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# The Impact of Social Media on Firm Value: A Case Study of Oil and Gas Firms in Indonesia

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## Abstract

The development of Internet technology can affect firm value through the use of social media by business people. Nowadays, social media affect businesses of all sizes in several different ways. Despite the various benefits obtained by using social media, research at the organizational level and its impact on business performance have not grown as fast as desired. This research aims to examine the effect of social media on oil and gas firms' value. The research sample consists of 9 oil and gas firms listed on the Indonesian Stock Exchange 2013-2018. Social media proxies are firms' social media, other social media mentions, and social media sentiment. Firm value is measured by the market value to assets ratio. Data analysis uses a random-effect regression test. Based on the analysis, the social media account of a firm has a positive effect on firm value. It indicates that social media give advantages for oil and gas firms to give a signal of business prospect, make use of opportunities related to industry alliances, recruit employees globally, and c. On the other hand, the positive sentiment on social media has no effect on oil and gas firms' value.

**Keywords:** Social Media, Firm Value, Indonesian Stock Exchange, Oil and Gas Industry

**JEL Classification Code:** M15, O35, Q40

## 1. Introduction

One of the things that investors consider in investing is the value of the firm in which the investor will invest (Ernawati & Widyawati, 2015). Based on a financial perspective, is an economic concept that reflects the value of a business. It is the value that a business is worthy of at a particular date. Firm value is a measure of a company's total value, often used as a comprehensive alternative to equity market capitalization. The higher the firm value, the greater the prosperity the firm owner will receive. For firms that issue shares on the capital market, the price of shares traded on the stock exchange is an indicator of firm value. Firm value is very important because the high firm value will be followed by high shareholder wealth (Brigham

et al., 2017). The higher the stock price, the higher the firm value. A high firm value is the desire of firm owners because a high value indicates that the prosperity of shareholders is also high. The wealth of shareholders and the firm is represented by the market price of the shares, which is a reflection of investment, financing, and asset management decisions. The same thing was stated by Pertiwi and Priyadi (2016), that high firm value will make the market believe not only in the firm's current performance but also in the firm's prospects.

One of the shareholders' wealth is seen from the high and low-value firms. A high firm value can be seen from the firm's stock price so that a high firm value is one of the factors for evaluating potential investors before investing in the firm. Market value is the company's worth based on the total value of its outstanding shares in the market, which is its market capitalization. The market value is the value of a company according to the financial markets. The market value of a company is calculated by multiplying the current stock price by the number of outstanding shares that are trading in the market. The firm value formed through the stock market value indicator is strongly influenced by investment opportunities. The existence of investment opportunities can provide a positive signal about the firm's future growth so that it can increase firm value (Erlina, 2008).

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What can affect firm value is the development of Internet technology through the use of social media by business people. Social media is an Internet-based media that facilitate the creation or sharing/exchange of information, ideas, career interests, and other forms of expression via virtual communities and networks (Carr & Hayes, 2015). Social media is used as a means of conveying important information for investors and as a place for investors to conduct social interactions. Technological developments, increasing market competition, globalization, and economic changes, the dynamics of consumer buying behavior, and changes in the environment have brought about substantial changes in the way firms communicate to customers. Competitive advantages generate greater value for a firm and its shareholders because of certain strengths or conditions. A competitive advantage distinguishes a company from its competitors. It contributes to higher prices, more customers, and brand loyalty. Establishing such an advantage is one of the most important goals of any company. Without it, companies will find it difficult to survive (Parveen et al., 2016). As a result, organizations are forced to find ways to develop strategies for existence and progress (Franco et al., 2016).

One of the strategies used by the organization is the use of social media (Akmese et al., 2016). Along with the development of Internet technology, the phenomenon of the use of social media by banks is also increasing. All business people are going digital. Digital transformation is the integration of digital technology into all areas of a business, fundamentally changing how you operate and deliver value to customers. It's also a cultural change that requires organizations to continually challenge the status quo, experiment, and get comfortable with failure. Social media offers many benefits to business owners, as it allows them to reach out to their customers and to gain the attention of more people/potential customers. Business people find a new medium to form opinions or share information and interact horizontally. Of course, with the increasing number of social media users, it can be seen that the greater the potential that firms should be able to exploit to develop new opportunities or just to survive amid competition. Currently, many firms, including the banking industry, are using social media as a means of strengthening business. Some businesses use social media for increasing their brand awareness, others use it for driving website traffic and sales. Social media can also help you generate engagement around your brand, create a community, and serve as a customer support channel for your customers.

