RELATIONSHIPS BETWEEN PROFITABILITY AND FIRM VALUE OF MANUFACTURING COMPANIES IN INDONESIA: THE QUANTILE REGRESSION APPROACH

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Abstract

Profitability and firm value are represents the financial performance, and a vital aspects for assessing the overall firm performance of manufacturing companies especially in Indonesia. Both have been able to portrait firm performance in the long-run. Thus, these two variables are expected to have strong relationship on the time segmentation that encompass of the problem of variables. Therefore, this study is attempting to examine the relation of variables using quantile regression approach. This study investigates the relationships between profitability and firm value of manufacturing companies in Indonesia by take into consideration of lagged firm performance ROA(-1) and Tobin's Q(-1). The profitability measured by return on asset (ROA) and Tobin's Q is as the firm value. The data of this study retrieved from Indonesia Stock Exchange (IDX) with purposive sample of 110 companies was selected for the period of 2010 to 2019. This study used two sets of quantiles regression (QREGs): 1) A set of additive quantiles regression of ROA on ROA(-1) and Tobin's Q(-1), and 2) A set of interaction QREGs of ROA on ROA(-1), Tobin's Q(-1) and ROA(-1)*Tobin's Q(-1). The results find that all independent of each QREGs are jointly significant. This implies that ROA(-1) has positive significant effect on ROA, adjusted for Tobin's Q(-1), based on each additive QREG(τ) in (1), for $\tau = 0.1$ to 0.9 at 1 percent level. Moreover, the effects of Tobin's Q(-1) on ROA, adjusted for ROA(-1), in the nine QREGs has positive significant at 5 percent level, in the QREG(0.9). As well as the Tobin's Q (-1) has positive significant adjusted effect on ROA, in the two QREG(0.3) and QREG(0.8). Lastly, based on the interaction QREG, ROA(-1) and ROA(-1) interact with Tobin's Q(-1) also are jointly significant, which shows the effect of ROA(-1) is increasing with increasing scores of Tobin's Q(-1). This indicates that last year profitability and firm value seems to have effect on current year performance.

Keywords: ***ROA, TQ Additive, Interaction, Quantile-regression, Purposive Sampling***

1. INTRODUCTION

Profitability and firm value are representing the financial performance of the firm based on accounting measures and market measures (Chakravarthy, 1986; Zeitun & Saleh, 2015). The efficiency of existing internal resources such asset, debt, profitability and others financial market indicators lead to increase firm performance. Prior studies has been documented firm performance could be achieved with increasing the profitability and value of the firm. However, the firm value denoted as the market indicators that measures with Tobin's Q, which is the higher value of Q indicates a higher performance. (Dakhlallh, Rashid, Abdullah, & Al Shehab, 2020; Muchtar, Nor, Albra, Arifai, & Ahmar, 2018).

Most of past studies proposed that both profitability and firm value used as dependent variable of firm performance by using other predictors that affect the firm performance (Dakhlallh et al., 2020; Muchtar et al., 2018; Ruzita, Hasimi, Norazlan, & Fauzias, 2010; Saidat, Silva, & Seaman, 2019; Zeitun & Saleh, 2015) and others. However, we assume that there is causal relationship between profitability and firm value, since higher return that generated from income would deliver the good signal the market value. According to value maximization of firm objectives explained it in stakeholder's theory, which suggested that manager should make decisions as to take account of the shareholders' interests. Stakeholders effectively make managers unaccountability for their actions (Michael C Jensen, 2010). Hence, the relationship between profitability and firm performance is theoretically positive, in which increase the firm profitability lead to enhance firm value. Those who have found empirical support for the relation of profitability and firm value (Chen & Chen, 2011; Varaiya, Kerin, & Weeks, 1987), found that ROA has positive and significant effect on firm value.

