

# DuPont Model and Product Profitability Analysis Based on Activity-based Costing and Economic Value Added

Lin Chen<sup>1</sup> Shuangyuan Wang<sup>1</sup> Zhilin Qiao<sup>2\*</sup>

1. School of Management, Northwestern Polytechnical University, Xi'an 710072, China

2. School of Economics and Finance, Xi'an Jiaotong University, Xi'an 710061, China

\* E-mail of the corresponding author: [clinne@126.com](mailto:clinne@126.com)

## Abstract

Although DuPont analysis is widely used it is not easy to provide accurate performance information based on DuPont profitability analysis, which is established on the basis of traditional accounting earnings. Since Activity-based Costing (ABC) and Economic Value Added (EVA) are advanced approaches to costing activities and estimating economic profit of a firm, DuPont analysis using ABC and EVA information can be more appropriate in understanding Return on Equity (ROE). In this paper we set up an improved EVA-ABC based DuPont analysis system as well as its relative indices. Then it is applied to traditional profitability analysis to get a better performance measurement. The results show that the improved system can reduce the negative impacts of accounting principles and objectively reflect the operating performance of the enterprise. It also provides more accurate information for decision makers.

**Keywords:** DuPont Analysis; Activity-based Costing; Economic Value Added; Profitability Analysis

## 1. Introduction

Return on equity (ROE) is fairly representative index of performance evaluation, which comprehensively reflects operation level and financial position of enterprises. For more detailed analysis and evaluation of enterprise operational efficiency, DuPont analysis is proposed using the intrinsic link between the major indicators of financial ratios, forming an evaluation system that takes sales margin, asset turnover and equity multiplier as the core index. In practice, the system is widely applied for its strong operability, and achieved the goal to provide corporate financial position and operating results, and other information related to the target decision for investors, creditors and other stakeholders.

However, due to establishing on the basis of profit maximization, inevitably, DuPont analysis cannot fully reflect the company's operating performance (Wenlei Ge, Wenya Gu, 2002). First, it cannot reflect sustained profitability that rigging profit through the accounting policy adjustment, debt restructuring or other non-business operation activities. Second, it excessively counts for excessive investment caused by pursuing scale and profit (Robin Cooper, 1999) and other similar behaviors damaging shareholders and creditors' interests. It also excessively accounts for management problems like insufficient investment caused by pure pursuit of asset return rate. Third, it only takes the cost of interest-bearing debt and not the equity capital which has higher cost rate into consideration. Therefore, relevant decision-making person cannot judge whether business create shareholder value or not. Finally, adopting traditional cost calculation method leads to inaccurate product profit and incomplete product cost information, especially in the enterprises where indirect costs accounted for more.

So the paper tries to implement Activity Based Costing (ABC) and Economic Value Added (EVA) into the traditional profitability analysis system. It sets up an improved EVA-ABC based products profitability system which is oriented at maximizing shareholder value to solve these problems including improving cost control circumstances, providing accuracy decision-making information and promoting enterprise profitability where value management is then widely welcome under current situation (Yan Dawu, 2004). It analyzes the ability to create value systematically and provides more effective decision basis for strengthening enterprise management.

## 2. Literature Review

DuPont analysis system caught world-wide attention and played a huge role in the enterprise management for it specified direction of improving business performance and ROE for managers which decomposes ROE to several financial indexes to reflect the changes in different aspects and factors of business performance (Kothari, S, P, 2001). With the widespread use of DuPont analysis system, its restrictiveness on the operation and management gradually appeared as enterprise development potential factors also become complicating. And

more research on improvements of the system has been put forward. Solimant (2008) found that DuPont financial indicators after the removal of financial leverage have more information content. Hongquan Zhu et al. (2011) claimed that neither traditional nor improved DuPont financial indicators have significant incremental information content in predicting the company's future earnings through empirical analysis.

Thus, Scholars began to try to introduce economic value added ideas into DuPont analysis. Tully (1993) claimed that EVA is the actual approach to create value, and establishes three ways to increase EVA. Topkis and Maggie (1996) assert that EVA is a new method to look for trading. Meanwhile, empirical researches also showed that EVA has more value relevance than traditional accounting appraising indexes (Chen Lin, Wang Pingxin, 2004). EVA measures enterprise's economic profit on the basis of economic cost and helps the manager to realize that all resource should be paid back (Chen Lin, Wang Pingxin, 2002). Chang Qing, B (2011) introduced EVA to build equity capital EVA rate to reflect the ability of value creation of invested capital. Since the index just deducted capital cost from the original profit, it still could not avoid the disadvantage of rigging profit. Changzong Yang, Z (2003) changed the profit under DuPont system into cash flow index to express real financial condition, it supported the idea of king of cash flow, but could not the goal of shareholder value maximization. Xingyu Shao (1994) integrated after-tax net operating profit and traditional DuPont system to set REVA. The index can overcome rigging profit but could not guarantee accuracy.

