ANALYSIS OF THE RELATIONSHIP BETWEEN FINANCIAL RATIOS AND NET INCOME USING A FACTOR AND PANEL DATA ANALYIS

Abstract

This paper attempts to find a relationship between the results of the financial ratios and the results in the net income for the companies listed as S&P 500. Knowledgeable in Accounting believe that financial ratios provide a picture of financial condition at a particular time, while providing a clear picture of the economic performance of the company. For that reason, this paper examines the results of the better-known financial indicators such as financial ratios and the auditor's opinion as a tool for the impact on the net income for the company classified as S&P 500 for the years 1990 through 2010. This relationship is studied taking first financial ratios and economic indicators such as the real net income. As there are no studies that take into consideration many different companies and a period of many years, will be considered Real net income, and nominal in five-year averages. The study showed large differences between the financial ratios that impact when it takes all the year and in group o five year. Also, the study showed the importance of using the real net income in the accounting analysis.

Key words: Accounting; Net Income; S&P 500; Financial Ratios; Panel Data; Factor Analysis

Introduction

The financial ratio are indicators that has as an objective to measure the changes of an economic phenomenon referred to a value taken as a basis in a given time. These indexes fulfill the identity property which consists that the index takes a value of 1% or 100% for the period that is taken as basis.

The financial ratios have been used since a long time ago. However, the use of this tool in the financial statements is relatively new (Horrigan, 1968). We can say that the standardization of the use of financial indexes was made by Alexander Wall for the Study of Credit Barometrics article. This study used the famous $\frac{2}{1}$ for the current index. This means that the current assets are 2 times the current liabilities (Wall, 1919

In the 1961 Beaver analyzed financial ratios to predict the failure of companies. This study had a more powerful statistical technique that became the model to follow for future studies. Thanks to this study, the effects of inventory valuation and the effect of capital on financial indices (Horrigan, 1968) were studied

This paper is very important because it addresses the issue of the compatibility of financial ratios between IFRS and GAAP. The study concludes that the impact of comparing companies that make their financial statements under different regulations can have a significant impact (Jeffers & Askew 2010). In the random gaming industry also, financial ratios have been used (Rowe 2010). Today, though we know that there are other factors that can influence the net income for this article, we will consider only the financial ratios.

The objective of this work is to find a relationship between net income, financial ratios and the auditor's opinion. At present, the accounting profession has several challenges as accounting still has three fundamental problems; the use of estimates, interpretations, and accounting methods. These characteristics inherent in the subject have the potential to alter both results financial indices and consequently their interpretation by the user. For example, the asset valuation method using the Market Value can triple the income of the company as (Bryan & Lilien, 2013). Another example would be the problem with active rentals presented by (Collins, Pasewark, & Riley, 2012). Although this paper differs from the famous Beaver study that the goal of research is the relationship of financial ratios with the net income, we can start from the same premise (Beaver, 1966, p. 91) that it should contain financial status as the key to understanding this behavior. Given these uncertainties and financial questions it's important to modern studies to demonstrate whether the financial indices are the appropriate tool to predict future changes in the departure of net income. Is also necessary substantiate the conceptual framework of accounting in to which the auditable process, so that the findings are in line with the expectations of internal and external users of financial statements lies. Is also necessary substantiate the conceptual framework of accounting in to which the auditable process is found, so that the findings are in line with the expectations of internal and external users of financial statements lies.

If the accounting is not correct to forecast economic performance mechanism nor the information provider for the creation of plans to maintain and improve the finances of the company, then it would be unproductive to use financial ratios to predict and measure future company results. However, if the accounting conceptual framework aims to find information of economic problems and helps us make future decisions, as

has happened in the Spanish PGDC[1] for example, then the study of financial ratios have a valid reason for use.