Similarly, the point of view of Indonesia firms has been examined, such study by Zuhroh (2019) analysis the relationship between profitability and firm value of property and real estate firms for the period 2012 to 2016 used a path analysis model, the results showed that profitability (ROA) significant and positively affect firm value (Tobin's Q). Similarly, study proposed by Kurniasari and Warastuti (2015) used CSR in these relationship, and the result showed that profitability seems to have positive and significant on firm value measured by market to book value. Moreover, the effect of Return on Asset against Tobin's Q also the same, that is positive and significant (Alghifari, Triharjono, & Juhaeni, 2013). Despite, some studies explored the dynamic firm performance used Generalized Method of Moment (GMM) estimators to analysis the dynamic firm performance (Muchtar et al., 2018; Rahman, Saima, & Jahan, 2020; Zeitun & Saleh, 2015). The results suggested that the firm performance is dynamic in nature, means that the current year performance (ROA) affected by last year performance ROA(-1) and Tobin's Q(-1). However, none of previous study carry out the causal relationship of ROA(-1), Tobin's Q(-1)) and ROA, as well as the interaction effect of ROA(1) and Tobin's Q(-1) on ROA, especially used the quantile regression.

Therefore, in this paper, we explicitly addressed the direct effect of lagged profitability and lagged firm value relationship by taking into account the last year financial performance or first lag ROA and Tobin's Q. This study differs than previous study in many ways: first, it used other explanatory variable in the model. In term of methodology, prior studies concentrate to static panel model and path analysis model, but none of previous study used Quantile Regression (QREG). Compare to the Least Square Regression, which presents only the conditional-mean and standard deviation of the objective or dependent variable, and they are effected by outliers; the estimation method QREG can present a set of 10 or 20 quantiles of the objective variable quickly, and they are not effected by outliers. In addition, the QREG also can present quickly the outputs of the Quantile Slopes Equality Test and Symmetric Quantiles Test for the set of quantiles.

2. LITERATURE REVIEW

2.1 Causal Relationships between ROA, ROA(-1), and TOBIN'S Q(-1)

The studies about profitability and firm value relationship have been intensively discussed by many Scholars in recent year. There are some theories of value maximization explained this study, such as stakeholders theory and agency theory (Michael C Jensen, 2010; M. C Jensen & Meckling, 1976). The corporate goal is value maximization of shareholders wealth. Thus, the stakeholder's theory described that managers should not act on their own interest, but they should make corporate decision on behalf shareholders interest. Both firm value and profitability has causal relationship

According to accounting-based measures proposed by Al-Matari, Al-Swidi, and Fadzil (2014) shows the highest measure of profitability is Return on Asset (ROA) compared to others measures, this ratio calculate of net income divided by total asset. Hence, ROA is the ability of a company in generating profit from available asset to shareholders (Chen & Chen, 2011). Meanwhile, the market-based measure is calculated by the ratio of Price to Book Value (PBV) and Tobin's Q. This study used Tobin's Q calculated by the market value of equity plus book value of debt divided by book value of total asset. Both firm value and profitability has positive correlation, this implies that increase the profitability caused by market value and otherwise.

Several prior study has been examined on the relationship between profitability and firm value (Machmuddah, Sari, & Utomo, 2020; Rachmata, Hardikab, Gumilarc, & Saudid; Sucuahi & Cambarihan, 2016; Zuhroh, 2019), found that ROA has significant effect on firm value. In addition, Rosikah, Muthalib, Aziz, and Rohansyah (2018) analyze the effect of ROA, ROE and EPS simultaneously on Tobin's Q, the results found that ROA has significant effect on Tobin's Q. Alghifari et al. (2013), used the simplest regression, found that ROA has positive and significantly affect Tobin's Q. Similarly, the results of positive and significant relation of ROA and Tobin's Q is addressed (Sucuahi & Cambarihan, 2016). The causal relationships

