE clearly demonstrates enterprise's efficiency in financing, investing, operating and capital management (Johansson 1998; Nissim and Penman 2001; Susan 2004; Milbourn, Haight 2005), so it serves as the most important indicator of how to maximize profitability and stockholder's wealth. Ohlson (1995) also

highlited the theoretical importance of ROE in the calculation of valuation models. However, ROE is limited that it is unable to examine the quality of company's cash flow movement (Soliman 2004). Therefore, cash flow ratios (Horrigan 1965; Selling, Stickney 1989; TRI Coporation 2009) are supposed to be added to re-decompose ROE to establish a new DuPont Model. We get the following Fig. 1:

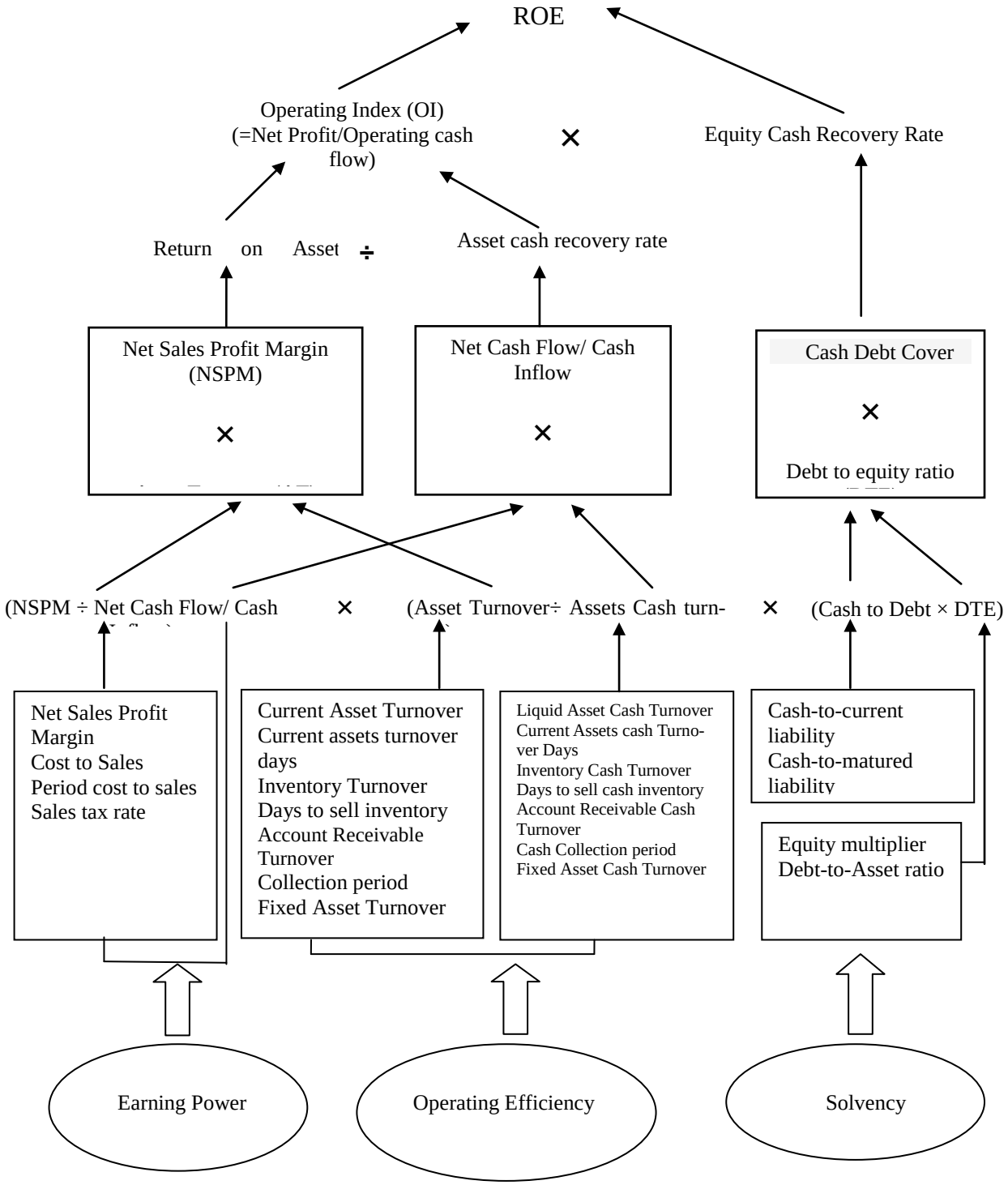


**Fig.1.** Adjusted DuPont Model

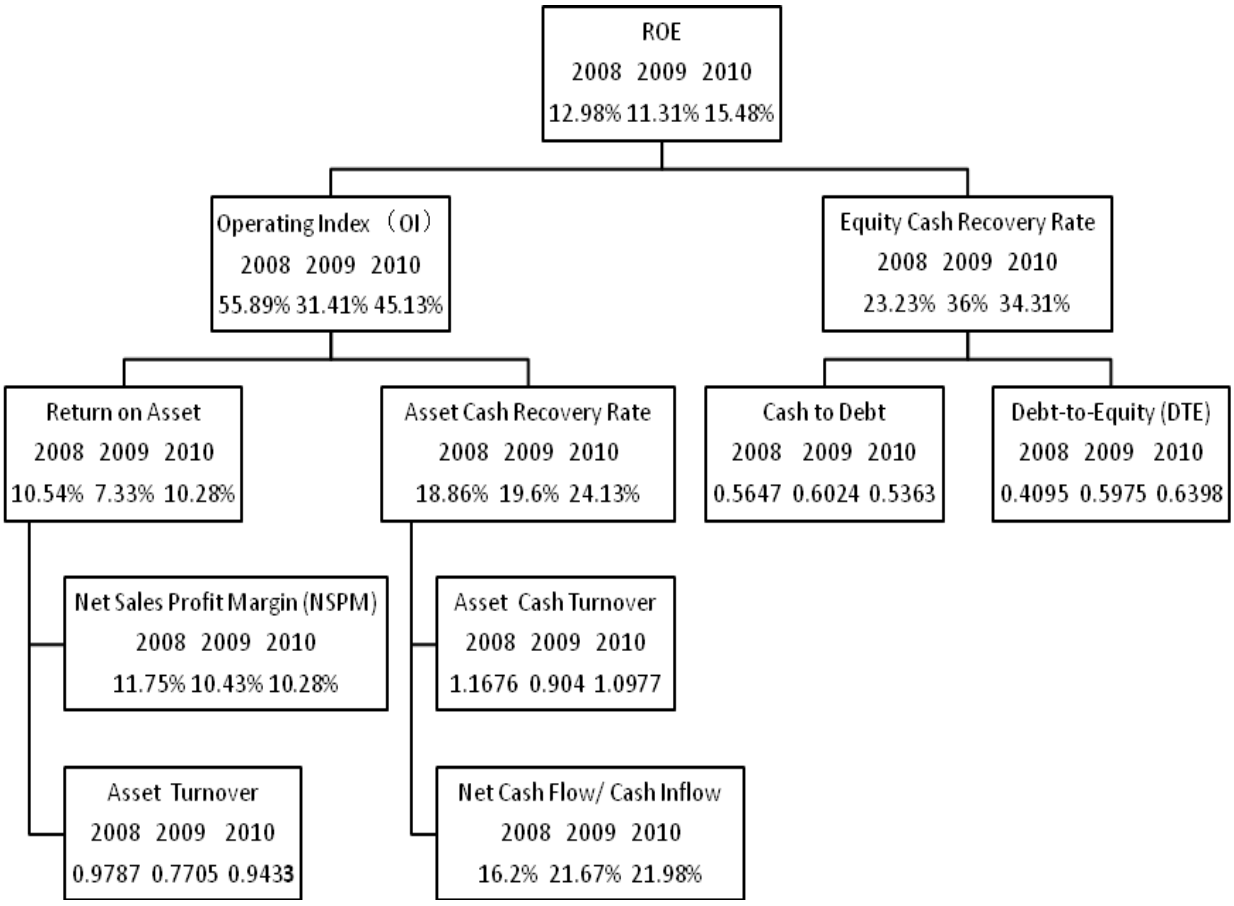


**Fig. 2.** Application of Adjusted DuPont Model in CNPC (Source: Annual Report of CNPC 2008-2010)

## 3. Sample

In this part, according to adjusted DuPont analysis, the financial performace of China National Petroleum Corporation (CNPC), one of the largest companies in sales income in China, will be deeply evaluated from 2008 to 2010 through three aspects, namely earning power, operating efficiency and solvency. All these datas and information used are precisely obtained from CNPC's disclosed annual report and its official website.