Experts believe that the financial ratios provide a picture of financial condition at a particular time, yet provide a clear picture of the economic performance of the company (Anupam De, National institute of technology, 2011). Rates also help us to compare companies. For that reason, this paper examines the results of the better known financial indicators such as financial ratios and the auditor's opinion as a tool for impact on net income of the company are classified as S & P 500 for the years 1990 through 2010. This relationship is studied taking first the financial ratios and economic indicators such as the actual net income. In the study the auditor's opinion on the financial statements is also taken into consideration as though the markets in the United States have gone through no less than six major loss of confidence in financial audits according to (Turner, 2006), the users of financial state have relied on financial ratios and the auditor's opinion to interpret the economic performance of companies. In the past, the use of financial ratios by companies is delegated to private entities such as Dun & Bradstreet, Inc., which, in 1849, was engaged in credit research (Altman, 1968). At present, universities, banks, financial analysts, private companies, and even the government have financial ratios used to measure the performance of companies and economic decisions made by the leaders who run them. It is very important to know whether these mathematical relationships are the right tool if they impact business results, whether the financial statements give a clear picture of the business and if they can be used to interpret financial statements and measure managerial performance (Epstein, Nach and Bragg, 2009). Although the study published in Beaver entitled

[1] Plan General de Contabilidad (PGDC) is the legal text that regulate the accounting in Spain.

Empirical Research in Accounting concludes that 30 financial ratios are useful to predict the probability of bankruptcy, he discovered that the cash flow divided by total debt provides a result of greater statistical reliability, which demonstrates the high predictive capacity of the treasury, as is highlighting throughout Europe. Also, as part of their findings, Beaver concludes that cash flow divided by total debt bankruptcy can predict outcome up to five years in advance (Beaver, 1966). Subsequent studies such as (Min-Tsung, 2006) confirm these findings.

This article contributes to the existing literature because it uses new forms to make a study of the financial ratios, such as the use of economic factors as suggested by actual net income (Dwi Martani & Rahfiani, 2009). This study found that external factors may affect the company's financial results; you should take them into consideration when a financial analysis of the company is made. Among the economic factors mentioned it also includes: interest rates, economic growth, and inflation, among others. The following factors are considered in this work.

1. Due to the relationship between the variables collinearity and financial ratios (BN & Gautam, 2011) recommends the use of factor analysis due to multicollinearity.
2. Current companies in Europe are allowed or required to report their subsidiaries in the currency of the parent company. This creates a problem with inflation in the financial statements. IAS 29 deals with this problem in Europe but in the United States, where the companies are in this research, have a regulation that work with this problem. For that reason we use the actual net income as suggested needs to be done in future research (Riordan & Riordan, 2009).

3. Many of the studies used samples of 50 or so companies like the famous work (Beaver, 1966). Today databases enable larger samples. This amount of data, although it appears to be correct, may have errors that can lead to erroneous conclusions. When working with large databases it is very important to eliminate the denominators with a zero because mathematically correct in practice are inconsistent with accounting practice (Nenide, Pricer, & Michael, 2010). The financial ratios at zero imply that one of the data is not available so you have to delete the index since statistically it is not the same zero, that data not available at time of computations. The most important studies such as (Beaver, 1968) (Altman, 1968), Ohlso (1980), Zavgren (1985), Deakin (1972) and Blom (1974) may have errors that lead to incorrect interpretations by (Nenide, Pricer , & Michael, 2010). This work is free from the four common mistakes in investigations of this type as can be: errors in input data, with zero denominators, very high standard deviation, and normal distribution of the data.
4. The type of company is an important factor as it is very important that the sample is large and homogeneous (Ezzamel & Beecher, 1987). Any investigation that seeks to draw conclusions from industry should have the same representation. We can conclude that when the sample is small a company the work is susceptible to errors in distribution and representation of different industry sectors (Ezzamel & Beecher, 1987). In this research we will use as a case study the following industries: Public Administration, Services, Finance, Insurance, Home Sales, Retail Sales, Manufacturing, Transportation, Communication, Electric, Gas and Sanitary Services, Wholesale Sales, Construction, Agriculture , Forestry, and Fisheries.

The amount of data is also a contribution because previous studies were with few companies. These ratios were taken using a rational basis work (Hossari & Rahman, 2005). In this study, 48[2] financial ratios after granting points for use in 53, separate written between 1966 and 2002 were selected. This score was awarded using a system of popularity which is better than a consensus system. In work used only 44 due to the limited information. Unused ratios were only 4% used so you should not have material consequences. In addition, it'll be considered the impact of the audit opinion and behavior of net income.