Theoretically, firm performance is dynamic in nature, implies that the last year performance affected the current year performance. Several empirical studies have been done to investigates the effect of lagged performance either profitability (ROA) nor firm value (Tobin's Q), and found that ROA(-1) and Tobin's Q(-1) have significant effect on firm performance (Muchtar et al., 2018; Zeitun & Saleh, 2015). Meanwhile, we could not find past studies with the interaction effect of past performance of ROA(-1) and Tobin's Q(-1) on profitability. Thus, the hypotheses are as follows:

H1: ROA(-1) and Tobin's Q(-1) have significant joint effects on ROA

H2: ROA(-1), Tobin's Q(-1) and ROA(-1)*Tobin's Q(-1) have significant joint effects on ROA

H3: The effect of ROA(-1) on ROA is significantly depend on Tobin's Q(-1)

2.2 Mean-Regression and Quantile-Regression

The LS-Regression or the Mean-regression (MR) has been applied since 1877, whilst Adcock (1877, 1878) is considered as the first person to present the fitting of a regression line as the simplest conditional MR. And the application of various additive or interaction multiple MRs have been widely presented, without presenting their limitation. The conditional linear MR has two limitations should be considered. The first is the assumption of its residuals have normal independent identical distribution (IID), N(0,σ^2), and the second is the unknown impacts of outliers on the means of dependent variable, conditional for the IVs, For this reasons, this paper presents the application of quantile regression, in which the outliers don't have any impact, and its residuals only have the assumption of independent identical distribution (Koenker and Basset, 1978, Koenker, 2005,and Davino, Furno & Vistochco, 2014).

For the conditional mean-regression model, where

$\mu(Y|X=x)=E(Y|X=x)=x'\beta+`2$

we have the partial derivative

$$\frac{\partial E(Y|X=x)}{\partial x_j} = \beta_j$$

In the case of the linear quantile regression, where

$$Q_{h(Y)}(\tau|X=x) = h\big(Q_Y(\tau|X=x)\big) = x'\beta(\tau)$$

For any monotone transformation h(.), we have (Koenker, 2005)

$$\frac{\partial(Q_{h(Y)}(\tau|X=x))}{\partial x_j} = \frac{\partial h^{-1}(x'\beta)}{\partial x_j}$$

And as an example for h(Y) = log(Y), it is obtained

$$\frac{\partial(Q_{h(Y)}(\tau|X=x))}{\partial x_j} = \frac{\partial h^{-1}(x'\beta)}{\partial x_j} = Exp(x'\beta)\beta_j$$

The estimates the QREG parameters are obtained by minimizing the *sum absolute deviation*,

$$SAD = \sum_{i=1}^{n} |y_i - x_i'\beta(\tau)|$$

which should be done using the linear programming process. As a semi-nonparametric regression, the quantile process in Eviews provides the option for estimating 10 or 20 conditional quantiles quickly of a response variable, apart from its mean.

3. DATA AND METHODOLOGY

The data used is a balance panel data of 110 companies for 10 years from 2010 to 2019, which are purposively selected from the population companies listed in the Indonesia Stock Exchange (IDX). The research variable of this study are ROA, ROA(-1) and Tobin's Q(-1). ROA measures by net income over the total asset, and Tobin's Q measures by market value of equity add book value of debt divided book value of total asset (Dakhlallh et al., 2020; Muchtar et al., 2018). Then the causal relationships presented in Figure 1 are valid and reliable.