There are several reasons for firms to take advantage of social media, including strengthening relationships with consumers or customers. Social media can change communication styles to be more interactive and participatory, this causes the relationship between firms and their consumers to become more intense, more personal,

and equal (horizontal). Social media allows consumers or customers to comment directly on what is being done or is happening with the firm. Social media can build brand attitudes that affect buying behavior. A good image of a brand or product can lead the consumer to decide on their purchases. Social media is not only for advertising, but it can also be a tool for brands or services to connect with their consumers. If the firm is careful in using social media by making it an integral part of the firm, the firm can make the role of social media a competitive advantage of the firm compared to other firms. So that firms can survive in an increasingly dynamic business world like today.

This research aims to examine the effect of social media on the value of oil and gas firms in Indonesia. Since oil and gas firms are sensitive to the global condition of oil price, there is a chance that the value of oil and gas firms is also sensitive to the global condition. Oil price crisis such as the oil price crash in 2014 shows that the value of oil and gas firms is important to be examined, especially in oil supplying countries such as Indonesia.

## **2. Literature Review**

### **2.1. The Value of the Firm**

The firm has a long-term goal of maximizing firm value. The higher the firm value, the more prosperous the shareholders will be. According to Hirdinis (2019), firm value is the measure of a company's total value. It looks at the entire market value rather than just the equity value, so all ownership interests and asset claims from both debt and equity are included. EV can be thought of as the effective cost of buying a company or the theoretical price of a target company (before a takeover premium is considered). The main objective of a firm is to maximize profit or wealth, especially for its shareholders, in the form of efforts to increase or maximize the market value of the share price of the firm concerned. The goal of a firm is to maximize the present wealth of the owners i.e., equity shareholders in a company. A company's equity shares are actively traded in the stock markets, the wealth of the equity shareholders is represented in the market value of the equity shares

The shareholder wealth maximization goal states that management should seek to maximize the present value of the expected future returns to the owners (that is, shareholders) of the firm (Jensen, 2001). Firm value is the investor's perception of the firm's financial condition. The value of the firm is usually reflected in the share price. Brigham et al. (2017) stated that the value of the firm is the determination of the comparison of results as firm performance as seen in the financial statements. Firm value can be seen from the maximization of shareholder wealth which is reflected in maximizing the firm's share price. Maximizing firm value

is very important for a firm because maximizing firm value means that the firm maximizes the prosperity of its shareholders.

Value is the monetary, material, or assessed worth of an asset, good, or service. “Value” is attached to a myriad of concepts including shareholder value, the value of a firm, fair value, and market value. Value denotes the degree of importance of some thing or action, with the aim of determining what actions are best to do or what way is best to live or to describe the significance of different actions (Jensen, 2001). Firm value is the investor’s perception of the firm which is often associated with stock prices. The value of the firm, which is formed through the stock market indicator, is strongly influenced by investment opportunities. According to Ernawati and Widyawati (2015), one of the things that investors consider when investing is the value of the firm in which the investor will invest. Based on a financial perspective, firm value is the present value of future income (future free cash flow). The higher the firm value, the greater the prosperity the firm owner will receive.

Firm value is very important because the high firm value will be followed by high shareholder wealth (Brigham et al., 2017). The higher the stock price, the higher the firm value. A high firm value is the desire of firm owners because a high value indicates the prosperity of shareholders is also high. The wealth of shareholders and the firm is represented by the market price of the shares which is a reflection of investment, financing, and asset management decisions. The same thing was stated by Pertiwi and Priyadi (2016), that high firm value will make the market believe not only in the firm’s current performance but also in the firm’s prospects. A high firm value can be seen from the firm’s stock price so that a high firm value is one of the factors for evaluating potential investors before investing in the firm. High stock prices also make the firm value high (Brigham et al., 2017).

