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## **Financial pressure and related party transactions on financial statement fraud: fraud triangle perspective**

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**Abstract:** This study aims to analyse the effect of financial pressure (financial stability, personal financial need and financial targets) and related party transactions (RPTs) on financial statement fraud. Respondents of the study are manufacturing companies listed on the Indonesia Stock Exchange for the years 2011 to 2015. By using fixed effect panel regressions, the survey results show that financial stability as measured by sales divided by total asset and RPTs negatively affect financial statement fraud. In addition, financial targets have a significant positive effect on financial statement fraud. However, this study shows that personal financial need does not affect the financial statement fraud. This study provides several important conclusions. First, companies are in a stable financial condition, enabling them to reduce their financial report fraud. Second, the findings suggest the possibility of a negative impact on the quality of financial statements due to the use of financial performance targets such as ROA. Third, the result of the study which states that RPTs negatively affect fraudulent financial statements implies that in Indonesia with reference to manufacturing companies, RPTs do not reflect negative behaviour or even vice versa.

**Keywords:** pressure; related party transactions; RPTs; financial statement fraud; FSF.

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## 1 Introduction

Related party transactions (hereafter known as RPTs) are transactions between firms and their managers, directors, investors, or affiliates. Such transactions, which are diverse and often complicated, are a challenge for management. Given the characteristics of the RPTs, some argue that RPTs provide benefits to the company but others say RPTs are negative and harmful practices (Gordon et al., 2004). Moreover, another study claims that RPTs have a positive effect by propping up companies' earnings but wield a negative effect through tunnelling activities (Cheung et al., 2009).

Based on the agency theory, assuming that agents are geared towards self-interest, this paper considers RPTs as negative practices that potentially harm the stakeholders. Hasnan et al. (2016) emphasise that RPTs reflect a potential conflict of interest, which provide greater incentives for managers to control the shareholders. Similar to what companies do in other countries, RPTs are also done by companies in Indonesia. To prevent the adverse effects of RPTs, therefore, the Institute of Indonesia chartered accountants through the statement of financial accounting standards No.7 has obliged companies listed in the capital market to disclose their RPTs.

Some researchers conducted in Indonesia also raise the topic of RPTs, such as those by Kuan et al. (2010) and Utama et al. (2010). To enrich the research on RPTs in Indonesia, this paper will examine the effect of RPTs on financial statement fraud (FSF). Several previous studies have examined the effect of RPTs on FSF, for example Lou and Wang (2009). Nevertheless, there are not many studies in Indonesia, published in established journals that have examined the effect of RPTs on FSF.

Companies should have the intention of publishing good quality financial statements, however, they often conduct fraud in this regard. FSF is detrimental to the company because it can lead to several bad consequences including;

- a investigation
- b improvement efforts
- c a negative market reaction
- d the object of research (Trompeter et al., 2012).

Moreover, Tugas (2012) argues that financial accounting fraud has placed the accounting profession in a bad light. Furthermore Beasley et al. (1999) explain that FSF may produce bankruptcy, significant changes in ownership and delisting from a stock exchange.

The desire to prevent or punish fraud is increasing because its negative impact has also increased over the years. Siregar and Tenoyo (2015) conducted a survey with respondents recruited from large companies' employees, public accountants and audit committee members. The results of the study show that 82.09% of respondents agree that

fraud is a major concern for businesses in Indonesia. The practice of fraud in financial statements is also one of the problems that occur in companies in Indonesia as stated by Mardiana (2015) and Akbar (2017). Moreover, FSFs are the most worrying aspect because they seriously compromise company performance (Kassem and Higson, 2012; Aghghaleh et al., 2016). Fraud is a topic that receives significant attention from regulators, auditors and the general public (Kassem and Higson, 2012; Rahman et al., 2016).

FSFs are caused by pressure, opportunity and rationalisation (Cressey, 1950). This study only focuses on two aspects, i.e., the pressure and opportunity. Pressure is measured using three variables: financial stability, personal financial need and financial targets. This paper uses the term financial pressure because the pressure being studied is limited to the pressure in the financial field. Opportunity is expressed by RPTs. The reason why this study focuses only on the pressure and opportunity is because preliminary research has shown inconsistent results. Moreover, Wuerger and Borba (2010) state that rationalisation is a part of the fraud triangle which is the most difficult to measure. Amara et al. (2013) also studied FSF by only focusing on opportunity and pressure.

Specifically, the aims of this study are to examine the effects of pressures including financial stability, personal financial needs, financial targets and determining the effect of RPTs on FSF. This research contributes to the past studies in several ways. First, RPTs research that has been done in Indonesia examined the effect of RPTs on market reaction (Utama et al., 2010), earnings management (Kuan et al., 2010) and firm value (Utama and Utama, 2014). This study examines the effect of RPTs on FSF. Secondly, there are many studies conducted in Indonesia that test the determinants of FSF by using the fraud triangle theory, for example, Kusumawardhani (2013), Jefri and Mediaty (2014) and Manurung and Hardika (2015). However, very few research has included RPTs as one of the determinants of FSF. Kusumawardhani (2013) studied the effect of financial stability, personal financial need and ineffective monitoring on FSF, in the banking sector in Indonesia for the years 2010–2011. Jefri and Mediaty (2014) also analysed fraud but did not use empirical data and only discussed preliminary research in Indonesia on FSF. Next, Manurung and Hardika (2015) also examined the determinants of FSF in banking companies but did not examine the effect of RPTs. This research was conducted among firms in the manufacturing sector for the years 2011–2015. The next contribution of the study concerns the findings. The results of this study promote the opinion that RPTs do not have a negative effect on the company; and this is consistent with the results of the RPTs' study in Indonesia, for example Koroy (2009), Utama et al. (2010) and Utama and Utama (2014). Even, this study found that RPTs have a significant negative effect on FSF.