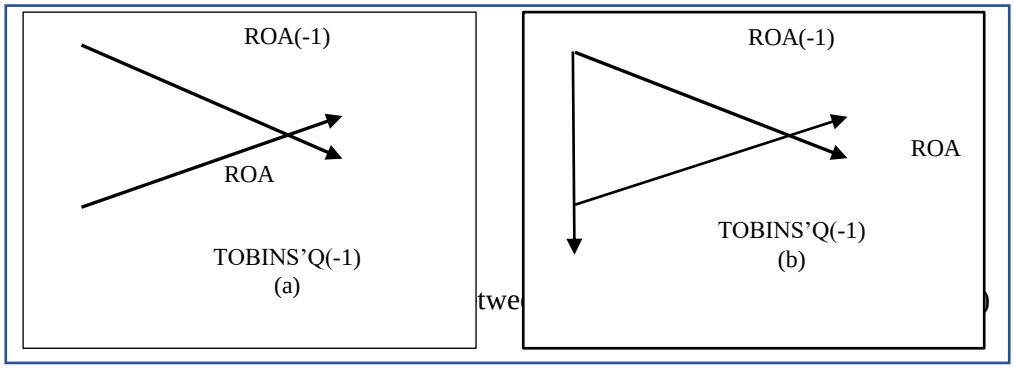

Figure 1a is representing the direct effects of both ROA(-1) and Tobin's Q(-1) on ROA, since QREG(-1) and Tobin's Q(-1) are the upper variables of ROA. Then, Figure 1b is representing the direct effect of ROA(-1) on Tobin's Q(-1), since ROA has effect on Tobin's Q, as found in the studies of (Rosikah et al., 2018; Sucuahi & Cambarihan, 2016), has an indirect effect on ROA, However Tobin's Q is not used as an Independent Variable of the model. Hence ROA(-1) has indirect effect on ROA through Tobin's Q(-1), and it is defined ROA, ROA(-1), and Tobin's Q(-1) have the *triangular relationship*.

Based on the causal relationship in Figure 1a, we have the statistical model of ROA on ROA(-1) and Tobin's Q(-1) with the following equation, which is the simplest additive model in three dimensional space.

$$ROA = \beta_0 + \beta_1 ROA(-1) + \beta_2 TOBIN'S\ Q(-1) + \varepsilon$$

Moreover, based on the causal relationship in Figure 1b, as an extension of the QREG (1), we have the statistical model of ROA on Tobin's Q(-1), and ROA(-1)*Tobin's Q(-1), with the following equation, which is the full two-way interaction model in three dimensional space, where ROA(-1)*Tobin's Q(-1) is representing the indirect effect of ROA(-1) on ROA through Tobin's Q(-1).

$$ROA = \beta_0 + \beta_1 ROA(-1) + \beta_2 TOBIN'S\ Q(-1) + \beta_3 ROA(-1) * TOBIN'SQ(-1) + \varepsilon$$

4. STATISTICAL RESULTS

4.1 Preliminary Statistical Results

As the preliminary statistical results, Figure 1 presents the outputs summary of the Quantile Process Estimates (QPE) of two quantile regressions; (a). QREG(τ): ROA C ROA(-1); and (b). QREG(τ): ROA C Tobin's Q(-1), for nine QREG(τ)s, τ = 0.1 to 0.9. This summary shows ROA(-1) has positive significant effect on ROA in each of the nine QREG(τ)s, at the 1% level, and at 1% or 5% levels, Tobin's Q(-1) also has positive significant effect on ROA, in each QREG.

Table 1: The Summary Results of QREQ ROA with ROA(-1) and Tobin's Q(-1)

QUANTILE	(a). QREQ: ROA C ROA(-1)		(b). QREG: ROA C TOBINS'Q(-1)	
	Coef.	t-Stat	Coef.	t-Stat
0.1	-0.0318	(-4.4288)***	-0.0672	(-2.8636)***
0.2	-0.0163	(-3.7696)***	-0.0393	(-2.7535)***
0.3	-0.011	(-2.4317)**	-0.0282	(-1.7014)*