Previous activity cost researches mainly focus on how to apply activity cost model in determining the best product combination (Robert C Kee, 2001), how to track cost (Aminah Robinson Fayek, 2001), how to support the operator's operation decision (Dickeson Roger V, 2001), etc. In recent years, applying EVA gradually becomes a trend in the development of activity cost theory. Cooper et al think that it is necessary to integrate ABC and EVA for enterprise's long-term decision, and emphatically analyze the characteristics of the enterprise capital (Robin Cooper, 1999). Roztocki (1998) studies the methods and specific steps of integrating ABC and EVA in service industry. Eva Labro and Mario Vanhoucke (2008) study the problems of various cost resources consumption model in the system and the stability of cost calculation system. Emblemvag (2007) combines ABC and EVA to improve manufacturing enterprise management at the grass-roots level, and analyzes several cases. Hubbell William (1996) puts forward integrated ABC and EVA to improve the quality of enterprise's cost information. However, it still limits cost calculation in production cost, and does not consider the cost of capital calculation and distribution in the product, so although the integration can reflect enterprise's overall profitability, it fails to reflect the profitability of products and customers clearly or make significant effects on the accuracy of the product and customer related decisions.

Therefore, the paper mainly solves the problem how to apply the effectiveness in performance evaluation of EVA and the accuracy in calculation as well as the positive utility in cost control of ABC to profitability appraising, in order to get high quality data information while helping enterprises to carry out cost control and decision analysis.

On the basis of previous studies, this paper implements ABC and EVA into traditional DuPont analysis system oriented at Economic Return on Equity (EROE). The new system brings equity capital cost into the scope of cost calculation, adjusts accounting data to eliminate accounting policy distortion, and uses ABC method to calculate the main operating profit to overcome the disadvantage of unreasonable indirect cost allocation resulting from traditional calculation method, so it obtains accurate cost and profit and lays the foundation for scientific profitability evaluation of the product.

### **3. DuPont Analysis System Based on EVA and ABC**

#### *3.1 Improvement on Traditional DuPont Analysis System*

ABC and EVA's concrete improvements on traditional DuPont analysis system are shown in Figure 1.

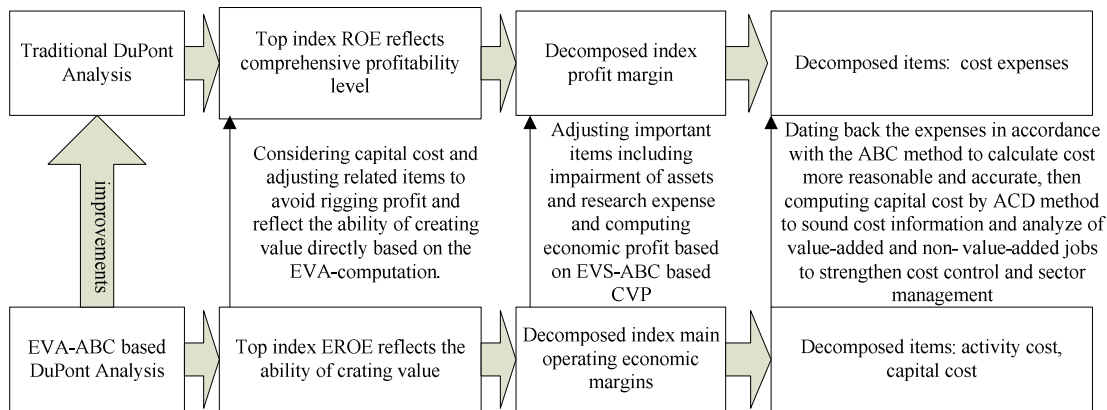


Figure 1. Comparison between Traditional DuPont System and EVA-ABC Based DuPont System

(1)After introducing EVA and corresponding adjustments for impairment items, DuPont system based on EVA and ABC can effectively reduce the possibility of manipulating profits through debt restructuring, accounting policies adjusting and other non-operating methods, and overcome the disadvantage of targeting short-term profits performance in traditional financial goal to reflect long-term sustainable profitability.

(2)After integrating EVA, DuPont analysis system based on EVA-ABC establishes indices of Economic Return on Equity (EROE) and Economic Return on Asset (EROA). These indicators consider the cost of capital. It means that the more assets enterprises occupy, the greater corresponding capital cost will be shared.

Only when these indicators are more than zero, the enterprises then create value for shareholders. They overcome the shortcomings of insufficient investment resulting from perusing traditional DuPont system decomposition indicators ROA, excessive investment caused by excessive pursuit of scale and profits and corporate governance issues such as managers and shareholders conflict. Therefore, EVA-ABC based DuPont analysis and corporate efforts in operation are compatible.

(3)After integration and adoption of EVA and ABC, DuPont system based on EVA and ABC can correct costs distortions resulting from traditional cost method and calculate product costs more accurately, especially for enterprises that indirect costs account for a large proportion. It considers the cost of equity capital that is higher than debt cost. It also improves cost information, then unifies business objectives and investors as a whole body through analyzing value-added and non-value-added jobs.

Thus, adopting the improved system will evaluate enterprise management more effective and encourage managers to think soundly standing on investor's point.

### 3.2 DuPont Analysis System based on EVA and ABC

As the superiority of introducing ABC and EVA, the improved system will take EROE as the top index. It is then decomposed to EROA assets and equity multiplier. EROA will be decomposed to main operating economy margins and asset turnover (shown in Figure 2).