The next sections of this paper are structured as follows. The second section describes the literature review that includes the description of the agency theory and FSF, fraud triangle theory and RPTs. The second part ends with the development of the hypotheses. The third section describes the research methodology, including sample selection and data collection and discusses the operational definition of the variables. Results and discussion are presented in section four and the conclusion section discusses and summarises the findings, the limitations of the research and suggestions for future study.

## 2 Review of the literature

### 2.1 *Agency theory and FSF*

The agency theory focuses on issues arising from cooperative relationships between agents and principals. Such cooperation relationship is called the agency relationship (Kazemian and Sanusi, 2015). Ross (1973) states that agency relationships exist between two or more parties if one party (agent) acts as a representative of the other party (principal) to manage a decision-making process on a particular issue. The agency relationship is broad-ranging and encompasses the relationship of the owner-manager, employer-employee, buyer-seller and other agent relationships (Ross, 1973; Eisenhardt, 1989). With reference to financial reporting, the agent is the manager and the investor is the principal.

The agency theory assumes that the firm is a nexus of contract between agents and principals (Jensen and Meckling, 1976). More specifically, this theory assumes that agents are opportunistic, self-interest and risk-averse (Ross, 1973; Jensen and Meckling, 1976; Eisenhardt, 1989). Self-interested agents and the existence of information asymmetry between the agent and the principal create agency problems. Due to the potential emergence of agency problems, financial statements are used by investors to monitor the managers' performance.

One of the phenomena of the agency problem is FSF (Amara et al., 2013; Zainudin and Hashim, 2016). According to the agency theory, an important component of the solution to the agency problem is to align the management goals with the goals of shareholders. This is usually done by arranging management incentives in such a way that the structure can adjust management behaviour with shareholder objectives (Albrecht et al., 2004; Mohamed and Handley-Schachelor, 2014). As well, the authors argue that the second solution to agency problems is monitoring activities, which means the board of directors must control managers. An alternative to agency theory in explaining why managers cheat is known as stewardship theory. However, Albrecht et al. (2004) argue that agency-based corporate structures provide a low chance for fraud to be done while a corporate-based stewardship structure provides a high chance of committing fraud for execution.

Du Toit (2008) defines FSF as 'fraud committed by the management of an organisation with the goal to artificially improve the financial performance and results of the company as stated in the financial statements. This is done most often by means of overstating assets and revenue or understating liabilities and expenses'. Moreover, Zhou and Kapoor (2011) explain that FSF involves the intentional furnishing and/or publishing of false information.

### 2.2 *Fraud triangle theory and RPTs*

Financial crimes and fraud have existed since the beginning of trade. Over the last 60 years, more sophisticated theories have been developed that differentiate cheating and motivation from other forms of financial crime, such as theft and burglary (Dorminey et al., 2012; Bakri et al., 2017). Abdullahi and Mansor (2015) claim that according to the Certified Fraud Examiners (ACFE), occupational fraud is the process of using a person's job or responsibility to satisfy his or her personal interests by enriching himself through the abuse of deliberate authority. Frauds are not routine or regular (Sanusi et al., 2015).

They are the result of (or some) intelligent human beings who deliberately avoid control and hide their tracks (Albrecht et al., 2008). The fundamental factors that contribute to fraud are based on the fraud triangle theory of Cressey (Dorminey et al., 2012). Fraud triangle theory developed by Cressey has been widely used by professionals as a useful model to explain why frauds occur (Lin et al., 2015).

Cressey (1950) suggests that fraud generally has three common properties, i.e., pressure, opportunity and rationalisation. Pressure refers to the factors that lead to unethical behaviours (Abdullahi and Mansor, 2015). Pressure can be interpreted as a motive that drives someone to commit fraud because of their lifestyle demands, economic demands and others, including financial and non-financial needs (Said et al., 2017). Incentives for misstating earnings stem from pressure to meet the analyst's expectations, compensation and incentive structures, external financing needs and/or poor organisational performance (Hogan et al., 2008). Albrecht et al. (2008) argue that most pressures involve a financial need, although non-financial pressures such as the need to report results better than actual performance can also motivate fraud. SAS No. 99 states that pressure has four elements including financial stability, external pressure, personal financial need and financial targets. In addition, some researchers classify pressure as personal, employment and external pressures, while others classify it as financial and non-financial pressures (Kassem and Higson, 2012).

The second element of the fraud triangle is opportunity. Opportunity is the condition or situation that would allow an individual to commit fraud (Huang et al., 2016). Dorminey et al. (2012) define perceived opportunities as 'perceptions,

- 1 that a control weakness is present and importantly
- 2 the likelihood of being caught is remote.

Therefore, opportunity requires the ability to perform such action and to do so without detection'. 'Opportunity is an open door to solve a problem by violating a trust. The higher the position of a person in the organisational hierarchy, the more trust is placed in him/her and the greater his/her opportunity to commit fraud' (Du Toit, 2008). Moreover, Huang et al. (2016) argue that complex organisations and transactions lead to increased opportunities for subjective interpretation. For this reason, RPTs are deemed one of the phenomena to measure opportunity.

The statement of financial accounting standard No. 7 which is applicable in Indonesia defines RPTs as a transfer of resources, services, or liabilities between the reporting entity and the related parties, regardless of whether the price is charged. Subsequently, the related parties are defined as persons or entities linked to the entity that prepares its financial statements. Gordon et al. (2004) emphasise there are two perspectives about RPTs. The first is conflict of interest view and the second perspective is the efficient transaction view. Conflict of interest view argues that RPTs are potentially harmful to the interests of shareholders. However, the efficient transaction view maintains that RPTs do not harm and even benefit to the shareholders. The third element of the fraud triangle theory is rationalisation. Rationalisation refers to the justification and excuses given to show how immoral conduct is different from criminal activity (Abdullahi and Mansor, 2015). Rationalisation is difficult to be observed because it is impossible to read the minds of fraudsters.