## 2.2. Signaling Theory

Connelly et al. (2011) stated that signaling theory is useful for describing behavior when two parties (individuals or organizations) have access to different information. Typically, one party, the sender, must choose whether and how to communicate (or signal) that information, and the other party, the receiver, must choose how to interpret the signal. A signal is an action taken by firm management that guides investors about how management views the firm’s prospects. This signal is in the form of information about what management has done to realize the owner’s wishes. The information released by the firm is important because it affects the investment decisions of parties outside the firm. This information is important for investors and business people because information essentially provides information, notes, or descriptions, both for the past, present, and future

conditions for the survival of the firm and how it affects the firm.

Social identities can be developed through the Internet by launching social media platforms. Companies are increasingly using social media to signal quality and provide information for potential investors. This is because social media can provide new channels for information access and quality signals, allowing disadvantaged companies to share information with investors about products and services. Signal theory addresses the problem of information asymmetry. Asymmetric information arises when one party to an economic transaction has more or better information than another and uses that to their advantage. Signaling refers to the act of using insider information to initiate a trading position. It occurs when an insider releases crucial information about a company that triggers the buying or selling of its stock by people who do not ordinarily possess insider information. The actions of the insider are considered a market signal to outsiders. So, from a signal theory perspective, it is argued that social media platforms can be used as a signaling mechanism aimed at customers and investors. Furthermore, two-way communication enables the recipient to send.

Information is an important element for investors and business people because information essentially provides information, notes, or descriptions for the past, present, and future conditions for the survival of a firm and how the securities market is. Complete, relevant, accurate, and timely information is needed by investors in the capital market as an analytical tool for making investment decisions. Information published as an announcement will provide a signal for investors in making investment decisions. If the announcement contains a positive value, it is expected that the market will react when the announcement is received by the market. This theory states the reason why firms have the incentive to provide financial statement information to external parties. The encouragement of firms to provide information is because there is information asymmetry between the firm and outside parties. Signaling theory is based on the assumption that information is not equally available to all parties at the same time, and that information asymmetry is the rule. Information asymmetries can result in very low valuations or a sub-optimum investment policy. The signaling theory states that corporate financial decisions are signals sent by the company’s managers to investors to shake up these asymmetries. These signals are the cornerstone of financial communications policy.

Lev and Penman (1990) stated that high profitability motivates management to provide greater information as investor confidence increases, and this is evidenced by greater information provided in annual reports to signal their superior performance, and the web is one way to

achieve these goals. However, actions are often limited by profitability. Singhvi and Desai (1971) stated in a free enterprise system, variations in corporate disclosure practices are likely to result since corporations are managed by groups that have varying managerial philosophies and wide discretion in connection with disclosing information to the investing public. The quality of corporate disclosure influences to a great extent the quality of investment decisions made by investors (Wallace & Naser, 1995). Fundamentally social media affects the industry. According to Jeong and Jeon (2008), social media is a free market research tool, such as focusing on evaluating customers and social media comments on different network sites to provide firm managers with ideas about the firm's overall business performance.

### 2.3. Social Media

Kaplan and Haenlein (2010) stated that social media is a group of Internet-based applications that are built on the ideology and fundamentals of web 2.0 technology and enable content creation and exchange. Social media refers to websites and applications that are designed to allow people to share content quickly, efficiently, and in real-time. While many people access social media through smartphone apps, this communication tool started with computers, and social media can refer to any internet communication tool that allows users to broadly share content and engage with the public (Nasrullah, 2014). Social media includes various forms of online applications such as social networking sites, blogs, forums, microblogs, photo sharing, video sharing, product/service reviews, evaluation communities and (Aichner & Jacob, 2015). To ensure that the content presented is truly effective and relevant to account followers on social media, there is an important parameter that needs more attention than the growth in the number of followers; namely the level of interaction with content on social media. The Social Interaction KPI measures the effectiveness of your social media campaigns at fostering positive engagement.