### 3.1. Analysis of CNPC's performance in 2008

With regards to solvency, CNPC does well in this aspect in 2008. Generally, the smaller the Debt-to-Equity (DTE) tends to be, the larger the liability becomes to be protected by equity capital, which represents for good solvency ability. From Fig. 2, it is revealed that the value of this ratio (DTE) in 2008 ranks the lowest among these three years.

That is to say, enterprise has the best solvency in this year and, as a result, creditors are much safer. In order to analyze it further, DTE is broke down into Equity Multiplier (EM) and Debt-to-Asset (DTA) ratio.

**Table 1.** Breaking down DTE

| year / index | 2008 | 2009 | 2010 |
|---|---|---|---|
| Debt-to-Equity (DTE) | 0.41 | 0.6 | 0.64 |
| Debt-to-Asset (DTA) | 0.29 | 0.37 | 0.39 |
| Equity Multiplier (EM) | 1.41 | 1.59 | 1.64 |

From Table 1, we can find that it is the relatively lower value of DTA this year that contributes to the proper implementation of DTE. Furthermore, CNPC's total debt only achieved at RMB 348523 million, which was less than 2009 around 200 million and nearly half of 2010. It is implicated that the affordable level of debt in 2008 makes DTA to be low, and eventually drives up solvency.

Surprisingly, although OI (55.89%) is highest in this year compared with the number in 2009 (31%) and 2010(45%), it is unexpected the performance of earning power in 2008 only lies in the middle. From Graph 1, we find that the forcing factor, giving rise to the result, is the relatively low value of Asset cash recovery (ACR) rate, caused by the lowest percentage of Net Cash Flow (NCF) to Cash Inflow (CI) in this year. Apart from OI, NCF/CI is another decisive value reflect-

ing earning power, because it accurately examines company's profitability by removing such expenses greatly affecting net profit like amortization and depreciation. The greater the ratio is, the better the earning power will to be. That is to say, the underperformance of NCF/CI drives down earning power level this year. Further decompose this ratio, it is found that cash-inflow in 2008 is high enough, but the net cash flow is out of expectation. Especially, CNPC spent too much on purchasing merchandise and labor cost, so a large amount of tax is generated. After all, it is the inadequate management of cash flow ultimately leads earning power to be not good enough.

### 3.2. Analysis of CNPC's performance in 2009

The most apparent problem in this year lies on the disappointed level of earning power, mainly caused by the fact that OI is fairly low. OI is one of the most dominate index to decide earning power. The more closely OI approaches to 1, the better will the quality of net profit be, eventually driving company's earning power to be better. From the fig. 2, the numbers of OI from 2008 to 2010 are respectively 55.89%, 31.41%, 45.13%, indicating that this corporation has sufficient cash flow. However, the figure in 2009 is obviously much lower than the other two years and far away from 1. Hence, profitability in 2009 is not good, so profit on book value is not well performed. In depth, through fig. 2, it can be found that the relatively bad performance of Asset Turnover (AT) in this year results in this kind of result. In order to accurately analyze the primary culprit, LAT, IT, ART and FAT, who closely affect AT, are calculated as follow (Table 2):

**Table 2.** Breaking down AT

| Year / Ratios | 2008 | 2009 | 2010 |
|---|---|---|---|
| Liquid Asset Turnover (LAT) | 4.72 | 3.45 | 5.05 |
| Inventory Turnover (IT) | 7.55 | 5.52 | 7.23 |
| Account Receivable Turnover (ART) | 63.81 | 35.41 | 32.56 |
| Fixed Asset Turnover (FAT) | 4.19 | 3.07 | 3.59 |

From table 2, it can be seen that the other three ratios in 2009, apart from ART, are obviously lower than that in 2008 and 2010, whose trends are similar with AT. Therefore, it is the bad performance of these three ratios that caused OI to be lower. In particular, among these ratios, LAT has the most direct effect on AT. In depth, it can be found that liquid asset increased significantly in 2009 compared with the previous year, but sales fell slightly, which created the sudden drop of LAT and eventually pushed down OI. In 2010, significant recovery existed on sales, triggering LAT to go up and finally driving the recovery of OI. Hence, there is no doubt that it is unsatisfied sales level ultimately generating the relatively tough time of earning power in 2009.