### 2.3 Hypothesis development

In the fraud triangle theory, financial stability is part of the pressure, one of the elements of the fraud triangle theory. Kassem and Higson (2012) classify pressures based on financial and non-financial pressures. Furthermore, the authors also point out that sudden financial problems encourage companies to commit fraud. The sudden financial problem implies that financial stability is threatened. When corporate financial stability is threatened, companies are driven to commit fraud. In addition, according to SAS No. 99, managers face the pressure to commit FSF because financial stability and/or profitability are threatened by the economic, industrial, or entity circumstances (Skousen et al., 2015). In cases where the company is experiencing growth that is below the industry average, the management can use the manipulation of financial statements to improve the prospects of the company. Similarly, after a period of rapid growth, management manipulates the report to make the company's growth more stable.

In addition to arguments based on the fraud triangle theory, the effect of financial stability on the tendency to conduct FSF can also be explained through the agency theory. According to the explanation in the literature review, agency theory stipulates that under conditions of information asymmetry, agents (managers) mainly work for self-interest (Jensen and Meckling, 1976; Eisenhardt, 1989). Self-interested agents along with the ongoing financial pressures, encourage the company (managers) to manage the financial statements (Noor et al., 2015).

According to Murcia and Borba (2007) and Brennan and McGrath (2007), one form of manipulation that companies do is to modify the records of assets, or misappropriation of the use of assets. Therefore, financial stability in this study is measured by asset changes. The findings of the study conducted by Skousen et al. (2015) indicate that the greater the rate of change in total assets, the greater the probability of FSF. Therefore, the first hypothesis is formulated as follows:

H1 There is a positive relationship between financial stability and FSF.

The second variable that is predicted to affect FSF is personal financial need which is measured by insider ownership. Personal financial need is also an element of pressure in the fraud triangle theory along with financial stability (Kassem and Higson, 2012). Dunn (2004) suggests that fraudulent financial statements are likely to occur when there is a concentration of power in the hands of the insiders. Skousen et al. (2015) explain that shares owned by corporate executives will certainly affect management policies in expressing the company's financial performance. Insiders can concentrate power in their hands by controlling the flow of information used to make decisions (Dunn, 2004).

Furthermore, greed by executives, investment banks, commercial banks and investors is also the reason why companies carry out fraud (Albrecht et al., 2008). These groups take advantage of the high performance of the company and economy. None of them want to receive bad news. As a result, sometimes they make unwise transactions. This argument is in line with the agency theory which states that the agent tends to behave in ways that are inconsistent with the company's interests. The greedy nature of the agent and the manager's share ownership in the company encourage managers to carry out the FSF, because according to Dunn (2004), shares ownership is one type of power. Beasley et al. (1999) point out that when executives have significant financial shares in the company, their personal financial situation may be threatened by the company's financial performance. Therefore, to defend their interests, managers are encouraged to conduct



fraud. Thus, it can be predicted that personal financial need encourages companies to conduct FSF. The results of empirical studies conducted by Skousen et al. (2015) show that personal financial need has a positive relationship with FSF. Therefore, the second hypothesis is formulated as follows:

H2 There is a positive relationship between personal financial need and FSF.

To encourage managers to achieve their best performance, the company implements a set of targets that are both financial and non-financial. Because the performance of managers will be measured from the level of achievement of these targets, managers who want a good performance will try to achieve the target that has been determined. Based on the assumptions of the agency theory, managers will probably do anything to make their performance looks good. Further, Soltani (2014) argues that excessive pressure on management to meet financial targets provides a reason for the management to commit fraud through FSF.

To measure the performance of managers, the companies mostly use return on asset (ROA). ROA is widely used to show how efficiently managers use the assets (Skousen et al., 2015). Therefore, the higher the ROA expected by the company, the more motivated the managers will be to commit FSF. Based on the argument above, the third hypothesis is formulated as follows:

H3 There is a positive relationship between financial targets and FSF.

Agency theory assumes there is a conflict of interest and information asymmetry between controlling and minority shareholders (Cheung et al., 2009; Utama and Utama, 2014). Furthermore, the agency theory also predicts that because of self-interest, a manager might alter the reliability of financial reporting by conducting a FSF. RPTs represent the potential expropriation of the firm's resources. In RPTs, there is an incentive to manipulate the transfer pricing (Lo et al., 2010). The statement on auditing standards no. 99 (AU Section 316) as quoted by Hogan et al. (2008) provides an example of a risk factor that can increase the chances of fraudulent financial statements. These risk factors include industry traits or entity operations such as complex transactions or significant RPTs and ineffective monitoring. RPTs are transactions which are complicated because they produce the probability of increasing fraud (Gordon et al., 2004). Lou and Wang (2009) state that RPTs may pose a risk of material misstatement due to fraud because they are vulnerable to management manipulation. Research conducted by Lou and Wang (2009) also found that RPTs may exert a positive effect on the FSF. Thus, it can be predicted that the opportunity measured by RPTs affect the FSF, which is hypothesised as follows:

H4 There is a positive relationship between RPTs and FSF.

### **3 Research methodology**

#### *3.1 Sample selection and data collection*

The samples of the study are 30 manufacturing companies listed on the Indonesia Stock Exchange for the years 2011 to 2015. The total sample of 30 companies was calculated from the number of manufacturing companies listed on the stock exchange in Indonesia

during 2011–2015. As many as 141 companies were reduced by delisting companies and reduced by companies that did not have the data needed by researchers. Compared to service and trading companies, manufacturing companies have more complex production processes so that RPTs and FSF are more likely to occur in manufacturing companies than in other industries. Akbar (2017) states that manufacturing companies require various assumptions and accounting methods in capturing corporate economic events.

### 3.2 *Operational definition of variables*

The dependent variable used in this study is FSF, which is measured by earnings management. According to Shapiro (2011), 'FSF is the intentional misrepresentation of financial statements, punishable criminally or civilly, in order to obtain wrongfully an advantage, retain a benefit, or avoid a detriment'. In this study, earnings management will be measured by discretionary accruals using the modified Jones' (1991) model as employed by Kuan et al. (2010) and Manurung and Hardika (2015). The reason for using earnings management to measure FSF is because fraud usually starts from the earnings management behaviour. Some studies suggest that earnings management is not only unethical but also a form of FSF (Kassem, 2012). Hogan et al. (2008) argue that significant or unusual accruals reflect a FSF.