0.4	-0.0034	-0.7379	-0.0452	(-4.0423)***
0.5	-0.0001	-0.0233	-0.0363	(-3.3255)***
0.6	0.0009	0.2496	-0.0228	(-2.1643)**
0.7	0.0048	1.3558	-0.0252	(-1.7225)*
0.8	0.0113	(2.9934)***	-0.0329	(-1.7313)*
0.9	0.0296	(3.4784)***	-0.0281	-1.4627
0.1	0.7168	(10.9342)***	0.0312	(2.3112)**
0.2	0.7052	(9.9037)***	0.0321	(2.9972)***
0.3	0.7274	(6.8016)***	0.0321	(2.3096)**
0.4	0.7791	(6.3954)***	0.0582	(7.6235)***
0.5	0.8914	(14.3187)***	0.0565	(7.4536)***
0.6	0.9331	(18.0595)***	0.0536	(7.4188)***
0.7	0.9479	(20.5726)***	0.0623	(5.3521)***
0.8	0.9818	(13.8659)***	0.0774	(4.6396)***
0.9	0.9027	(12.4889)***	0.0893	(5.2576)***

Notes: QREG is Quantile Regression, ROA is return on asset. The parenthesis ***, ** and * is significant at 1%, 5% and 10% significant level. The outputs summary of the Quantile Process Coefficients of two QREGs. (a). QREG(τ): ROA C ROA(-1); and (b). QREG(τ): ROA C Tobin's Q(-1), for 10 process quantiles

4.2 Statistical results on the QREG(τ) of ROA on ROA(-1) and Tobin's Q(-1) in (1)

The results of the Quantile Process Estimates of nine QREG(τ), τ = 0.1 to 0.9 is presented in Table 2. The finding show that ROA(-1) has positive significant on ROA at the 1% level adjusted for Tobin's Q(-1), based on each additive QREG(τ) in (1), for τ = 0.1 to 0.9. this indicates that the first lag of ROA is the dynamic in nature, mean that last year return on asset has significant effect on current year profitability (ROA).

Table 2: The Outputs of the Quantile Process Estimates

Variable	Quantile	Coef.	t-Stat.
C	0.1	-0.0023	-0.1144
	0.2	-0.0196	-1.4769
	0.3	-0.0199	-2.5707***
	0.4	-0.0115	-1.5091
	0.5	-0.0031	-0.3841
	0.6	-0.0026	-0.4048
	0.7	-0.0005	-0.0731
	0.8	0.0068	0.9207
	0.9	-0.0019	-0.1118
ROA(-1)	0.1	0.9251	5.7420***
	0.2	0.6593	7.4010***
	0.3	0.7007	5.7415***
	0.4	0.7631	5.3714***
	0.5	0.8551	9.0906***
	0.6	0.9177	15.5480***
	0.7	0.8919	14.4146***
	0.8	0.8527	13.8898***
	0.9	0.6816	5.3327***
TQ(-1)	0.1	-0.03509	-1.5637*

0.2	0.00447	0.3608
0.3	0.00846	1.3188*
0.4	0.00648	0.9281
0.5	0.00219	0.3344
0.6	0.00372	0.7541
0.7	0.0067	1.0455
0.8	0.00863	1.3242*
0.9	0.03774	1.8150**

Notes: The parenthesis ***, ** and * is significant at 1%, 5% and 10% percent level of significance

However, the different findings of Tobin's Q(-1) on ROA, adjusted for ROA(-1), in the nine QREGs are show that at the 5% level, Tobin's Q(-1) has positive effect and significant adjusted effect on ROA, in the QREG(0.9) based on the *t*-statistic of t_0 = 1.8150 with p-value = 0.0726/2 = 0.0363. Furthermore, Tobin's Q(-1) has positive significant at 10 percent level adjusted effect on ROA, in the two QREG(0.3) and QREG(0.8) with the p-value of 0.1904/2 = 0.0952 and 0.1886/2 = 0.0943, respectively. In the QREG (0.1), Tobin's Q(-1) has a negative significant adjusted effect, based on the *t*-statistic of t_0 = -1.56367 with p-value = 0.1212/2 = 0.0606. Lastly, Tobin's Q(-1) has positive insignificant adjusted effects in the other QREGs. Note these adjusted effects of Tobin's Q(-1) on ROA are different from the unadjusted or direct effects of Tobin's Q(-1) on ROA, as presented in Figure 1.The results suggest that Tobin's Q(-1) and ROA(-1) is significantly correlated, based on the *t*-statistic of t_0 = 8.326618 with *df* = 97 and *p* -value = 0.0000.