Another problem this year lies on the underperformance of operating efficiency, affected by Asset Cash Turnover (ACT). Low level of ACT in 2009, illustrated by graph 1, represented for inefficient assets utilization of CNPC's. In depth, ACT is broke down into the following ratios (Table 3):

**Table 3.** Breaking down ACT

| Year / Ratios | 2008 | 2009 | 2010 |
|---|---|---|---|
| Current Assets Cash Turnover (CACT) | 5.63 | 4.04 | 5.88 |
| Accounts Receivable Cash Turnover (ARCT) | 76.12 | 41.54 | 37.89 |
| Fixed Assets Aash Turnover (FACT) | 4.99 | 3.61 | 4.18 |

It was obvious that only the trend of ARCT changed different from ACT, caused by recently relaxation of credit policy in CNPC, was not the problem. Actually, low level of operating efficiency should be explained by the change of other two ratios triggered by low cash inflow in operation.

### 3.3. Analysis of CNPC's performance in 2010

Compared with the low-ebb period in 2009, there comes with an apparent recovery in the next year on all of indexes, which should be explained by the improvement of operation and capital management according to shortages in previous years. Especially, ROE in this year ranks the highest among this period, representing for excellent peformance of profitability.

### 3.4. Assessments and Recommandations

After comprehensively evaluating CNPC's financial posotion from 2008 to 2010 through adjusted DuPont Model, following assessments are suggested:

#### 3.4.1. Good sales revenue

CNPC's good performance of ROI in 2010 mainly relies on the improvement of earning power, whose primary cause is characterized by sales increase this year compared to 2008 and 2009. This fact acts as a good implication for CNPC's 'long-

run growth' (Romer 1986), which will help CNPC to enhance confidence from public and investors.

### 3.4.2. Sufficient cash flow

CNPC has abundant cash flow, which serves as a cushion for financial crisis and also supports public confidence. As a result, CNPC is able to achieve a relatively higher credit level and lower borrowing cost from bank, which is helpful to the further expansion of this company. In the other hand, it will be difficult for this company to yield higher return because of holding too much cash (Stigler 1963). Therefore, CNPC faces a trade-off between profit and safety. CNPC is suggested to increase investment in fixed asset with excessive cash to expand scale in order to push profit.

### 3.4.3. Inefficient assets utilization

Although the value of Asset Cash Turnover (ACT) from 2008 to 2010 keeps steady, the average level is not high enough, revealing that CNPC does not make full use of assets. If improving this problem, profitability will increase to a great extent (Fairfield, Yohn 2001). At the same time, there also comes with good news that Account Receivable Cash Turnover (ARCT) keeps increasing, indicating well-recognised ability to draw back accountts receivable.

### 3.4.4. Inadequate use of debt financial leverage

CNPC's total amount of debt is reasonable and affordable, contributing to the good performance of solvency. However, it also demonstrates that this corporation does not take full advantage of debt leverage (Devine, Seaton 1995; DataWise Limited 2009). That is to say, CNPC is short of profitable investing opportunity, which prevents it from further growth. Therefore, this company is strongly suggested to expand with reasonable borrowing cost, in order to increase economic value in the future.

### 3.4.5. Cost management is not good enough

CNPC's efficient manufacture system, who generats high profit margin, improve the control of cost management on core earnings. However, improper use of management expenses, such as excessive labor and purchasing cost in 2008, will increase period expenses and selling expense, which ultimately undermine CNPC's earning power. Without taking measures to reduce these costs, it is very possible for CNPC to get into trouble in the futher competition. In adverse, if measures are taken to reduce costs, the further performance will also be worried. Consequently, CNPC gets into a dilemma on deciding whether to reduce management cost. It is recommended that CNPC should invest in developing new products with high gross margin and reduce unnecessary costs.