The independent variables selected in this study consist of financial stability, personal financial need, financial targets and RPTs. Financial stability is a state that describes the company's financial condition in an unstable condition. Financial stability is measured using three measurements, they are:

- a percentage of asset changes over two years
- b sales divided by accounts receivable
- c sales divided by total assets as used by Skousen et al. (2015), Lou and Wang (2009), Kusumawardhani (2013) and Akbar, T. (2017).

The company seeks to improve the company's good outlook; one of them is by manipulating information of assets or the growth of corporate assets.

Personal financial need is a situation where the company's financial condition is also influenced by the financial condition of the company's executives. Insider's ownership can be used as a mechanism to control the quality of financial reporting. Accordingly, personal financial need will be measured by the percentage of shareholding by insiders as used by Kusumawardhani (2013) and Skousen et al. (2015). Furthermore, the third independent variable comprises the financial targets that are measured by return on assets (ROA) as used by Skousen et al. (2015) and Akbar (2017). The fourth independent variable is RPTs. Conceptually, RPTs are measured by comparison between RPTs divided by the total item/transaction as used by Lou and Wang (2009), Lo et al. (2010) and Utama and Utama (2014). In this study, RPTs are measured by the amount of RPTs receivables divided by the total receivables.

## 4 Results and discussion

### 4.1 Descriptive statistics and correlations

Descriptive statistics of the variables are explained in Table 1 below.

**Table 1** Descriptive statistic (N 150)

	<i>Minimum</i>	<i>Maximum</i>	<i>Mean</i>	<i>Std. dev.</i>
Financial stability	-0.77	0.44	0.0863	0.15825
Personal financial need	0.0000461	0.2056700	0.0408	0.05782
Financial target	-0.28	0.53	0.0560	0.10348
RPTs	0.0000373	1.0000000	0.2341	0.31779
Financial statement fraud	-0.56	0.52	-0.0105	0.14351

From the results of the descriptive analysis in Table 1, the conclusions that can be derived are as follows. The minimum value of financial stability (measured by percentage changes in asset) is -0.77, while the maximum value is 0.44. The average value of financial stability is 0.0863 (the standard deviation is 0.15825). The average value of financial stability as measured by asset change is much lower than the study conducted by Skousen et al. (2015). According to Skousen et al. (2015), the average value of asset change is 2.274 for a non-fraud firm, while average value of asset change for a fraud firm is 2.926.

The second variable used in this study is personal financial need which has a minimum value of 0.0000461 while the maximum value is 0.2056700. The average value of personal financial need (measured by percentage of insider ownership) is 0.0408 (the standard deviation is 0.05782). The average value of insider ownership found in this study is higher than the findings by Skousen et al. (2015). These authors found that average value of insider ownership is 0.227 for a non-fraud firm and 0.200 for a fraud firm.

For financial target as measured by ROA, the minimum value is -0.28 whereas the maximum value of financial target is 0.53. The average value of financial target is 0.0560 (the standard deviation is 0.10348). The average value of ROA in this study is much smaller than the findings in the study by Skousen et al. (2015). Skousen et al. (2015) found that the average score of ROA is 1.265 for a non-fraud firm and 1.120 for a fraud firm.

Furthermore, the minimum value of RPTs is 0.0000373 while the maximum value of RPTs is 1. The average value of RPTs is 0.2341 (the standard deviation is 0.31779). Finally, the minimum value of FSF is -0.56 while the maximum value is 0.52. The average value of FSF is -0.0105 (the standard deviation is 0.14351).

After the explanation of the descriptive statistics, this study will describe the correlation analysis which can be seen in Table 2.

Table 2 shows that financial stability is not significantly correlated with any variable. Personal financial needs are positively related to financial targets but not related to RPTs and FSF. Financial targets are not correlated with RPTs but are positively correlated with FSF. Finally, Table 2 shows that RPTs are not correlated with FSF.

**Table 2** Correlation (N 150)

	<i>Financial stability (FS)</i>	<i>Personal financial need (PFN)</i>	<i>Financial target (FT)</i>	<i>Related party transactions (RPTs)</i>	<i>Financial statement fraud (FSF)</i>
FS	1	-0.053	0.048	-0.035	-0.039
PFN		1	0.164*	-0.116	0.025
FT			1	0.108	0.307**
RPTs				1	0.078
FSF					1

Notes: \*\* Correlation is significant at the 0.01 level (2-tailed). \* Correlation is significant at the 0.05 level (2-tailed).

#### 4.2 Chow and Hausman test

The Chow test is done to see which model – whether fixed effect or common effect – is more appropriate. If the probability of chi-square statistic is more than 0.05 then the better model is common effect and vice versa. The results of the Chow test for the main model (1) are explained in Table 3. The chi-square value of the calculation using Eviews 9 is 119.501715 with a probability of 0.0000 (less than 5%), so the better model is fixed effect. Then, the Hausman test is done to see which model, whether the fixed effect or random effect, is better. If the probability of chi-square statistic is more than 0.05 then the better model is random effect and vice versa. The results of the Hausman test for the main model (1) are explained in Table 4. The chi-square value is 18.512959 with a probability is 0.0010 (less than 5%), so the better model is fixed effect. Based on the Chow and Hausman test, it can be stated that the best model is the fixed effect.

**Table 3** Test for common and fixed effects (model 1)

<i>Effects test</i>	<i>Statistic</i>	<i>d.f.</i>	<i>Prob.</i>
Cross-section F	4.872641	(29,116)	0.0000
Cross-section Chi-square	119.501715	29	0.0000

**Table 4** Test for fixed effects and random effects (model 1)

<i>Test summary</i>	<i>Chi-sq. statistic</i>	<i>Chi-sq. d.f.</i>	<i>Prob.</i>
Cross-section random	18.512959	4	0.0010

#### 4.3 Results

The results of the panel regression for the main model (1) can be seen in Table 5 below.