Table 3: The QLR statistic for the testing hypothesis H1

QREG(τ): ROA C ROA(-1) TOBIN'S Q(-1)					
tau	**QLR stat**	**Prob.**	**τ**	**QLR stat**	**Prob.**
0.1	52.4516	0	0.6	168.8023	0
0.2	86.8180	0	0.7	187.2151	0
0.3	104.3272	0	0.8	103.8598	0
0.4	123.1971	0	0.9	103.8598	0
0.5	137.0596	0			

Notes: QLR is *Quasi-LR* statistic,

The results of Table 3 show that the QLR statistic for the testing hypothesis H1, which shows ROA(-1) and Tobin's Q(-1) have significant joint effects on ROA, based on each QREG(τ), for τ = 0.1 to 0.9, at the 1% level. The Quasi-LR statistic for testing the hypothesis H1, which shows ROA(-1) and Tobin's Q(-1) have significant joint effects on ROA, based on each QREG(τ), for τ = 0.1 to 0.9, at the 1% level. Hence it can be concluded the data supports the hypothesis H1.

4.3 Statistical results based on the two-way interaction QREG(τ) of ROA in (2)

Table 4 present the outputs summary of the statistics for testing the hypotheses H2 and H3 based on the two-way interaction QREG(τ) in (20, for τ = 0.1 to 0.9. (a) The QLR statistic for the testing hypothesis H2, and (b) The Wald Test (Chi-squares statistic) for the testing hypothesis H3. Based on this summary, the findings, notes and additional statistical results are presented. The results shows all IVs of each QREG(τ), for τ = 0.1 to 0.9, are jointly significant at the 1% level, based on the *Quasi-LR* statistic with *df* =3 and *p*-value = 0. Moreover, ROA(-1) & ROA(-1)*Tobin's Q(-1) are jointly significant, based on the Wald Test (Chi-square statistic) with *df* =3 and *p*-value = 0. Hence, it can be concluded that the data supports the hypotheses H2, and H3. Specific for the QREG(0.5), it has the Pseudo R-squared = 0.49410, and Adjusted R-squared = 0.479475. Hence, the IVs can explain 49.4% of the total variance of ROA.

Table 4: The Outputs Summary for Testing the Hypotheses H2 and H3

$\tau(tau)$	(a). Quasi-LR Statistic for H2			(b). Chi-square for H3		
	Value	df	Prob.	Value	df	Prob.
0.1	57.1000	3	0	41.9490	2	0
0.2	89.7757	3	0	72.8201	2	0
0.3	108.114	3	0	38.4036	2	0
0.4	129.6432	3	0	26.5265	2	0
0.5	142.2913	3	0	71.8597	2	0
0.6	173.4109	3	0	252.3180	2	0
0.7	193.7830	3	0	296.1163	2	0
0.8	180.6690	3	0	206.1289	2	0
0.9	92.2152	3	0	75.4774	2	0

Notes: The parenthesis ***, ** and * is significant at 1%, 5% and 10% percent level of significance

The output of the QREG in (2) has the estimation equation,

ROA = C(1) + C(2)*ROA(-1) + C(3)*TOBIN'S Q(-1) + C(4)*ROA(-1)*TOBIN'S Q(-1), which can be written as follows:

ROA = [C(1) + C(3)*TOBIN'S Q(-1)] + [C(2) + C(4)*TOBIN'S Q(-1)]*ROA(-1) to show the effect of ROA(-1) on ROA depends on [C(2) + C(4)*Tobin's Q(-1)].