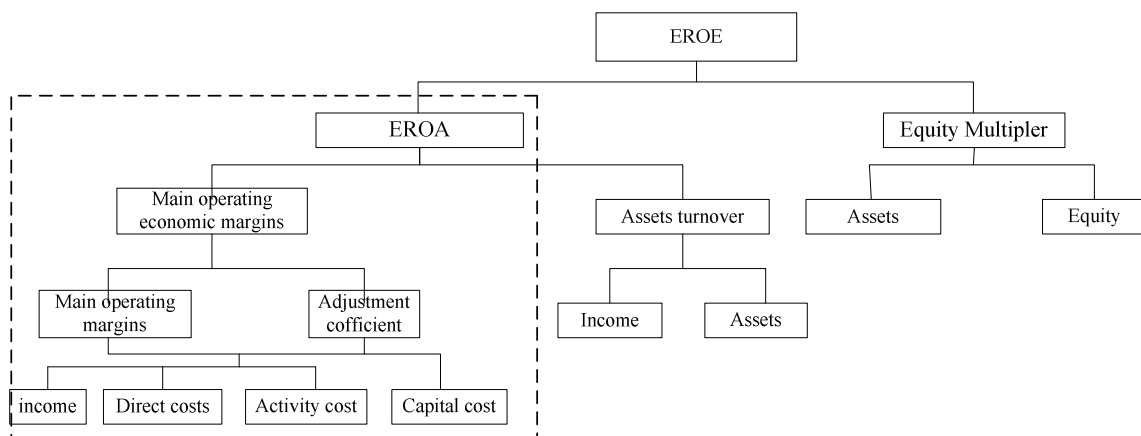


Figure 2. EVA-ABC based DuPont Analysis System

EROE comprehensively reflects equity multiplier and EROA. It directly shows the value creation ability of enterprises that no longer need to calculate the difference between capital cost and traditional ROE to determine

whether enterprises create value or not. EROA comprehensively reflects main operating economy margin and asset turnover which correct the product cost distortions caused by overvaluing high-production costs while undervaluing low-production cost under traditional cost method. Here, main operating margins are also different from the one calculated under traditional cost method. That exactly shows the improvement on DuPont model resulting from introducing ABC. Meanwhile, introducing EVA takes the cost of capital into cost computation and provides more accurate cost information. Its improvements on DuPont system, the main operating economy margins, differ from main operating margins. It is expressed as profit adjustment factor, i.e. the ratio of main operating economic margins to main operating margins. The new system reflects not only the traditional cost, but also the opportunity cost of the occupied assets, i.e. capital cost. So the profit calculated in new system is more accurate. By comparing the top index to zero, we can determine whether an enterprise has created value for shareholders.

The specific implementation of DuPont analysis system based on EVA-ABC mainly includes five steps.

①Definite activities, activity cost pools and activities measurement basis, and collect financial information.

Activity refers to kinds of specific jobs in enterprises' operation (Chinese Institute of CPAs,2010), such as signing material procurement contracts, delivering material to store, inspecting material quality, managing storage procedures, registering materials details, etc. An activity must be specific or standardized processes and approaches executed repeatedly for any processing or service object. While activity cost pool is a drum container that contains costs associated with the single activities measurement basis which is distribution standard in the system (Eric et al,2010). Activity measurement basis is usually related to cost drivers. Therefore, this step is the key link to apply ABC method. But it's difficult to some extent in practice and needs the help of professional judgment and takes a lot of time. Usually, we can solve the problem by watching producing and manufacturing process, asking related workers and other alternatives. The sources of financial information mainly rely on corporate financial statements, including balance sheet, income statement, cash flow statement, and costs associated reports, etc.

②Calculate activity cost.

According to the basic principal of ABC, "activities consume resources and products consume activities" (Ernest Glad, Hugh Becker,1996), the consumption ratio of activities costs is determined by original information on production costs and other expenses. Then the indirect costs are allocated to activity cost pools and finally dated back to cost objects. The calculation process is shown in Figure 3.

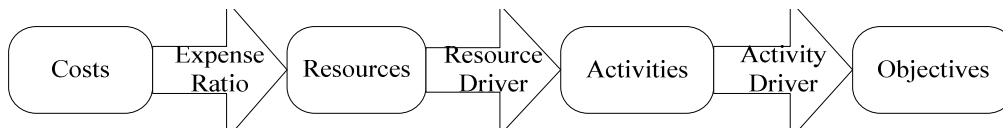


Figure 3. Activity Cost Calculation Process

③Calculate capital cost.

Adjusted capital of the enterprise is firstly calculated according to the related information from balance sheet (shown as formula (1)).

$$AdjuNA = NA + AI - AdjuD \quad (1)$$

In formula (1), *AdjuNA* represents adjusted capital, *NA* represents book assets, *AI* stands for impairment preparation and *AdjuD* is non-interest current liabilities. Then calculate the amount of capital which various activities occupied and calculate the cost of capital using activity capital dependence analysis. That is to calculate total capital cost according to the capital multiplying by weighted average cost of capital (*WACC*), and then to trace the total capital cost consumed in previous step back to specific cost objects by activity drivers. The weighted average cost of capital is shown in formula (2).

$$WACC = \frac{D}{D+E} \times r_D (1-T) + \frac{E}{D+E} \times r_E \quad (2)$$

In formula (2), *WACC* represents the weighted average cost of capital, *D* stands for liabilities, *r<sub>D</sub>* represents liabilities' interest rate, *E* is equity and *r<sub>E</sub>* is the ratio of equity capital, *T* stands for tax rate.