As in this work the hypothesis of the research is to test the range of financial ratios, it is part of a broader process as to check whether the results of the ratios are significantly related to changes in net income for which a null hypothesis (Ho) is stated and the alternative (H1), a statistical model was constructed from data obtained by 20 years of financial statements of S & P 500 companies and the acceptance region exchange or rejection is established. The contrasting hypothesis developed in this study is as follows:

1. Hypotheses for (H0) financial ratios chosen by the factor analysis are related to changes in net income.
2. Alternative hypothesis (H1) financial ratios are unrelated to changes in net income.

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[2] Liabilities / Total Equity; RE/TA: Retained Earnings / Total Assets; S/TA: Sales / Total Assets; C/TA: Cash / Total Assets; CA/S: Current Assets / Sales; CA/TA: Current Assets / Total Assets; MVE/TL: Market Value of Equity / Total Liabilities; QA/CL: Quick Assets / Current Liabilities; CF/TA: Cash Flow / Total Assets; NI/S: Net Income / Sales; NI/TE: Net Income / Total Equity; EBIT/I: Earnings Before Interest and Taxes / Interest; TE/TA: Total Equity / Total Assets; Inv/S: Inventory / Sales; QA/S: Quick Assets / Sales; WC/S: Working Capital / Sales; QA/TA: Quick Assets / Total Assets; S/FA: Sales / Fixed Assets; TE/TL: Total Equity / Total Liabilities; C/CL: Cash / Current Liabilities; C/S: Cash / Sales; EBIT/S: Earnings Before Interest and Taxes / Sales; EBIT/TE: Earnings Before Interest and Taxes / Total Equity; FA/TA: Fixed Assets / Total Assets; FA/TE: Fixed Assets / Total Equity; LTL/TA: Long-Term Liabilities / Total Assets; AR/Inv: Accounts Receivable / Inventory; C+MS/CL: (Cash + Marketable Securities) / Current Liabilities; C+MS/TA: (Cash + Marketable Securities)/ Total Assets; CF/CL: Cash Flow / Current Liabilities; CF/S: Cash Flow / Sales; CL/TA: Current Liabilities / Total Assets; CL/TE: Current Liabilities / Total Equity; Div/NI: Dividends Paid / Net Income; EBT/TA: Earnings Before Taxes / Total Assets; Exp/S: Expenses / Sales; Inv/WC: Inventory / Working Capital; LTL/TE: Long-Term Liabilities / Total Equity; OpEx/TA: Operating Expenses / Total Assets; S/Inv: Sales / Inventory; S/TE: Sales / Total Equity; TE/LTL: Total Equity / Long-Term Liabilities.

The financial statements of the companies contain valuable information for internal users and external users. This paper aims to identify the companies that are listed as Standard & Poor's. S & P 500 has offices in 23 countries and 150 years of history. S & P has published more than 870,000 credit news and statistics. One of the benefits of using S & P is that your selection of companies representing 75% of net assets of companies with public capital for sale in the United States. This high percentage gives us confidence that the results are representative of the total population. The selection of companies to S & P, and therefore part of the study of this paper, is a set of rules described below:

1. Company based in USA. The company should have to host the United States. You must also be in compliance with SEC documents such as Form 10-K.
2. Market Cap. The company must have a market capitalization surplus of at least $ 4 trillion.
3. Important percentage of the company is public. The company must be at least 50% with public capital.
4. Financial Viability. The company must have at least four consecutive positive earnings. These reports must be created following the generally accepted standard of accounting in the United States (GAAP).
5. Liquidity and reasonable price. The reason to capitalize exchange value must be 1 or greater since actions at very low prices may affect liquidity.
6. Sectorial representation. The company has to maintain balance in their represented sector.

Point number 4 of the requirements of S & P is very important as it ensures the consistency of financial ratios, this study seeks to make. If companies do not complete

their financial statements evenly it would be impossible to conduct comparative studies using ratios.