The value of the adjusted R-squared is 0.478571. Accordingly, the magnitude of the independent variable in influencing the variation of the dependent variable is 47.8% and the remaining is influenced by other factors not included in the study. F-statistic is 5.144042 and the significance value is 0.00000 and it can be inferred that the regression model fits and can be used for further analysis.

**Table 5** Estimates result of fixed effects (model 1)

<i>Variable</i>	<i>Coefficient</i>	<i>T-statistic</i>	<i>Prob.</i>
Constant	-0.067250	-0.283171	0.7776
Financial stability	-0.003777	-0.503193	0.6158
Personal financial need	1.256821	0.209783	0.8342
Financial target	1.084741	6.880780**	0.0000
RPTs	-0.237821	-2.028529*	0.0448
R-squared	0.594056		
Adjusted R-squared	0.478571		
F-statistic	5.144042		
Prob. F-statistic	0.000000		
Durbin-Watson stat.	2.288008		

Notes: \*, \*\* = significant at the 0.05 and 0.01 levels, respectively. Dependent variable FSF.

#### 4.4 Hypothesis testing

Table 5 explained that a regression coefficient of financial stability is  $-0.003777$  and the p-value is 0.6158 more than 0.05. Accordingly, financial stability has no significant effect on FSF and so the first hypothesis is not supported. The regression coefficient of personal financial need is 1.256821 and the p-value is 0.8342 more than 0.05, so personal financial need does not have a significant effect on FSF. Consequently, the second hypothesis is also not supported.

Concerning the effect of financial target on FSF, the regression coefficient of financial target is 1.084741 and the p-value is 0.0000 less than 0.05. It is indicated that the financial target has a significant positive effect on FSF; thus the third hypothesis is accepted. The regression coefficient of the related party transaction is  $-0.237821$  and the p-value is 0.0448 less than 0.05, thus the result suggests that the related party transaction has a significant negative effect on FSF. Although the results of the analysis show that RPTs have a significant effect on the FSF, but the direction of the relationship is contrary to the expected. The result is that the fourth hypothesis is rejected.

#### 4.5 Additional analysis

To strengthen the results of the analysis, this study uses model 2 and model 3. In model 1, financial stability is measured by the percentage change of assets, in model 2, financial stability is measured by sales divided by accounts receivables. Furthermore, in model 3, financial stability is measured by sales divided by total assets.

The Chow test and Hausman test for model 2 (Table 6 and Table 7) and model 3 (Table 9 and Table 10) show that the best model is fixed effect. Regression analysis for model 2 and model 3 can be seen in Table 8 and Table 11. In model 2, the regression coefficient of financial stability is  $-0.002594$  and the p-value is 0.1938 greater than 0.05. The regression coefficient of personal financial need is 1.233685 and the p-value is 0.8357 greater than 0.05. Therefore, it is stated that financial stability and personal financial need do not affect FSF. Furthermore, it is shown that the value of financial

target regression coefficient is 1.112644 and p-value is 0.0000 less than 0.05. So the financial target has a significant positive effect on FSF. The fourth variable affecting FSF is RPTs. RPTs regression coefficient is  $-0.215667$  and the p-value is 0.0635 less than 0.1, indicating that the RPTs have a significant negative effect on FSF.

Furthermore, model 3 in Table 11 shows that the regression coefficient for financial stability is  $-0.107809$  and the p-value is 0.0026 less than 0.05. These results indicate that financial stability negatively affects the FSF. The regression coefficient for personal financial need is 1.806102 and p-value 0.7541 is greater than 0.05, accordingly personal financial need does not affect FSF. For financial target, the value of regression coefficient is positive and significant, which indicates that the financial target has a significant positive effect on FSF. Finally, Table 11 shows that RPTs have a negative and significant effect on the FSF.

**Table 6** Test for common and fixed effects (model 2)

<i>Effects test</i>	<i>Statistic</i>	<i>D.f.</i>	<i>Prob.</i>
Cross-section F	4.677249	(29,116)	0.0000
Cross-section chi-square	116.161535	29	0.0000

**Table 7** Test for fixed effects and random effects (model 2)

<i>Test summary</i>	<i>Chi-sq. statistic</i>	<i>Chi-sq. d.f.</i>	<i>Prob.</i>
Cross-section random	18.575010	4	0.0010

**Table 8** Estimates result of fixed effects (model 2)

<i>Variable</i>	<i>Coefficient</i>	<i>T-statistic</i>	<i>Prob.</i>
Constant	-0.050400	-0.213988	0.8309
Financial stability	-0.002594	-1.306867	0.1938
Personal financial need	1.233685	0.207864	0.8357
Financial target	1.112644	7.053496**	0.0000
RPTs	-0.215667	-1.873329*	0.0635
R-squared	0.599072		
Adjusted R-squared	0.485015		
F-statistic	5.252396		
Prob. F-statistic	0.000000		
Durbin-Watson stat.	2.276796		

Notes: \*, \*\* = significant at the 0.10 and 0.01 levels, respectively. Dependent variable FSF.

**Table 9** Test for common and fixed effects (model 3)

<i>Effects test</i>	<i>Statistic</i>	<i>D.f.</i>	<i>Prob.</i>
Cross-section F	4.396812	(29,116)	0.0000
Cross-section chi-square	111.233661	29	0.0000

**Table 10** Test for fixed effects and random effects (model 3)

<i>Test summary</i>	<i>Chi-sq. statistic</i>	<i>Chi-sq. d.f.</i>	<i>Prob.</i>
Cross-section random	20.330151	4	0.0004

**Table 11** Estimates result of fixed effects (model 3)

<i>Variable</i>	<i>Coefficient</i>	<i>T-statistic</i>	<i>Prob.</i>
Constant	0.022185	0.096631	0.9232
Financial stability	-0.107809	-3.072904*	0.0026
Personal financial need	1.806102	0.313966	0.7541
Financial target	1.212532	7.721876**	0.0000
RPTs	-0.257973	-2.311512*	0.0226
R-squared	0.623794		
Adjusted R-squared	0.516770		
F-statistic	5.828531		
Prob. F-statistic	0.000000		
Durbin-Watson stat.	2.395516		

Notes: \*, \*\* = significant at the 0.05 and 0.01 levels, respectively. Dependent variable FSF.