## 4. Conclusion

In this paper, firstly we highlight the importance of selecting appropriate evaluation method to analysis enterprise performance, especially in China whose market is immature and different from developed countries. Next, a brief introduction of adjusted DuPont Model combined with flow ratios is clearly stated. Then this new model is applied to analyze the performance of CNPC from 2008 to 2010, through its earning power, operating efficiency and solvency, by using data from its disclosed annual financial reports. Ultimately, according to the results, several assessments are given on CNPC's financial positions, along with some recommendations about futher operation

The sample analysis comprehensively evaluates CNPC's financial performance, and exposes specific problems faced by the corporation, which could act as an indicator for CNPC's future management. Moreover, the successful application of Adjusted DuPont analysis on CNPC reveals that this model is actually suitable for evaluating company's performance, especially for Chinese firms. Generally, the adjusted DuPont model not only reflects company's financial performance but also effectively covers the shortage of examining cash flow movement in traditional method.

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## Appendix--Calculation Process of Figure 2

### • 2008

*NSPM=Net Profit÷Sales*
=113,798,000,000÷[(1,071,150,000,000+835,037,000,000) ÷2] =11.7581%

*AT=Sales÷Total Assets*
=1,071,150,000,000÷[(1,194,900,000,000+994,092,000,000) ÷2] =0.9787

*ROA=NSPM×AT*
= 10.54%

*ACT= Operating Cash Inflow÷Total Asset*
=1,277,940,000,000÷[(1,194,900,000,000+994,092,000,000) ÷2] = 1.1676

*Net Cash Flow/ Cash Inflow=*
*Net Operating Cash Flow÷Operating Cash Inflow*
=176,803,000,000÷[(1,194,900,000,000+994,092,000,000) ÷2]=0.1615

*Asset Cash Recovery Rate =*
*ACT× (Net Cash Flow/ Cash Inflow)*
=1.1676×0.1615=0.1886

*OI=ROA÷Asset Cash Recovery Rate*
= 10.54%÷0.1886=55.89%

*Cash to Debt*
*=Net Operating Cash Flow÷Total Liabiity*
=176,803,000,000÷ [(347,176,000,000
+279,021,000,000) ÷2] =0.5647

*DTE =Total liability÷Sharehoder's Equity*
= 347,176,000,000÷847,725,000,000=0.4095

*Equity Cash Recovery Rate =Cash to Debt×DTE*
=0.5647×0.4095=0.2323

*ROE=OI×Equity Cash Recovery Rate*
=55.89%×0.2323=12.98%

**• 2009**

*NSPM*
=103,173,000,000÷[(1,019,280,000,000+1,071,150,000,000) ÷2] = 10.4366%

*AT*
=1,019,280,000,000÷[(1,450,740,000,000+1,194,900,000,000) ÷2] = 0.7705

*ROA*
= 10.4366%×0.7705=7.3327%

*ACT*
=1,195,880,000,000÷[(1,450,740,000,000+1,194,900,000,000) ÷2] = 0.904

*Net Cash Flow/ Cash Inflow*
=268,017,000,000÷[(1,195,880,000,000+1,277,940,000,000) ÷2] =0.2167
*Asset Cash Recovery Rate*
=0.904×0.2167=0.196

*OI*
=7.3327%÷0.196=31.41%

*Cash to Debt*
=268,017,000,000÷[(542,631,000,000+347,176,000,000) ÷2]=0.6024

*DTE*
=542,631,000,000.00÷908,111,000,000.00=0.5975

*Equity Cash Recovery Rate*
=0.6024×0.5975=0.36

*ROE*
=31.41%×0.36=11.31%

**• 2010**

*NSPM*
=139,871,000,000÷[(1,465,410,000,000+1,019,280,000,000) ÷2] = 10.28%

*AT*
=1,465,410,000,000÷[(1,656,370,000,000+1,450,616,112,583)/2] = 0.9433

*ROA*
= 10.28%÷0.9433=10.89%

*ACT*
=1,705,200,000,000÷ [(1,656,370,000,000
+1,450,616,112,583)/2] =1.0977

*Net Cash Flow/ Cash Inflow*
=318,796,000,000÷[(1,705,200,000,000+1,195,880,000,000) ÷2] =0.2198

*Asset Cash Recovery Rate*
=1.0977×0.2198=0.2413

*OI*
=10.89%÷0.2413=45.13%

*Cash to Debt*
=318,796,000,000÷[(646,267,000,000+542,631,000,000)÷2]=0.5363

*DTE*
=646,267,000,000.00÷1,010,100,000,000.00=0.6398

*Equity Cash Recovery Rate*
=0.5363×0.6398=0.3431

*ROE*
=45.13%×0.3431=15.