④Calculate main operating margins, main operating economic margins, profit adjustment coefficient and capital adjustment coefficient.

$$P = \sum_i p_i - f - h_i = \sum_i (s_i - v - ac) - f - h_i \quad (3)$$

$$EP = \sum_i p_i - f - h_t - rc = \sum_i (s_i - v - ac) - f - h_t - rc \quad (4)$$

$$Adjukp = EP / P \quad (5)$$

$$Adjuka = Adjuna / NA \quad (6)$$

In formula(3),  $P$  represents the operating profit,  $p_i$  stands for operating profit of product  $i$ ,  $ac$  represents total activities costs. In formula(4),  $EP$  represents the operating economic profit,  $f$  stands for fixed costs that cannot be traced back to product,  $h_t$  is the current adjustment items should be amortized,  $rc$  stands for capital cost. In formula(5),  $Adjukp$  stands for profit adjustment coefficient, and in formula (6),  $Adjuka$  is for capital adjustment coefficient.

⑤ Calculate adjustment coefficients and ratios, then make profitability analysis.

$$PMO = P / S \quad (7)$$

$$EPMO = EP / S = Adjukp \times PMO \quad (8)$$

$$\begin{aligned} EROE &= EROA \times Adjum \\ &= EMPO \times Adjut \times Adjum \\ &= Adjukp \times PMO \times (t \times 1 / Adjuka) \times m \times Adjuka \\ &= Adjukp \times PMO \times t \times m \end{aligned} \quad (9)$$

In formula (7),  $PMO$  stands for main operating margins, and  $EPMO$  is main operating economic margins. In formula (9),  $Adjum$  stands for the adjusted equity multiplier,  $Adjut$  represents adjusted asset turnover,  $m$  is equity multiplier,  $t$  is asset turnover. From formula (9), we can see that profit adjustment coefficient is the fundamental factor that affects the final results. So the key to correctly analyze enterprise profitability is accurate calculation of profit adjustment coefficient.

The above steps can be summarized to three dimensions including defining activities, activity cost pools and activities measurement basis, cost calculation and data adjustment, and ratio computation, profitability analysis (shown in figure 4).

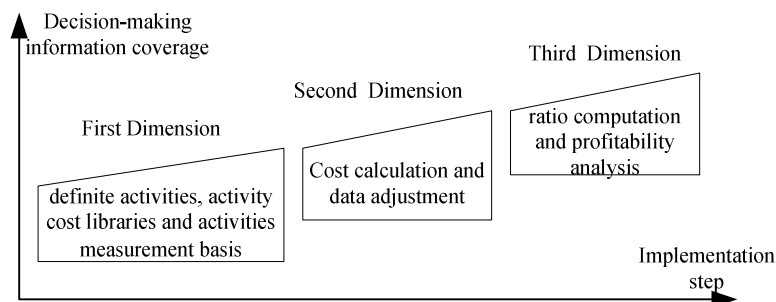


Figure 4. Implementation Steps

The first dimension lays the foundation for the next one. The second dimension is the main body for reception based on first level. It guarantees the reasonable and accurate results. The third dimension works out the result to provide base for analyzing and making coping strategies.

#### 4. Case study

XY Steel Tube and Wire Rope Company is a big backbone company in domestic oil industry. It produces high quality steel tubes, wires and ropes. The paper just chose main activities to study with considering the production complexity, product diversity and the company's scale. It also merged some activities according to the principle of nature similarity to satisfy the requirements for effective design and simple selection. The required financial information is shown in table 1.

Table 1 Balance Sheet Unit: Thousand RMB

Assets		Liabilities & Equity	
Cash	2,432	Accounts Payable	892.8
Receivables	1,717.5	Short-term Liabilities	3,000
Fixed Assets	8,299	Long-term Liabilities	4,000
Inventories	1,000	Total Liabilities	7,892.8
		Capital	3,500
		Capital Reserve	
		Retained Earnings	2,055.7
		Total Owners' Equity	5,555.7
Total Assets	13,448.5	Total Liabilities & Equity	13,448.5

In addition, the company's R & D expenditures are 500,000 RMB. Allowance for bad debts is 68,700 RMB, in which the rope (Model: K5×7-FC) is 47,700 RMB and the rope (Model: K3×19S) is 21,000 RMB. The company's rate of debt interest is 6.5% and equity interest is 12%. The annual product sales revenue and cost information are shown in table 2.

Table 2 Product Sales Revenue and Cost Information Unit: Thousand RMB

Model	Sales	Direct materials	Direct labor	Volume
K5×7-FC	3,180	864	172.8	1.2
K3×19S	1,400	252	50.4	0.7

Then use DuPont analysis system based on EVA-ABC to do the analysis. The process is as follows:

①Definite activities, activity cost pools and activities measurement basis.