The first step in obtaining the results was the selection of companies. In this paper all companies classified as S & P 500 for the reasons explained above were taken. As the FASB and the SEC regulate these companies differently to private companies, this way ensures that when we do the comparison in the study we kept the homogeneity of the data obtained for the work. The data was obtained from Compustat and transferred to Excel. Then, using suggestions (Hossari & Rahman, 2005) we proceeded to calculate financial ratios. These results had to be analyzed as containing calculation errors by divisions between 0 and lack of information. Like (Nenide, Pricer, & Michael, 2010) suggests when you have big database with 0 denominators can alter the outcome.

After the database was transported they were ready to SPSS for factor analysis. The factor analysis is a multivariate statistical technique whose main purpose is to summarize the observed relationships between a set of variables in a concise and safely as an aid to the construction of new concepts and theories. It uses a set of unobserved random variables, which we call common factors, so that all covariance or correlations are explained by these factors and any portion of the unexplained variance by the common factors are assigned to terms of residual error that call only factors or specific (Gorsuch, 1983). Is precisely one contribution of this paper is the use of factor analysis that is correct because when you have variables that interact with each other creating Colinearity (BN & Gautam, 2011). Once the factor analysis identifies the factors, inherent in the entire set of financial ratios categories, at least one ratio can be selected in each category. This way, you can identify fewer financial ratios to be used for analysis. For purposes of the study, a set of 35 financial ratios and the auditor's opinion were selected and classified into different categories. These categories vary according

to the type of company or the number of years of study. For example, factors resulting from the analysis for 1990 and 2010 are different to doing it every five years. Since the objective of this study is to identify a small number of financial ratios that are able to capture the desired information, the proportions who have weak inter-correlation (is to say, <± 0.5) were identified and excluded from the study. Factor analysis is a statistical tool that identifies latent variables, that is factors inherent in the total set of observed variables. Each factor of this type comprises a number of variables which are similar in terms of correlation. Then regression analysis was performed taking the factor scores as dependent on different factors and variables in the respective constituent factor as independent variables. Variables with corresponding p values (namely values (p> 0.05) are excluded.

When we take into consideration all companies, Table 1 shows the information of the factorization of the variables for the years 1990 to 2010 The Kaiser-Meyer-Olkin, best known for KMO, shows us a result of .728. This is a measure of suitability of the sample, which it is a test of the difference between the amount of data that could be explained by selected factors. As a measure of factorability the result of .728 indicates that the sample is appropriate as shown by textbooks (Brace, Kemp, & Snelgar, 2003) (Field, 2009) and studies like (Kizikaya & Askar, 2009), (Ocal, Oral, Erdis, & Vural, 2007) (Das, 2009), (Jordan, Clark, & Donald, 2009), (Riaz & Afzal, 2011), (Riaz & Afzal, 2011), (Garcia Amparo & Zapata, 2011), (Garcia, Amparo, & Zapata, 2011), (Sharma & Upneja, 2005).

Table 1 KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.	.728

Bartlett's Test of Sphericity	Approx. Chi-Square	284667.006
	df	171
	Sig.	0.000

After obtaining the results of the factorization we proceed to compute the averages of the groups of factors, consisting Utilization Factor Net Worth, 2 Effectiveness of Sales, 3 Using debt and 4 Using the Assets[3] added to the regression model the auditor's opinion. This last variable is not worked with the factor model because it is not a financial ratio. Due to the importance of the audit, in recent studies such as (Stokes, 1989), (Siyu & Shiwei, 2012), (Banimahd, 2013), it was decided to consider it in the regression. Table 2 shows the summary of the obtained model. The first factor has an R of .622 and an R ^ 2 of .387 we can interpret that factor 1 accounts for 39% of the change in equity.

Table 2 Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	**Change Statistics**				
					R Square Change	F Change	df1	df2	**Sig. F Change**
1	**.622**	**.387**	**.348**	**11.6234279**	**.387**	**9.760**	**518**	**7999**	**0.000**

[3] These financial ratios are used: Total Liabilities / Equity, Total Current Liabilities / Equity, Long Term Liabilities / Equity Sales / Equity, Fixed Assets / Equity, Earnings Before Interest and Taxes / Equity , liquid Assets / Sales, Earnings before interest and taxes / Sales, Cash / Sales, Working Capital / Sales, Net Income / Sales, Current Assets / Total Current Liabilities, Equity / Total Liabilities liquid Assets / Total Current Liabilities (Cash + Marketable securities)

The regression results in Table 3 show the beta coefficient and statistical significance for the variation of real net gain. As the beta increases the relationship between the factor and the dependent variable increases. Before considering this relationship we must examine the factors that are significant.