The results for the null hypothesis H_0: C(2)=C(4)=0 for each QREG(τ) is rejected, based on the Wald Test (Chi-squares statistic) with *df* = 2 and *p*-value=0, as presented in Table 4. So the effect of ROA(-1) on ROA is significantly depend [C(2) + C(4)*TOBIN'S Q(-1)], based on each of the nine QREG(τ)s. The output of the Quantile Process Estimates based on the QREG(τ) in (2), using 10 process quantiles, indicated by the nine τ = 0.1 to 0.9. The findings presented in Table 5 for the eight QREG(τ), $\tau \neq 0.2$, the coefficients of Tobin's Q(-1)*ROA(-1), $\widehat{C(4)}$, are positive, which show the effecs of ROA(-1) on ROA are significantly increasing with increasing scores of Tobin's Q(-1). Specific for the QREG (0.2), $\widehat{C(4)}$ = - 0.27346 < 0, then the effect of ROA(-1) on ROA is significantly decreasing with increasing scores of Tobin's Q(-1).

Referring to output of the quantile process estimates in Figure 5, which shows the interaction ROA(-1)*TOBIN'S Q(-1) has insignificant effect on ROA in each of the nine QREG(τ)s in (2), it is interesting to learn its reduced models.

Table: 5 The Output of the Quantile Process Estimates of QREG(τ) in (2)

Variable	Quantile	Coefficient	t-Statistic
C	0.1	0.0065	0.3478
	0.2	-0.0274	-2.2496**
	0.3	-0.0139	-1.5033
	0.4	-0.0031	-0.3146
	0.5	0.0002	0.0273
	0.6	0.0003	0.0364
	0.7	0.0071	0.8939
	0.8	0.0050	0.3728
	0.9	0.0292	0.7233

ROA(-1)	0.1	0.5641	1.5132
	0.2	0.6639	2.5293***
	0.3	0.5510	2.9282***
	0.4	0.6120	2.7138***
	0.5	0.7330	5.0684***
	0.6	0.8573	8.2761***
	0.7	0.8479	8.6008***
	0.8	0.8883	8.8610***
	0.9	0.4311	1.2054
Tobin's Q(-1)	0.1	-0.0392	-1.9416**
	0.2	0.0123	1.2713
	0.3	0.0045	0.6113
	0.4	0.0021	0.2665
	0.5	-0.0006	-0.0749
	0.6	0.0002	0.0324
	0.7	-0.0011	-0.1826
	0.8	0.0101	0.8185
	0.9	0.0130	0.3892
ROA(-1)*Tobin's Q(-1)	0.1	0.1565	0.7156
	0.2	-0.0273	-0.1862
	0.3	0.0743	1.2708
	0.4	0.0577	0.7494
	0.5	0.0634	1.2291
	0.6	0.0345	0.7476
	0.7	0.0361	0.8393
	0.8	-0.0188	-0.3199
	0.9	0.1578	0.7122

Notes: The parenthesis ***, ** and * is significant at 1%, 5% and 10% percent level of significance

Then let's see the two possible reduced QREGs having the equations in (3) and (4). As a comparison, Table 6 presents a summary of the parts statistical results of the QREGs in (3) and (4), the quantile process estimates specific for the interaction IV, ROA(-1)*TQ(-1), and their good of fit measures Pseudo R-squared (Adjusted R-squared) and S.E. of regression, specific for the QR(Median). Based on this summary, the findings and notes are as follows:

First of all, it should be noted that an IV has "insignificant" effect does not mean it does not have effect. So based on the QR (4), the interaction ROA(-1)*TQ(-1) in each of the QR(τ)s do have positive effect on ROA, And based on each QR (3), the interaction also has positive significant effect.