Interaction: A communication between an audience member and your brand's social profile. This may take the form of platform-specific interactions such as Mentions on Twitter, Likes on Facebook, or +1's on Google+. According to Van Ruler (2018), social media engagement is some form of interaction between the customer and the brand, which takes place within social media networks. In reality, the term is certainly not about one-off communication. It is more about the construction of a long-term relationship with your target customers. When we talk about such a relationship, we have to take into consideration the positive actions of users as a reaction on any brand's engagement tactics. Cooley and Parks-Yancy (2019) stated that feedback

is very important and also states that the results of good communication are if followers on social media pay attention in the form of a response.

The immense popularity and use of social media can facilitate online learning and information sharing (Appel et al., 2020). Social media allows users without the need for a physical presence to communicate and produce content (Zhang et al., 2017). Social media advertising, or social media targeting, are advertisements served to users on social media platforms. Social networks utilize user information to serve highly relevant advertisements based on interactions within a specific platform. In many instances, when the target market aligns with the user demographics of a social platform, social advertising can provide huge increases in conversions and sales with a lower cost of acquisition. (Rapp et al., 2013). Most firms use social media to enhance their business brand image and brand awareness (Nisar & Whitehead, 2016).

Furthermore, social media influences the firm's branding strategy that leads to e-WOM (electronic word of mouth). Because of this, e-WOM attracts consumers and increases their purchase intention. By using social media, customers have access to various common sources of information from other customers regarding experiences and recommendations. This affects their purchasing decisions (Chen et al., 2011). Therefore, what is important in the role of social media in developing relationships and trust with customers, suppliers, and potential partners is an important consideration for the firm (Rapp et al., 2013). Thus, social media has become a research topic for various fields including banking without exception (Dănăiață et al., 2014). Despite the various benefits obtained by using social media, research at the organizational level and its impact on business performance have not grown as fast as desired (Franco et al., 2016).

### 2.4. Hypotheses

According to Connelly et al. (2011), signaling theory is a firm's management behavior in guiding investors regarding management's views on the firm's prospects for the future. In the signal theory framework, it is stated that the firm's motivation to provide information is due to information asymmetry between firm managers and outsiders, this is because firm managers know more information about the firm and its prospects than outsiders (Wolk et al., 2017). Signal theory also states that profit-making firms guard against losses by attracting investors and maximizing their value (Lev & Penman, 1990). As a result, firms with good news have an incentive to signal and market their firms, and the web is one way to achieve these objectives. However, this action is often limited by profitability. Singhvi and Desai (1971) stated that high profitability motivates management



to provide greater information as investor confidence increases, and this is evidenced by the greater information provided in annual reports to signal firm performance (Wallace & Naser, 1995).

Social media attracts information seekers to get information about the products/services they will buy and leads to an increase in consumer purchase intentions (Hajli, 2015). On the other hand, social media as a communication channel helps firms to achieve different organizational goals including marketing (Patma et al., 2020), public relations, advertising, branding (Puspaningrum, 2020), customer service, human resources, and problem-solving (Nisar & Whitehead, 2016). Thus, social media has been considered as an effective platform for firms to connect with large firms, with several potential customers, and to spread information about their business (Schaupp & Bélanger, 2014). Firms can increase profitability by reducing information asymmetry. When some investors have more private information than others, information asymmetry occurs in the capital market. To reduce the cost of capital, corporations exert great effort at reducing information asymmetry. One way to reduce information asymmetry is to provide signals to outsiders, in the form of positive and reliable financial information that will reduce uncertainty about the firm's prospects to increase the firm's credibility and success (Wolk et al., 2017).

Using social media by firms can create a strong network of businesses, customers, and suppliers (Siamagka et al., 2015). Social media fundamentally influences the industry. According to Jeong and Jeon (2008), social media is a market research tool; social media research is the process of analyzing social media data to conduct quantitative (and at times qualitative) research to understand how audiences relate to topics, by using tools and data extraction techniques (Harrigan et al., 2017).

Social media is an individual communication channel that can be used to share experiences, including experiences with firms. These experiences, created through word of mouth, can influence firm value indirectly through their influence on intangible assets such as the firm's customer equity. The consideration that social media is related to firm performance is based on the fact that the number of individuals who spend a long time on social media and provide information (Luo et al., 2013). Furthermore, customers and investors make decisions with a collective mind (Tirunillai & Tellis, 2012). Also, investors focus on more visible information, which concludes that the more visible and accessible information on social media networks, the more investors will focus on that information.