First, determine the direct costs of products according to the financial information. It includes direct material cost and direct labor cost. The unit direct cost of model K5×7-FC is 864 RMB and model K3×19S is 432 RMB.

Second, 14 activities are identified after thorough investigation of the production process. They are (1) product design, (2) making samples, (3) purchasing materials, (4) receiving materials, (5) production preparation, (6) scouring and phosphorizing, (7) heat treatment, (8) oil immersion, (9)repairing mold, (10) wire drawing/twining, (11)testing, (12)workshop management, (13) transportation,(14) after-sales services.

Third, activities are analyzed and merged according to the principal of quantity homogenization, and 8 activity pools are established. Activity pool I and II are product-sustaining level activities. Activity III is batch level activity. Activity pool IV, V, VI and VII are unit level activities. And activity VIII is facility level activity. During the period, total indirect cost is 1,440,144 RMB. Ratios of various activities sharing indirect costs, occupied capitals and other related information are shown in table 3.

Table 3 Information of Activities

Activity Pools	I	II	III	IV	V	VI	VII	VIII
Activity Details	(1),(2)	(4)	(3),(4),(5)	(6),(7),(8)	(9),(10)	(11)	(13)	(12)
Ratios of Indirect Cost (%)	9	3	20	25	12	9	7	15
Ratios of OccupiedCapital (%)	5	3	15	20	8	5	4	32

②Calculate activity cost.

The first step is to calculate indirect cost which every activity pool should share through multiplying total indirect cost by ratios of various activities sharing indirect costs, expressed in matrix  $C=[c_1 \ c_2 \ \dots \ c_8]^T$ . Matrix

of activity drivers is expressed as  $D = [d_1 \ d_2 \ \dots \ d_8]^T$ . Thereby, matrix of activity distribution ratio is worked out as

$$DC = \left[ \frac{c_1}{d_1} \ \frac{c_2}{d_2} \ \dots \ \frac{c_8}{d_8} \right]^T \quad (10)$$

The activities volume  $q_{ij}$  is expressed as matrix  $Q$ , meaning the volume of activity  $j$  that product  $i$  consumed. Activity cost is expressed as  $AC = Q \times DC$ . Then we will get

$$AC = \begin{bmatrix} 3 & 1 & 3 & 2800 & 8000 & 94 & 60 & 318 \\ 5 & 0 & 8 & 1700 & 6080 & 82 & 35 & 140 \end{bmatrix} \times \begin{bmatrix} \frac{1440144 \times 9\%}{8} & \frac{1440144 \times 3\%}{1} & \frac{1440144 \times 20\%}{11} & \frac{1440144 \times 25\%}{4500} & \frac{1440144 \times 12\%}{14080} & \frac{1440144 \times 9\%}{176} & \frac{1440144 \times 7\%}{95} & \frac{1440144 \times 15\%}{458} \end{bmatrix}^T = [775460 \ 664684]^T$$

Thus, activity cost of model K5×7-FC is 775,460 RMB, and model K3×19S is 664,684 RMB.

Then, we can separately calculate the total cost of model K5×7-FC and model K3×19S under ABC method:

Cost of model K5×7-FC = activity cost + direct cost = 775,460 + (864,000 + 172,800) = 1,812,260 RMB

Cost of model K3×19S = activity cost + direct cost = 664,684 + (252,000 + 50,400) = 967,084 RMB

However, the indirect costs of model K3×19 and K5×7-F are allocated in accordance with machine hours under traditional cost method. The computation is as follows:

Indirect cost of Model K3×19S = 1,440,144 / (2800 + 1700) × 2800 = 896,090 RMB

Indirect cost of Model K5×7-FC = 1,440,144 / (2800 + 1700) × 1700 = 544,054 RMB

Then, we separately calculate the total cost of model K5×7-FC and model K3×19S under traditional cost method:

Cost of Model K5×7-FC = indirect cost + direct cost = 896,090 + (864,000 + 172,800) = 1,932,890 RMB

Cost of Model K3×19S = indirect cost + direct cost = 544,054 + (252,000 + 50,400) = 864,454 RMB

### ③ Calculate capital cost

Capital cost contains two items. One comes from the capital occupied by activities ( $RC$ ) and the other comes from the capital occupied by direct materials ( $VC$ ).  $RC$  will be calculated with formula (11).

$$RC = WACC \times Q \times DA \quad (11)$$

According to activity capital dependence analysis, we will get the volume matrix of activity capital  $A = [a_1 \ a_2 \ \dots \ a_8]^T$ , and distribution rate matrix of activity capital  $DA = \left[ \frac{a_1}{d_1} \ \frac{a_2}{d_2} \ \dots \ \frac{a_8}{d_8} \right]^T$ , According

to the adjusted total capital  $AdjuNA$  (¥12,624,40) and weighted average capital cost  $WACC$  (8.15%),  $R$  is calculated as follows:

$$RC = 8.15\% \times \begin{bmatrix} 3 & 1 & 3 & 2800 & 8000 & 94 & 60 & 318 \\ 5 & 0 & 8 & 1700 & 6080 & 82 & 35 & 140 \end{bmatrix} \times \begin{bmatrix} \frac{12624400 \times 5\%}{8} & \frac{12624400 \times 3\%}{1} & \frac{12624400 \times 15\%}{11} & \frac{12624400 \times 20\%}{4500} & \frac{12624400 \times 8\%}{14080} & \frac{12624400 \times 5\%}{176} & \frac{12624400 \times 4\%}{95} & \frac{12624400 \times 32\%}{458} \end{bmatrix}^T = [549127 \ 397450]^T$$

Similarly, we will get the capital cost of direct materials  $VC = [57150 \ 25160]^T$ .