#### 4.6 Discussion

This study aimed to examine the two elements in the fraud triangle theory, i.e., financial pressure and opportunity. The third element, rationalisation, is not examined because as discussed above, the rationalisation is a variable which is difficult to measure. In addition, according to the research by Huang et al. (2016), the highest weight of the three dimensions of the fraud triangle is pressure and opportunity and the lowest weight is rationalisation.

The findings of this study indicate that financial stability measured by the percentage change in total assets for two years has no significant effect on FSF, accordingly, it does not support Kusumawardhani (2013) and Skousen et al. (2015). Kusumawardhani (2013) and Skousen et al. (2015) show the percentage of asset change significantly related to FSF. However, financial stability as measured by sales divided by receivables which is not significantly related to FSF and this supports Skousen et al.'s study.

According to Skousen et al. (2015) financial stability can also be measured by sales divided by total assets. Companies with good management capabilities in using assets will survive and have a competitive advantage. Disability in the use of corporate assets provides motivation for managers to engage in fraudulent financial reporting. Good asset use capability indicates that the company is able to generate large sales volume. Therefore, sales can be used to measure financial stability and the results reveal that financial stability as measured by sales divided by total assets can curtail FSF. Results of this study contributed to Skousen et al.'s research because they showed insignificant results. This study contributes to preliminary research in Indonesia. Kusumawardhani (2013) and Manurung and Hardika (2015) use only the percentage change of total assets to measure financial stability.

Concerning variable personal financial need, the results of this study (in all three models) prove that the personal financial need does not have a significant effect on FSF. Accordingly, the finding of the study does not support the agency theory. These results are in contrast to studies conducted by Skousen et al. (2015), which shows that the percentage of ownership of shares by insiders has a positive effect on FSF. However, the findings of the study are similar to those of Kusumawardhani (2013) who also conducted a study in Indonesia.

The next independent variable used in this study is financial target. The results of the analysis prove that the financial target has a significant positive effect on FSF, in all three models used in this study. Higher financial targets will increase the likelihood of FSF. Findings of this study contribute to previous researchers conducted in Indonesia, because according to Manurung and Hardika (2015), financial targets are not significantly related to FSF.

The fourth hypothesis states RPTs have a significant positive effect on fraudulent financial statements. The three models used in this study show that RPTs have a significant negative effect on the FSF. Consequently, the outcome is contrary to what was predicted, so the agency theory's prediction is not proven. Findings that do not support the hypothesis are likely to be caused by RPTs which do not increase the risks facing by the business. Therefore, the increase in the value of RPTs does not increase the fraudulent financial statements; in fact it reduces the FSF. Gordon et al. (2004) provided a summary of the research on RPTs and found that the presence of RPTs alone did not seem to improve the auditor's risk assessment. The findings of this study are consistent with Kuan et al. (2010) who examine the relationship between RPT and earnings management. Kuan et al. (2010) show there is no statistically significant evidence for a relationship between RPTs and earnings management. Then, Kuan et al. (2010) suggest that the presence of RPTs in Indonesia does not indicate that management engages greater earnings management. This finding also suggests that the RPTs does not cause harm to the organisation. Even then, the finding that RPTs have a negative effect on fraudulent financial statements may imply it improves company performance. In other words, in Indonesia RPTs can be viewed as an efficient form of transaction, which is consistent with Utama and Utama (2014). They find that RPTs have a positive impact on firm value when the transaction involves asset placements in related parties.

## 5 Conclusions

The results of the analysis proved that financial stability measured by sales divided by total asset affect FSF. However, concerning the relationship between personal financial need and the FSF, research has shown that personal financial needs do not exert an effect on FSF. Accordingly, this result proves that the size of personal financial needs will not influence FSF. Our hypothesis stated that financial target has a significant positive effect on FSF. The analysis supports this hypothesis. Lastly, the results of this study prove that RPTs affect negatively FSF.

The findings of the study that financial stability as measured by sales divided by total asset affect negatively FSF implies that companies in stable financial conditions, allow them to reduce their financial statements. Therefore, a good sales performance must be maintained to prevent the company from behaving negatively. The result of the study shows that financial targets have a significant positive effect on FSF, giving the



implication that senior management needs to be wiser in applying the performance appraisal system. A too rigorous performance appraisal system with difficult targets increases the tendency of firms to manipulate their financial statements.

Finally, the study shows that RPTs negatively affect the FSF implying that in Indonesia for the case of manufacturing companies, RPTs do not reflect negative behaviour even vice versa. Furthermore, the findings of a study showing that financial targets will increase FSF, suggesting that agency theory is supported. However, in the case of RPTs the study does not support the agency theory but supports stewardship theory as explained by Albrecht et al. (2004).

RPT research conducted in Indonesia found that RPT has an effect on market reaction (Utama et al., 2010) and has a positive effect on firm value (Utama and Utama, 2014). The findings of this study which show that the RPT negatively affects the fraudulent financial statements contributed to previous research. Furthermore the results of the study provide support that RPT transactions in Indonesia are efficient transactions.

This study measuring RPTs only focuses on receivables from related parties. For future research, analyses can examine RPTs in liabilities, assets, sales and expenses. According to the findings of Kuan et al. (2010), RPTs transactions in Indonesia for manufacturing companies are lower than non-manufactured companies. Due to differences in industry characteristics, the findings of a study conducted in a non-manufacturing company are likely to produce different results. For this reason alone it is worth investigating in future studies.