Table 6: The Statistical Results Summary of the QREG in (3) and (4)

VARIABLE		QREG in (3)		QREG in (4)	
	Quantile	Coef.	t-Stat.	Coef.	t-Stat.
ROA(-1)*TOBIN'S Q(-1)	0.1	0.4065	5.5563***	0.0206	0.1358
	0.2	0.3077	3.4002***	0.0240	0.1578
	0.3	0.2437	7.2455***	0.0900	1.7741*
	0.4	0.2776	5.6212***	0.0777	1.6042
	0.5	0.4211	6.3568***	0.0617	1.6313
	0.6	0.4307	9.3819***	0.0354	1.1156
	0.7	0.446	11.9508***	0.0310	1.0457
	0.8	0.4079	11.4001***	0.0909	0.33
	0.9	0.4215	8.5980***	0.2397	2.8330***
Pse. R-sq. QR(Median)			0.495291		0.407924
Adj. R-sq. QR(Median)			0.484777		0.395589
S.E. of reg. QR(Median)			0.040668		0.047339

The parenthesis ***, ** and * is significant at 1%, 5% and 10% percent level of significance
Equation: ROA= β_0+ β_1 ROA(-1)+β_2 ROA(-1)*TOBIN^' SQ(-1)+ε
ROA= δ_0+ δ_1 TOBIN^' S Q(-1)+δ_2 ROA(-1)*TOBIN^' S Q(-1)+ε

However, for an additional comparison, the QREGs in (3) and (4) should be written as follows:

$$ROA= \beta_0+[\beta_1+\beta_2\ TOBIN^{'}\ SQ(-1)]*ROA(-1)+\varepsilon \quad (3a)$$

$$ROA=[\delta_0+\delta_1\ TOBIN^{'}\ S\ Q(-1)]+\delta_2\ ROA(-1)*TOBIN^{'}\ S\ Q(-1)+\varepsilon \quad (4a)$$

which both show heterogeneous regression lines of ROA on ROA(-1) for any set of Tobin's Q(-1)'s scores. Based on the QREG in (4), its complete Quantile Process Estimates (QPE) are presenting heterogeneous regression lines of ROA on ROA(-1) for any set of Tobin's Q(-1)'s scores having various intercepts, indicated by [δ_0+ δ_1 TOBIN^' S Q(-1)], but the QPE of QREG in (3) present heterogeneous regressions of ROA on ROA(-1) having a single intercept only, indicated by β_0. Then it can be considered the QREG in (4) is a better QREG, in the theoretical sense, even though the QREG (4) has smaller Adjusted R-squared. Why? It is because, the true heterogeneous regressions lines, in general, should have different slopes and different intercepts.

5. CONCLUSION

This study investigate the causal relationships between profitability and firm value, of the 110 manufacturing listed companies in Indonesia using two sets of quantiles regression (QREGs): 1) A set of additive quantiles regression of ROA on ROA(-1) and Tobin's Q(-1), and 2) A set of interaction QREG of ROA on ROA(-1), Tobin's Q(-1) and ROA(-1)*Tobin's Q(-1), which are the dynamic performance. A sample of 110 companies which were selected from the population of companies listed on the Indonesia Stock Exchange (IDX) in 2010 -2019. The results shows the lagged firm performance ROA(-1) and Tobin's Q(-1) are jointly significant based on the model (1), and based on the model (2), ROA(-1), Tobin's Q(-1) and the interaction effect of ROA(-1) with Tobin's Q(-1) are jointly significant. In addition, based on the model (2), ROA(-1) and ROA(-1)*Tobin's Q(-1) are jointly significant, indicating the effect of ROA(-1) on ROA is significantly depend on Tobin's Q(-1). As an additional finding, the effects of ROA(-1) on ROA are increasing with the increasing Tobin's Q(-1)'s scores. Furthermore, compare to the only one conditional mean-regression, this quantile regression analysis presents a set of the quantile process estimates for nine QR(τ)s, τ = 0.1 to 0.9.

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