Therefore, total capital cost equals to  $RC + VC = [606277 \ 422610]^T$ .

④ Calculate main operating margins, main operating economic margins, adjustment coefficients and other ratios. DuPont analysis system based on EVA-ABC and product profitability analysis are shown in figure 5.

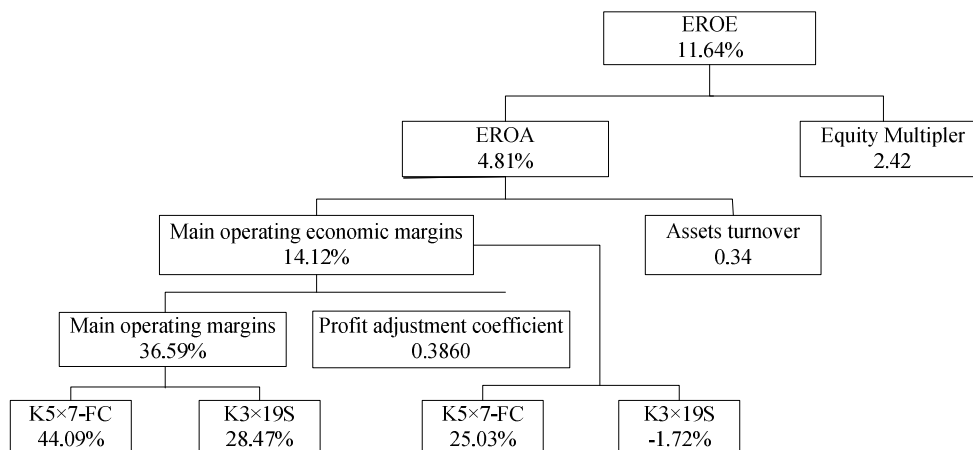


Figure 5. EVA-ABC based DuPont Analysis System

Detailed analysis will be developed from product level and overall level according to the results in figure 5.

①Product level analysis

The distortion rates resulted from traditional cost of model K3x19S and K5x7-FC are respectively -6.66% and 12.47%. The main reason is that indirect cost is apportioned by simple working hours or machine hours proportion under traditional accounting method. For activity “production preparation”, preparation times of high-yield model K5x7-FC are less than model K3x19S, but the cost is not allocated in accordance with the consumption of resources. Similarly, some other activities such as “purchasing materials” are the same. This results in cost overestimation of high-yield model K5x7-FC and underestimation of low-yield model K3x19S. This distorted product information seriously affects the accuracy of product operating profit. Costs and differences under different cost methods are shown in Figure 6.

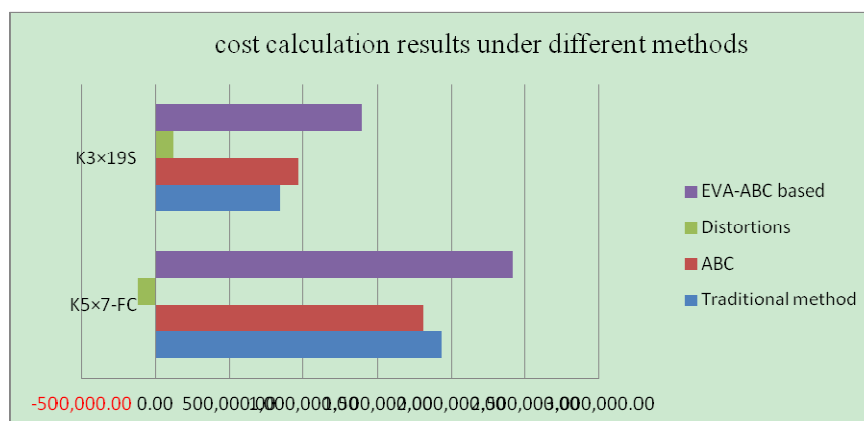


Figure 6. Costs and Differences under Different Methods

Under traditional cost method, profit margin of model K5x7-FC is 39.22% and model K3x19S is 39.54%. Under ABC method, profit margin of model K5x7-FC is 44.09 % while model K3x19S is 28.47%. However, under DuPont system based on EVA-ABC, profit margin of model K5x7-FC is 25.03 %, and model K3x19S is only -1.72%.

Profit distortion under traditional cost method is not conducive to business profitability analysis and will lead to decision-making mistakes. As the data source of DuPont model, it will have influence on the company’s operating efficiency and performance measurement.

According to cost calculation based on EVA-ABC which considers the cost of capital, the profit margin of model K5x7-FC decreased by 43.24% and model K3x19S reduced by 106.04%. Figure 7 lively shows profit margins of model K5x7-F and K3x19S under traditional, ABC and DuPont analysis based on EVA-ABC.