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## References

- Abdullahi, R. and Mansor, N. (2015) 'Fraud triangle theory and fraud diamond theory: understanding the convergent and divergent for future research', *International Journal of Academic Research in Accounting, Finance and Management Sciences*, Vol. 5, No. 4, pp.38–45.
- Aghghaleh, S.F., Mohamed, Z.M. and Rahmat, M.M. (2016) 'Detecting financial statement frauds in Malaysia: comparing the abilities of Beneish and Dechow models', *Asian Journal of Accounting and Governance*, Vol. 7, No. 1, pp.57–65.
- Akbar, T. (2017) 'The determination of fraudulent financial reporting causes by using pentagon theory on manufacturing companies in Indonesia', *International Journal of Business, Economics and Law*, Vol. 14, No. 5, pp.106–133.
- Albrecht, W.S., Albrecht, C. and Albrecht, C.C. (2008) 'Current trends in fraud and its detection', *Information Security Journal: A Global Perspective*, Vol. 17, No. 1, pp.2–12.
- Albrecht, W.S., Albrecht, C.C. and Albrecht, C.O. (2004) 'Fraud and corporate executive: agency, stewardship and broken trust', *Journal of Forensic Accounting*, Vol. 5, No. 1, pp.109–130.
- Amara, I., Amar, A.B. and Jarboui, A. (2013) 'Detection of fraud in financial statements: French companies as a case study', *International Journal of Academic Research in Accounting, Finance and Management Sciences*, Vol. 3, No. 3, pp.44–55.

- Bakri, H.H.M., Mohamed, N. and Said, J. (2017) 'Mitigating asset misappropriation through integrity and fraud risk elements: evidence emerging economies', *Journal of Financial Crime*, Vol. 24, No. 2, pp.242–255.
- Beasley, M.S., Carcello, J.V. and Hermanson, D.R. (1999) *Fraudulent Financial Reporting: 1987–1997: An Analysis of US Public Companies*, Working Paper, Committee of Sponsoring Organizations of the Treadway Commission.
- Brennan, N.M. and McGrath, M. (2007) 'Financial statement fraud: some lessons from US and European case studies', *Australian Accounting Review*, Vol. 17, No. 42, pp.49–61.
- Cheung, Y.L., Jing, L., Lu, T., Rau, P.R. and Stouraitis, A. (2009) 'Tunneling and propping up: an analysis of related party transactions by Chinese listed companies', *Pacific-Basin Finance Journal*, Vol. 17, No. 3, pp.372–393.
- Cressey, D.R. (1950) 'The criminal violation of financial trust', *American Sociological Review*, Vol. 15, No. 6, pp.738–743.
- Dorminey, J., Fleming, A.S., Kranacher, M.J. and Riley Jr., R.A. (2012) 'The evolution of fraud theory', *Issues in Accounting Education*, Vol. 27, No. 2, pp.555–579.
- Du Toit, E. (2008) 'Characteristics of companies with a higher risk of financial statement fraud: a survey of the literature', *South African Journal of Accounting Research*, Vol. 22, No. 1, pp.19–44.
- Dunn, P. (2004) 'The impact of insider power on fraudulent financial reporting', *Journal of Management*, Vol. 30, No. 3, pp.397–412.
- Eisenhardt, K.M. (1989) 'Agency theory: an assessment and review', *Academy of Management Review*, Vol. 14, No. 1, pp.57–74.
- Gordon, E.A., Henry, E. and Palia, D. (2004) 'Related party transactions and corporate governance', in Hirschey, M., K.J. and Makhija, A.K. (Ed.): *Corporate Governance (Advances in Financial Economics, Vol. 9)*, Emerald Group Publishing Limited, Bingley, pp.1–27.
- Hasnan, S., Daie, M.S. and Hussain, A.R.M. (2016) 'Related party transactions and earnings quality: does corporate governance matter?', *International Journal of Economics and Management*, Vol. 10, No. 2, pp.189–219.
- Hogan, C.E., Rezaee, Z., Riley, R.A. and Velury, U.K. (2008) 'Financial statement fraud: insights from the academic literature', *Auditing: A Journal of Practice & Theory*, Vol. 27, No. 2, pp.231–252.
- Huang, S.Y., Lin, C.C., Chiu, A.A. and Yen, D.C. (2016) 'Fraud detection using fraud triangle risk factors', *Information Systems Frontiers*, Vol. 19, No. 6, pp.1–14.
- Jefri, R. and Mediaty (2014) 'Pendeteksian kecurangan laporan keuangan (Detecting the financial statement fraud)', *Jurnal Akuntansi*, Vol. 1, No. 2, pp.56–64.
- Jensen, M.C. and Meckling, W.H. (1976) 'Theory of the firm: managerial behavior, agency costs and ownership structure', *Journal of Financial Economics*, Vol. 3, No. 4, pp.305–360.
- Jones, J. (1991) 'Earnings management during import relief investigations', *Journal of Accounting Research*, Vol. 29, No. 2, pp.193–228.
- Kassem, R. (2012) 'Earnings management and financial reporting fraud: can external auditors spot the difference?', *American Journal of Business and Management*, Vol. 1, No. 1, pp.30–33.
- Kassem, R. and Higson, A. (2012) 'The new fraud triangle model', *Journal of Emerging Trends in Economics and Management Sciences*, Vol. 3, No. 3, pp.191–195.
- Kazemian, S. and Sanusi, Z.M. (2015) 'Earnings management and ownership structure', *Procedia Economics and Finance*, Vol. 31, pp.618–624.
- Koroy, T.R. (2009) 'Pendeteksian kecurangan (fraud) laporan keuangan oleh auditor eksternal (Detection of fraud of financial statements by external auditors)', *Jurnal Akuntansi Dan Keuangan*, Vol. 10, No. 1, pp.22–33.
- Kuan, L., Tower, G., Rusmin, R. and Van der Zahn, J.W.M. (2010) 'Related party transactions and earnings management', *Jurnal Akuntansi dan Auditing Indonesia*, Vol. 14, No. 2, pp.115–137.