Previous research by Mahboub (2018) found that the use of social media has a positive and significant effect on profitability. Chikandiwa et al. (2013) found that social media has a significant effect on business growth. Pourkhani

et al. (2019) and Singh and Sinha (2017) found that the use of social media has a positive effect on firm growth. Uyar and Boyar (2015) and Kim and Johnson (2016) found that social media has a positive and significant relationship to firm value. Miqdad and Oktaviani (2021) found a small contribution of social media on firms' performance and value.

For oil and gas firms, social media can be used as a marketing tool. First, social media can be used to make industry alliances. The oil and gas industry is not limited by location and can generate a universal demand. Social media has no boundaries to reach global audiences. Social media also provide a platform to build the relationship by interaction and communication, such as knowledge of the oil and gas industry. Second, social media can be used to recruit employees. Young talent can be recruited easily through social media since they put their knowledge, skill information, and connection on social media. Third, social media can be used as an education platform. Since the oil and gas industry is not a core business flow, some people do not have any knowledge about the oil and gas industry. People can learn about the oil and gas industry through social media and monitor their function to understand the environmental and sustainability impact on society. The impact of social media on oil and gas firms can be seen by the firm's social media accounts/types. The more social media accounts/types that firms have, the more tools firms have to increase their value. The more social media accounts mean the more firms are noticed by the audience.

*H1: The number of social media accounts/types of a firm has a positive effect on firm value.*

*H2: Number of other social media accounts/types that mention the firm has a positive effect on firm value.*

The impact of social media on oil and gas firms also can be seen by the perception of the social media audience. Information on social media is not always good news. Improvement of firm value is not only dependent on the use of social media but also on the firm's brand that has been represented in the media. Public sentiment can also determine the firm value.

*H3: Positive sentiment on social media increase firm value.*

### 3. Research Design

#### 3.1. Research Sample

The research sample consists of oil and gas firms listed on the Indonesian Stock Exchange 2013–2018. There are 9 oil and gas firms as in Table 1.

**Table 1:** Research Sample

Firms	Stock Code
Apexindo Pratama Duta	APEX
Benakat Integra	BIPI
Elnusa	ELSA
Energi Mega Persada	ENRG
Medco Energi International	MEDC
Perdana Karya Perkasa	PKPK
Radiant Utama Interinsco	RUIS
Ratu Prabu Energi	ARTI
Surya Esa Perkasa	ESSA

### 3.2. Variables

Research variables consist of the dependent variable, independent variable, and control variables. The dependent variable is firm value. Firm value is measured by the market value to assets ratio. The market value to assets ratio is calculated by the market value of equity divided by total assets.

The Independent variable is the use of social media. Social media proxies are firms' social media, other social media mentions, and social media sentiment. Firms' social media is measured by the number of social media accounts/types the firm has (Uyar et al., 2018). This research uses six types of popular social media platforms used in Indonesia which are Facebook, Youtube, Pinterest, Twitter, Instagram, and Tumblr (StatCounter, 2020). Other social media mention is measured by the number of other social media accounts/types that mention the firms. Social media sentiment is measured by the number of positive mentions. Other social media mention and social media sentiment data come from <https://www.social-searcher.com>.

Control variables are negative sentiment on social media, oil price, firm size, leverage, and profitability. Negative sentiment controls the negative effect of social media. Negative sentiment is measured by the number of negative mentions. Oil price controls the condition of the oil and gas industry. Oil price is measured by Indonesian oil price per barrel at the end of the year. Firm size, leverage, and profitability control the triangle relationship that determines the firm value (Muzir, 2011). Firm size is measured by the logarithm of total assets. Leverage is measured by the debt to assets ratio. Profitability is measured by return on assets (ROA).