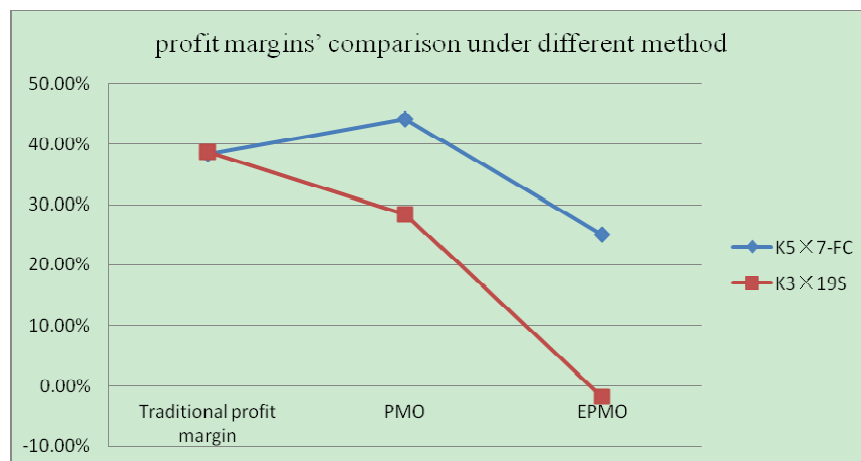


Figure 7. Profit Margin Comparisons under Different Methods

Figure 7 shows that profit margin of model K3×19S is higher than model K5×7-FC under traditional method but lower than model K5×7-FC under ABC method. Although profit margin of model K5×7-FC is still higher than model K3×19S under DuPont system based on EVA-ABC, profit margin of model K3×19S drops to -1.73%, which indicates model K3×19S can't create value for shareholders and even more worse, it will ruin shareholder value. In contrast with other two methods, traditional cost method can not reveal the true profitability of products, which will lead to incorrect cost analysis and product pricing, thereby misleading operating decisions and losing market opportunities.

## ②Overall level analysis

Equity multiplier is 2.42 in terms of capital structure, indicating the enterprise's financing policy is conservative and financial risk is low. However, it results in higher weighted average capital cost so that profits significantly decline after considering the cost of capital. Therefore, it will be a good choice to increase certain liability to seek a better capital structure.

From the view of return on assets, EROA is 4.81% and EIMO is 14.12%. But the asset turnover is only 0.34, which directly results in low EROA. On the one hand, the enterprise could increase the yield to improve its revenue, but at the same time it needs to avoid the high risk of bad debts caused by loose credit policy. So it must pay attention to strengthening the management of accounts receivable while improving revenue. On the other hand, the enterprise should strengthen the assets management such as cleaning up inefficient assets timely and maintaining current assets regularly to guarantee the efficiency of operation.

From the view of main business, *Adjupk* is as high as 0.3860, indicating that capital cost has an important effect on profits. Capital cost is determined by weighted average capital cost and the volume of capital occupied. It can be seen from low asset turnover that activities occupied a lot of assets. This implies that the enterprise may have excess production capacity. Therefore it is better to improve the production efficiency and develop new market to make full use of its production capacity. That will be an effective way to improve its profitability.

## 5. Conclusion

An excellent financial management analysis system must be able to analyze and evaluate the enterprise's profitability correctly. To maximize shareholder value, the enterprise usually concerns about assets, value and the ability to create value. DuPont analysis system based on EVA-ABC composes EVA's advantages on performance evaluation and effectively reduces the distortions which traditional accounting indicators have on economic efficiency. Besides, it overcomes the disadvantage that EVA, an absolute indicator, cannot directly be applied to comparing two different scale enterprises or investing centers to truly reflect enterprises' performance. Meanwhile, it takes full use of ABC's advantages of tracing costs to products by cost or activity drivers in cost calculation and control, revealing the differences among value-added activities and non-value added activities, available resources and actual needed resources. Thus, the improved system could provide useful information for improving activity management and optimizing resources allocation. It also contributes to correctly evaluating the product's profitability, improving product pricing decisions, and providing accurate information for whether to stop old products or introduce new products. Profitability analysis based on EVA-ABC is consistent with the goal of maximizing shareholder value. It possesses necessary conditions that a good financial management

analysis should have and provides objective analysis for performance measurement and strategic decision-making.

DuPont analysis system based on EVA-ABC also has some limitations. In capital market, weighted average capital cost is difficult to define, which is a necessary indicator for the calculation of capital cost. And there are a lot of accounting items needed to be adjusted according to EVA and the adjusting process in practice is complex to some extent. Also, calculation based on ABC has some difficulty in implementation since there are not sufficient cost management data in traditional accounting system. Further research is needed to find new methods on how to guarantee accuracy of costing in DuPont analysis system based on EVA-ABC.