- Kusumawardhani, P. (2013) 'Deteksi financial statement fraud dengan analisis fraud triangle pada perusahaan perbankan yang terdaftar di BEI (Financial statement fraud detection using fraud triangle: analyzes on banking companies listed on Indonesia stock exchange)', *Jurnal Akuntansi Unesa*, Vol. 1, No. 3, pp.1–20.
- Lin, C.C., Chiu, A.A., Huang, S.Y. and Yen, D.C. (2015) 'Detecting the financial statement fraud: the analysis of the differences between data mining techniques and experts' judgments', *Knowledge-Based Systems*, Vol. 89, pp.459–470.
- Lo, A.W.Y., Wong, R.M.K. and Firth, M. (2010), 'Can corporate governance deter management from manipulating earnings? Evidence from related-party sales transactions in China', *Journal of Corporate Finance*, Vol. 16, No. 2, pp.225–235.
- Lou, Y.I. and Wang, M. (2009) 'Fraud risk factor of the fraud triangle assessing the likelihood of fraudulent financial reporting', *Journal of Business & Economics Research*, Vol. 7, No. 2, pp.61–78.
- Manurung, D.T.H. and Hardika, A.L. (2015) 'Analysis of factors that influence financial statement fraud in the perspective fraud diamond: empirical study on banking companies listed on the Indonesia stock exchange year 2012 to 2014', in *International Conference on Accounting Studies (ICAS) 2015*, Johor Bahru, Johor, Malaysia, 17–20 August.
- Mardiana, A. (2015) 'Effect ownership, accountant public office and financial distress to the public company financial fraudulent reporting in Indonesia', *Journal of Economics and Behavioral Studies*, Vol. 7, No. 2, pp.109–115.
- Mohamed, N. and Handley-Schachelor, M. (2014) 'Financial statement fraud risk mechanisms and strategies: the case studies of Malaysian commercial companies', *Procedia-Social and Behavioral Sciences*, Vol. 145, pp.321–329.
- Murcia, F.D.R. and Borba, J.A. (2007) 'Framework for detecting risk of financial statement fraud: mapping the fraudulent environment', *Brazilian Business Review*, Vol. 4, No. 3, pp.162–177.
- Noor, N.F.M., Sanusia, Z.M., Heang, L.T., Iskandar, T.M. and Isa, Y.M. (2015) 'Fraud motives and opportunities factors on earnings manipulations', *Procedia Economics and Finance*, Vol. 28, pp.126–135.
- Rahman, R.A, Sulaiman, S., Fadel, E.S. and Kazemian, S. (2016) 'Earnings management and fraudulent financial reporting: the Malaysian story', *Journal of Modern Accounting and Auditing*, Vol. 12, No. 2, pp.91–101.
- Ross, S.A. (1973) 'The economic theory of agency: the principal's problem', *The American Economic Review*, Vol. 63, No. 2, pp.134–139.
- Said, J., Alam, M.M., Ramli, M. and Rafidi, M. (2017) 'Integrating ethical values into fraud triangle theory in assessing employee fraud: evidence from the Malaysian banking industry', *Journal of International Studies*, Vol. 10, No. 2, pp.170–185.
- Sanusi, Z.M., Rameli, M.N.F. and Isa, Y.M. (2015) 'Fraud schemes in the banking institutions: prevention measures to avoid severe financial loss', *Procedia Economics and Finance*, Vol. 28, pp.107–113.
- Shapiro, D.M. (2011) 'Better understanding accounting fraud', *Journal of Corporate Accounting & Finance*, Vol. 22, No. 4, pp.61–64.
- Siregar, S.V. and Tenoyo, B. (2015) 'Fraud awareness survey of private sector in Indonesia', *Journal of Financial Crime*, Vol. 22, No. 3, pp.329–346.
- Skousen, C.J., Smith, K.R. and Wright, C.J. (2015) 'Detecting and predicting financial statement fraud: the effectiveness of the fraud triangle and SAS No. 99', in Hirschey, M., John, K. and Makhija, A.K. (Eds.): *Corporate Governance and Firm Performance (Advances in Financial Economics)* Vol. 13, pp.53–81, Emerald Group Publishing Limited, Bingley.
- Soltani, B. (2014) 'The anatomy of corporate fraud: a comparative analysis of high profile American and European corporate scandals', *Journal of Business Ethics*, Vol. 120, No. 2, pp.251–274.

- Trompeter, G.M., Carpenter, T.D., Desai, N., Jones, K.L. and Riley jr, R.A. (2012) 'A synthesis of fraud-related research', *Auditing: A Journal of Practice & Theory*, Special Issue, Vol. 32, No. 1, pp.287–321.
- Tugas, F.C. (2012) 'Exploring a new element of fraud: a study on selected financial accounting fraud cases in the world', *American International Journal of Contemporary Research*, Vol. 2, No. 6, pp.112–121.
- Utama, C.A. and Utama, S. (2014) 'Corporate governance, size and disclosure of related party transactions and firm value: Indonesia evidence', *International Journal of Disclosure and Governance*, Vol. 11, No. 4, pp.341–365.
- Utama, S., Utama, C.A. and Yuniasih, R. (2010) 'Related party transaction-efficient or abusive: Indonesia evidence', *Asia Pacific Journal of Accounting and Finance*, Vol. 1, No. 1, pp.77–102.
- Wuerges, A.F.E. and Borba, J.A. (2010) *Accounting Fraud Detection: Is It Possible to Quantify Undiscovered Cases?* 1 December 2010, SSRN: <https://ssrn.com/abstract=1718652> or <http://dx.doi.org/10.2139/ssrn.1718652>.
- Zainudin, E.F. and Hashim, H.A. (2016), 'Detecting fraudulent financial reporting using financial ratio', *Journal of Financial Reporting and Accounting*, Vol. 14, No. 2, pp.266–278.
- Zhou, W. and Kapoor, G. (2011) 'Detecting evolutionary financial statement fraud', *Decision Support Systems*, Vol. 50, No. 3, pp.570–575.