Table 3 Regression Real

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations			Collinearity Statistics	
	B	Std. Error	Beta			Zero-order	Partial	Part	Tolerance	VIF
(Constant)	.994	3.930		.253	.800					
Capital utilization	.008	.013	.005	.602	.547	.014	.007	.005	.943	1.061
Sales Effectiveness	.007	.015	.004	.436	.663	-.002	.005	.004	.775	1.290
Debt utilization	-.004	.178	.000	-.021	.983	-.052	.000	.000	.382	2.620
Asset utilization	5.922	2.012	.058	2.942	.003	-.034	.033	.026	.199	5.015
Auditor opinion	-.112	.107	-.012	-1.049	.294	.034	-.012	-.009	.625	1.601

The correct way to conceptualize the t-test is how much contribution a significant predictor is making the model. Therefore, if the t-test b-value associated with a significant, if the value in the column labeled Sig. Is less than 0.05, then the predictor is making a significant contribution to the model. The lower the value of Sig., And the larger the value of t, the greater the contribution of the predictor.

Table 4 shows the regression results using as dependent variable the nominal net income, shows similar results in the column Sig.006 But greater results for the beta and the standard error with 1099 and 398, respectively.

Tabla 4 Regression Nominal for all company in the year 1990 al 2010

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations			Collinearity Statistics	
	B	Std. Error	Beta			Zero-order	Partial	Part	Tolerance	VIF
(Constant)	319.788	777.316		.411	.681					
Capital utilization	1.512	2.663	.005	.568	.570	.013	.006	.005	.943	1.061
Sales Effectiveness	1.450	2.986	.005	.486	.627	-.002	.005	.004	.775	1.290
Debt utilization	5.026	35.161	.002	.143	.886	-.047	.002	.001	.382	2.620
Asset utilization	1099.048	398.096	.055	2.761	.006	-.028	.031	.024	.199	5.015
Auditor opinion	-19.116	21.112	-.010	-.905	.365	.041	-.010	-.008	.625	1.601

This difference can be explained as asset accounts are recorded in historical form complying with FASB standards, resulting in the change in asset accounts but can vary by depreciation; they do not vary by the inflation adjustment. As a result, net income includes inflationary increases in the economy through the price of expenses and the selling price which causes greater variability that is reflected in a higher standard error and beta in table A3. Previous studies (Rowe, 2010), (Amit & Arun, 2005), (Riaz & Afzal, 2011), (Capillo, Serer, & Frerrer, 2010), (Altman, 1968) and (Beaver, Financial Ratios as Predictors of Failure 1966) had already reflected the importance of assets as predictors of net income. This work confirms that relationship and did not find a difference in the sig. In real or nominal net gain but did find a difference in the beta for the reasons explained above. The assets of a company can be artificially inflated by debt and this change decreases with time as the debts are eliminated. A proportional increase between assets and net income is also expected since it is important that the company acquires assets that have the ability to increase the equity of the same. We should clarify that beta can't be interpreted as factors as it composes an average of financial ratios signs may vary. The purpose of this work is to find out which group of financial ratios have a greater influence on the net and not to establish a predictive model of behavior.

The ability to predict the net income will be shown with future research based on these results.

When the results are taken into account in every 5 years, the summary of the regression model shows an R 2 of .104 and adjusted R ^ 2 of .011. This analysis was done to rule out the disparity between the action plans of management which should see after a year reflected in net income. Rates associated with liquidity are the only ones shown in Table 5 that are statistically significant with significance of .000 and a beta of 1282.

Table 5 Result of the regression Real in five-year average.

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	4.430	.747		5.928	.000
	LIQUITY	-1.282	.366	-.106	-3.506	.000
	SALES	.031	.023	.036	1.304	.192
	CASH FLOW UTILIZATION	.023	.032	.018	.699	.484
	ASSET UTILISATION	-.057	.043	-.032	-1.337	.181
	AUDITOR OPINION	.335	.247	.033	1.354	.176

This group is composed of 7 financial ratios[4]. The composition of these elements contains current debt, current assets and net income. These results should not be surprising as there is a big difference when you consider the results at intervals of five-

[4] (Cash + Marketable securities) / Total Assets, Liquid Assets / Total Assets, Cash / Total Assets

year average. Those interested in the relation of the ratios with a net income should analyze relationships with current accounts.