### Acknowledgements

*Financial supports from National Natural Science Fund (71201125), National Social Science Fund (09CJY038), Scientific Research Foundation for the Returned Overseas Chinese Scholars of State Education Ministry, National Natural Science Fund of Shaanxi Province (2013JQ9001), Soft Science Fund of Shaanxi Province (2009KRM073), Social Science Fund of Theoretical and Practical Issues in Shaanxi Province (2014Z035), Humanities Social Science and Management Fund of Northwest Polytechnical University (3102014RW0005) are greatly acknowledged.*

### References

- Aminah Robinson Fayek. (2001). Activity-Based Job Costing for Integrating Estimating, Scheduling and Cost Control. *Cost Engineering*, Aug, 23-32.
- Chang Qing, B. (2011). EVA -based DuPont Financial Analysis System Construction. *Accounting Monthly*, 5,5-7.
- Chen Lin, Wang Pingxin. (2004). Empirical Study on the Relation Between EVA and Traditional Performance Measurement. *Management Review*, 9, 14-17.
- Chen Lin, Wang Pingxin. (2002). EVA: New Development of enterprise management and performance evaluation. *Management Review (Foreign management Herald)*, 10, 39-40.
- Chinese Institute of CPAs. (2010). *Financial Cost Management*. Beijing: Financial and Economic Publishing House of China.
- Changzong Yang, Z. (2003). Improvements on DuPont Financial Analysis System. *Modern Accounting*, 3, 37-39.
- David Young, Stephen O'Byrne. (2002). *EVA and Value Management - A Practical Guide*. Beijing Social Sciences Documentation Publishing House.
- Dickeson Roger V. (2001). Enter The World of Activity-Based Costing. *Printing Impressions*, 11, 72.
- Emblemsvag J. (2007). Using Activity-based Costing and Economic Profit to Grow the Bottom-line. *Business Strategy Series*, 8, 418-425.
- Eric W. Noreen, Peter C. Brewer, Ray H. Garrison. (2010). *Managerial Accounting for Managers*. New York: McGraw Hill Higher Education.
- Ernest Glad, Hugh Becker. (1996). *Activity-Based Costing & Management*. Chichester, England: John Wiley & Sons.
- Eva Labro, Mario Vanhoucke. (2008). Diversity in Resource Consumption Patterns and Robustness of Costing System to Errors. *Management Science*, 54,10,1715-1730.
- Hubbell William. (1996). Combining Economic Value Added and Activity-Based Management. *Journal of Cost Management*, Spring,18-29.
- Hongquan Zhu, et al. (2011).DuPont analysis and value judgments - Empirical Study Based on A-share listed companies. *Management Review*, 23,10,152-161.
- Kothari, S, P. (2001).Capital Markets Research in Accounting. *Journal of Accounting and Economics*, 31(1-3),105-231.
- Li Liu, Zhiyi Song. (1999). New method to measure business performance - economic value added (EVA) and correction of economic value added (REVA) indicators. *Accounting Research*, 8,30-35.
- Robert C Kee. (2001). Evaluating the Economics of Short- and Long-Run Product-Related Decisions. *Journal of*

*Managerial Issues*, Summer, 139-158.

Robin Cooper. (1999). Integrating Activity-based Costing and Economic Value Added. *Management Accounting*, **80**, 16-17.

Roztock N. (1998). The Integrated Activity-based Costing and Economic Value Added System for the Service Sector. *Proceedings of the International Conference on Service Management*. France : 494-506.

Roztock N., Kim Lascola Needy. (1999). Integrated Activity-Based Costing and Economic Value Added in Manufacturing. *Engineering Management Journal*, **11**:17-22.

Soliman, M. (2008).The Use of DuPont Analysis by Market Participants. *The Accounting Review*, **83**(3),823-853.

Topkis, Maggie. (1996). A New Way to Find Bargains. *Fortune*, **134**(11), 265-266.

Tully, S. (1993). The Real Key to Creating Wealth. *Fortune*, **128**(6), 38-44.

Wenlei Ge, Wenya Gu. (2002). Applying EVA to Measure the Operating Performance--A Research on 95 Industrial Corporations in Shanghai Stock Exchange. *Journal of Donghua University (Natural Science)*, **6**,55-59.

Xingyu Shao.(1994). Extended DuPont analysis system based on EVA. *Modern Business*, **2**,260—261.

Yan Dawu.(2004). Value Chain Accounting: Review and Prospect . *Accounting Research*, **2**, 3-7.

The IISTE is a pioneer in the Open-Access hosting service and academic event management. The aim of the firm is Accelerating Global Knowledge Sharing.

More information about the firm can be found on the homepage:  
<http://www.iiste.org>

## CALL FOR JOURNAL PAPERS

There are more than 30 peer-reviewed academic journals hosted under the hosting platform.

**Prospective authors of journals can find the submission instruction on the following page:** <http://www.iiste.org/journals/> All the journals articles are available online to the readers all over the world without financial, legal, or technical barriers other than those inseparable from gaining access to the internet itself. Paper version of the journals is also available upon request of readers and authors.

## MORE RESOURCES

Book publication information: <http://www.iiste.org/book/>

## IISTE Knowledge Sharing Partners

EBSCO, Index Copernicus, Ulrich's Periodicals Directory, JournalTOCS, PKP Open Archives Harvester, Bielefeld Academic Search Engine, Elektronische Zeitschriftenbibliothek EZB, Open J-Gate, OCLC WorldCat, Universe Digital Library, NewJour, Google Scholar