### 3.3. Data Analysis

Data analysis uses a random-effect regression test. Since the number of social media used by the firm does not easily change each year, the fixed-effect regression test will

be irrelevant. This research also performs common-effect regression analysis as a robustness test. The regression model can be seen in equation 1.

$$\begin{aligned} \text{VALUE} = & \alpha + b1 \text{SOCMED} + b2 \text{MENTION} \\ & + b3 \text{POSITIVE}_{\text{SENTIMENT}} \\ & + b4 \text{NEGATIVE}_{\text{SENTIMENT}} \\ & + b5 \text{PRICE} + b6 \text{SIZE} + b7 \text{ROA} + e \end{aligned} \quad (2)$$

Where VALUE is the value of the firm, SOCMED is the number of social media accounts/types the firm has, MENTION is the number of other social media types that mention the firm, POSITIVE<sub>SENTIMENT</sub> is the number of social media mention that has positive sentiment, NEGATIVE<sub>SENTIMENT</sub> is the number of social media mention that has negative sentiment, PRICE is the oil price, SIZE is firm size, DAR is debt to assets ratio, and ROA is the return on assets. Hypotheses are accepted if coefficients of b1-b3 are positive and significant.

## 4. Results

### 4.1. Descriptive Statistics

Table 2 shows that the highest firm value (VALUE) is 1.89 while the lowest is 0.05. The average value of the firm value is 0.38 with its deviation of 0.40. The highest number of social media (SOCMED) accounts/types a firm has 5 while the lowest number is 1. The average value of the number of social media accounts/types a firm has is 2.78 with its deviation of 1.33. The highest number of other social media accounts/types that mention the firm (MENTION) is 4 while the lowest number is 0. The average value of the number of other social media accounts/types that mention the firm is 1.04 with its deviation of 0.91. The highest number of mentions with a positive sentiment (POSITIVE<sub>SENTIMENT</sub>) is 62 while the lowest number is 0. The average value of the number of mentions with positive sentiment is 1.48 with its deviation of 8.45.

### 4.2. Random-Effect Regression Testing

Table 3 shows that 'the number of firms' social media accounts/types (SOCMED)' has a coefficient value of 0.512899 with *t*-statistics of 1.545339 (significant at 0.05). It indicates that H1, which is, the number of social media accounts/types of a firm has a positive effect on firm value, is accepted. Social media role can be seen from the number of firms' social media accounts/types. A higher number of social media accounts allow oil and gas firms to make industry alliances and collaboration, reach a global audience, recruit global employees, and increase knowledge of the oil and gas industry. Further, it will increase oil and gas firm value.

**Table 2:** Descriptive Statistics

	VALUE	SOCMED	MENTION	POSITIVE <sub>SENTIMENT</sub>	NEGATIVE <sub>SENTIMENT</sub>	PRICE	SIZE	DAR	ROA
Mean	0.38	2.78	1.04	1.48	0.13	67.90	12.68	0.63	-0.01
Median	0.20	3.00	1.00	0.00	0.00	57.86	12.81	0.62	0.02
Maximum	1.89	5.00	4.00	62.00	3.00	105.85	13.88	1.29	0.11
Minimum	0.05	1.00	0.00	0.00	0.00	40.13	11.11	0.24	-0.42
Std. Dev.	0.40	1.33	0.91	8.45	0.48	24.72	0.71	0.23	0.10

**Table 3:** Random-Effect Regression Testing

Variable	Coefficient	t-Statistic
SOCMED	0.512899	1.545339**
MENTION	0.186944	2.463521**
POSITIVE <sub>SENTIMENT</sub>	-0.004185	-0.606553
NEGATIVE <sub>SENTIMENT</sub>	-0.309029	-2.591825**
PRICE	0.00389	1.651652
SIZE	-0.92463	-3.025732*
DAR	-2.185201	-3.592532*
ROA	-1.307476	-1.629579
Constant	9.89336	
R-squared	0.560875	
F-statistic	7.184576*	

Note: \*significant in 0.01, \*\*significant in 0.05

The ‘number of other social media accounts/types that mention the firm (*MENTION*)’ has a coefficient value of 0.186944 with *t*-statistics of 2.463521 (significant at 0.05). It indicates that H2, which is, the number of other social media accounts/types that mention the firms has a positive effect on firm value, is accepted. Other social media account also contribute to the firm being noticed by the social media audience. By using the e-WOM (worth of mouth) concept, social media increase firms’ brand image not only through the firms’ own social media accounts but also other social media accounts.