The results using the nominal net gain in Table A6 shows the same factor as significant but with a marked difference in the beta of 220,428. Table A6 nominal regression of all firms on average five years.

Table 6

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(CONSTANT)	724.347	146.082		4.958	.000
	LIQUITY	-220.428	71.466	-.093	-3.084	.002
	SALES	5.221	4.592	.032	1.137	.256
	CASH FLOW UTILIZATION	4.200	6.322	.017	.664	.507
	ASSET UTILISATION	-9.799	8.333	-.028	-1.176	.240
	AUDITOR OPINION	100.885	48.372	.051	2.086	.037

This difference in beta is due to the impact of price and inflation on net income. Importantly, the use of nominal and real measures are regularly used in economic studies but not in the financial analysis. This work shows that the integration of these in time studies should be the norm for a correct interpretation of the results.

DISCUSSION AND CONCLUSION

Based on the research work the evidence to conclude that the financial ratios are directly related to the net income of the companies are obtained. This ratio varies directly or indirectly depending on the industry to which they belong and the types of financial ratios. This means that for the first time an analysis with all companies classified as S & P 500 for a period of 20 years using factor analysis and the actual net income and nominal exchange rate does. The same analysis was also performed but in five-year intervals and classification companies. To demonstrate the relationship

between financial ratios and net profit first Compustat data was obtained and then calculate ratios a factor analysis was performed. Finally, there was a regression to measure the relationship of the factors with a net profit. As part of this result we see that when all companies are taken only the factor that groups assets have statistical significance. Rates belonging to this factor are: (Cash + Marketable securities) / Total Assets, liquid / Total Assets, Assets and Cash / total assets. Beta obtained was 0.058. It is important to clarify that the purpose of the research was not to create a predictive model for what should not be interpreted as the ability of beta this group to predict the change but rather the relationship to the net income. The results using all companies but with the nominal net show us that the same financial ratios have or possess statistical significance. The difference in these two analyzes is the size of the beta because it is recommended to use real data in multi-year studies except for the financial industry as explained below.

The beta using the nominal net income is 1099. This change is due to the nominal net income that contains inflationary elements. This widespread and sustained increase in market prices over a period of time, usually a year, tends to create a difference between years. As the work is for 20 years this item was removed by measuring the actual net income. The analysis using the exchange rate was not significant with all years and in intervals of five.

Analysis of companies in five-year intervals contains few different factors to those obtained using all years. It can be seen that the analyzes in five-year intervals are more accurate as these grouped companies investing and long-term management efforts are unified with the results. Statistically significant factors were the 4 groups of financial ratios. The names of the factors obtained were: liquidity, sales, cash flow, asset utilization, and the auditor's opinion. The only ratio with statistical significance was that

of liquidity of seven financial ratios[5]. Beta obtained was 1,282. We can't interpret the sign of the beta as regression to group the rates in group averages so to have some negative rates and other positive results shown by the negative sign.

As part of this result, we see that when all companies are taken, only the factor that groups assets have statistical significance. Rates belonging to this factor are: (Cash + Marketable securities) / Total Assets, liquid / Total Assets Assets and Cash / total assets. Beta[6] obtained was 0.058.

Within a project as large and as ambitious as this empirical load you always want it to be a continuous improvement. Therefore future investigators recommended complementation analysis of financial ratios with manufacturing factors and that the possibility of is investigated make a model with the rates that compose the statistically significant factors.

[5] Average Liquid Assets / Total Assets Current Liabilities, Average Current Assets / Total Current Liabilities, Average (Cash + Marketable securities) / Total Current Liabilities, Average Equity / Total Liabilities, Average Cash / Total Current Liabilities, Total Average Liabilities / Total Assets, Average (Cash + Marketable securities) / Total Assets

[6] Beta indicates the amount of change that will occur in the dependent variable per unit change in the corresponding independent variable.

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