The ‘number of positive mentions’ (POSITIVE<sub>SENTIMENT</sub>) has a coefficient value of -0.004185 with *t*-statistics of -0.606553 (insignificant). It indicates that H3, which is, positive sentiment on social media increase firm value, is rejected. It shows that good news from social media does not always increase firm value. In contrast, negative sentiment has more effect on firm value (with *t*-statistics that is significant at 0.05). Social media audience responses more to bad news than to good news

**Table 4:** Classical Assumption Testing

Test	Result	Notes
Jarque-Bera (before transformation)	sig. = 0.0000	Data is not distributed normally
Jarque-Bera (after transformation)	sig. = 0.3326	Data is distributed normally
White	sig. = 0.3826	Free of heteroskedasticity problem
Breusch-Godfrey Serial Correlation LM Test	sig. = 0.5090	Free of autocorrelation problem
Variance Inflation Factors	VIF < 10	Free of multicollinearity problems

### 4.3. Common-Effect Regression Testing

As a robustness test, this research performs common-effect regression to ensure that the main result is consistent if the analysis is done by another test. Since the common-effect regression test needs classical assumption fulfillment, this research also performs normality, heteroskedasticity, autocorrelation, and multicollinearity tests. Classical assumption results can be seen in Table 4.

Table 4 shows that the significance value of Jarque-Bera (before transformation) is 0.0000 (significant at 0.01). It indicates that data is not distributed normally. To solve the normality problem, this research transforms the firm value variable into a natural logarithm value of market value to assets ratio. After transformation, the significance value of Jarque-Bera is 0.3326 (insignificant). It indicates that data is distributed normally. The significance value of White is 0.3826 (insignificant). It indicates that this research is free of heteroskedasticity problem. The significance value of Breusch-Godfrey Serial Correlation is 0.5090 (insignificant).

**Table 5:** Common-Effect Regression Testing

Variable	Coefficient	t-Statistic
SOCMED	0.330347	3.130341*
MENTION	0.255487	1.954422***
POSITIVE <sub>SENTIMENT</sub>	-0.003836	-0.318407
NEGATIVE <sub>SENTIMENT</sub>	-0.337823	-1.621025**
PRICE	0.006539	1.559462
SIZE	-0.439207	-2.228793**
DAR	0.232176	0.419887
ROA	-0.642244	-0.506616
Constant	2.484166	
R-squared	0.323574	
F-statistic	4.169125*	

Note: \*significant in 0.01, \*\*significant in 0.05, \*\*\*significant in 0.10

It indicates that this research is free of autocorrelation problem. The value of variance inflation factor (VIF) for all independent variables is below 10. It indicates that this research is free of multicollinearity problems.

Since all classical assumptions are fulfilled, a common-effect regression test can be performed. Results of the common-effect regression test can be seen in Table 5.

Table 5 shows that the number of firms' social media accounts/types (SOCMED) has a coefficient value of 0.330347 with *t*-statistics of 3.130341 (significant at 0.01). The number of firms' social media accounts/types has a positive effect on firm value. The number of other social media accounts/types that mention the firm (MENTION) has a coefficient value of 0.255487 with *t*-statistics of 1.954422 (significant at 0.10). The number of other social media accounts/types that mention the firm has a positive effect on firm value. The number of positive mentions (POSITIVE<sub>SENTIMENT</sub>) has a coefficient value of -0.003836 with *t*-statistics of -0.318407 (insignificant). Positive sentiment on social media has no effect on firm value. The result of the common-effect regression test is consistent with the main result.

## 5. Conclusion

This research aims to examine the effect of social media on oil and gas firms' value. Based on the analysis, the number of firms' social media accounts/types and other social media accounts/types that mention the firms have a positive effect on oil and gas firms' value. It indicates that social media give advantages for oil and gas firms to give a signal of business prospect, make use of opportunities related to industry alliances, recruit employees globally, and do learnings education of oil and gas industry.

On the other hand, the positive sentiment on social media has no effect on oil and gas firms' value. The role of social media can be examined deeply by future research since social media affect businesses of all sizes in several different ways.

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